



## DOCTOR OF CLINICAL PSYCHOLOGY (DCLINPSY)

**Research Portfolio Submitted in Part Fulfilment of the requirements for the Degree of Doctorate in Clinical Psychology**

**Alternative Format Thesis 1) Persuasive systems design features of smartphone applications for psychosis: a systematic review; 2) Psychological wellbeing for patients and families following an Intensive Care Unit (ICU) Admission at the Royal United Hospitals, Bath; 3) How do users of a mental health app conceptualise digital therapeutic alliance? A qualitative study using the Framework Approach.**

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*Award date:*  
2024

*Awarding institution:*  
University of Bath

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# Research Portfolio Submitted in Part Fulfilment of the requirements for the Degree of Doctorate in Clinical Psychology

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Systematic review: Persuasive systems design features of smartphone applications for psychosis: a systematic review

Main research project: How do users of a mental health app conceptualise digital therapeutic alliance? A qualitative study using the Framework Approach

Service-related project: Psychological wellbeing for patients and families following an Intensive Care Unit (ICU) Admission at the Royal United Hospitals, Bath

Volume 1

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Doctorate in Clinical Psychology

University of Bath

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May 2024

### **Declaration of any previous submission of the work**

The material presented here for examination for the award of a higher degree by research **has not** been incorporated into a submission for another degree. (If applicable, provide the relevant details i.e. those parts of the work which have previously been submitted for a degree, the University to which they were submitted and the degree, if any, awarded).

Candidate's signature.....Theresa Taylor.....

### **Declaration of authorship**

I am the author of this portfolio, and the work described therein was carried out by myself personally with the support from my supervisor. This is except for in the systematic review, in which second reviewer work was done by my collaborators. I also worked with collaborators on my main researcher project, however, I led on all parts of the project. Please see the authorship statement on the project for further details.

Candidate's signature.....Theresa Taylor.....

**Word counts**

<b>Systematic Review</b>	<b>6630</b>
Persuasive systems design features of smartphone applications for psychosis: a systematic review	
<b>Service-Related Project</b>	<b>6462</b>
Psychological wellbeing for patients and families following an Intensive Care Unit (ICU) Admission at the Royal United Hospitals, Bath	
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How do users of a mental health app conceptualise digital therapeutic alliance? A qualitative study using the Framework Approach	
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## Abstracts

### **Systematic review: Persuasive systems design features of smartphone applications for psychosis: a systematic review**

*Background:* It is unclear why some smartphone applications designed for people with psychosis are successful in engaging users, while others are not. One possible explanation is the differing choices app development teams make in selecting persuasive strategies, and the operationalization and implementation of these strategies can vary.

*Objective:* This systematic review set out to quantify and describe the persuasive features being used in smartphone applications for psychosis, investigate whether there was any association between persuasive features and attrition or adherence rates and document the quality of the included apps.

*Methods:* We searched electronic databases PsycINFO, Pubmed and Google Scholar for eligible papers published between the years of 2013 and 2023. Hand searches of reference lists were completed. Apps were selected if they were designed for people with psychosis and had published experimental studies. Two reviewers independently screened papers and extracted data on adherence and attrition, as well as coded papers for evidence of persuasive features according to the Persuasive Systems Design model. Available data was synthesized descriptively and narratively. We attempted to access apps via app stores, or by correspondence with the research team.

*Results:* We found 22 apps for psychosis, with 30 associated published papers. The most common persuasive features were personalisation, reminders, suggestion, tunnelling, and self-monitoring. Features in the categories of primary task support and dialogue support were well represented, while social support and system credibility support were underutilised in the apps assessed. It was found that there was no association between number of persuasive features and attrition; and association between persuasive features and adherence could not be

assessed. The quality of the apps could not be judged due to 20 of the 22 apps being inaccessible either through the paper authors or through app stores.

*Conclusions:* Our findings indicate that in psychosis apps there is potential to include a broader range of persuasive features which might maximise engagement. Psychosis apps may benefit from incorporating more features which leverage the persuasive impact of having users interact (social support) and incorporating features that emphasize system credibility and trustworthiness. It is not clear whether an increase in number of persuasive features has any impact on app engagement, and further empirical work is required to determine which features are most impactful in this context.

**Service-related project: Psychological wellbeing for patients and families following an Intensive Care Unit (ICU) Admission at the Royal United Hospitals, Bath**

*Objectives:* To investigate the levels of mental illness in patients/families post discharge from the Bath RUH ICU, the evidence-based supports patients/families had been offered during admission, and patient/family suggestions to improve support of psychological wellbeing during admission.

*Design:* Mixed methods, retrospective surveys

*Setting:* Two 12 bed ICUs in a 700-bed hospital in England.

*Main outcome measures:* Generalised Anxiety Disorder 7 (GAD-7), Patient Health Questionnaire 9 (PHQ-9), Trauma Screening Questionnaire (TSQ)

*Findings:* Thirty-six (36) former Bath RUH ICU patients and 29 family members returned the survey questionnaires. A third of patients and family members were indicated to have at least one mental health condition at the time of the survey. Completing an ICU diary, providing information on the mental health impacts of an ICU stay and providing direct mental health support to patients and families had reportedly not been done with a significant majority of

patients and families surveyed. Three themes regarding what supports well-being during an ICU admission for patients and family were produced from qualitative feedback: the importance of communication from staff on both physical and mental health aspects of ICU admission, the ability of staff kindness, attentiveness, and competence to impact both patient and family well-being and how Covid-19's impact on human interaction reduced well-being.

*Conclusions:* The rates of indicated patient and family mental illness following ICU discharge in this study are comparable to those found in the literature. This study highlights challenges in implementing evidence-based supports for psychological wellbeing in a district general hospital.

**Main research project: How do users of a mental health app conceptualise digital therapeutic alliance? A qualitative study using the Framework Approach**

*Background:* Fully automated mental health apps have the potential to increase access to evidence-based psychological interventions and reduce burden on staff resources in overburdened mental health services. Within human-to-human therapy the working relationship (therapeutic alliance) between the client and therapist is well studied and has been consistently linked to effective and engaging therapy. However, less is known about whether a digital therapeutic alliance exists, what its components may be and how it can be fostered to improve engagement and adherence to digital interventions. This study explored the experiences of users of a mental health app to better understand digital therapeutic alliance and how persuasive systems design may be able to help us understand which features of app design influence this.

*Methods:* We conducted a qualitative study using semi-structured interviews with 13 participants who had recent experience of using a mental health app. Data were analysed using framework analysis with therapeutic alliance and persuasive systems design as deductive theoretical frameworks.



*Results:* We constructed five dimensions of digital therapeutic alliance: 1) Humanness of the app 2) Personal meaningfulness 3) Progression towards goals 4) How I use the app and 5) Flexibility enhances relationship. Themes 1-4 are digital analogues of the existing dimensions of therapeutic alliance and theme 5 (Flexibility enhances relationship) provides the context within which a digital therapeutic alliance forms. Persuasive systems design features were found to reinforce and enhance aspects of digital therapeutic alliance.

*Conclusions:* This study provides valuable insight into the existence of digital therapeutic relationships (alliance) and its dimensions. From our findings, there are indicators that digital therapeutic alliance is a digital analogue of therapeutic alliance and is enhanced by persuasive features of the app. Findings from this study could be used to inform the design of digital interventions to enhance their capacity to foster digital therapeutic alliance with users.

## Systematic Review

### **Persuasive systems design features of smartphone applications for psychosis: a systematic review**

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**Word Count:** 6630 (excluding the abstract, tables, figures, references, and appendices)

**Date of Report:** May 2024

**Internal Supervisor:** Dr Pamela Jacobsen

This paper will be submitted to the Journal of Medical Internet Research. The guidance on journal formatting requirements is here: <https://www.jmir.org/author-information/instructions-for-authors>. This journal was chosen as it is an open-access, peer-reviewed journal, and this project meets the aims and scope of the journal. This journal has no set word count criteria.

**Data Access Statement:** The extracted data from the relevant papers will be uploaded to the University of Bath Research Data Archive

**Authorship Statement:** I am the author of this thesis, and the work described therein was carried out by myself personally under supervision from Pamela Jacobsen. The tasks not carried out by myself was the second reviewing of apps for inclusion in the review, and repetition of data extraction, which was done by my coauthors.

## Introduction

There is a well-recognised global gap between the need for and of provision of services to prevent, identify and treatment mental health conditions (Keynejad et al., 2021). People who experience psychosis are amongst those with the highest need for support (Ben-Zeev et al., 2019), thus, interest and research into digital treatments for this condition has grown over the last decade. A recent meta-analysis of Randomised Controlled Trials (RCTs) assessing apps designed for symptom reduction in patients with schizophrenia found statistically significant symptom reduction across positive (SMD = -0.205, 95% CI: -0.388 to -0.022) and negative symptoms (SMD = -0.406, 95% CI: -0.791 to -0.020) (Kim et al., 2022). However, adherence to smartphone applications for mental health is notoriously low in both trial and real-world conditions. For example, a systematic review of 93 popular publicly available mental health and well-being apps found that only 3.3% (IQR 6.2%) of users were still accessing the app after 30 days (Baumel et al., 2019) Specifically relating to mental health apps, a meta-analysis of 70 RCTs found that adherence consistently declined with time (Linardon & Fuller-Tyszkiewicz, 2020). One potential contributor to disengagement is insufficient attention being paid to system design and how this impacts users' experience of apps (Balcombe & De Leo, 2022). Increasing researcher and app designer understanding of the role the technology is playing in digital interventions has potential to shift these patterns of user disengagement (Gega et al., 2022).

One area of system design research that can be applied to app development is Persuasive Systems Design (PSD). Persuasive systems design is defined as the use of computer-mediated products which aim to influence or change people's cognition and behaviours (Fogg, 2002). A framework has been developed which transforms persuasive principles into software requirements and system features — namely primary task support, dialogue support, system credibility support, and social support (Oinas-Kukkonen & Harjumaa, 2009a). For example, a simple app feature such as praising a user after they complete a

session, is a system feature of the persuasive systems design principle dialogue support, which pertains to the feedback an interactive system provides to its users to help them move toward their goal.

It has been hypothesized that persuasive features will increase alliance, adherence, and engagement, in turn leading to better treatment outcomes. Kelders et al. (2012) conducted a systematic review of web-based health interventions and found persuasive features accounted for a significant difference in adherence scores. However, more recent research on apps has produced mixed results. A review of 70 apps for health and wellness available to the public found a positive correlation between apps' ranks of popularity (based on ratings and installation) and the app's persuasive features (Alslaity et al., 2022). In contrast, Alqahtani et al. (2019) found no link between the number of persuasive features of 103 mental health apps and efficacy or engagement. Interestingly, a recent meta-analysis looking at efficacy, engagement, and persuasive design in smartphone applications for depression and anxiety found persuasive features were linked to increased effect sizes, however, an increased number of persuasive features was also linked to an increase in attrition (Wu et al., 2021). Thus, the relationship between persuasive design, efficacy and engagement is multifaceted and opaque. It may be that in some cases and for some client groups, persuasive design or overapplication of persuasive design has the opposite to intended impact, causing users to disengage. This requires further investigation.

There is evidence that motivation type (Alqahtani et al., 2019) and psychological and demographic characteristics (McGowan et al., 2022) impact mHealth users' proclivity to persuasive design, meaning the characteristics of the user may be relevant to understanding how they relate to an app's features. People with psychosis may have unique needs. For example, a review on the implementation of digital interventions with people with psychosis and bipolar found that this client group may have cognitive impairment that makes engaging with

complex interventions challenging (Aref-Adib et al., 2019). A related difficulty for people with serious mental illness is difficulties in social functioning (Couture, 2006; Fett et al., 2011). Furthermore, in human-to-human psychosis interventions, the quality of the therapeutic alliance has been found to be associated with treatment outcome, thus the quality of this client group's interaction with the therapeutic agent (app) may be paramount to the intervention's success (Goldsmith et al., 2015). Thus, understanding how apps are being designed for people with psychosis, and the links between system design and app adherence could provide important information for improving these interventions going forward.

Thus, there is a gap in the literature for a review that looks in a granular manner at persuasive features within mobile applications designed for people with psychosis. This review aimed to answer the following questions: 1) What persuasive systems design features do apps aimed at people with psychosis have? 2) Which persuasive systems design features of smartphone applications aimed at people with psychosis are associated with app adherence and attrition rates? 3) What is the quality of apps aimed at people with psychosis?

## **Methods**

This study's protocol was pre-registered on the Open Science Framework (Ref: <https://doi.org/10.17605/OSF.IO/F6MZ4>). The electronic databases searched were: PsycINFO, Pubmed and Google Scholar. Due to the fast-evolving nature of technology, database searches were limited from the year 2013 onwards and searched in November 2023. Query strings were (smartphone\* or "mobile phone" or "cell phone") AND ("app" or "apps" or "application" or "applications") AND ("schizophrenia" or "schizo" or "psychosis" or "psychotic"). To identify articles not found in the original searches, we reviewed the reference lists of included papers for relevant apps. The authors also used prior knowledge of apps to identify additional inclusions and linked these with their associated papers. Where papers could not be accessed, study authors were contacted.

## Study eligibility and screening

The 'unit of interest' in this review were the smartphone applications themselves, as we were aware that multiple papers may be published relating to different aspects of the same app (e.g. pilot studies, clinical trials, qualitative papers). We linked together multiple papers where they related to the same app. Inclusion criteria for eligible apps were:

- i) The app has associated with it a minimum of one peer reviewed journal article reporting empirical data.
- ii) The app is aimed at people with psychosis.
- iii) The study sample has been confirmed to have psychosis via a prior diagnosis, psychometric measures of symptoms clinically relevant to psychosis or clinical interview.
- iv) App features were sufficiently described in the associated publications, provided by the authors upon request, or the intervention was accessible to the review team.

Exclusion criteria were:

- i) The app targets medication adherence, another condition (e.g. cannabis addiction, smoking or diabetes) or is aimed at supplying the user information (e.g. on their legal rights).
- ii) App is aimed at monitoring or accessing treatment records only.
- iii) Other digital interventions for example computer-based interventions, text, email, online counselling, videoconferencing.
- iv) Apps that require other digital devices (e.g. virtual reality (VR) headsets).
- v) Apps targeting family of people with psychosis or the care team.

Covidence was used for all stages of review, including screening and data extraction. After duplicate records were excluded, two reviewers (TT, DK, SD, JP) independently screened each paper at both title/abstract and full-text review. All screeners completed training and a consensus check on a small selection of papers to ensure consistency between screeners. Initial agreement between screeners was 81% at title and abstract review and 70% at full text review. Where there conflicting decisions between screeners, consensus was reached by discussion and with input from the senior author (PJ) when needed.

### **Data extraction**

Relevant data from included studies were extracted in duplicate independently by two reviewers (TT and JP, DK or SD) using a predetermined data collection tool. Prior to extraction reviewers piloted the tool and discussed discrepancies. During extraction regular meetings allowed discussion of and resolution of discrepancies. The review team extracted information on the apps including the intervention name, a brief description of the app, treatment target, where the app was automated or blended, intended frequency of intervention and intended duration of intervention. Persuasive features were documented and compared to the persuasive systems design model from Oinas-Kukkonen and Harjumaa (2009a) which outlines 28 persuasive features under 4 categories.

For the most recent empirical paper on the app information describing the study was extracted (study design, location, sample size, participant mean age and diagnoses, attrition during trial and available adherence data. A final set of all extracted data included in the review will be deposited open access in the University of Bath Research Data Archive and the Open Science Framework. Missing data was reported in the write up.

### **Quality assessment**

The reviewers had planned to assess the quality of the apps using the Mobile Application Rating Scale (Stoyanov et al., 2015) – a quality assessment tool for health apps with published psychometrics (Terhorst et al., 2020). Attempts to access the included apps were made by searching the Apple and Android app stores and contacting corresponding authors to request access to the applications. However, only 2 of the 22 included apps could be accessed, thus assessing app quality could not be done meaningfully and this was not completed.

### Results

The search identified 412 studies including 103 duplicates. A total of 309 titles and abstracts were reviewed and 263 were excluded. The full texts of the 45 studies that could be accessed were assessed for eligibility, with 22 being included. Hand searching resulted in 25 articles which were full text screened with 18 being excluded. At the end of the screening process, 30 qualifying papers had been identified, collectively reporting on 22 apps. Twenty-three papers were outcome studies, 3 qualitative papers, 3 protocols and 1 thesis manuscript. The search and screening process are summarized in the PRISMA diagram (Figure 1). All corresponding authors were contacted to request access to the app in order that features could be more fully explored. App names, treatment targets and whether they functioned in an automated (the app is a standalone intervention) or blended (the app is used alongside a human-to-human intervention) are detailed in Table 1. More information on the apps, associated outcome study characteristics, and attrition and adherence rates are provided in Appendix A.

**Table 1**

*App names, treatment target and automated or blended intervention*

App name	Treatment target	Automated or blended
A4i (Kidd et al., 2021; and Kidd et al., 2019)	Medication adherence, personal recovery, and psychiatric symptomatology	Automated
Actissist (Bucci et al., 2018)	CBT informed early psychosis intervention	Automated



App name	Treatment target	Automated or blended
Chilltime (Pennou et al., 2023)	Emotional regulation in dual diagnosis psychosis and substance use disorder	Automated
CBT2go (Granholm et al., 2020)	CBT for negative symptoms. Aims to reduce severity of defeatist performance attitudes	Blended (Group therapy + app)
Connect+ (Lim et al., 2020)	Loneliness	Automated
Focus (Achtyes et al., 2019; Ben-Zeev et al., 2014)	Sleep, mood, social, meds and voices	Automated
Focus-AV (Ben-Zeev et al., 2018)	Sleep, mood, social functioning, medications adherence and voices	Automated
Grasp (Sedgwick et al., 2021)	Social cognition and social functioning	Blended (Group therapy + app)
IMPACHS (Austin et al., 2020; von Malachowski et al., 2022)	Reducing psychotic and depressive symptom severity	Blended
MASS (Fulford et al., 2021)	Social skills training	Automated
Moneo (Krzystanek et al., 2019, 2020)	Cognitive training/cognitive rehabilitation	Automated
My Journey (Stearé et al., 2020, 2021)	Develop self-management skills, achieve self-determined recovery goals and avoid future relapses	Blended
MCI-S (Han et al., 2023)	Metacognitive beliefs, psychotic symptoms, and social functioning	Automated and blended versions
PEAR004 (Nassir Ghaemi et al., 2022)	Positive and negative symptoms of schizophrenia	Automated

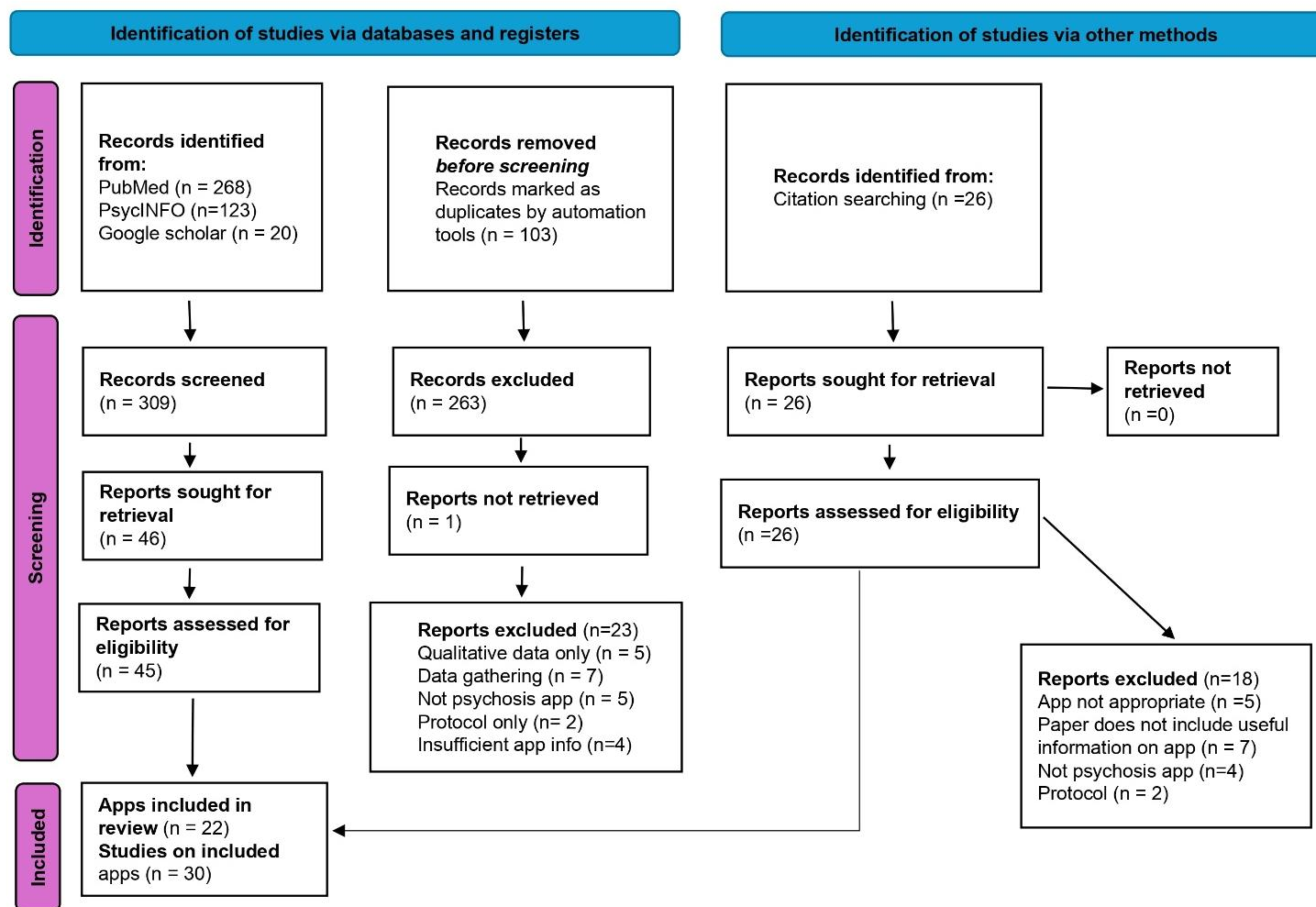
App name	Treatment target	Automated or blended
PRIME (Fisher et al., 2023)	Motivation, cognition, and negative symptoms	Blended (app + coaches)
Savvy (Bell et al., 2018, 2020)	Voice hearing	Blended
Sleep app (Taylor et al., 2022)	Sleep	Blended
SlowMo (Garety et al., 2021; Garety et al., 2017)	Paranoia	Blended
SMART app (Hanssen et al., 2020)	Improve social functioning and psychiatric symptoms	Automated
TechCare (Gire et al., 2021; Husain et al., 2016)	Positive and negative symptoms of schizophrenia	Automated
TemStem (Jongeneel et al., 2022)	Voice hearing, emotionality, and vividness	Automated
WeCOPE (de Almeida et al., 2018)	Improvement in schizophrenia symptoms and personal and social functioning.	Automated

### Research question 1: Persuasive System Design Elements

Figure 2 depicts which persuasive systems design features are most represented in psychosis intervention studies, those that were occasionally mentioned, and those that were not identifiable, either by examining the apps directly or via the articles associated with them. The visualisation aims to provide more insights about the highlights, gaps and blank spots in current

mobile application persuasive design features on psychosis. Twenty-one categories of persuasive features were found across the 22 apps (Figure 2). The most coded areas of persuasive features were Primary Task Support and Dialogue Support, with Social Support and System Credibility Support being coded significantly less frequently. The maximum number of persuasive systems design elements in an app was 11, while the least was 2.

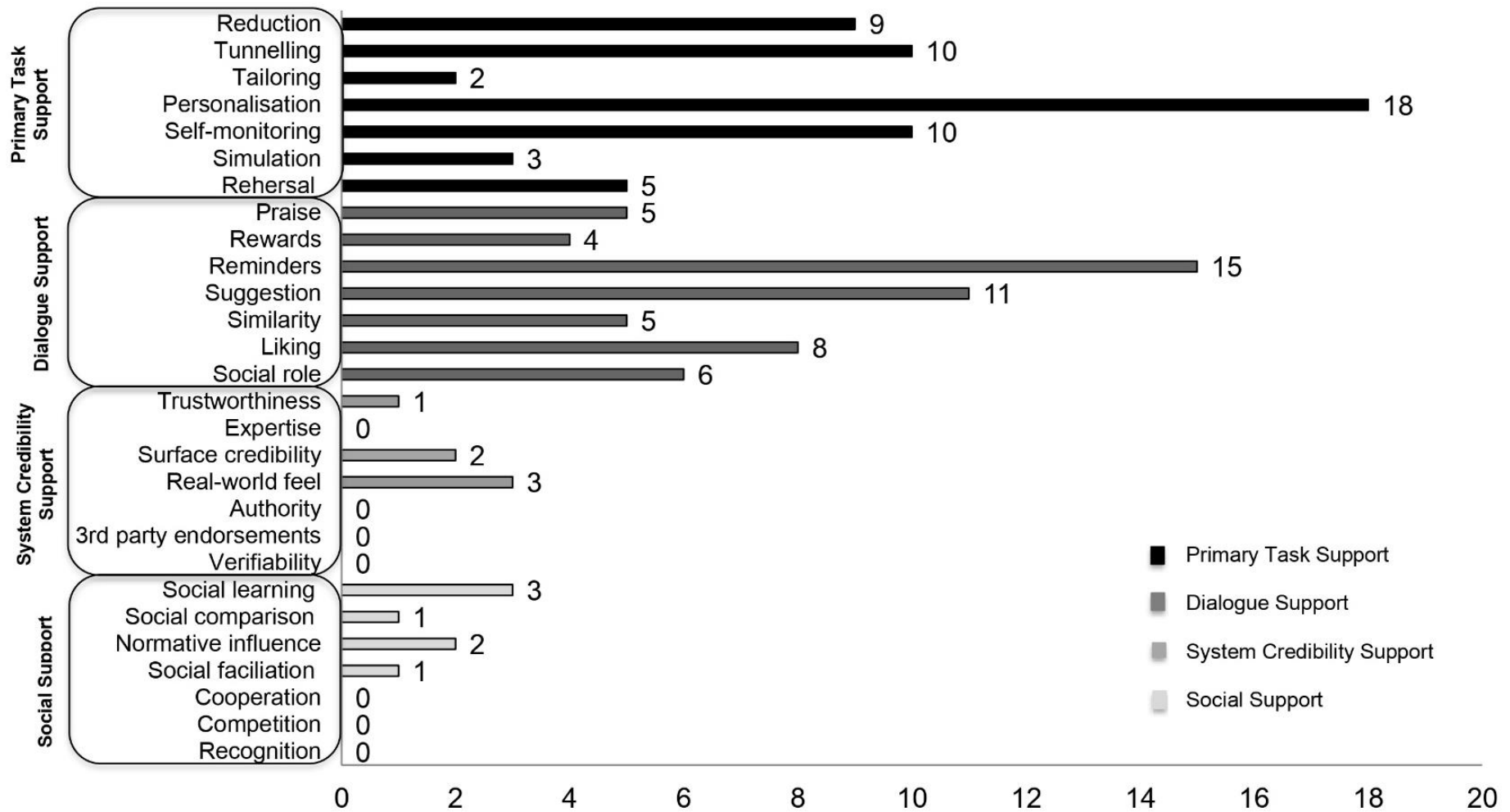
**Figure 1**  
*Prisma diagram of study selection and screening process*



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

**Figure 2**

*Persuasive Systems Design features in the psychosis apps reviewed*



**Primary Task Support**

The primary task support category includes features that support the user to carry out their primary tasks in the app (Oinas-Kukkonen & Harjumaa, 2009a).

**Personalisation.**

Personalisation was the most widely represented primary task support feature in the apps reviewed (referenced in 18 of 22 apps) (Achtyses et al., 2019; Bell et al., 2020; Ben-Zeev et al., 2018; Bucci et al., 2018; de Almeida et al., 2018; Fisher et al., 2023; Fulford et al., 2021; Garety et al., 2021; Gire et al., 2021; Granholm et al., 2020; Hanssen et al., 2020; Jongeneel et al., 2022; Kidd et al., 2019; Ghaemi et al., 2022; Pennou et al., 2023; Steare et al., 2020; Taylor et al., 2022; von Malachowski et al., 2022). Personalisation is when the app notes the user's inputs and adjusts its content based on these. Applications of personalisation included personalised goals (de Almeida et al., 2018; Fisher et al., 2023; Steare et al., 2020) with some apps providing personalised steps towards that goal (Fulford et al., 2021; Granholm et al., 2020; Kidd et al., 2019). Another key category was personalised encouragement (Granholm et al., 2020; Jongeneel et al., 2022; Taylor et al., 2022), for example in the TemStem app if the user assessed themselves as feeling "powerless" an avatar would give them personalized support such as: 'You are strong!' (Jongeneel et al., 2022). A personalisation strategy operationalised in the SlowMo app was using the person's name (Garety et al., 2021). Multiple apps allowed users to personalise a toolbox of skills (Kidd et al., 2019; Ghaemi et al., 2022; von Malachowski et al., 2022) or used ecological momentary assessment to gather information on the user's thoughts, feelings, or behaviours, and then suggested personalized coping strategies (Achtyses et al., 2019; Bell et al., 2020; Bucci et al., 2018; Gire et al., 2021; Hanssen et al., 2020). The ChillTime app allowed users to feedback on the personalised coping strategies offered and used artificial intelligence to improve future suggestions (Pennou et al., 2023). Some apps provided multiple ways to interact with content, such as video or audio (Ben-Zeev et al., 2018; Pennou et al.,

2023; von Malachowski et al., 2022), while the WeCOPE app allowed the user to choose either a male or female voice in audio recordings (de Almeida et al., 2018). Other examples of personalization included customising the app's looks (Bucci et al., 2018), the app triggering a personalised crisis plan (Gire et al., 2021) and multiple apps allowed users to personalise notification frequency (Achtyses et al., 2019; Granholm et al., 2020; Ghaemi et al., 2022; Steare et al., 2020). Hornstein et al. (2023) proposes that there are four levels of personalisation (intervention content, content order, level of guidance or communication) and an underlying mechanism (user choice, provider choice, decision rules, and machine-learning based approaches). Most of the personalisation in the apps reviewed happened at the level of intervention content with the underlying mechanism being user choice or decision rules.

### **Tunnelling.**

Tunnelling was present in 10 of the reviewed apps (Bucci et al., 2018; Fisher et al., 2023; Fulford et al., 2021; Granholm et al., 2020; Han et al., 2023; Jongeneel et al., 2022; Kidd et al., 2019; Lim et al., 2020; Sedgwick et al., 2021; von Malachowski et al., 2022). Tunnelling means the app's content changes progressively as the user engages more with the app, providing various opportunities for the user to be persuaded to make behavioural changes. Tunnelling strategies observed included content that changed in a stepwise fashion towards goals (Fisher et al., 2023; Fulford et al., 2021; Granholm et al., 2020; Han et al., 2023; Kidd et al., 2019) and modules that progressively became more difficult (Fisher et al., 2023; Jongeneel et al., 2022). For example, the Connect+ app had sequential modules with a challenge between each module (Lim et al., 2020).

### **Self-Monitoring.**

The self-monitoring allows users to keep track of their symptoms or progress towards goal achievement and was present in 10 apps (Bell et al., 2020; Bucci et al., 2018; Fisher et al., 2023; Fulford et al., 2021; Granholm et al., 2020; Jongeneel et al., 2022; Kidd et al., 2019; Lim

et al., 2020; Steare et al., 2020; von Malachowski et al., 2022). A cycle of data capture and feedback can be a powerful tool in effectively persuading the user to modify their behaviour. Apps allowed users to access graphs of their information for self-monitoring purposes (Bucci et al., 2018; Fisher et al., 2023; Jongeneel et al., 2022; Kidd et al., 2019; Steare et al., 2020; von Malachowski et al., 2022). The IMPACHS app connected the user's self-monitoring with customizable action-plans (von Malachowski et al., 2022).

### **Reduction.**

The persuasive feature reduction reduces complex behaviour into simple tasks was present in 9 apps (Ben-Zeev et al., 2018; de Almeida et al., 2018; Fulford et al., 2021; Jongeneel et al., 2022; Lim et al., 2020; Pennou et al., 2023; Sedgwick et al., 2021; Taylor et al., 2022; von Malachowski et al., 2022). Strategies included using simplified language (Pennou et al., 2023; von Malachowski et al., 2022), standardization of content across the app to build familiarity (Pennou et al., 2023), breaking tasks down into components (Fulford et al., 2021; Sedgwick et al., 2021; von Malachowski et al., 2022) and ensuring app tasks were quick to do (Lim et al., 2020; Pennou et al., 2023; Taylor et al., 2022).

### **Simulation.**

Simulation is a feature which allows the user to observe the link between cause and effect, for example between increased physical activity and weight loss. This feature was present in 3 apps; in all three examples an actor demonstrated a skill and how this skill contributed to the attainment of the user goal (Ben-Zeev et al., 2018; Fulford et al., 2021; Lim et al., 2020).

### **Rehearsal.**

Rehearsal provides a way for user to rehearse a behaviour in the app that they then use in daily life and was present in 6 apps (Achtyses et al., 2019; Bell et al., 2020; Ben-Zeev et al., 2018; Garety et al., 2021; Granholm et al., 2020; Sedgwick et al., 2021).

### **Tailoring.**

Tailoring means there are different user groups that are shown different versions of the app, and this was a feature in 2 of the reviewed apps (Fulford et al., 2021; Taylor et al., 2022).



**Dialogue Support.**

Dialogue support incorporates the features a system uses to increase interactivity between the app and the user.

**Reminders.**

Reminders are notifications which remind the user of their target behaviour and these reminders were the most widely used dialogue support feature (present in 15 of 22 apps) (Bell et al., 2020; Bucci et al., 2018; Fulford et al., 2021; Garety et al., 2021; Gire et al., 2021; Granholm et al., 2020; Hanssen et al., 2020; Kidd et al., 2019; Krzystanek et al., 2020; Lim et al., 2020; Ghaemi et al., 2022; Pennou et al., 2023; Sedgwick et al., 2021; Steare et al., 2020; Taylor et al., 2022). The primary reason for sending notifications or reminders was to prompt accessing the app. Additional to this reminders were sent to encourage users to take medication (Hanssen et al., 2020; Kidd et al., 2019; Krzystanek et al., 2020; Steare et al., 2020), to prompt symptom assessment (Gire et al., 2021; Hanssen et al., 2020), to remind of appointments with healthcare professionals (Kidd et al., 2019), to do core daily activities such as hygiene (Hanssen et al., 2020), to prompt goal focused real world behaviour change (Granholm et al., 2020; Steare et al., 2020; Taylor et al., 2022) or to use coping strategies such as positive self-talk (Bell et al., 2020). The SlowMo app specified that notifications were optional (Garety et al., 2021) however most apps sent multiple notifications daily and did not state if users could disable notifications.

**Suggestion.**

Suggestion occurs when the app suggests skills or behaviours the user can implement in daily life. This feature was present in 11 apps (Achtyses et al., 2019; Bucci et al., 2018; Fisher et al., 2023; Fulford et al., 2021; Granholm et al., 2020; Hanssen et al., 2020; Kidd et al., 2019; Lim et al., 2020; Ghaemi et al., 2022; Pennou et al., 2023; von Malachowski et al., 2022). Most apps were imprecise in defining what suggestions were made, stating that a range of cognitive and behavioural strategies were encouraged (Achtyses et al., 2019; Bucci et al., 2018; Fisher et

al., 2023; Kidd et al., 2019; Ghaemi et al., 2022; von Malachowski et al., 2022). However, some apps were very clear in how they made suggestions, for example the CBT2Go app suggested behavioural experiments to test out beliefs (e.g. “Try asking someone to go for a short walk”) (Granholm et al., 2020) and the MASS app suggested step-by-step actions towards a goal such as making a new friend (Fulford et al., 2021). Apps also had varying approaches to the aim of their strategies. For example, the ChillTime app suggested randomly selected strategies to encourage the user to try new things (Pennou et al., 2023), while the SMART app matched suggestions to the user’s current mood state (Hanssen et al., 2020).

### **Liking.**

Liking is the visual attractiveness of the app to the user and was highlighted as having been considered and implemented in 8 reviewed apps (Achtyses et al., 2019; Bucci et al., 2018; Fisher et al., 2023; Garety et al., 2021; Lim et al., 2020; Pennou et al., 2023; Steare et al., 2020; von Malachowski et al., 2022). Approaches to creating a visually appealing app included using multiple images (Bucci et al., 2018), visual simplicity (Pennou et al., 2023), use of colour (Steare et al., 2020), user customisation of visuals (Bucci et al., 2018; Garety et al., 2021) and using a visual format that’s familiar to the target user, for example the Connect+ app used a format that mimicked Instagram (Lim et al., 2020).

### **Social role.**

When the system was found to adopt a social role in six of the reviewed apps (Fisher et al., 2023; Granholm et al., 2020; Kidd et al., 2019; Krzystanek et al., 2020; Steare et al., 2020; von Malachowski et al., 2022). Social role was largely related to users interacting with healthcare professionals and included connecting the user to the healthcare professional (Kidd et al., 2019), gathering information with the purpose of facilitating deeper conversations between the user and healthcare professional (Granholm et al., 2020; Steare et al., 2020; von Malachowski et al., 2022) and facilitating arranging of appointments with healthcare providers (Krzystanek et al., 2020). Only the PRIME app actively encouraged users to connect to one

another (Fisher et al., 2023) by each day generating a post such as “Share a silly selfie!” or “Write down a list of things you are grateful for” to encourage participants to share responses.

### **Similarity.**

Similarity is when the system reminds the user of themselves in some meaningful way (e.g. describes scenarios similar to the user’s life, uses language the user might use). Five apps reported using Similarity features (Bucci et al., 2018; Fulford et al., 2021; Han et al., 2023; Lim et al., 2020; Taylor et al., 2022). Some apps used videos to show the experiences of others in a similar situation moving towards their goals (Bucci et al., 2018; Fulford et al., 2021; Lim et al., 2020). For example, the Actisist app showed users the video story: “William walks away from weed” about a person with psychosis stopping cannabis (Bucci et al., 2018). Another example of similarity is the Connect+ app trying to imitate language used by young people to increase relatability (Lim et al., 2020). Multiple apps reported valuing input from people with lived experience to create these features (Bucci et al., 2018; Fulford et al., 2021; Lim et al., 2020; Taylor et al., 2022).

### **Praise.**

Praise is a form of feedback within a persuasive system and was found in 5 reviewed apps (Fisher et al., 2023; Fulford et al., 2021; Granholm et al., 2020; Jongeneel et al., 2022; Taylor et al., 2022). The MASS app used praise to increase anticipatory pleasure for future social experiences in accordance with the temporal experience of the pleasure model of impairment in schizophrenia (Fulford et al., 2021). In the CBT2Go app praise was used to reinforce high ratings of confidence in achieving goal related tasks while low confidence ratings were challenged (Granholm et al., 2020).

### **Rewards.**

Rewards are a tactic to reinforce target behaviours and were present in 4 apps (Granholm et al., 2020; Jongeneel et al., 2022; Lim et al., 2020; Taylor et al., 2022). For most apps rewards were given in the form of points, stickers, or stars, however, the CBT2go app allowed a selfie to be taken after an achievement (Granholm et al., 2020).

**System Credibility Support**

System credibility support is an umbrella term for the ways a system promotes the perception of its own credibility and therefore increases its persuasiveness by doing so. This category was not well represented in the articles reviewed. It was challenging to assess apps in this area as most publications did not detail whether these features were included, and only the Actissist and ChillTime apps (Bucci et al., 2018; Pennou et al., 2023) of 22 apps could be accessed to check the apps directly. These two apps were found to meet the threshold of surface credibility (system has a competent look and feel). The persuasive feature real world feel, where a system provides information about the people behind its content and services to build credibility was demonstrated in three apps (Ben-Zeev et al., 2018; Bucci et al., 2018; Pennou et al., 2023). Two of these apps gave details of the clinicians involved in creating the app such as their names and work addresses (Bucci et al., 2018; Pennou et al., 2023), while two apps showed videos of involved clinicians demonstrating key skills or explaining the rationale for the content (Ben-Zeev et al., 2018; Bucci et al., 2018). One app showed evidence of trustworthiness in qualitative data with users calling the app “honest” (Lim et al., 2020). No evidence could be found of third-party endorsements (the system provides endorsements from other sources), authority (the system refers to people in the role of authority), expertise (provides information showing knowledge, experience, and competence) or verifiability (the system provides means to verify the accuracy of program via outside sources) in the apps or their associated papers.

**Social Support**

Social support includes the ways a system leverages social influence to motivate users. This could mean facilitating users observing other peoples’ behaviours or comparing their own behaviours to others. Social interaction can be persuasive and thus a system that taps into this is able to motivate individuals to achieve their target behaviour. Four apps detailed features which fall under the category of social support (Fisher et al., 2023; Fulford et al., 2021; Han et al., 2023; Lim et al., 2020). Social learning is when the user can use the system to observe

others performing target tasks or behaviours and this was present in 3 apps (Fulford et al., 2021; Han et al., 2023; Lim et al., 2020). One app used the social facilitation feature where the user can discern via the system that others are performing the behaviour along with them, while two engaged normative influence, which leverages peer pressure to encourage target behaviours (Fisher et al., 2023; Kidd et al., 2019). For example, the A4i app included a peer-to-peer engagement platform that facilitates anonymized and moderated strategy and tip-sharing between users (Kidd et al., 2019). The PRIME app also utilized the social comparison persuasive feature (the system facilitates users comparing their performance with the performance of others) and when a participant completed a challenge, an accomplishment post was automatically generated, creating additional opportunities for social reinforcement (Fisher et al., 2023). No examples of competition (system leverages drive to compete against others in completing a task or action), cooperation (system leverages drive to cooperate to complete tasks or behaviours) or recognition (system offers public recognition for an individual or group) were found in the apps examined.

**Research question 2: Which persuasive system design features of smartphone applications aimed at people with psychosis are associated with app adherence and attrition rates?**

A correlation was calculated between the number of persuasive features and the attrition percentage for each app (Pearson's correlation coefficient  $r = 0.07$ , 95% CI [-0.4, 0.5]) which indicated no evidence of an association between attrition and number of persuasive features. This finding should be treated with caution however, as analysing the data in this way assumes that each persuasive systems design feature is of 'equal weight' which is likely not to be a justifiable assumption. It is more likely that certain features are more strongly associated with attrition than others (if any such relationship exists at all), however the available data is not currently sufficient for this level of analysis. There was no consistency across apps in how they

reported adherence, therefore it was not possible to make comparisons between apps regarding adherence persuasive feature links.

### **Research question 3: What is the quality of apps aimed at people with psychosis?**

All apps were searched for in app stores and all corresponding authors were contacted to gain access to the apps. However, only 2 apps were accessible. Thus, it was not possible to do a quality assessment as this would have required being able to open and use the apps to assess each criteria point.

## **Discussion**

### **Principal Results**

This systematic review assessed persuasive features within mobile applications for people with psychosis and aimed to describe the persuasive features, their association with adherence and attrition rates and the quality of the included apps. The five most common persuasive features were personalisation, reminders, suggestion, tunnelling, and self-monitoring. Features in the categories of primary task support and dialogue support were well represented, while social support and system credibility support were underutilised in the apps assessed. This limitation in the application of persuasive features may impact app efficacy and engagement as both social connectivity (social support) and a user having ways to judge a system's credibility (system credibility support) could have a very powerful impact on motivation with this client group. It was found that there was no association between the number of persuasive features and attrition; and association between persuasive features and adherence could not be assessed. The quality of the apps could not be judged due to the apps being inaccessible.

## Comparison with Prior Work

No previous study has systematically documented the persuasive features present in apps for psychosis. The finding that personalisation, self-monitoring, and reminders were among the most common strategies is consistent with previous findings on physical activity, mental health, and health apps (Aldenaini et al., 2020; Alqahtani et al., 2019; Alslaity et al., 2022). However, the existence of these features does not guarantee a positive impact on users; how these features are applied is crucial to their utility. For example, reminders were prominent persuasive feature in the psychosis apps reviewed, however most apps did not give users choice in notification frequency. One of the postulates of persuasive systems is that the system should aim to be unobtrusive, and inappropriate or ill-timed reminders may have a reverse to desired impact (Bakker et al., 2016). Persuasion depends largely on symbolic strategies to trigger emotions (Miller & Rollnick, 2002) and a blunt unskilled approach such as sending countless reminders to use the app per day can provoke a negative emotional response which is counterproductive. Similarly, self-monitoring is considered a fundamental feature of several evidence-based psychological therapies including cognitive behaviour therapy (Cohen et al., 2013), mindfulness (Erisman & Roemer, 2010), emotion-focused therapy (Paivio, 2013), dialectical behaviour therapy (Feldman et al., 2009), and acceptance and commitment therapy (Hayes et al., 2012). Thus, it is logical that psychosis apps would utilise self-monitoring to help users track their feeling, thoughts, and behaviours. However, the apps reviewed in this study limited data gathering to manual input, prompted by several daily notifications. Manual entry of personal data can be time consuming, tedious and may be a barrier to people with serious mental health difficulties (Orji et al., 2018). Thus, in the context of psychosis it is unclear if self-monitoring promoted engagement in the manner intended or had a reverse to desired impact due to the frequency and high cost to the user of multiple manual inputs per day.

Research indicates that psychological and demographic variables influence susceptibility to persuasion (McGowan et al., 2022); thus, in planning these interventions these variables should be considered. For example, in this review reduction (simplifying tasks) and suggestion (suggesting actions to users) were amongst the top strategies used. However, in a review of mental health apps, these two strategies were used in less than 5 of 103 apps (Alqahtani et al., 2019). Thus, these strategies which facilitate ease of app use may be more widely implemented and necessary in a psychosis sample due to cognitive impairment and disability associated with this client group (Aref-Adib et al., 2019; Couture, 2006; Fett et al., 2011).

This study also found that apps relied heavily on the primary task support and dialogue support categories of persuasive design, with social support and system credibility support underrepresented. This means that attempts to be persuasive are unbalanced, emphasizing helping users complete tasks and app interactivity, while ignoring techniques to make the app more trustworthy and credible to users and methods to leverage the impact social forces (cooperation, competition etc.) to support behaviour change. Social support strategies have been found to be more widely implemented in physical than in mental health apps (Matthews et al., 2016). However, social support is an important strategy for users who experience mental health issues because it is common to feel isolated or stigmatized and digital interventions could benefit from intervening at the level of the social rather than limiting treatment targets to internal drivers for poor mental health. Lack of system credibility support is common across multiple types of apps (Alqahtani et al., 2019; Matthews et al., 2016). A postulate of persuasive systems is that they should always be open to the user and reveal designer bias behind the system both to protect fairness and increase persuasiveness. We argue that system credibility support is fundamental in current times, where technology is developing at a rapid rate and users cannot be expected to understand a system's functions without guidance. Users need to be assured of not only the effectiveness, reliability and evidence base of the app's content, but also that their



data will be protected (privacy). Furthermore, without this in place it is difficult to advance other features such as passive monitoring if users aren't fully assured of the app's credibility.

Our findings suggest that the number of persuasive strategies employed in psychosis apps is not linked to attrition rates. However, this is not necessarily an indicator that the persuasive features were not assisting the user to achieve their purpose with the app. Some authors propose that disengagement is not a barrier to efficacy if a user has achieved their goals with the digital intervention at the point of disengagement (O'Brien et al., 2022). For example, a recent meta-analysis looking at efficacy, engagement, and persuasive design in smartphone applications for depression and anxiety found increased persuasive features were linked to increased effect sizes, and increased attrition rates (Wu et al., 2021). However, there may be other factors explaining the disconnect between increased persuasive features and engagement in this review; for example, there is a lack of evidence on which persuasive strategies are the most effective at increasing adherence and reducing dropout. Therefore, it is likely that totalling persuasive features is insufficient, and employing one appropriate strategy is preferable to: multiple inappropriate strategies, too many strategies from one persuasive category, or a combination of appropriate and inappropriate strategies (Orji et al., 2017). Furthermore, although persuasive systems design is commonly used to inform app development, the model does not contain a guideline on operationalising the strategies (Kok et al., 2016; Mohr et al., 2014; Wang et al., 2019). Consequently, the same persuasive strategy can be shaped differently in different interventions (Mohr et al., 2014; Schembre et al., 2018). Thus, this study examined how these have been put into action and found some apps with highly creative implementation, while others executed persuasive features in a minimal manner. This mirrors the results of Sporrel et al. (2021) who examined 29 physical activity applications and found heterogeneity in how the features were executed which appeared to influence the effectiveness of the intervention. These diverse implementations mean that interventions with the same persuasive feature might evoke different user responses, rendering it difficult to draw

a conclusion about the impact of a specific persuasive strategy at the theoretical level.

Furthermore, technological advancements mean that some apps used features that did not fit within the persuasive systems design framework (Aldenaini et al., 2020). Thus, the lack of clarity on how many persuasive features is optimal, lack of guidance on the operationalization of features and the lack of acknowledgement of emerging features highlights the need to extend the persuasive systems design model.

### **Strengths and limitations**

Methodological strengths of this review include having a preregistered protocol, using a systematic search, and having two independent raters throughout the study selection and data extraction phases. A key limitation on the conclusions of this review is that twenty of the 22 apps were assessed based on the papers associated with them and not by testing the apps directly. Thus, what is in this review may not be comprehensive as the applications may have persuasive features that are not reported in their associated articles. Furthermore, determining persuasive features is in some cases a subjective process and thus it is not beyond possibility that discrepancies between this review other reviews could be due to differing review team perspectives on persuasive features. We wanted to examine adherence and attrition in relation to persuasive features, however found that because adherence is not reported in a standardized way in papers this was not possible. Similarly, this review did not include a quality assessment as our planned quality assessment of the apps was not possible due to the lack of availability of apps. Furthermore, our analysis is limited to counting persuasive features and, in this regard, assumes that the value of different persuasive features is equal, however this may not be the case and no more nuanced analysis was done of this. The review is limited to articles written in English. Therefore, articles describing persuasive technologies in mobile health applications that were published in other languages were overlooked during the article selecting process.

**Conclusions and future work**

Our findings indicate that in psychosis apps there is an uneven use of persuasive features, with most apps relying on primary task support and dialogue support features while social support and system credibility support remain underrepresented. This may be impacting the efficacy and engagement of these interventions. Psychosis apps may benefit from incorporating more features which leverage the persuasive impact of having users interact (social support). There is a human instinct to respond to social forces and thus incorporating these domains into psychosis apps may allow developers to engage non-engagers. Incorporating features that emphasize system credibility and trustworthiness to the user is also crucial. As technology advances, there is increasing need for designer openness about their positioning, bias and how data is stored and used and further technological advances can only be widely applied if users have confidence in the systems that gather their data. Future research could explore expanding the Persuasive Systems Design model, as this review indicates it no longer encompasses all features apps are using and although the underlying principles may remain sound, the way the model quantifies and describes features is becoming outdated with rapid technological advancements. Furthermore, there is a lack of clarity on how many persuasive features are optimal, how-to operationalise features and how persuasive categories work together. It may be that certain features are more effective in this context than others, and emphasis should not be on increasing numbers of persuasive features but on those most likely to influence adherence, attrition and efficacy. In future research a positive deviance approach could be used to examine the features of the most engaging and effective apps, while correlational or experimental research designs could explore the impact of different features on adherence and attrition. Qualitative interviews with users may shed light on what features are experienced as most impactful.

Another limitation is the unavailability of apps, which contrasts open science which emphasizes the sharing of data, code and tools associated with publications. Applying open

science principles to app availability could benefit transparency and accelerate research productivity. A potential way to make this happen could be for future funding applications for digital interventions to specify additional funding to maintain apps subsequent to the study period. Another possible avenue is a database of background information on digital interventions such as videos of the intervention's user experience and detailed technical information on the intervention features and functionality. However, Intellectual Property (IP)/licensing issues may be a barrier to this if apps are for commercial purposes.

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## Service-Related Project

**Psychological wellbeing for patients and families following an Intensive Care Unit (ICU) Admission at the Royal United Hospitals, Bath.**

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**Internal and external supervisor:** Dr Rachel Paskell

**Word Count:** 6462 (excluding the abstract, tables, figures, references, and appendices)

**Date of Report:** May 2024

This paper has been prepared for the Journal of Clinical Nursing

The guidance on journal formatting requirements is here:

<https://onlinelibrary.wiley.com/page/journal/13652702/homepage/forauthors.html>

This journal was chosen as it is an open-access, peer-reviewed journal, and this project meets the aims and scope of the journal. This journal has a word count limit of 8000 words.

**Data Access Statement:** Data for this article remains stored in password protected folders at the university and hospital sites.

**Authorship Statement:** I am the author of this thesis, and the work described therein was carried out by myself personally under supervision.



## Introduction

Being admitted to an Intensive Care Unit (ICU) increases the risk for mental health difficulties among patients (Myhren et al., 2010, Wade et al., 2014) and families (Johnson et al., 2019). Hatch et al. (2018) surveyed nearly 5,000 former ICU patients (hereafter referred to as patients) within the United Kingdom (UK) and found 55% still met thresholds for at least one mental health condition a year after discharge. For some, declines will persist years post-discharge and significantly impact quality of life (Cameron et al., 2016, Rosendahl et al., 2013). Furthermore, improvements in ICU provisions mean more people are surviving critical illness and post-discharge mental health complications are thus increasingly evident. Patient psychological problems during or following discharge from ICU has been linked to length of sedation, use of certain medications, disturbed memories of time spent on ICU and psychological history (Wade et al., 2013).

Numerous unique factors impact family/carer (hereafter referred to as family) mental health. Admission to an ICU is most often unplanned, and families may struggle to understand their relative's condition (Azoulay et al., 2000), while concurrently making crucial decisions regarding care. Family members who feel they were given incomplete information by ICU staff are reported to experience higher rates of mental distress (Azoulay et al., 2005).

The importance of supporting the symbiotic interplay between mental and physical recovery during and post ICU is outlined in national and international guidelines (National Institute for Health and Care Excellence [NICE], 2018; Intensive Care Society [ICS], 2022). Psychological impacts can be reduced through preventative measures and integrating psychology throughout the critical care pathway (NICE, 2018; ICS, 2022) as experiences during admission are likely relevant to post-discharge mental health (Myhren et al., 2010).

Guideline recommended and evidence-based interventions to support mental health during admission include the use of a diary completed by family or staff, psychological screening, changes to the environment, training of staff and actions on the part of staff aimed at reducing distress, for example, providing comfort or giving information on psychological impacts of ICU (Wade et al., 2016).

Despite being guideline recommended and having an evidence base, the understanding of how and why these interventions work is still developing. For, example, the ICU diary is underpinned by the cognitive model of post-traumatic stress disorder (PTSD) and is completed by staff or relatives during admission and returned to patients following discharge to help develop a more coherent narrative of the ICU stay. However, the exact impact on patient and family well-being remains opaque. For example, some studies indicate that diaries reduce rates of PTSD in family (McIlroy et al, 2018, Nielsen et al., 2020), while others have found diaries ineffective at decreasing family PTSD rates (Rice et al., 2022, Barreto et al., 2019). Furthermore, despite the rationale for diary use being the cognitive model of PTSD, diaries appear not to have a clinical impact on patient PTSD following discharge, however, do appear to reduce rates of depression (McIlroy et al., 2018, Barreto et al., 2019). Thus, multicentre trials with larger sample sizes are necessary to clarify findings. Despite these mixed results, qualitative data indicate diaries may still be useful. For example, in Rice et al. (2022) most family members said the diary helped them make sense of the ICU stay and gave them something to do during a difficult time.

With this emerging evidence base in mind, in 2015/2016 an evaluation was undertaken looking at the key impacts on, and supports for, patient and family psychological well-being during admission to the Royal United Hospitals (RUH), Bath ICU. Patient and family views were gathered by questionnaire, and staff views by focus group and email. One-third of patients discharged from the RUH ICU in a three-month period and who provided data were found to meet cut-off criteria for anxiety, depression or PTSD, and nearly half of the patients in the study were concerned about the impact of their time in ICU on their mental wellbeing. A variety of recommendations were made to the Unit, amongst them the use of patient diaries; giving information to patients and families on possible mental health impacts of an ICU admission; communication of medical information to families daily, and training for staff. This evaluation aimed to assess the current situation and any change over time (which included the Covid-19 pandemic) since the previous project.

### **Service context and consultation with key stakeholders**

The project took place at the RUH, Bath ICU wards B12 and B36. The evaluation was requested by the Unit Matron and wider staff team, including the ICU Wellbeing Team and Wellbeing Lead. These data will further inform the ongoing psychological wellbeing strategy developed by the ICU psychologists with the ICU Leadership Team. The psychology strategy outlines a three-tiered approach to psychological wellbeing that encompasses primary prevention as well as secondary and tertiary interventions for all who encounter the ICU (patients, families and staff). This is in the context of greater public awareness of the links between mental and physical health and the Covid-19 pandemic, which has impacted ICU support, care packages, visiting and workload, adding to the potential for increased distress in patients and families.

### **Aims/Research Questions**

#### **Aims**

- 1) Engage discharged patients and families to assess what the service is doing well for their psychological wellbeing during admission, and what it could do better.
- 2) To produce a report with recommendations for the Unit on what it should keep doing and what further improvements can be made.

#### **Questions**

- 1) What are the probable levels of depression, anxiety & PTSD in patients/families post-discharge from ICU?
- 2) What psychological wellbeing interventions or support have patients/families been offered during admission to ICU and what have they found to be helpful/unhelpful?
- 3) What suggestions would patients/families make about how to improve the service to support psychological wellbeing during ICU admission?

### **Methods**

#### **Design**

This study used a mixed methods design and collected quantitative and qualitative data via survey. A patient list was generated by the Trust's Business Intelligence Unit, as

approved by the Information Governance Team. This list included patients discharged during the first four months of 2022 and was extracted in line with the criteria in Table 1.

**Table 1**

*Criteria for Patient Eligibility for Participation*

Inclusion criteria	Exclusion criteria
Is a former ICU patient or family member/carer	The former ICU patient is deceased
Is over 18-years-old	The former ICU patient has a brain injury
	The former ICU patient is in palliative care or a nursing home

**Setting**

An invite letter for patients and their families was posted to the patients. This included an information sheet (Appendix B), consent form and questionnaire for patients (Appendix C), plus a consent form and questionnaire for family (Appendix D). A self-addressed pre-paid envelope was included in the package sent out by the ICU ward clerk. Families were not directly contacted but were accessed via the discharged patients, if they choose to share the questionnaires. Patient and family questionnaires and the subsequent data were not linked. Patient and family respondents formed two separate groups, linked only via the recruitment method (i.e., inclusion/exclusion criteria for patients and sending the patient the questionnaire to hand on). The questionnaires included a link and QR code so that patients/family members could choose to provide data online via a Qualtrics survey, rather than postal return. They were clearly told to provide data via one route only, i.e., only postal questionnaire or online, to avoid duplication. Participants were also given the option to complete questionnaires via phone with the lead researcher to improve accessibility.

Questionnaires assessed ICU process in supporting mental wellbeing and mental health outcomes and were based on previous evaluation recommendations, guidelines and

the current research base. Questionnaires were developed alongside a Person with Personal Experience (PPE) of ICU admissions. The Generalised Anxiety Disorder Assessment-7 (GAD-7) (Spitzer et al., 2006), Patient Health Questionnaire-9 (PHQ-9) (Spitzer et al., 1999) and Trauma Screening Questionnaire (TSQ) (Brewin et al., 2002) were used to screen for depression, anxiety and PTSD. A score of more than eight on the GAD-7 indicates probable anxiety that meets clinical levels, which is the threshold at which it is appropriate to initiate treatment (IPAT, 2011). Although the GAD-7 is widely used in research on ICU populations, data on its psychometric properties in ICU populations are limited. However, the GAD-7 has been found to be valid and reliable in the general population (Lowe et al., 2008) and in a large sample of Traumatic Brain Injury patients, 40% of whom had been in ICU 6 months before (Teymoori et al., 2020). A score of more than 10 on the PHQ-9 indicates probable depression that meets clinical levels (IAPT, 2011). A study of hospitalised medical patients found that the PHQ-9 outperformed the Hospital Anxiety and Depression Scale (HADS) and Beck Depression Inventory II (BDI) in detecting depression (Daray et al., 2019). A score of 6 is the optimal cut off on the TSQ at which PTSD is deemed probable from the screener (Brewin et al., 2002). The TSQ has been shown to have a sensitivity of 0.85 and a specificity of 0.89 when detecting PTSD in assault victims (Walter et al., 2006), however, no psychometric data could be found in an ICU or medically hospitalised population.

### **Sample Size**

The desired sample size for this study was determined using Healthcare Quality Improvement Partnership guidelines (2018) and Bath RUH ICU discharge figures. According to the latest discharge figures, the Bath RUH ICU treats about 800 patients yearly, thus in a four-month period (the period of the study) we would expect a population of 267, with some exclusions due to death or health issues preventing participation. Therefore, for a population of approximately 250, the Healthcare Quality Improvement Partnership (2018) guidelines recommend a sample of 130 to provide 90% confidence and 5% accuracy in outcomes measured. This figure assumes an expected incidence of 50% for the outcomes being

measured, and assumes the data being collected are binomial (yes/no format). Thus, the formula is not readily applicable to this study, as the data collected is ordinal (scaled responses). However, based on the above, a sample size of 130 was estimated as sufficient to be representative of the patients who would be discharged from the Bath RUH ICU and meet inclusion criteria of this study.

### **Ethical Issues**

Approval for the evaluation was given by the Bath RUH Quality Improvement Team. Informed consent was obtained from all participants, as they were provided an information sheet (British Psychological Society, 2021) and given the opportunity to ask questions and discuss the project before consenting and taking part. Potential participants were signposted to mental health and crisis support available to them. Participants were made aware they can withdraw consent up to the point of submitting/posting their questionnaire data; withdrawal was not possible after this point as the data were anonymised. No patient identifiable information was gathered nor stored by the researcher. A risk review did not indicate that the proposed survey, which was in line with standard operating procedures for the service, posed any additional risk to participants. Equality of access was promoted by sharing the survey with all patients who met inclusion/exclusion criteria. Inclusivity was promoted by offering the survey electronically, on paper or by phone.

### **Analysis Plan**

The qualitative data were analysed by inductive thematic analysis based on Braun and Clarke's (2006) six step guide. The epistemological approach of this research is the essential/realist approach, semantic themes have been identified using an inductive approach. The essential/realist approach assumes that the language used reflects and represents the meaning and experience of the participants (Potter & Wetherell, 1987; Widdicombe & Wooffitt, 1995). The rationale for undertaking inductive thematic analysis was to ensure the themes identified are strongly associated with the data gathered (Patton, 1990), i.e., the themes have been generated from the data and aren't trying to fit into a pre-existing, theory-driven coding frame. Whilst the evaluation has aimed to use an inductive

approach it is acknowledged that, researchers cannot be completely theoretically neutral and will be influenced from their views and understandings of the topic (Braun & Clarke, 2013).

Coding was performed manually, and overarching themes were then generated from the codes. Themes generated for individual survey questions were then used to generate the final themes that were found throughout the total survey. The codes and overarching themes were checked by the doctoral supervisor for agreement.

## Findings

### Demographic Data

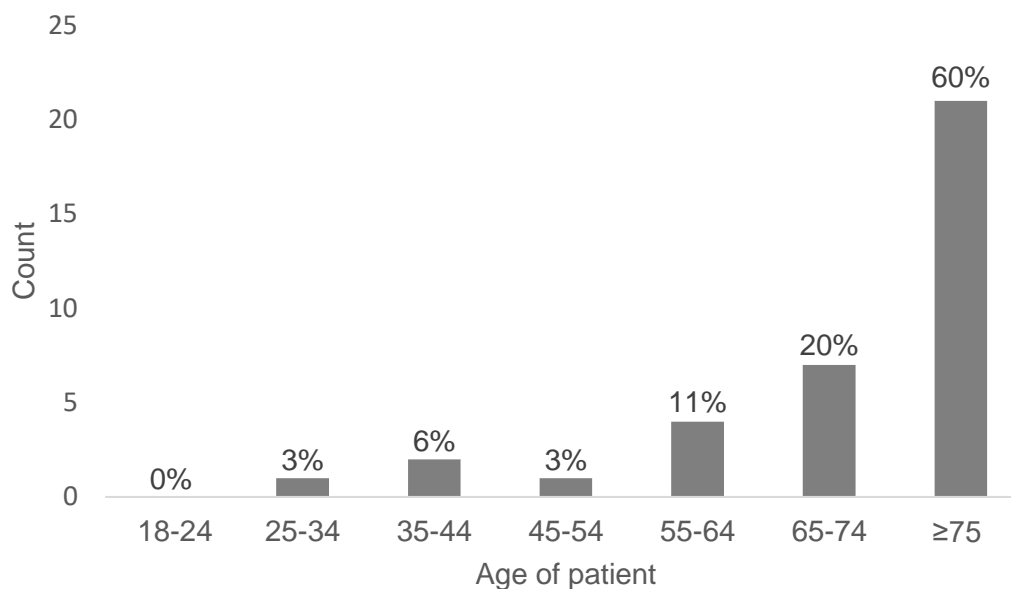
Thirty-six (36) patients and 29 family members returned their questionnaires (a response rate of 13% and 10% respectively).

#### *Patient Demographics*

Sixty percent (60%) of patient respondents were 75-years old or older (Figure 1).

**Figure 1**

*Age groups of patient respondents*



Fifty-six percent (56%) of patient respondents had spent 3-10 days in ICU (Table 2). Eighty-six percent (86%) of patients reported they had not experienced depression, anxiety or PTSD in the six months prior to ICU admission (Table 3).

**Table 2***Time spent in ICU for patient respondents*

	<b>Count</b>	<b>Percent</b>
< 3 days	9	25%
3-10 days	20	56%
11-30 days	6	17%
>30 days	1	3%

**Table 3***Patients who reported experiencing depression, anxiety or PTSD in the 6 months prior to admission*

<b>Experienced depression, anxiety, or PTSD 6 months prior to ICU</b>	<b>Count</b>	<b>Percentage</b>
Yes	3	8%
No	31	86%
Can't say/Not sure/Not answered	2	6%

***Family demographics***

Thirty-eight percent (38%) of family members were age 75 and above (Table 4). Fifty-five percent (55%) of family reported that their relative who was in ICU was aged 75 or above. Fifty-nine percent (59%) of family reported their relative had stayed in ICU for 3-10 days and 86% of family reported being the partner of the patient (Table 5).

**Table 4***Age groups of family respondents and the age groups of their relative who was in ICU*

<b>Family member's age</b>	<b>Count</b>	<b>Percentage</b>
18-24	0	0%
25-34	0	0%
35-44	2	7%
45-54	4	14%
55-64	5	17%
65-74	7	24%
75 and above	11	38%



Former ICU patient's age	Count	Percentage
18-24	1	3%
25-34	0	0%
35-44	1	3%
45-54	2	7%
55-64	5	17%
65-74	4	14%
75 and above	16	55%

**Table 5**

*Family report on length of patient's ICU admission and their relationship to the patient*

Length of family member's ICU admission	Count	Percentage
Less than 3 days	9	31%
3-10 days	17	59%
11 -30 days	2	7%
More than 30 days	1	3%

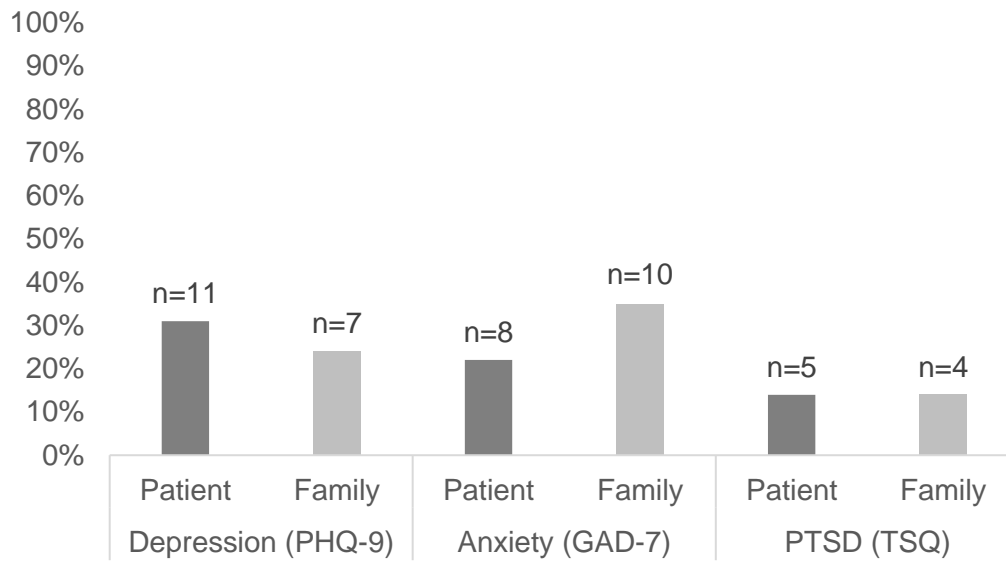
Relationship to patient	Count	Percentage
Partner	25	86%
Parent	1	3%
Child	3	9%
Sibling	0	0%
Friend	1	2%

### **Mental health data**

Thirty-one percent (31%) of patients were found to be at risk of depression, 22% at risk of anxiety and 14% at risk of PTSD (Figure 2). Twenty-four percent (24%) of family members/carers were found to be at risk of depression, 34% at risk of anxiety and 14% at risk of PTSD. Overall, a third of both former ICU patients or family/carers were found to meet caseness for at least one mental illness.

### **Figure 2**

*Percent of Respondents that met Threshold for Caseness for a Mental Health Disorder Post-ICU Admission*

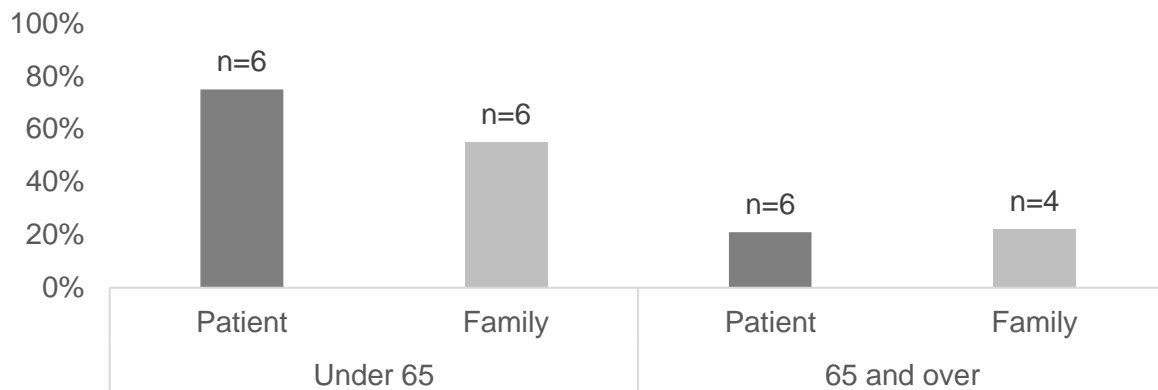


Eighty-six percent (86%) of patients reported no mental health difficulties in the six months prior to admission while the 14% who did report mental health difficulties in the 6 months prior were all experiencing current mental illness (Appendix E).

When mental health data were broken into under 65 and over 65 age categories, 75% of patients and 55% of family who were under 65 were found to have at least one mental health condition (Figure 3). Twenty-one (21%) of patients and 22% of family who were aged 65 and over were found to have at least one mental health condition. This was based on small samples as the sample size of under 65-year-old patients was 8 and the under 65-year-old family sample size was 11.

**Figure 3**

*Age Categories of Patients and Family who met Threshold for Caseness for at least one Mental Health Condition*



Fifty percent (50%) of patients who met threshold for at least one mental health condition disagreed or strongly disagreed that their mental health difficulties were caused by, or significantly aggravated by the admission (Appendix F). While forty percent (40%) of family who met threshold for at least one mental health condition agreed or strongly agreed that their mental health difficulties were caused by, or significantly aggravated by the admission.

**Actions of ICU**

Fifty-six percent (56%) of patients disagreed or strongly disagreed that they had been given information on mental health impacts of an ICU stay (Appendix G). Of those patients who stated they had been given information on mental health impacts of an ICU stay, 80% said this information was helpful. Fifty-eight percent (58%) of patients agreed or strongly agreed that staff had noticed their distress and attempted to make them more comfortable. Patients gave a range of responses regarding whether they had had someone to speak to about any psychological distress during the admission with no clear pattern discernible (Table 6).

**Table 6***Patient report on mental health support from staff during their ICU stay*

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Can't say/Don't know/Not answered
During my ICU stay, I had someone to speak to about any emotional distress, confusion, or strange psychological experiences	6%	27%	14%	14%	25%	14%

Sixty-six percent (66%) of family agreed or strongly agreed that someone in their family had received daily communication from ICU staff (Appendix H). Sixty-nine percent (69%) disagreed or strongly disagreed that they had been given information on how an ICU stay might impact their family member's mental health. Sixty-nine percent (69%) disagreed or strongly disagreed that during the stay they were given information about how their family members admission might impact on their own mental health. Seventy-five percent (75%) of those given information about ICU impacts on their mental health agreed or strongly agreed that they found this information to be helpful. Forty-eight percent (48%) disagreed or strongly disagreed that during admission their family member was offered the opportunity to speak to a staff member about their mental health or wellbeing. Sixty-nine percent (69%) disagreed or strongly disagreed that during the admission they were offered the opportunity to talk with a staff member about their own mental health or wellbeing.

Fifty-three percent (53%) of patients agreed or strongly agreed that they know how to seek support for their mental health following their ICU stay (Appendix I). Fifty-two percent (52%) of family agreed or strongly agreed that they know how to seek support for their mental health following their family member's ICU stay.

No clear pattern was discernible from the data from patients when they were asked if Covid-19 related procedures, rules and restrictions negatively impacted their experiences during their ICU stay (Table 7). However, 52% of family agreed or strongly agreed that Covid-19 related procedures, rules and restrictions negatively impacted their experience of their family member's ICU stay (Appendix J). Forty-five percent (45%) of family disagreed or strongly disagreed that Covid-19 procedures, rules and restrictions impacted the support they received from the ICU team. Forty-one percent (41%) of family agreed or strongly agreed that they were aware of the practical facilities available to family at the ICU and found these to be sufficient.

**Table 7**

*Percentage of Patients reporting a negative impact of Covid-19 on their experience of the ICU admission*

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Can't say/Don't know/Not answered
Covid-19 related procedures, rules and restrictions negatively impacted my experiences during my ICU stay	16%	17%	19%	11%	28%	8%

Those who stay in ICU for three or more days are expected to have a diary completed for them, this can be by both family and staff, and sometimes by the patients

themselves where able. Fifty-two percent (52%) of patients who had been in ICU for 3 days or longer (and therefore would have been expected to receive a diary according to RUH ICU policy) disagreed or strongly disagreed that a diary recording their ICU stay had been completed (Appendix K). In those who had had a diary completed, there was no clear pattern regarding whether the patient had looked at the diary and/or had found it helpful and/or interesting (Table 8). One family member whose relative had been in for three days or longer reported having been given or creating a diary during the ICU admission. This family member reported having seen the diary and finding it helpful for both theirs and their family member/friend's mental wellbeing.

**Table 8**

*Percentage of Patients Indicating whether they looked at a diary kept for them and the helpfulness/interest of this diary*

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Can't say/Don't know/Not answered
I have looked at the diary completed for me during my ICU stay	33%	0%	0%	33%	0%	33%
I have found the diary completed for me during my ICU stay to be helpful and/or interesting	33%	0%	33%	33%	0%	0%

### Qualitative data

Qualitative survey questions asked patients and family members to reflect on what they had found supportive or unsupportive towards their wellbeing on ICU, as well as make any suggestions for improvements to supporting well-being during admission. A map of themes can be seen in Figure 4. Throughout all themes, the importance of human interaction

on modulating well-being while on ICU was emphasized for both patients and family and this was a common thread amongst all themes.

### ***Theme 1: The impact of Covid-19 on Interpersonal Interactions***

This theme draws together data from both patients and family on the impact Covid-19 had on supporting well-being during the admission. Both patients and family reflected that Covid-19 impacted well-being support by reducing interaction with others. A patient commented on reduced interaction with staff due to Covid-19: "During my stay in ICU I also contracted Covid-19 so I had little interaction with the staff. Some personal interaction would have been helpful even from behind a screen." While another patient commented on how Covid-19 reduced interactions with family: "Due to being on the COVID ICU ward I was not able to see any family during my admission. This was one of the scariest moments of my life. Alone except for the staff." A family member commented that: "Covid restricted visiting which was difficult", while another commented that the difficulty was not just restricted visiting, but restricted external support for the visiting family member: "Not being able to have a friend with me during visiting time due to Covid."

### ***Theme 2: Staff impacted my well-being positively***

This theme incorporates the overwhelming feedback received from both patient and family respondents, that staff actions were a positive support for well-being during ICU admission. This theme divided into the sub-themes: Staff were kind and attentive and Staff were Competent.

**Subtheme: Staff were kind and attentive.** Patients commented on the qualities staff exhibited which assisted their wellbeing: "kind", "caring", "attentive", "gentle", "sympathetic", "empath(etic)". One patient commented: "I felt very spoilt with loving, kind care from all." Multiple patients expressed gratitude for the impact of these qualities shown by staff, for example, "I am truly grateful for the care I was given." Although limited in number, there was an indication of the negative impact of when staff were not perceived to display these positive qualities, for example: "The staff caring for me were impatient, irritable and insensitive."

Patients also commented in staff actions which displayed attentiveness and care and commented on the impact of these on well-being during admission. For example, one patient said: “The ward staff were attentive and responsive when required”, while others commented on idiosyncratic needs that staff went “above and over their pay scale”, for example taking one patient outside to a garden and providing another a “puzzle tool”.

Family commented on the impact of staff kindness and attentiveness on well-being with one saying: “I could see (staff) cared about my mum when I visited” and another: “(Staff) were very sensitive to my wellbeing. I found them very kind.”

**Subtheme: Staff were Competent.** Patients commented on the impact of staff competence on supporting well-being saying: “(Staff) showed knowledge, skill and dedication... I had every confidence I was in good hands”, another patient said: “Emotionally and psychologically, I felt as safe as I could be once on ICU, due to its seeming to be well staffed.” This indicates not only staff knowledge, but feeling there are sufficient staff to protect physical health is key. Family commented that: “I was hugely impressed with the care, consideration and treatment the patient received” and “I can't speak highly enough of the medical staff their expertise saved my husband's life”.

### ***Theme 3: Communication supports well-being***

This theme encompasses both the general impact of communication from staff to patients and family on well-being, as well as a sub-theme of the need for communication on mental health/well-being on ICU which was reported by patients and family not to happen.

Patients commented on the positive impact of receiving good communication on their physical health for example: “The consultant and doctors fully explained what and why things happened.” Family commented on the well-being benefit of daily communication, effective communication of physical health information and flexible communication. For example: “Communication was good. Staff rang me and I was able to ring them when I felt like it.”

When communication did not happen, family commented this was a barrier to well-being, for example: “(It was unhelpful) saying they were going to call and then not calling, I



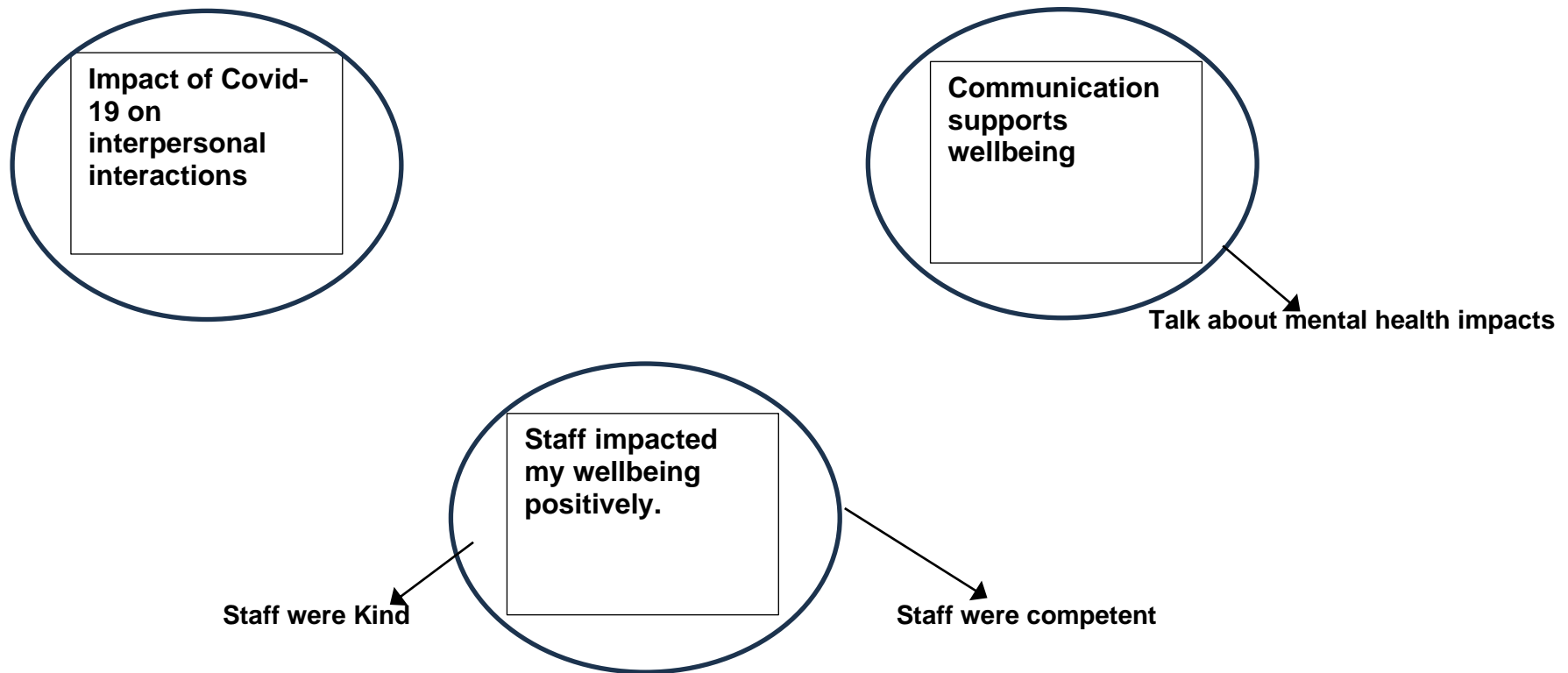
then called the ICU. It was difficult to understand if there was a problem with the patient, they had forgotten or they were too busy.”

**Subtheme: Talk about Mental Health Impacts.** Patients commented on the well-being impact of not being given clear information on mental health impacts, either verbally or in written format. For example one said: “At no point did anyone mention the huge emotional and psychological impact being in ICU would have on me”, while another said: “Some written information on PTSD in relation to ICU stays to take with me to read would have been helpful and reassuring the reality was it felt like being left to look after your own mental health and to deal with the aftermath of trauma alone.” Some patients suggested direct mental health support from specially trained individuals would be useful while on ICU.

Family members also commented that a lack of communication on mental health impacts had not been supportive to their well-being. For example: “Staff were very happy to talk about what was going on but there was never any specific discussion about mental health, thoughts or emotions.” Family suggested that “More well-being check ins & sign posting” and discussions around mental health would be “reassuring”.

**Figure 4**

*Map of themes originating from data on what patients and family found helpful or unhelpful in supporting mental health or wellbeing while on ICU*



### **Discussion/Implication of the Study**

This study aimed to assess: the levels of mental illness in patients/families post discharge from the Bath RUH ICU, the evidence-based supports patients/families had been offered during admission, and patient/family suggestions to improve support of psychological wellbeing during admission.

This study highlights challenges in implementing evidence-based (Wade et al., 2016) and recommended (ICS, 2022) supports for psychological wellbeing. For example, completing an ICU diary (ICS, 2022, McIlroy et al, 2018, Nielsen et al., 2020, Barreto et al., 2019), providing information on the mental health impacts of an ICU stay (ICS, 2022, Wade, 2016) and providing direct mental health support to patients and families (ICS, 2022, Wade, 2016) were reported to have not been done by a significant majority of patients and families surveyed.

The triangulation of family and patient qualitative feedback indicated that what supports well-being during an ICU admission is communication from staff on both physical and mental health aspects of ICU admission and staff kindness, attentiveness and competence are paramount to family and patient wellbeing. Respondents made several suggestions for improvements to the service including improved communication on both physical and mental health aspects of ICU and direct mental health support for patients and families during admission.

The data gathered indicates that a third of the responding former ICU patients and family members reported symptoms indicating at least one mental health issue (anxiety, depression and/or PTSD). The findings regarding patients are like the findings of the 2015/2016 evaluation in which 30% of patients were found to meet caseness for PTSD, anxiety, or depression. These similar results are despite many of the patients and families in the current study being impacted by Covid-19 and the associated impact on healthcare. The rates of indicated patient and family mental illness following ICU discharge in this study are comparable to those found in the literature (Moss et al., 2022, Hatch et al., 2018, Johnson et

al., 2019). However, when the data are divided into older adult (over 65) and working age samples, rates of mental illness in working age patient and family samples were 75% and 55% respectively. The literature is inconclusive regarding the links between age and mental health difficulties following ICU admission. Some studies have found that younger age is a risk factor for PTSD (Girard et al., 2007, Wallen et al., 2008), others have found that older age is associated with increased depression (Jackson et al., 2014, Brummel et al., 2015), whereas other studies have found that age is not associated with the risk of PTSD, depression or anxiety (Davydow et al., 2008, Myhren et al., 2010, Wade et al., 2013, Rabiee et al., 2016). Due to underpowered sample sizes in this study, generalisability of these findings is limited.

Research indicates that those with premorbid mental health difficulties are more likely to develop mental health difficulties following an ICU admission (Prince et al., 2018). This may be important to consider with this sample as one quarter of patients (25%) reported premorbid mental health difficulties and all those reporting premorbid mental health difficulties reported current post-discharge mental health difficulties. However, 70% of patients and 60% of family reporting mental health difficulties did not believe their ICU admission was a significant contributor to their poor mental health.

### **Communication and information sharing**

Patients and family surveyed reported that increasing communication about possible mental health impacts of an ICU admission and increased communication generally would better support their wellbeing. This is unchanged from the 2015/2016 evaluation in the same service of family needs, in which respondents said assurance and information were top priorities and suggested improved communication between ICU staff and families to better their wellbeing. This is mirrored widely in the literature. Family members with incomplete information from ICU staff are reported to experience higher rates of mental distress (Azoulay et al., 2005, Mikkelsen et al., 2017, Scott et al., 2019).

Fourteen percent (14%) of patients reported they were given information regarding possible mental health impacts of an ICU admission, a slight improvement on the 10% reporting this in the 2015/2016 evaluation. Only half of respondents agreed or strongly agreed that they know how to seek support for their mental health now. Family data indicated a majority of family were receiving daily communication on the physical health condition of the patient, while less than 20% reported receiving any information on mental health impacts, meaning where communication is happening it is not including psychological or mental wellbeing.

Potential barriers, identified in the literature, to families and patients receiving information on the potential mental health impacts of ICU stays can include the high level of emotional distress the family are subject to, which may impair the ability to understand or digest large quantities of information (Shields et al., 2017). Nurses who are in constant close contact with families may be in a good position to provide smaller, more regular chunking of information and assurance. However, according to research, some nurses report a lack of confidence in providing information, often being afraid of not giving the correct information or not providing adequate answers (Engstrom & Soderberg, 2007; Soderstrom, et al., 2003; Stayt, 2007). Increased education and training for nurses, as well as structured written and oral information may reduce these barriers (Krimshstein et al., 2011; Stayt, 2007, Scott et al., 2019).

### **Use of the ICU diary**

This study looked at how many patients who had been in ICU 3 days or more were administered the diary. For those whose ICU stay had been 3 days or longer, low numbers of patients (11%) and one family member said that a diary had been completed during the Bath RUH ICU stay. Factors including lack of guidelines for implementation, lack of awareness and time constraints may lead to poor diary use in ICU settings (Costa et al., 2021). Previous research on both implementation of information giving on ICU (Scott et al., 2019) and implementing ICU diaries (Costa et al., 2021) has recommended use of a

structured implementation plan with clear outcomes. For example, Costa et al. (2021) trialled changes implemented via the 'Plan-Do-Study-Act' method which included adding alerts to the online patient note system, providing education sessions and introducing a guidance document to facilitate entry completion. They increased 'diary provision' from a baseline of 26% to 100%.

### **Staff attributes and actions**

In qualitative data both patients and family reported that staff kindness, attentiveness and competence positively impacted their well-being. Previous research validates the importance of a trusting and mutually respectful relationship between staff and families in adjusting to an ICU admission (Bond et al., 2003; Fry & Warren, 2007; Keenan & Joseph, 2010). A third of patients (33%) agreed or strongly agreed that they had a staff member to speak to while on ICU and 58% agreed or strongly agreed that a member of staff noticed if they were distressed and attempted to assist them. These outcomes are an improvement on the 2015/2016 evaluation in which 8% of patients reported having spoken to someone from the ICU about any mental health concerns.

### **Recommendations for the service**

The previous 2015/2016 audit recommended the following changes to the admission process: training for staff on communication, daily communication between staff and families, leaflets for patients and family on mental health impacts of ICU, improvements to family areas, diary keeping for each patient, and a mental health lead to implement the recommendations and timely audit of the recommendations.

Thus, in line with Intensive Care Society guidelines (2022) and the recommendations of the patients and families surveyed in this study the following are now recommended for the Unit/service:

- 1) A dedicated Unit Clinical Psychologist for developing, implementing, and improving the mental health wellbeing environment and support for patients and families, whose role would cover patient admissions, time on the Unit, discharge and follow-up.

- 2) The Clinical Psychologist should actively provide consultation and outreach to step down wards from intensive care, providing short-term early intervention where possible, and signposting to community services on discharge.
- 3) Improved standard multidisciplinary team communications (and recording of such) on communication, sleep, effects of sedation, anxiety, stress, mood, delirium, family issues and holistic care plans.
- 4) A multi-disciplinary team system where ICU patients and/or family members identified as being at risk of current or future psychological concerns related to their ICU stay are referred for clinical psychology input, this might include direct psychological assessment and support on the Unit, or support via the wider ICU team.
- 5) Increased/improved psychological support for families to help reduce the psychological burden and distress of the ICU admission and/or concerns about caring for a patient post ICU discharge.
- 6) Increased use of patient diaries, with an associated protocol and training to facilitate implementation and monitor progress.
- 7) Increased discussions about the mental health impacts of ICU between patients, families, and all ICU staff as part of routine care,
- 8) Training for all ICU staff on having mental health and wellbeing conversations with patients and families, with supporting materials e.g., leaflets, sign-posting, etc. This may include support to increase knowledge and understanding of psychological reactions, delirium, environmental stressors and psychological outcomes of critical illness, and enhanced communication skills.
- 9) Improved signposting to other services such as bereavement counselling, local mental health services, and ICU steps.
- 10) The data from this study (and the 2015/2016 study) to continue to inform the psychological wellbeing strategy for the Unit.
- 11) This study should be repeated in 12 months to monitor for change/progress.

This would bring the service more into line with recent Psychologists in Intensive Care UK Group (PINC) benchmarking which found 79% of Units had a paid and dedicated psychologist on the ICU team who used their time to contribute to the inpatient experience of patients and families (ICS, 2022).

A research project has been initiated, following this evaluation, on the perceived skills, knowledge, and confidence in working with mental health in ICU in nurses and medical staff. This project will be broader than the RUH ICU but is a consequence of the findings from it.

### **Limitations**

This study has several methodological limitations. Response rates to this study were 13% for patients and 10% for family, lower than 40% response rate achieved with families and the 28% response rate with patients in the 2015/2016 evaluation. The sampling technique would have introduced bias into the study as the sample was collected from a four-month period, reducing the number and range of discharged patients contacted. Patients needed to opt in, and the self-selecting nature of the sample means it may not have been representative of the discharged patient population. It is known that this study's sample of patients was not representative of the discharged patient population for that four-month period regarding age. Eighty percent (80%) of patient and 62% of family responders were over age 65. For the same period as the study (Jan – April 2022) the mean age of a patient discharged was 61 years old. Furthermore, for families to respond to the survey they required the patient to give them their response sheets, further skewing the sample of family members who responded. The retrospective nature of the method relied on patients and families being able to accurately remember what happened during the ICU stay. Thus, the data collection methods would have biased results, and this should be accounted for. The postal questionnaire method relied on patients and families being able to read/write the invite letter in English. The screeners for mental illness used were established tools, however, the questionnaires developed especially for this project have unknown psychometric properties. The analysis of qualitative data is a subjective process, influenced by several factors including the researcher's own experiences. A researcher from a different background or



training may have produced alternative themes from the data. To ease the impact of this, triangulation of the quantitative and qualitative data was done.

Generalisability of these findings, both to the Bath RUH ICU population and to ICU populations generally will be significantly limited by these methodological issues.

### **Dissemination/Implementation Plans**

The findings have been disseminated to staff via a report and recommendations have been made to the ICU Wellbeing and Leadership Teams.

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## Statement of Authorship

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<b>This declaration concerns the article entitled:</b>			
<p><b>How do users of a mental health app conceptualise digital therapeutic alliance? A qualitative study using the Framework Approach</b></p>			
<b>Publication status (tick one)</b>			
Draft manuscript	<input type="checkbox"/>	Submitted	<input type="checkbox"/>
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The material has been published with a CC-BY license	<input type="checkbox"/>	The publisher has granted permission to replicate the material included here	<input type="checkbox"/>
<b>Candidate's contribution to the paper (provide details, and also indicate as a percentage)</b>	<p>TT conceptualised this study and developed its methodology with support from SD and PJ. TT created study resources, conducted interviews, and transcribed all data. TT lead on data analysis in collaboration with MJTD, PJ, SD, and JY. TT undertook data curation. PJ and SD provided research supervision. TT wrote the original draft manuscript and PJ, SD, MJTD and JY reviewed and edited the manuscript. All authors read and approved the final manuscript.</p>		
<b>Statement from Candidate</b>	<p>This paper reports on original research I conducted during the period of my Higher Degree by Research candidature.</p>		
<b>Signed (typed signature)</b>	Theresa Taylor	<b>Date</b>	22 <sup>nd</sup> May 2024



## Main Research

**How do users of a mental health app conceptualise digital therapeutic alliance? A qualitative study using the Framework Approach**

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**Word Count: 7783** (excluding the abstract, tables, figures, references, and appendices)

**Date of Report:** May 2024

**Internal Supervisor:** Dr Pamela Jacobsen

This paper has been submitted to BMC Public Health. This journal has no word count limit.

The guidance on journal formatting requirements is here:

<https://bmcpublikealth.biomedcentral.com/submission-guidelines/preparing-your-manuscript>

This journal was chosen as it is an open-access, peer-reviewed journal, and this project meets the aims and scope of the journal.

**Data Access Statement:** Quantitative data will be deposited into the University of Bath Research Archive where it will be available to researchers on request.

**Authorship Statement:** I am the author of this thesis, and the work described therein was carried out by myself personally. However, input was provided by my co-authors, with the intention of submitting this piece of work for publication.

### **Commentary**

Neither the possibility of digital therapists nor the ability of humans to have relational interactions with them is new. In the 1960s researchers developed an early natural language processing computer program that simulated a Rogerian psychotherapist and found users ascribed it human traits and intentions (Weizenbaum, 1966). However, the Covid 19 pandemic, as well as advances in technology (for example recent releases of more advanced natural language processing and generative artificial intelligence) have increased interest in what jobs these technologies can take on, and how they might fit into an existing mental health workforce. Furthermore, there has now been a decade of research into smartphone interventions such as the one described in this study and there is an increasing understanding of the unique possibilities the technology itself holds, beyond merely being a conduit for existing human-to-human models.

Thus, this project rides on the wave of several forces which are gaining momentum and interest. However, to further understand the unique possibilities of the technology, psychologists need to work with other researchers outside our direct field (Bond et al., 2023). This project was one of collaboration and my supervisor and I worked with a computer scientist, a research psychologist, and a person with lived experience. This collaboration was one of the key strengths of the research and added depth from multiple perspectives as optimising user interfaces from behavioural, lived experience and technological standpoints has the potential to increase user retention and engagement.

Although this was a separate study, this research was done using participants who had completed a Randomised Controlled Trial (RCT) which meant the research process was immediately contextualised with the work being done by other researchers on the same trial. This gave scope for extra thinking and connection building beyond the immediate tasks of

producing the paper. For example, I will be presenting this project to the McPin Foundation who are a collective of lived experience researchers who are involved in the RCT, thus increasing the scope of the project beyond those reading the journal article.

### **Background**

There is a well-recognised global gap between the need for and provision of services to prevent, identify and treat mental health conditions. Thus, in the last two decades digital solutions have become a critical target for increasing availability of psychological care (Bond et al., 2023). Fully automated mental health smartphone applications (apps), where no therapist input is required, have the potential to reduce demand on under-resourced mental health services (Torous et al., 2021). A recent study found nearly half of respondents had used a fully automated smartphone app for their mental health or wellbeing in the preceding year (Cruz et al., 2023). However, there remains a lack of clarity around the efficacy of treating mental health symptoms using apps without clinician support. A recent systematic review and meta-analysis of fully automated digital mental wellbeing interventions found a significant small effect on mental wellbeing in the general population when compared with no intervention (Groot et al., 2023). However, an earlier systematic review and meta-analysis of fully automated smartphone apps found that although some apps showed potential in targeting mental health symptoms, consistent efficacy data for these interventions was lacking (Weisel et al., 2019). Furthermore, adherence to smartphone applications for mental health is notoriously low in both trial and real-world conditions. For example, a systematic review of 93 popular publicly available mental health and well-being apps found that only 3.3% (IQR 6.2%) of users were still accessing the app after 30 days (Baumel et al., 2019) while a systematic review and meta-analysis of 70 randomised control trials of smartphone delivered mental health interventions found that adherence consistently declined with time (Linardon & Fuller-Tyszkiewicz, 2020). One reason for poor engagement, adherence, and efficacy in the case of fully automated smartphone interventions may be an insufficient therapeutic alliance (Baumel & Kane, 2018).

In human-to-human interventions the quality of the relationship between the client and therapist, known as therapeutic alliance, is well studied and has been consistently linked to effective and engaging therapy across multiple psychotherapies (Flückiger et al., 2018; Horvath et al., 2011). Indeed, the James Lind Alliance, a nonprofit initiative where patients, carers and clinicians work together to identify research priorities, named digital therapeutic alliance, a term for the therapeutic quality of client-intervention interactions in the digital context, as one of the top 10 priorities in advancing digital interventions (Hollis et al., 2018). Conceptualisations of digital therapeutic alliance have used existing human-to-human theories of therapeutic alliance as the starting point. The most widely used of these theories is Bordin's (Bordin, 1979) pan-theoretical model of alliance. It defines alliance as consisting of goals (mutual understanding of what the client hopes to achieve), tasks (steps the therapist and client agree need to be taken towards the goal), and bond (trust and confidence between the client and therapist). Bordin (1979) (pg. 252) stated that the therapeutic alliance was between a person seeking change and a "change agent" and could happen outside of therapy, opening the possibility for this theory to be applied beyond traditional human-to-human contexts.

There is a lack of consistency around how digital therapeutic alliance is measured and conceptualised. To date, only a handful of studies have examined this concept in fully automated mental health apps. Previous studies have simply used established measures originating from therapeutic alliance theories to measure alliance in fully automated mental health apps, generally replacing the word 'therapist' with 'app'. For example, a recent study used the Working Alliance Inventory (WAI) measure of therapeutic alliance (based on Bordin's theory) to examine therapeutic alliance with an automated AI conversational app and found evidence of increasing alliance as the intervention progressed comparable to ratings from previous studies in human-delivered face-to-face psychotherapy with clinical populations (Beatty et al., 2022). Similarly, Clarke et al. (2016a) studied 90 participants with mild-to-moderate mental health difficulties using an automated Cognitive Behavioural

Therapy intervention and found a positive alliance with the program when measuring this with the therapeutic alliance measure the Agnew Relationship Measure (ARM). Other authors have adapted existing therapeutic alliance measures, for example the Mobile Agnew Relationship Measure (mARM) (Berry et al., 2018) and the Digital Working Alliance Inventory (DWAi) (Goldberg et al., 2022a) have been created to measure the digital therapeutic alliance in the context of fully automated mental health apps. Both measures were created by adapting face-to-face tools, the ARM and WAI respectively. However, a criticism of these measures is that they do not go far enough in reconceptualising therapeutic alliance to digital therapeutic alliance and a clearer understanding of therapeutic alliance in digital interventions could therefore help the development of better measurement tools.

Despite attempts to measure and conceptualise digital therapeutic alliance, the relationship between digital therapeutic alliance and clinical outcomes in the context of fully automated mental health apps remains unclear (Idrees et al., 2021; Tong et al., 2022). For example, Clarke et al. (2016a) found there was no significant correlation between ARM rating and clinical outcomes, while Goldberg et al. (2022a) reported that week 3 and week 4 DWAi scores related to reductions in psychological distress. These mixed findings stand in contrast to findings in human-to-human therapy, which have found more consistent associations between therapeutic alliance and clinical outcomes. Lack of replication of the alliance-outcomes relationship seen in person-to-person interventions may be due to lack of conceptual clarity or imprecise measurement of digital therapeutic alliance (Hillier, 2018; Tong et al., 2022). It is possible that not all aspects of the traditional therapeutic alliance apply in the digital environment, or that digital therapeutic alliance may have unique dimensions salient to its context and features. For example, bond is an important subscale of both the ARM and WAI and is considered crucial in face-to-face therapy, however, whether a person can build a sort of one-way bond with an app (Darcy et al., 2021; Tong et al., 2022, 2023) is unclear. The importance of the dimension of goals is uncertain (Scherer et al., 2016; Tong et al., 2023), while there is some evidence that tasks are predictive of

digital therapeutic alliance (Gómez Penedo et al., 2020; Scherer et al., 2016; Tong et al., 2022). Conversely, research has pointed to unique dimensions of digital therapeutic alliance not present in therapeutic alliance scales including flexibility (Hillier, 2018; Tong et al., 2022; Tremain et al., 2020a), interactivity (Hillier, 2018) and non-judgementalness (Tong et al., 2022). Furthermore, a recent qualitative study investigating digital therapeutic alliance dimensions in fully automated mental health apps found that apps provide unique emotional experiences such as reduced relational pressure, an aspect not included in therapeutic alliance (Tong et al., 2023). However, relational limitations of these unique dimensions also require consideration, as authors of another recent qualitative study on alliance in an app for endometriosis state that the term “therapeutic adherence” may be more appropriate in digital interventions to indicate a more unidirectional connection than the therapeutic alliance (Stern et al., 2024).

Thus, there is a need to better understand, define and measure alliance in digital contexts. One path to doing this is to hone in on the unique attributes of the technology itself and how this technology interacts with humans. Human-Computer Interaction (HCI) is a multidisciplinary field which over the last few decades has explored the interface between digital technologies and people and set about designing technologies that allow humans to interact with machines in novel ways. Thus, its theories can be useful to mental health professionals in contemplating the possibility of a bi-directional relationship between a digital intervention and its user. A particularly relevant subset of human-computer interaction for mental health smartphone application developers is persuasive systems design, which is the use of computers or digital technologies such as smartphone applications to change or shape people’s behaviours and attitudes without using deception or coercion (Fogg, 2002). A framework has been developed which transforms persuasive principles into software requirements and system features known as persuasive systems design (Oinas-Kukkonen & Harjumaa, 2009b). For example, a simple feature of an app such as praising users after they complete a session, is a system feature of the persuasive systems design category

“Dialogue Support”, which pertains to the feedback an interactive system provides to its users to help them move toward their goal. Authors have hypothesised that persuasive features may be one of the mechanisms through which digital therapeutic alliance develops (D’Alfonso et al., 2020; Tremain et al., 2020b), however, this has not been tested.

Thus, understanding digital therapeutic alliance could be essential to pinpointing mechanisms of effectiveness and engagement. The degree of overlap between therapeutic alliance and digital therapeutic alliance; and digital therapeutic alliance’s unique features remains unclear. As digital therapeutic alliance is a nascent topic, there is need to understand it in various population groups who may have specific relational needs. Furthermore, there is a gap in the literature for a study which conceptualises alliance in the digital environment within the context of app features and design. This study will investigate whether and to what extent users perceive an alliance with an automated smart phone application for mental health treatment. It will also explore how aspects of persuasive systems design map onto user experience of an alliance (or lack thereof) with the mental health application.

### **Research Questions**

- 1) How do mental health smartphone application users conceptualise digital therapeutic alliance?
- 2) How does user experience of digital therapeutic alliance map onto persuasive systems design theory?

### **Methods**

A qualitative approach was used to address the research questions, with this report written with reference to the 32 item Consolidated Criteria for Reporting (Tong et al., 2007) and Standards for Reporting Qualitative Research (SRQR) (O’Brien et al., 2014).

### **Participants**

Recruitment was via approaching people who had completed their participation in a clinical trial of an automated smartphone application for mental health (Successful Treatment

of Paranoia (STOP) trial) (Hsu et al., 2023; Taher et al., 2024), and who had opted in to hear about further research opportunities. STOP trial participants had been randomized into 3 arms: a 6-week intervention arm, a 12-week intervention arm, and a control arm in addition to usual treatment. Both completers and non-completers were invited to a 24-week follow up. STOP trial recruitment was from a range of local sources including NHS settings, research registers, service users' networks and voluntary sector organisations. Participants were eligible if they were (i) aged 18 to 65 years (ii) had a diagnosis featuring clinically significant persecutory or paranoid symptoms, present for at minimum a month (iii) scored 3 or more on the paranoia item (item 6) of the Positive and Negative Symptoms Scale (PANSS) (iv) scored 1 or less on the interpretation bias item (item 8) on the Similarity Ratings Task (SRT) (v) stable on any psychotropic medication for minimum 3 months prior and were expected to remain so for the study duration (vi) judged to have capacity to consent as assessed by a clinician. Participants were ineligible if they (i) had severe cognitive impairment (ii) illiteracy (iii) major physical illness (cancer, heart disease, stroke) (iv) major substance or alcohol misuse as assessed by the SCID-V screen 5 (v) were currently receiving, due to receive, or had received in the last 3 months a psychological intervention targeting paranoid beliefs. STOP participants who attended their 24 week follow up were invited by the research assistant to participate in this optional additional interview. Additional consent was provided to participate in this study, interviews were conducted in English and participants needed an email address and a computer or phone.

Interested participants received an information sheet, had the opportunity to ask any questions, and gave written consent. Purposive sampling of those interested was used in priority order of gender, ethnicity, age. This was because we wanted to interview as diverse a participant group as possible to increase the representativeness and usefulness of data (Robinson, 2014).

A sample size of 12 was proposed based on study characteristics such as sample homogeneity and focused study aims and scope (Hennink & Kaiser, 2022a; Vasileiou et al., 2018), guidelines (Hennink & Kaiser, 2022b) and similar studies (Leung et al., 2019a).



During data collection saturation was reached at 13 interviews when additional information obtained from subsequent interviews continued to fit into existing categories (Braun et al., 2019).

### **Ethics Approval**

This study was approved by the Social Sciences Research Ethics Committee at the University of Bath (Ref: 0179-353). All participants gave written consent.

### **Intervention description**

The STOP app uses a proposed digitally based therapy for paranoia called Cognitive Bias Modification for paranoia (CBM-pa) (Leung et al., 2019b; Yiend et al., 2017, 2023). Participants read stories in the app and complete missing words and answer a question about each story in a way that encourages more helpful beliefs about themselves and others. STOP encourages people to develop alternative ways of interpreting paranoid thoughts (i.e. “someone is watching me”), leading participants to change their understanding of what these situations might mean. The control arm of the trial involved reading text and performing the same tasks, without the interventional content.

### **Patient & Public Involvement**

The study focus was developed collaboratively with a person with lived experience of using digital interventions for their mental health. They then reviewed the study design and research questions and deemed these relevant from a lived experience perspective. The same person subsequently helped develop all study materials to ensure they were easy to understand for participants. During data analysis two people with lived experience of psychosis were given training on the framework method. They then contributed to the coding of data and construction of themes from these codes, as well as participating in research analysis meetings.

## **Data collection**

One-off, in-depth, semi-structured interviews were conducted in line with the study protocol developed before the study commenced. Interviews were conducted using Microsoft Teams between September and December 2023. A topic guide (Supplementary Information 1) of questions based on Bordin's pantheoretical model of therapeutic alliance (Bordin, 1979), persuasive systems design (Oinas-Kukkonen & Harjuma, 2009b) and previous literature on digital therapeutic alliance was used. This was piloted on the first 3 interviews and these interviews coded to ascertain if the questions were producing relevant data. All participants were given a gift card of £15 following the interview. Interviews were recorded and auto-transcribed by Microsoft Teams with transcripts checked and corrected manually. Fieldnotes were written during or after interviews to record any additional observations.

## **Reflexivity**

The researchers took a critical realist epistemological position when using framework analysis (Fletcher, 2017). This position assumes that reality cannot be fully represented by data, however, interpretation of data by researchers can create structure and meaning in the data (Willig, 2012). The interpretation is also affected by the researchers' own knowledge. The research team consisted of TT, a doctorate in clinical psychology trainee, PJ (academic clinical psychologist), SD (computing and information technology researcher), MJTD (person with lived experience) and JY (academic psychologist). TT has experience delivering psychological interventions to people with psychosis. PJ and JY have extensive experience researching psychosis. SD has extensive research experience in digital mental health and digital therapeutic alliance (D'Alfonso et al., 2020). MJTD has lived experience and has experience in psychosis research design. Authors' own perspectives, for example that connections can be formed between technology and humans, and knowledge of clinical practice and digital therapeutic alliance will have influenced choices made throughout the research process. Involvement of people with lived experience in protocol development, topic guide and material development and coding and data interpretation was a core part of

the research in terms of grounding the data and interpretation of findings from multiple perspectives.

### **Analysis**

Qualitative analysis software NVivo 12 was used to assist the data analysis process. Framework Analysis (Ritchie & Spencer, 1994) was used as it enabled the use of a frame of deductive codes based on Bordin's pan-theoretical theory of therapeutic alliance and the persuasive systems design model to identify, analyse and interpret patterns and meaning within qualitative data alongside inductive codes.

Framework analysis involved a five-stage process: (1) familiarisation with the data which was done by transcribing and listening to recordings; (2) coding of a subset of the data using a priori codes based on Bordin's (1979) pan-theoretical model of alliance and persuasive system design framework (Oinas-Kukkonen & Harjuma, 2009b) and inductive codes (3) developing of an analytical framework of codes that can be applied to the remaining dataset (4) indexing stage in which data were inputted into the analytical framework (5) charting stage in which summaries were produced of the data within the analytical framework and (5) mapping and interpreting of the data where themes were created and reviewed until definitive concepts could be produced from the data. This was done as an iterative process moving between stages as needed. Two people with lived experience (including MJTD) blind coded a sample of the data and assisted in indexing and mapping data into themes in a series of meetings with TT. Codes and themes were also reviewed and developed by the wider research team, including all co-authors.

### **Results**

Thirteen people participated in the study, of which 62% identified as female and 62% labelled their ethnicity as white (Table 1). Most participants (60%) were over age 40 and 92% said they were currently or previously attending mental health services. Just over half of participants (54%) reported having received therapy previously from a human therapist. Interviews ranged between 45 minutes and 1 hour in length.

**Table 1***Demographic information of participants*

<b>Variable</b>	<b>% (n)</b>
<b>Age category</b>	
18-29	15% (2)
30-39	15% (2)
40-49	23% (3)
50-59	39% (5)
>60	8% (1)
<b>Gender</b>	
Male	38% (5)
Female	62% (8)
<b>Transgender</b>	0% (0)
<b>Ethnicity</b>	
Asian or Asian British	0% (0)
Black, Black British, Caribbean or African	15% (2)
Mixed or Multiple Ethnic Groups	15% (2)
White	62% (8)
Other Ethnic Group	8% (1)
<b>Employment status</b>	
Full-time employment	32% (4)
Part-time employment	38% (5)
Unable to work	15% (2)
Unemployed	15% (2)
<b>Marital status</b>	
Cohabiting	15% (2)
Divorced	15% (2)
Married	23% (3)
Other	8% (1)
Single	39% (5)
<b>Currently or previously used Mental Health Services</b>	92% (12)

## Persuasive Systems Design

Oinas-Kukkonen & Harjumaa's (Oinas-Kukkonen & Harjumaa, 2009b) persuasive systems design model is described in Table 2. Features available in the STOP app are in bold type.

**Table 2**

*The persuasive systems design model with features present in the STOP app in bold*

Category	Persuasive feature	Definition
Primary task support		Supports the user in carrying out their primary tasks in the app
	<b>Reduction</b>	Reduces complex behaviour into simple tasks
	<b>Tunnelling</b>	Guides a user through a process or experience (e.g. app content changes as the user progresses)
	Tailoring	Tailors the experience to different user groups
	Personalization	Personalizes content (e.g. allows you to customize the interface or uses your name)
	<b>Self- monitoring</b>	Allows the user to keep track of their performance

	or status towards goal achievement
Simulation	Allows the user to observe the link between cause and effect
<b>Rehearsal</b>	Provides a way for user to rehearse a behaviour that they then use in daily life
Dialogue support	The features a system uses to increase interactivity
<b>Praise</b>	Offers praise as a form of feedback
Suggestion	Suggests skills or behaviours the user can implement in daily life
<b>Rewards</b>	Rewards target behaviours (e.g. badges)
<b>Similarity</b>	Reminds the user of themselves in some meaningful way (e.g. describes scenarios similar to the user's life, uses language the user might use)

<b>Reminders</b>	Reminds the user of their target behaviour
<b>Liking</b>	Is visually attractive for the user
Social role	Adopts a social role (e.g. connecting the user to healthcare professionals)
<hr/>	
System credibility support	The ways a system promotes a perception of its own credibility
<hr/>	
<b>Trustworthiness</b>	Provides information that is truthful, fair, and unbiased
Expertise	Provides information showing knowledge, experience, and competence
<b>Surface credibility</b>	Has a competent look and feel
<b>Real-world feel</b>	Provides information of the people or institutions behind its content and services

Authority	Refers to people in the role of authority
Verifiability	Provides means to verify the accuracy of program via outside sources
Third-party endorsement	Provides endorsements from other sources
<hr/>	
Social support	The ways a system leverages social influence to motivate users
<hr/>	
Social learning	Can use the system to observe others performing tasks or behaviours
Normative influence	Leverages normative influence or peer pressure
Social comparison	Can use the system to compare their performance with the performance of others
Social facilitation	User is able to discern via the system that others are performing the behaviour along with them



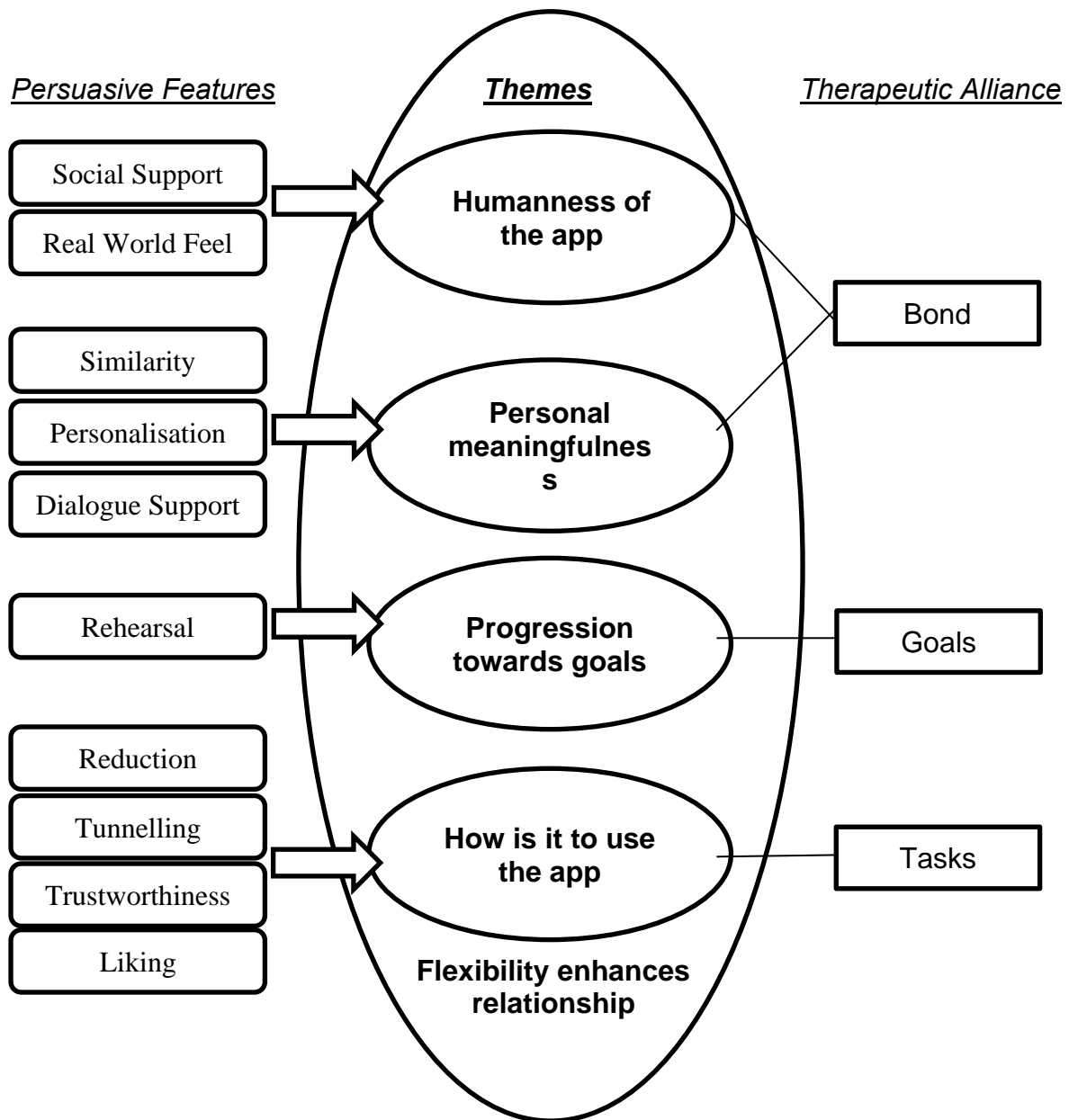
Cooperation	Leverages drive to cooperate to complete tasks or behaviours
Recognition	Offers public recognition for an individual or group
Competition	Leverages drive to compete against others in completing a task or action

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Five themes were constructed during data analysis: 1) Humanness of the app 2) Personal meaningfulness 3) Progression towards goals 4) How is it to use the app and 5) Flexibility enhances relationship. All five themes contribute to the formation of digital therapeutic alliance. Figure 1 shows how these themes map onto therapeutic alliance (Bordin, 1979), with themes 1-4 being digital analogues of the existing dimensions of therapeutic alliance and theme 5 (Flexibility) being unique to the digital environment and providing the context for formation of these other themes. Figure 1 also shows how persuasive systems design features (Oinas-Kukkonen & Harjumaa, 2009b) reinforce and enhance aspects of digital therapeutic alliance.

**Figure 1**

*Thematic map of digital therapeutic alliance and its relationship to persuasive features and therapeutic alliance*



### **Theme 1: Humanness of the app**

As the app is not human; however, this does not mean it cannot symbolise humans or humanness. Knowing about other humans associated with the app, such as app developers or other app users, appeared to enhance app-user relationship quality. This was promoted via two persuasive features, Real World Feel and Social Support. Alongside this, users also anthropomorphised the app, giving it human characteristics and describing facets of a connection with it akin to a human therapist-to-client relationship. However, users did not always want the app to be a human substitute and described valuing its non-human attributes in building connection.

### **Impact of other humans associated with the app**

Most participants reported that if they had contact with other app users, this would decrease their sense of isolation and impact their alliance with the app through increasing their motivation. In persuasive systems design, features that allow contact between app users fall under the category of Social Support and can take multiple forms including message boards and anonymised user stories. These app design features tap into known human psychology, that we are more likely to perform behaviours that we see others performing.

*"I think [seeing other users on the app] would for me impact positively on: 'These other people think this is useful as well and these other people are going through the same experience of using this app as me', so to me that would help my motivation and help my connection with the app." (Participant 12)*

The STOP app lacked features to allow users to connect, and yet some users said app use decreased feelings of isolation by increasing perceived connection. Participants reported that the app's content promoted a sense of communion with others experiencing paranoia and normalised their difficulties, which might be particularly helpful for people who did not have connections to other people with similar experiences in their everyday life. Thus, the app's existence was said by users to imply that there were others like them and

was compared to group therapy, with its impact being socially mediated despite users having no actual contact with others.

*"That element of like community in a weird way... I know everyone has, maybe everyone has those kind of thoughts, but it's just nice to to know like ohh okay this is actually an issue enough for it to be provided inside an app." (Participant 13)*

However, a desire for community was not universally reported by interviewees. Some participants felt that connecting with other app users could backfire, leading to mistrust, judgement and ultimately disengagement. Ambivalence about the utility of connecting with others is likely more elevated in people with paranoia due to this client group experiencing impaired social interactions and altered trust (Gromann et al., 2013). Despite this some users described themselves as "a people person" while others said they were disinterested in others generally.

User's belief in the credibility and usefulness of the app increased with increased indications of the humans and human institutions creating the app. Most participants reported that Real World Feel, a persuasive systems design term for the positive impact of a digital system highlighting the people (research assistants/app developers) or organization (the National Health Service) behind the product, built confidence in and connection to the app. This also happened in unexpected ways through seemingly trivial app content. For example, the app contained fun facts which participants said *"[showed] humanity... [which] made me more trusting" (Participant 2)* and *"made me feel a bit more warmer towards it" (Participant 6)*.

### **I like that the app is non-human**

Participants said they worried that talking about difficulties with a human therapist could exacerbate symptoms and required developing a trusting relationship that not everyone wanted to, or felt, they could build with someone. Therefore, they valued that they could engage in an app which did not require talking about difficulties, which reduced the relational burden and fear of judgement experienced in therapeutic interactions. The app not asking personal details or aspects of a person's individual difficulties or symptoms also

meant it did not have much information on users which was a positive for some clients as it reduced the need for relational trust and fears around data privacy. As mentioned above, relational difficulties and trust is particularly pertinent for this client group. Furthermore, the here and now focus of the app seemed to be most rewarding for those who stated they had significant previous experience of talking therapy and now wanted the more focused approach a non-human entity with reduced interactive capacities could provide.

*"[The app] feels targeted and it is intensive against [paranoid thoughts] and I think that's what I really needed... when I've been to face to face, they just want to bring up the childhood and trigger stuff and what happened between your parents and blah blah blah."* (Participant 9)

In addition, the app's lack of human responsiveness provided unique therapeutic possibilities, for example more space for personal reflection.

*"With a person they're just speaking, I'd be disagreeing, and with the app, I've got more time [to think] well, maybe, wait a minute, maybe this is a bit of paranoia."* (Participant 5)

### ***I experienced the app as I might a human***

Many participants anthropomorphised the app calling it "friendly" (Participant 3), saying it had a "sense of humour" and "personality" (Participant 6), was "someone to talk to" (Participant 9) and had "made me smile" (Participant 2). The therapeutic journey with the app was described similarly to how a human-to-human therapeutic relationship might evolve. Stopping using the app was experienced as a loss and some participants said they would have wanted a therapeutic ending such as a letter or goodbye conversation.

*"I did feel connected with the app because when I finished the trial and then you can't access [the app] anymore it was a bit like ohh. I felt a bit of a loss."* (Participant 12)

However, for some participants the app's limitations meant they could not connect with it and these participants did not experience the app's features as indications of humanness. Therapeutic abilities of humans including interactiveness, responsiveness,

warmth and reassurance were judged beyond the app's capabilities, and this was a barrier to both connection and therapeutic progress.

*"An app it's inanimate it's an object and (my former therapist) was a person a, a person, a person who can challenge the status quo. The app cannot do that." (Participant 8)*

These participants described seeing therapeutic recovery as being a relational pursuit, while those who described the app's abilities as sufficient tended to value self-efficacy and autonomy. Attachment style is known to impact therapy utilisation and engagement (Adams et al., 2018). Thus, it may be that those who wanted a more relational experience were not getting these needs met elsewhere or had had attachment experiences that meant they required relational attunement for their treatment.

## **Theme 2: Personal meaningfulness**

To feel connected to the app participants wanted personally meaningful app content and meaningful responsiveness to their individual inputs. Participants who saw their circumstances in the app's scenarios experienced these exercises as more useful. This is the persuasive systems design principle of Similarity (the system reminds me of myself) and when participants encountered this, they reported they reflected more on their struggles, potentially enabling change. Conversely, participants whose worries and lives were not represented reported that this led to disconnection, an increased sense of isolation and generally were able to apply the content less readily.

*"The scenarios... were all things about going to work and things that are not relevant to my [life]. I haven't been to work for 20 years and going to a party, I've been to about one party in my life." (Participant 2)*

Participants wanted personally meaningful reciprocity from the app, which could be using the person's name, adapting app content or treatment progression based on user inputs or giving users feedback on their mental state or progress. This would indicate a genuineness on the part of the app, but also a respect and collaboration as feedback would allow the user to be an active participant in their treatment.

*"It's [increases] trust to know that the product that you're inputting your data into is also sharing that with you, so there's like an element of transparency." (Participant 13)*

In the persuasive systems design framework this links into principles of Personalisation (the app treats user input responsively) and Dialogue Support (the app is interactive through system feedback). However, arbitrary attempts at reciprocity risk rupturing the relationship and promoting disengagement. For example, giving users badges as they progressed (known as Rewards in the persuasive systems framework) which participants said were not reinforcing as they lacked meaning and were not married to personal goals.

*"It's like a gold star at school where you get a gold star at school, but then it's like, what does the gold star really mean?" (Participant 6)*

### **Theme 3: Progression towards goals**

When the app's purpose aligned with the user's hopes or goals for using the technology, and the user experienced progress towards that goal, alliance increased. This occurred even in the absence of there being agreed goals between the app and the user. *"The more you use it, the more you want to use it because it is making a difference... you start thinking a bit more clearly and putting things into perspective." (Participant 3)*

Participants who made real world progress towards goals through practicing first in the app before practicing in their lives (the Rehearsal feature of persuasive systems design) reported increased motivation to keep using the app and connection to it.

*"It did definitely change the way I was thinking... I don't get panicked on the train anymore when I used to have really bad panic attacks or I couldn't breathe." (Participant 9)*

### **Theme 4: How is it to use the app**

The user experience should not be neglected when contemplating user-app relationships. Participants expressed that the app's sessions (tasks) could trigger positive or negative emotions and make them feel more or less hopeful about achieving their goals. Interactive elements such as sound, pictures, videos, badges, and colours were reported to increase a sense of playfulness, while fun features have the potential to increase connection

by lightening the mood, increasing motivation, facilitating learning, or provoking a sense of achievement. Where the app was more enjoyable, goals also felt more achievable.

*"Those cartoons and so it was not only oral it was visual. So I could visualize the things that was happening, what was being asked of me. So it became more positive as to my goal of getting well." (Participant 8)*

The app's tasks were generally experienced as manageable, however, alliance declined when tasks were challenging or time intensive. This aligns with the persuasive systems design principle of Reduction, that systems should be simplified. As the app lacks human communication skills, ruptures around task complexity are harder to spot and resolve, leading to disengagement.

*"The voices start disturbing me [when I didn't understand the questions]... then I get frustrated I just wanna finish it quick." (Participant 11)*

A few participants valued repetitiveness as it reduced task demand, however, most reported repetitiveness of tasks made them perceive the app as boring or tiresome and decreased connection. It symbolised for users a lack of bidirectional relationship as the information they entered into the app never triggered a change in treatment trajectory. This aligns to the persuasive principle of Tunnelling in which the system guides users through a process with opportunities for behavioural or attitude change enroute.

Tasks should also be transparent in their purpose, and where they do not run smoothly developers can anticipate that this may be interpreted as a covert attempt to induce paranoia in users. Multiple users expressed wondering if the app might be trying to "trick" them.

*"I never trusted the technical glitch I always thought this is deliberate. (Participant 2)*

Persuasive systems design dictates that systems should provide information that can be perceived by users to be truthful, fair and unbiased (Trustworthiness). Participants commented that responsive technical support could increase perceived credibility.



### **Theme 5: Flexibility enhances relationship**

Apps are inherently flexible in their design, and this has several common-sense impacts such as being able to use the app anywhere, anytime, without delays. Less intuitive is the impact this has on relationship quality. Participants expressed that attempting to access public mental health care can lead to feelings of frustration and rejection. However, participants reported that they had a positive relationship with the app as its flexibility and availability allowed them treatment they previously felt barred from.

*"I've got to really fight for [face to face therapy] whereas the app... it's my choice."*

*Participant 12)*

This boosted a sense of autonomy as participants spearheaded their own care, and promoted a bond with the app based on it being there when others were not. Similarly, being able to connect to the app in times of increased paranoia and use the app as a break from aversive experiences increased bond.

*"During the time I was using the app I did become quite ill and I had to go into a crisis house and so it did help me distract myself at times when there weren't workers or anything available." (Participant 5)*

However, for some participants flexibility of the app was meaningless as the app could not provide the type of support they viewed as helpful.

*"I get days I'll get low and and how can the app help me? Whereas I can ring [care coordinator] and tell [care coordinator]: 'Help can you take me out to do something?' The app can't do that and especially for someone like me, I'm not confident person." (Participant 10)*

App flexibility also presents a tension as it may inadvertently increase the possibility of disengagement due to treatment open-endedness while participants said scheduled regular sessions promoted momentum. The app uses strategies such as reminders to keep users working towards goals; however, no participant reported that techniques like reminders could prevent drop out.

*"You can get notifications of the emails and stuff, but life gets in the way." (Participant*

*7)*

All participants who were highly engaged with the app reported this was due to internal motivation. Thus, although in some cases flexibility may aid alliance, it can also disrupt alliance if it reduces the mechanisms of accountability such as regular scheduled sessions and human follow up.

## **Discussion**

### **Summary of findings**

This study set out to investigate how users of an automated smartphone application conceptualise the digital therapeutic alliance and how their experience of digital therapeutic alliance was supported by persuasive systems features. Persuasive features were examined as a possible mechanism through which digital therapeutic alliance is created given the unique context of the digital environment.

Five themes were constructed during data analysis: 1) Humanness of the app 2) Personal meaningfulness 3) Progression towards goals 4) How I use the app and 5) Flexibility enhances relationship. All five themes contribute to formation of digital therapeutic alliance. Themes 1-4 were understood to map onto existing dimensions of therapeutic alliance while Theme 5 was interpreted as being part of the context of smartphone interventions and supportive to the formation of the other digital therapeutic alliance dimensions. Persuasive features were found to enhance Themes 1-4.

### **Contextualising findings within previous research**

Previous research has drawn mixed conclusions about a user's ability to bond with an automated mental health app (Berry et al., 2018; Darcy et al., 2021; Tong et al., 2022, 2023). Tong et al. (2023) argued that there could not be a bond dimension in digital therapeutic alliance due to bond requiring bidirectional connections and being influenced by the life experiences of those involved (Bordin, 1979). The authors of that paper preferred to use the term "connection" to explain interaction between a user and app. One of the complexities of the term "bond" is that it is conceptualised as a two-way process of connection. However, even in a human-to-human therapy dyad, the therapist is using

professional techniques and behaviours to facilitate this connection, and maintains boundaries regarding their life and internal world, thus skewing the two-way aspect of the bond. Furthermore, in human-to-human therapy different therapeutic modalities will necessitate different intensities of bonds (Bordin, 1979), indicating that bond can occur along a spectrum. With this in mind, we propose that the digital therapeutic alliance dimensions of Humanness of the App and Personal Meaningfulness map onto the Bond dimension of therapeutic alliance. Our findings indicate that users of automated mental health apps may draw on their perception of the app developers and other users to lend life story/characteristics to the app where it has none, thus facilitating a bond. Persuasive systems design features of Real World Feel and Social Support appear to enhance this process, indicating that app developers wanting to nourish alliance should give users information on the team and organisations behind the app and create opportunities for app users to experience peer-to-peer community, either directly or indirectly. This is supported by evidence from a systematic review on peer-to-peer interactions in digital interventions for psychosis, which found that those including moderated peer-to-peer contact were more engaging and acceptable to users and appeared to have increased compliance (Biagiante et al., 2018). This study also indicates that the benefits of feeling less isolated and perceiving oneself as part of a community can be built by an app through its own content, without any peer-to-peer contact. This mirrors findings from a trial of the blended app for paranoia which found users viewed animated vignettes as peers, and thus felt more connected, understood and less isolated (Greenwood et al., 2022). This study's novel contribution is that both direct and implied social connectivity appears to confer benefits to the app-user relationship, promoting alliance. Where users experienced a positive emotional response to the app, they anthropomorphised it which increased alliance. This echoes studies which showed users assigned human traits to automated mental health chatbots (Beatty et al., 2022; Dosovitsky & Bunge, 2021). Reactions from users, such as missing the app on therapy termination, confirms the results of a previous qualitative study on an app for psychosis (Berry et al., 2018), and gives further evidence to the assertion that a user's reaction to a mental health

app is not an emotionally cold response to a piece of technology but can include warmth and be relationally based. This is further validated by findings on smartphone attachment, which indicate that when individuals experience fatigue or stress, they may experience emotional bonding with a mental health app that meets their emotional needs (Li et al., 2020).

However, it is not clear if the experience of bond in the digital context would be as strong as with a human therapist as this goes beyond the data available in this study.

This study also found the app's non-human manner of interacting was experienced by some users as reducing relational burden and fear of judgement. This aligns with previous findings that people could be open and honest with automated mental health apps (Berry et al., 2018) with reduced pressure (Tong et al., 2023), and that users may be turned off by digital technologies that are experienced as trying too hard to be human (Venning et al., 2021). Many users appreciated the app's focused approach, which may be particularly relevant in a population with significant contact with mental health services. It may be significant that about half of the sample had previously had therapy with a human, and this may be relevant in considering their level of satisfaction with an app focused on a single therapeutic target (paranoia), as these users had already experienced a potentially more wide ranging, interactive and containing therapeutic intervention. Multi-featured apps or apps that attempted to more closely replicate the varied experience of interacting with a human may have produced a very different response from participants. Thus, this supports the contention that mental health technologies provide more than an emulation of human-to-human interactions but provide unique relational and therapeutic opportunities.

This study supports the notion that lack of interactivity and personal responsiveness to individuals impacts alliance (Berry et al., 2018; D'Alfonso et al., 2020; Tong et al., 2023). Although an app may not be able to make an empathic body gesture or facial expression, several persuasive features may increase alliance including Personalisation (the app adapting to user input such as using their name) and Dialogue Support (interactive

elements, feedback or graphs) by giving the user the sensation of a bi-directional collaborative relationship. This study indicated that this feedback and responsiveness can be seen as a sign of respect and genuineness by users and therefore part of the essential relational traits of a therapeutic alliance. However, the digital therapeutic alliance dimension of Personal Meaningfulness in this study contains a warning to those developing apps, that interactive features that lack meaning to users risk promoting disconnection. Another unique contribution of this study is the idea that where the user perceives the system as being more like themselves (Similarity in persuasive systems design) this will enhance connection. In human-to-human therapy there is substantial evidence that client-therapist match on demographics, life experiences and worldviews influence therapeutic alliance and therapy outcomes (Chao et al., 2012; Kim et al., 2005; Wintersteen et al., 2005). This study indicates that issues of identity and similarity remain relevant online and app developers may want to understand the life experiences of their user group or have different versions of the app for different user groups to build connection (known as Tailoring in persuasive system design).

Previous research suggested that agreed upon goals enhance digital therapeutic alliance in fully automated mental health apps (Goldberg et al., 2022b; Prochaska et al., 2021; Tong et al., 2022). Our study found that while the app did not allow the user to input a specific, measurable and time limited goal, users who both had a goal in mind which the app aligned with; and saw progress towards this goal, reported increased alliance with the app. This validates Tong et al.'s (2023) suggestion that when building alliance with fully automated mental health apps goals may be considered as reasons/goals for using an app as opposed to concrete agreed app-client goals. However, persuasive theory on cognitive consistency (Cialdini et al., 1981) and goal setting theory (Latham et al., 2002) state that setting specific goals increases motivation to continue towards those goals, thus indicating that app developers may benefit alliance by having user stated goals in their interventions. App developers should also note that systems that allow Rehearsal (persuasive systems design principle where things practiced in the app are done in real life) are primed to create

more app-user connection as users take progress made in the digital environment and apply this to their lives.

Flexibility is not included in existing therapeutic alliance or digital therapeutic alliance measures; however, it has been proposed in previous literature as being part of the context which allows digital therapeutic alliance to develop (Clarke et al., 2016b; Hillier, 2018; Tong et al., 2022, 2023; Tremain et al., 2020a). This study found that flexibility has both a surface level (time, location, duration of intervention) and relational impact. Therapeutic contact goes beyond what happens in the therapy session to include a myriad of aspects such as the referral process and waiting times and this study found that the flexibility of an app meant service users did not need to navigate this process and ease of access could mean a more positive relational experience and increased user-app bond. Increased flexibility could also impact the user's relationship to self, increasing autonomy and empowerment as the user saw themselves as being in the driver's seat of their treatment. This finding reinforces previous accounts, that the autonomy and self-determination aspects of using digital interventions for mental health treatment may be particularly relevant for those with experiences of serious mental illness (Tremain et al., 2020a) often associated with experiencing high chronicity, disability and powerlessness (Hoffman et al., 2020; Linhorst, 2005). However, flexibility increases the need for self-initiation of app use and self-motivation as the app lacks robust mechanisms of accountability. This study indicates that app features such as reminders encourage, but do not enforce, app use (Tong et al., 2023).

This study verified previous assertions that tasks are predictive of digital therapeutic alliance (Gómez Penedo et al., 2020; Scherer et al., 2016; Tong et al., 2022) and indicates that an app that is effortful to use can lead to alliance ruptures which the app will not be able to repair due to its reduced communications abilities. Thus, the persuasive systems design principle of Reduction (simplifying complex tasks) is essential in building apps that maintain connection. In therapeutic alliance genuineness is one of the core components in building

alliance in face-to-face therapy (Overholser, 2007). Rogers (1966) (p. 185) wrote that “genuineness in therapy means that the therapist is his actual self during the encounter with his client. Without facade.” This concept of genuineness, transferred to the context of fully automated mental health apps, could represent whether an app does what it claims to. This study found that users needed to feel sure of what the app was doing and its intentions. The persuasive systems design principle of Trustworthiness is relevant here and app development teams must take steps to boost app credibility in the eyes of the users, for example a simple strategy such as warning users that technical glitches may happen and having prompt technical support may demonstrate genuineness to users.

### **Strengths and limitations**

The participants recruited in qualitative studies interviewing mental health app users are frequently younger digital natives (Aref-Adib et al., 2016; Bucci, et al., 2018). A strength of this study is that most participants were aged 40 years or above. This expands understanding to a wider range of users of mental health apps, especially given that an older age group are sometimes subject to stereotypical views that they will not be interested in, or be able to use, digital interventions which could lead to unequal access to new innovations in treatment. Another study design strength was the use of a multidisciplinary study team which also included people with lived experience as this allowed a more nuanced data analysis.

All the participants in this study had experience of using the same app, which was designed to help with paranoia. This had the advantage of creating a more homogenous sample which facilitated the analysis process; however, this does mean that the findings may not be representative of users of a different kind of mental health app. As the sample for this paper was taken from an ongoing randomised control trial, the study team remained blinded to whether those completing the trial were from the two intervention or one control arm. Thus, this sample is a mix of those who received both intervention and control. Although all intervention arms had the same features, this is a factor worth considering for

those who reported not experiencing an alliance or connection to the app as they may have been recipients of the control arm. Furthermore, length of intervention (either 6 or 12 weeks) may have also impacted on experiences of alliance. Respondent validation, which includes inviting participants to comment on the interview transcript and whether the final themes and concepts created adequately reflect the phenomena being investigated could have been used to increase the credibility of the findings (Noble & Smith, 2015), as well as to potentially generate additional data or analysis which may have added further depth to the findings (Lindheim, 2022).

### **Conclusions**

This study provides qualitative support for the existence of a digital therapeutic alliance between a user and a mental health app when there is no therapist involvement. Our data suggests that there are relational aspects to people's use of mental health apps which appear to be digital analogues of alliance as experienced in human-to-human therapeutic interactions. Findings from this study could be used to inform the design of digital interventions to enhance their capacity to foster digital therapeutic alliance with users, with the supposition that as with the traditional therapeutic alliance, its digital counterpart is also conducive to better outcomes in terms of mental health app efficacy. Dimensions of digital therapeutic alliance proposed by previous authors, such as flexibility, are also confirmed in this study as being of importance. Thus, this convergence of new dimensions across multiple investigations is a promising sign of an increasing understanding of digital therapeutic alliance. This study is also the first to link digital therapeutic alliance to persuasive features which outlines tangible information for app developers who can implement these features with the potential to enhance the relational quality of interventions. Future studies could explore the impact of design on digital therapeutic alliance, for example by comparing different versions of the same clinical content with varying features. It is currently poorly understood to what degree digital therapeutic alliance is linked with outcomes in apps and thus selecting appropriate methods to assess the association between digital therapeutic alliance and clinical outcomes is also important, which is likely to require the development of



new measures. Assessing digital therapeutic alliance in a variety of types of fully automated mental health apps would also expand understanding.

### List of abbreviations

Agnew Relationship Measure (ARM)

Digital Working Alliance Inventory (DWAI)

Mobile Agnew Relationship Measure (mARM)

Working Alliance Inventory (WAI)

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## **Executive summary**

### **Service-Related Project: Psychological wellbeing for patients and families following an Intensive Care Unit (ICU) Admission at the Royal United Hospitals, Bath**

Research has documented the need for evidence-based mental health supports for patients and family following discharge from ICU, however, implementation challenges and patient and family views on the support provided requires further investigation. This project sent out survey questionnaires to patients and families following discharge from the Bath RUH ICU and asked about the evidence-based supports patients/families had been offered during admission and gathered their suggestions to improve provided support for psychological wellbeing during admission. Anxiety, depression, and post-traumatic stress disorder were also screened for. Thirty-six patients (N=36) and twenty-nine family members (N=29) returned the questionnaires. A third of patients and family members indicated to have at least one mental health condition. A significant majority of respondents reported that completing an ICU diary, providing information on the mental health impacts of an ICU stay and providing direct mental health support during admission had not happened during admission. Patients and families reported that some of the factors which impacted on their wellbeing during admission included communication from staff on both physical and mental health aspects of ICU admission, staff kindness, attentiveness, and competence. Covid-19's impact on human interaction was also found to reduce well-being. Based on these findings, recommendations for psychological services in ICUs were made. Some of these included provision of wellbeing supports by a dedicated clinical psychologist, improved signposting, training opportunities for all ICU staff and use of a multidisciplinary referral system for 1:1 psychological intervention.

### **Literature review: Persuasive systems design features of smartphone applications for psychosis: a systematic review**

It is unclear why some smartphone applications designed for people with psychosis are successful in engaging users, while others are not. Possible explanations are the differing

choices app development teams make in selecting persuasive strategies or the variation in the operationalization and implementation of these strategies. This systematic review set out to quantify and describe the persuasive features used in smartphone applications for psychosis, investigate whether there was any association between persuasive features and attrition or adherence rates and document the quality of the included apps. The persuasive systems design model was used to assess the apps. The most common persuasive features in the 22 apps included in the study were personalisation, reminders, suggestion, tunnelling, and self-monitoring. It was found that there was no association between number of persuasive features and attrition, and association between persuasive features and adherence could not be assessed. The quality of the apps could not be judged due to apps being inaccessible. Our findings indicate that in psychosis apps there is an uneven use of persuasive features which may be impacting the efficacy and engagement of these interventions. Psychosis apps may benefit from incorporating more features which leverage the persuasive impact of having users interact (social support). There is a human instinct to respond to social forces and thus incorporating these domains into psychosis apps may allow developers to engage people with psychosis who may benefit from the app. Features that emphasize system credibility and trustworthiness to the user also appear to be crucial. As technology advances, there is an increasing need for designer openness about their positioning, bias and how data is stored and used. Further technological advances can only be widely applied if users have confidence in the systems that gather their data. Future research could expand the Persuasive Systems Design model, as this review indicates it no longer encompasses all features apps are using. Furthermore, there is a lack of clarity on how many persuasive features is optimal, how-to operationalise features and how persuasive categories work together.

**Main Research Project: How do users of a mental health app conceptualise digital therapeutic alliance? A qualitative study using the Framework Approach**

Fully automated mental health apps have the potential to increase access to evidence-based psychological interventions and reduce burden on staff resources in overburdened mental health services. Within human-to-human therapy the working relationship (therapeutic alliance) between the client and therapist is well studied and has been consistently linked to effective and engaging therapy. However, less is known about whether a digital therapeutic alliance exists, what its components may be and how it can be fostered to improve engagement and adherence to digital interventions. This study explored the experiences of users of a mental health app to better understand digital therapeutic alliance and which app features enhance it. We conducted a qualitative study using semi-structured interviews with 13 participants who had recent experience of using a mental health app and analysed the data using the framework analysis method. Results identified five dimensions of digital therapeutic alliance: 1) Humanness of the app 2) Personal meaningfulness 3) Progression towards goals 4) How I use the app and 5) Flexibility enhances relationship. Persuasive systems design features were found to reinforce and enhance aspects of digital therapeutic alliance.

This study provides qualitative support for the existence of a digital therapeutic alliance between a user and a mental health app when there is no therapist involvement. Our data suggests that there are relational aspects to people's use of mental health apps which appear to be digital analogues of alliance as experienced in human-to-human therapeutic interactions. Dimensions of digital therapeutic alliance proposed by previous authors, such as flexibility, are also confirmed in this study as being of importance. Thus, this convergence of new dimensions across multiple investigations is a promising sign of an increasing understanding of digital therapeutic alliance. This study is also the first to link digital therapeutic alliance to persuasive features which outlines tangible information for app developers who can implement these features with the potential to enhance the relational quality of interventions. Future studies could quantify the impact of design on alliance by accounting or and assessing these variables into randomised control trials on digital interventions. It is currently poorly understood to what degree digital therapeutic alliance is

linked with outcomes in apps and thus selecting appropriate methods to assess the association between digital therapeutic alliance and clinical outcomes is crucial, which may necessitate the development of a new measure.

### **Acknowledgments**

Thank you to my family, friends and partner who are endlessly supportive and kind. Thank you to the course staff for your help.

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Appendix M: Ethics application for Main Research Project

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## Appendix A

### Table of extended data set for included papers in systematic review

App name	Study design	Location	Sample size, Mean age, Participant diagnoses	Brief description of the app	Treatment target	Automated or blended	Intended frequency/duration of use	Attrition data)	Adherence data
A4i (S. Kidd et al., 2021; S. A. Kidd et al., 2019)	Pre post-test design	Canada	38 participants, mean age 31.4 (SD 8.6), diagnosed with: schizophrenia diagnosis, schizoaffective, psychosis NOS, psychosis comorbid with bipolar, or autism with prominent psychosis symptomatology	The A4i app provides seven functionalities including daily activities, passive data collection, peer support, and self-management such as coping tips. A unique feature is an ambient sound tester to allow users to discriminate ambient sound from auditory hallucinations.	Medication adherence, personal recovery, and psychiatric symptomatology	Automated	One month, twice daily notifications	0%	The mean number of interactions per day was 4.21 (SD = 5.19), used for a mean of 25.12 days (SD = 6.32; range: 16–46 days)
Actissist (Bucci, Barrow clough,	Single blind RCT	United Kingdom	36 participants (24 participants use Actissist plus treatment as usual and 12	App features include non-directive content, recovery videos, calming	CBT informed early psychosis intervention	Automated	12 weeks, 3 notifications a day, 6 days a week	21% (Actissist app users)	75% participants used Actissist at least once/day

App name	Study design	Location	Sample size, Mean age, Participant diagnoses	Brief description of the app	Treatment target	Automated or blended	Intended frequency/ duration of use	Attrition data)	Adherence data
et al., 2018)			participants used ClinTouch plus treatment as usual), mean age of 20.21 years (SD = 7.37)— Actissist; mean age of 18.33 years (SD = 7)— ClinTouch, diagnosed with psychosis	exercises, psychoeducation, and goal-setting.					
Chilltime (Penno u et al., 2023)	Pilot (Feasibility + acceptability)	Canada	13 participants, mean age 27.6 (SD 4.5), diagnosed with schizophrenia spectrum disorder with a comorbid substance use disorder	A total of 20 coping strategies regrouped in four categories (behavioural, emotional, cognitive, spiritual) were included in the app.	Emotional regulation in dual diagnosis psychosis and substance use disorder	Automated	30 days, notifications twice daily	18%	Approximately half of the patients (5/11) used the tool at least 33% of the days (11-21 days) while the other half used it 27% of the days or less (5-8 days) during the project.

App name	Study design	Location	Sample size, Mean age, Participant diagnoses	Brief description of the app	Treatment target	Automated or blended	Intended frequency/duration of use	Attrition data)	Adherence data
CBT2go (Granh olm et al., 2020)	Single-arm, open-trial, pre-post evaluation	USA	31 participants, mean age 48.3 (SD 9.5) years, diagnosed with schizophrenia or schizoaffective disorder	App features included recovery goal setting, thought challenging, scheduling of pleasurable activities and social interactions and activity tracking.	CBT for negative symptoms. Aims to reduce severity of defeatist performance attitudes	Blended - weekly in-person group therapy with a smartphone app	24 weeks, daily notifications	19%	There was a mean of 32.3 (SD 31.5) responses to 168 action plan prompts (19.2%) at 24 weeks
Connect+ (Lim et al., 2020)	Pilot, pre post design	Australia	12 participants, mean age 20.50 years (SD =2.65), diagnoses of schizophrenia, schizoaffective, schizophreniform and psychotic disorder NOS	The +Connect app aims to reduce loneliness in young adults with early psychosis by providing exercises to practice positive interpersonal skills and	Loneliness	Automated	6 weeks, daily notifications	17%	All but two participants completed the +Connect program, completing 95% (40.10 out of 42 days) of the program.

App name	Study design	Location	Sample size, Mean age, Participant diagnoses	Brief description of the app	Treatment target	Automated or blended	Intended frequency/duration of use	Attrition data)	Adherence data
Focus (Achtys et al., 2019; Ben-Zeev et al., 2014)	Large, prospective, multicentre longitudinal study	USA	368 participants. Participants aged <35 years = 199 (57%), aged 35-45 years = 80 (23%), >45 years = 68 (20%). Diagnosed with schizophrenia spectrum disorder and within 60 days of discharge from a psychiatric hospital.	strengthen relationships. The app provided patients with access to illness management strategies in the areas of medication, mood, social, sleep and voices which they could self-initiate use of.	Sleep, mood, social, meds and voices	Automated	6 months, notifications up to 3 times a day, *Analysis restricted to on demand access by participants	6%	There were a total of 75,447 FOCUS logins; 35,739 (47.4%) were self-initiated and 38,139 (50.6%) were off-hours. 18,450 of the logins during off-hours were self-initiated (24.5%).
Focus-AV (Ben-Zeev et al., 2018)	Mixed methods	USA	10 participants, mean age of 45.5 years (SD 13.18), schizophrenia or schizoaffective disorder	FOCUS-AV is an adapted version of the FOCUS smartphone intervention with video adaptations for all the FOCUS content	Sleep, mood, social functioning, medications adherence and voices	Automated	One month, notifications up to 3 times a day	10%	Participants responded to 67% of prompts. On average, participants used interventions 6 days a week, 4 times daily.

App name	Study design	Location	Sample size, Mean age, Participant diagnoses	Brief description of the app	Treatment target	Automated or blended	Intended frequency/duration of use	Attrition data)	Adherence data
Grasp (Sedgwick et al., 2021)	Pilot (Feasibility + acceptability)	United Kingdom	14 people, mean age 45.1 (9.78), diagnosed with psychosis-spectrum difficulties,	Three types of tasks delivered by the app: stories (short vignettes of social situations), emotions (aimed to target perception) and facts and guesses (aimed to address difficulties with jumping to conclusions in social situations)	Social cognition and social functioning	Group therapy + app	21 days, 2 notifications per day	21%	Average number of tasks completed was 70%. Mean number of days the app was used was 12.91 (SD = 7.40).
IMPACT HS (Austin et al., 2020; von Malachowski)	Non-controlled trial	Germany and Denmark	24 participants, mean age 28.21 years, 75% with a diagnosis of schizophrenia	The CBT-p based smartphone-app includes a psychoeducational manual, eight interactive e-learning-modules on difficulties	Reducing psychotic and depressive symptom severity	Blended	6 months, client initiated	29%	Participants used the solution on M = 2.91 days/week, with more frequent usage in month one

App name	Study design	Location	Sample size, Mean age, Participant diagnoses	Brief description of the app	Treatment target	Automated or blended	Intended frequency/duration of use	Attrition data)	Adherence data
et al., 2022)				associated with psychosis, individualizable action plans, a trigger response plan, and self-assessment.					(M = 4.25 days/week) than in later months (e.g., month five: M = 2.10 days/week).
MASS (Fulford et al., 2021)	Pre post test	USA	37 participants, mean age 46 (SD 11), diagnosis of schizophrenia or schizoaffective	The MASS app seeks to address social impairment by offering social skills training and administering EMA surveys.	Social skills training	Automated	60 days, Notifications twice daily, also client initiated	16%	Participants responded to 42.5% (51/120) of notifications on average.
Moneo (Krzysztof et al., 2019, 2020)	1-year multicentre, open-label randomized study	Poland	199 in intervention, 91 in control, Mean age 32.1 years, diagnosed with paranoid schizophrenia	Cognitive training focusing on response time, correct answer rate, incorrect answer rate, and fatigability to check. Exercises were based on Cognitive Remediation Therapy and each training	Cognitive training/cognitive rehabilitation	Automated	12 months, twice weekly	29% (intervention) 34% (control)	Fifty participants completed at least one cognitive training per month in the last 4 months of the study. On average, each patient completed 23

App name	Study design	Location	Sample size, Mean age, Participant diagnoses	Brief description of the app	Treatment target	Automated or blended	Intended frequency/duration of use	Attrition data)	Adherence data
My Journey (Stearns et al., 2020, 2021)	Two-arm unblinded feasibility RCT.	UK	40 participants (20 in each arm), mean age 29.7 years (SD 9.78), diagnosed with schizophrenia, schizotypal or delusional disorder	included three series of exercises, with increasing levels of difficulty. The My Journey 3 app aims to support psychosis patients by providing self-management interventions. The features include relapse prevention plan, symptom and medication tracker, and psychoeducation	Develop self-management skills, achieve self-determined recovery goals and avoid future relapses	Blended	12 months, user initiated	17% drop out at 4 months and 25% drop out at 12 months	training modules. The median number of My Journey 3 uses was 16.5 (IQR 8.5 to 23) and median total minutes spent using My Journey 3 was 26.8 (IQR 18.3 to 57.3).
MCI-S (Han et al., 2023)	Quasi-experimental design	Unclear	50 participants, ages 18-65, diagnosed with schizophrenia	An app based metacognitive intervention program with	Metacognitive beliefs, psychotic symptoms,	Automated and blended versions	Ten 90-minute app sessions	8% (app only) 17% (app +	No information on adherence



App name	Study design	Location	Sample size, Mean age, Participant diagnoses	Brief description of the app	Treatment target	Automated or blended	Intended frequency/duration of use	Attrition data)	Adherence data
	with a non-equivalent comparison group			weekly mentoring sessions. Sessions focused on metacognition, understanding of perspectives, identifying the social context and daily practice.	and social functioning			mentoring)	
PEAR004 (Nassir Ghaemi et al., 2022)	Randomised Controlled Trial	United States	56 PEAR participants, 56 control, PEAR mean age 43.7 (10.99) control mean age 45.7 (11.60), diagnosed with schizophrenia	PEAR-004 is a self-management app that provides skills, surveys and modules.	Positive and negative symptoms of schizophrenia	Automated	12 weeks, 3 notifications per day	14% drop out of PEAR sample	4.1 (SD 1.7) sessions/day, 4.2 (SD 3.4) hours/day
PRIME (Fisher et al., 2023)	Double blind RCT	27 US states and 7 countries (Canada, Mexico, UK, France, Australia)	100 participants (48 in PRIME and 52 in control), mean age PRIME = 33.98 (10.6) and control 33.58 (10.89), Psychosis	PRIME techniques include CBT, behavioural activation, mindfulness, psychoeducational approaches, and coaching.	Motivation, cognition, and negative symptoms	Blended (app + computer + coaches)	16 weeks, 2 hours per day	22%	Participants in the PRIME group averaged 17.15 (SD 13.89) hours of cognitive training across the study, with

App name	Study design	Location	Sample size, Mean age, Participant diagnoses	Brief description of the app	Treatment target	Automated or blended	Intended frequency/duration of use	Attrition data)	Adherence data
		, India, Israel)	spectrum disorder (schizophrenia, schizoaffective, schizophreniform , psychosis (NOS), bipolar, MDD with psychotic features	PRIME participants message and interact with their coach as well as a community of peers.					an intensity of 1.33 (SD 0.98) hours per week.
Savvy (Bell et al., 2018, 2020)	single-blind, parallel group, pilot RCT	Australia	34 participants (17 intervention 17 control), mean age SAVVY 39.12 (10.64) mean age control 42.59 (10.64), bipolar w. psychotic features, major depression w. psychotic features,	The app content is composed of two phases: identifying and implementing individualised coping strategies which then are supported by personalised EMI reminders in daily life.	Voice hearing	blended	4 weeks - EMI notifications 5x per day	24	The average completion rate of the daytime EMA questionnaires was 72%. Completion rates of evening EMA questionnaires across the intervention was 74%.

App name	Study design	Location	Sample size, Mean age, Participant diagnoses	Brief description of the app	Treatment target	Automated or blended	Intended frequency/ duration of use	Attrition data)	Adherence data
Sleep app (Taylor et al., 2022a)	Single-arm, uncontrolled study	United Kingdom	14 participants, mean age 35.57 (SD 10.88), diagnosis of first episode psychosis, schizophrenia, schizoaffective disorder	The smartphone app intervention draws on CBTi techniques, adapted for individuals with psychosis. Six core weekly modules, and one further participant-chosen module ('Managing Worry' or 'Coping with Voices').	Sleep (CBTi)	Blended	6 weeks	21.40%	Scheduled EMI reminders were viewed on average 2.5 times per day, and 1.5 times per day when user-initiated The mean number of modules engaged with was 5.6 (SD = 1.8). On average, participants engaged with 13.7 (34.3%; SD = 10.4) of the 40 reminders.
SlowMo (P. Garety)	Parallel-arm, assessor	UK	361 participants, 181 randomised to SlowMo, 180	SlowMo is a digitally supported CBTp	Paranoia	Blended	12 weeks, app used on demand	8%	Mobile app adherence was operationalized

App name	Study design	Location	Sample size, Mean age, Participant diagnoses	Brief description of the app	Treatment target	Automated or blended	Intended frequency/ duration of use	Attrition data)	Adherence data
et al., 2021; P. A. Garety et al., 2017)	-blinded, randomized clinical trial		to TAU, mean age 42.6 (11.6), diagnosed with schizophrenia, psychosis (other), delusional disorder, schizoaffective disorder	consisting of 8 individual, face-to-face sessions (60-90 minutes) in accordance with a clinical manual that was delivered within 12weeks. The web app synchronises to a native android mobile app providing access in daily life to SlowMo strategies and individualized safer-thought bubbles					as at least 1 home screen interaction after a minimum of 3 therapy sessions. Therapy fidelity was high; of the 168 individuals who attended at least 1 session, 159 (94.6%) met a priori criteria for web app delivery, and 100 of 140 (71.4%) met adherence criteria for mobile app use

App name	Study design	Location	Sample size, Mean age, Participant diagnoses	Brief description of the app	Treatment target	Automated or blended	Intended frequency/duration of use	Attrition data)	Adherence data
SMART app (Hansen et al., 2020)	Pre and posttest, feasibility and effectiveness	Netherlands	64 participants (27 participants receiving ESM-derived personalized feedback and 23 participants without feedback), mean age of 37.9 years (SD = 8.6)—feedback; mean age of 40.3 years (SD = 10.9)—no feedback, diagnoses of schizophrenia, schizoaffective disorder, psychotic disorder, schizophreniform disorder	ESM app with personalized activity suggestions based on ESM. Feedback was provided on psychotic symptoms, social engagement, health behaviour, physical activity, and mood and emotion.	Improve social functioning and psychiatric symptoms	Automated	21 days, 6 ESM notifications daily, 2 personalised prompts daily	22%	The response rate was 64% for the ESM questionnaires. In the feedback group, participants indicated that on 49% of the ESM days they acted on at least one personalised feedback prompt per day.
TechCare (Gire et al.,	Mixed methods feasibility study	UK	16 participants (4 in test-run study, 12 in feasibility study), mean age	The TechCare app aims to reduce relapse by improving user	Positive and negative symptoms	Automated	6 weeks, 3 notifications per day	17% drop out (for feasibility	66.67% of participants engaged with ≥33% of the

App name	Study design	Location	Sample size, Mean age, Participant diagnoses	Brief description of the app	Treatment target	Automated or blended	Intended frequency/duration of use	Attrition data)	Adherence data
2021; Husain et al., 2016)			of 24.83 years (SD = 4.83), Participants recruited from Early Intervention Services (for psychosis)	of coping strategies and monitoring user symptoms and responses.	of schizophrenia			y sample)	app's notifications. Participants used the app on average 1.88 times per day.
Temstem (Jongeneel et al., 2022)	Naturalistic study, pre and post tests	Netherlands	1048 participants, mean age 35.34 (SD 14.03), self-identifying as voice hearing	After psychoeducation about voice hearing, Temstem offers two functions: one designed to inhibit voice activity through the processing of incompatible language and one which uses tasking to decrease memory	Voice hearing, emotionality, and vividness	Automated	Data was collected over a two and a half year period between 2017 and 2019. App use user initiated.	No drop out due to being a naturalistic study	The total number of Temstem sessions per user ranged from 2 to 110 (total 16,235 games, M = 15.49, SD = 16.88).

App name	Study design	Location	Sample size, Mean age, Participant diagnoses	Brief description of the app	Treatment target	Automated or blended	Intended frequency/duration of use	Attrition data)	Adherence data
WeCOPE (de Almeida et al., 2018)	Pretest and posttest design	Portugal	9 participants, mean age of 38 years (SD±9.701), diagnosis of schizophrenia	vividness and emotionality The WeCOPE app has four modules: symptom monitoring, problem solving, anxiety management and goal setting.	Improvement in schizophrenia symptoms and personal and social functioning.	Automated	8 weeks, user initiated app use.	Unclear in study reporting	The majority of participants (45%) used the app two or three times a week.

## Appendix B Participant Invitation Letter and Information Sheet



Royal United Hospitals Bath

Information Sheet for patients and one of their family members/friends

### Questions or concerns?

If you have any questions or concerns regarding this study at any time (either during or after the project) please contact Theresa Taylor, Trainee Clinical Psychologist via [Theresa.taylor3@nhs.net](mailto:Theresa.taylor3@nhs.net).

We do not expect people to find participating in this study distressing, however, we do know that ICU can be an upsetting experience that impacts people differently.

If you or your family member/friend/carer is distressed and need someone to talk to immediately, you or they could contact the Samaritans on 08457 909090. Alternatively, you can speak to one of your care team or a GP, who will be able to offer you help and/or advice. If the issue is life threatening, please contact the emergency services.

### What now?

If you would like to take part in this study:

- 1) Please **complete the included patient consent form and questionnaire**. This should take about 10 minutes per questionnaire. They could alternatively be completed online via the link on the questionnaire.
- 2) Please do not write your name/s on the questionnaire, we want them to be anonymous and confidential.
- 3) Please give the **'Family Consent Form'** and **'Family Questionnaire'** to your family member/friend/carer. They could alternatively complete it online via the link on the questionnaire.
- 4) Please put any completed paper consent forms and questionnaires in the envelope provided, seal it and post it – no stamp needed, postage is pre-paid.
- 5) Please only complete one questionnaire per person. Please do not complete the online questionnaire if you have already completed the paper version (and vice versa) as this will be a duplication.

**Thank you for your time.**

**Theresa Taylor**, Clinical Psychologist in Training, NHS and University of Bath

**Dr Jenny Smerdon**, ICU Clinical Psychologist, RUH NHS, Bath

**Dr Rachel Paskell**, ICU Clinical Psychologist, RUH NHS, Bath and Lecturer, Doctorate in Clinical Psychology, University of Bath

All service evaluations are approved by the Research and Development Team at the RUH, Bath. This study (reference SE 0058) has been reviewed by that Team and has been given a favourable opinion and authorised to go ahead.



## Information Sheet

### NHS improvement project: Working with patients and their family members/friends/carers to understand and reduce the impact of an ICU admission on psychological wellbeing.

#### Information about the project

Please read this information, talk to others about the study if you like and feel free to ask any questions you may have by contacting Theresa Taylor via [Theresa.taylor3@nhs.net](mailto:Theresa.taylor3@nhs.net). When we have explained the study, answered any questions you may have, and you have had enough time to decide, you will then be able to choose whether or not to take part.

#### What is the purpose of the study?

Previous research shows that having an ICU admission may impact on a patient's psychological and emotional wellbeing. Similarly, family members/friends/carers may also experience difficulties with their mental health during and following the ICU admission. We know from clinical experience and research that there are things ICU teams can do to help decrease the psychological and emotional impact of an ICU stay on both groups.

We want to find out if these things are happening, whether they are helping, and what we could be doing better for our patients and their families/friends/carers. We also aim to find out what levels of mental health difficulties patients and their families/friends/carers are experiencing after being discharged from the ICU at the RUH, Bath.

We will use the information we collect to make recommendations to the ICU leadership team on how to improve treatment and care.

#### Why have I been invited?

You have been invited because you or your family member/friend/carer has recently been discharged from the ICU at RUH Bath. We are inviting all those who have recently been discharged and one of their family members/friend/carer to provide feedback and views.

#### Do I have to take part?

No, taking part in this study is entirely voluntary. It will not affect your care in any way whether you choose to take part or not. If you choose to take part you have the right to withdraw yourself and your responses up until the point they have been submitted, without needing to give any reasons for this.

#### What will happen to me if I decide to take part?

As the patient discharged from the ICU, if it is possible and you choose to, please:

- Complete the '**Patient** Questionnaire' that came with this letter and Information Sheet (either the paper copy or complete it online via the link)
- Ask the most relevant person in your life to complete the '**Family** Questionnaire' – it is best this is a family member/friend/carer who was most involved with your ICU stay.

The questionnaire/s should take about 10 minutes each to complete.

Please do not write your name on the questionnaire/s as we want them to remain anonymous.

Once the consent forms and questionnaires are completed:

- Put the completed consent forms and questionnaires in the 'Freepost' envelope provided – we have paid for the postage so no need for a stamp.
- Seal it - we have included a sticky label that might help as we are aware the envelope glue may not work in high heat.
- Post it.

By returning this questionnaire you are consenting for the information you return to be used in this study.

#### **Are there any risks or benefits from taking part?**

This service evaluation and improvement project presents minimal risk. We hope this project will help to improve the service and will be of benefit to future patients and their families/friends/carers who encounter the ICU at RUH.

You will not receive payment for participating in this study.

#### **Will my taking part in the study be kept confidential?**

Yes. Your responses will not be able to be linked to you, even by the researchers completing the study as all questionnaires are returned anonymously. Furthermore, any data gathered via the online link will be gathered anonymously (without your name or the IP address of your computer/phone). As a further protection, all information gathered in this study will be treated as patient data. This means it will be kept completely confidential (private) and anonymised. Staff working in the ICU will not be able to link your questionnaires or the questionnaires of your family member/friend/carer to you or them. Responsible members of the Royal United Hospitals Bath NHS Foundation Trust may be given access to data (in anonymised form) for monitoring and/or audit of the study to ensure that it is complying with applicable regulations.

#### **What will happen to my data?**

Completed questionnaires will be kept separate from your personal details in a locked cabinet or case or stored securely in a protected computer file. The information we collect will be fed back to ICU staff and leaders in a confidential, anonymised, and summarised format, where individuals cannot be identified by what they have said in their questionnaires.

#### **What will happen to the results of this study?**

As mentioned above, the results will be fed back to staff and leaders at the ICU to inform adaptations to the service. We also hope to feedback the anonymised and summarised results of the study to patients and their families/friends/carers and will take advice from the Royal United Hospitals patient experience team on how best to do this. This will likely be via a poster in the ICU waiting area, the Trust's social media pages and on the hospital's website. If you would like to know the outcome of this study please check the Trust's social media pages and website for potential updates. Any information released would be highly anonymised and would not contain any single individual's information. This project will also contribute to the fulfilment of Theresa Taylor's clinical psychology training.

### Psychological Wellbeing Questionnaire for Patients Discharged from RUH ICU

Once you have read the **Information Sheet** that was sent with this questionnaire:

- 1) Please **complete the consent form and this questionnaire**. This should take about 10 minutes. You can complete the paper versions and return them in the post **OR** you can complete them online via this link:



[https://bathpsychology.eu.qualtrics.com/jfe/form/SV\\_4Ga0a9ED14gBcVg](https://bathpsychology.eu.qualtrics.com/jfe/form/SV_4Ga0a9ED14gBcVg)

- 2) Please do not write your name on the consent form nor questionnaire as we want them to be anonymous and confidential.
- 3) Please give the **'Family' Questionnaire** to your family member/friend/carer to complete. They can complete the paper version and return it in the post **OR** they can complete it online via the link above.
- 4) Please put any completed paper consent forms and questionnaires in the envelope provided, seal it and post it.
- 5) Please only complete one questionnaire per person. Please do not complete the online questionnaire if you have already completed the paper version (and vice versa) as this will be a duplication.

If you have any questions or concerns regarding this study at any time (either during or after the project) please contact Theresa Taylor, Trainee Clinical Psychologist:  
[Theresa.taylor3@nhs.net](mailto:Theresa.taylor3@nhs.net).

**Please turn over to start the questionnaire**

**Questions****Section A. Participant/patient (your) background information**

- 1) What is your age? Please circle or tick one answer.
  - 18-24
  - 25-34
  - 35-44
  - 45-54
  - 55-64
  - 65-74
  - 75 or older
  
- 2) How long were you in ICU for (please answer for your most recent stay)? Please circle or tick one answer.
  - Less than 3 days
  - 3-10 days
  - 11-30 days
  - More than 30 days
  
- 3) In the 6 months prior to your ICU admission did you experience depression, anxiety, or post-traumatic stress disorder (PTSD)? Please circle or tick one answer.
  - Yes
  - No
  - Can't say/Not sure

**Please turn over to continue answering the questionnaire**

**Section B. Please complete the below questions regarding your own mental wellbeing**

**If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?**

Over the last 2 weeks, how often have you been bothered by any of the following problems? Please circle or tick one answer per question.

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3
	<b>Not difficult at all</b> <input type="checkbox"/>	<b>Somewhat difficult</b> <input type="checkbox"/>	<b>Very difficult</b> <input type="checkbox"/>	<b>Extremely difficult</b> <input type="checkbox"/>

**Please turn over to continue answering the questionnaire**

**Section C. Please complete the below questions regarding your own mental wellbeing**

Over the last 2 weeks, how often have you been bothered by the following problems? Please circle or tick one answer per question.

	Not at all	Several days	Over half the days	Nearly every day
1. Feeling nervous, anxious, or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it's hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3

**If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?**

Not difficult at all	Somewhat difficult	Very difficult	Extremely difficult
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Please turn over to continue answering the questionnaire**

**Section D. Please complete the below questions regarding your own mental wellbeing**

Please consider the following reactions, which sometimes occur after a traumatic event. This questionnaire is concerned with your personal reactions to the potentially traumatic event - your ICU stay. Please indicate (by ticking the box) whether or not you have experienced any of the following **AT LEAST TWICE IN THE PAST WEEK**.

	Yes, at least twice in the past week	No
1. Upsetting thoughts or memories about the event (my ICU admission) that have come into your mind against your will	<input type="checkbox"/>	<input type="checkbox"/>

2. Upsetting dreams about the event		
3. Acting or feeling as though the event were happening again		
4. Feeling upset by reminders of the event		
5. Bodily reactions (such as fast heartbeat, stomach churning, sweatiness, dizziness) when reminded of the event		
6. Difficulty falling or staying asleep		
7. Irritability or outbursts of anger		
8. Difficulty concentrating		
9. Heightened awareness of potential dangers to yourself and others		
10. Being jumpy or being startled at something unexpected		

Section E. Regarding your answers to Sections B, C and D - please rate your level of agreement with the following statement:

- 1) Any difficulties I have indicated above with my mental health are because of my ICU stay or were significantly impacted by my stay in ICU. Please circle or tick one answer.
- Strongly disagree
  - Disagree
  - Neutral
  - Agree
  - Strongly agree
  - Can't say/Not sure

**Please turn over to continue answering the questionnaire**

Section F. Your experiences whilst on the ICU.

Please circle or tick the option that best indicates your level of agreement with the below statements in relation to your ICU stay. Please note these questions are in relation to your care **while on the ICU** and not during a prior or subsequent general ward stay or to your post-discharge care.

- 1) **During** my ICU stay, I was given, or sign-posted to, information about how my ICU stay might impact my mental health and wellbeing
  - Strongly disagree
  - Disagree
  - Neutral
  - Agree
  - Strongly agree
  - Can't say/Not sure
  
- 2) **During** my ICU stay, I found the information given or sign-posted to me about possible impacts on my psychological wellbeing to be helpful
  - Strongly disagree
  - Disagree
  - Neutral
  - Agree
  - Strongly agree
  - Can't say/Not sure
  
- 4) **During** my ICU stay, members of the ICU team noticed when I was distressed and attempted to make me more comfortable, if they could
  - Strongly disagree
  - Disagree
  - Neutral
  - Agree
  - Strongly agree
  - Can't say/Not sure
  
- 5) **During** my ICU stay, I had someone to speak to about any emotional distress, confusion, or strange psychological experiences
  - Strongly disagree
  - Disagree
  - Neutral
  - Agree
  - Strongly agree
  - Can't say/Not sure

**Please turn over to continue answering the questionnaire**

- 6) **During** my time in ICU, a diary recording my ICU stay was completed for me by staff and/or family/friends
  - Strongly disagree
  - Disagree
  - Neutral
  - Agree
  - Strongly agree



- Can't say/Not sure
- 7) I have looked at the diary completed for me during my ICU stay
- Strongly disagree
  - Disagree
  - Neutral
  - Agree
  - Strongly agree
  - Can't say/Not sure
- 8) I have found the diary completed for me during my ICU stay to be helpful and/or interesting
- Strongly disagree
  - Disagree
  - Neutral
  - Agree
  - Strongly agree
  - Can't say/Not sure
- 9) Covid-19 related procedures, rules and restrictions negatively impacted my experiences during my ICU stay
- Strongly disagree
  - Disagree
  - Neutral
  - Agree
  - Strongly agree
  - Can't say/Not sure
- 10) I know how to seek support from services for my mental health and wellbeing, following my ICU stay (even if this is not currently necessary for me)
- Strongly disagree
  - Disagree
  - Neutral
  - Agree
  - Strongly agree
  - Can't say/don't know

**Please turn over to continue answering the questionnaire**

- 11) Please tell us more about the things you found particularly helpful in supporting you with the emotional and psychological aspects of being in ICU. Please feel free to expand on your answers to the above multiple-choice statements and give more detail.

- 12) Please tell us more about the things you didn't find helpful in supporting you with the emotional and psychological aspects of being in ICU. Please feel free to expand on your answers to the above multiple-choice statements.
- 13) Do you think there is any support you were not provided with by ICU staff that would have been helpful for you or your family's emotional and psychological wellbeing during your ICU admission?

**Thank you for completing this important questionnaire.**

Please put any completed paper consent forms and questionnaires in the envelope provided, seal it and post it.

Please only complete one questionnaire per person. Please do not complete the online questionnaire if you have already completed the paper version (and vice versa) as this will be a duplication.

If you have any questions or concerns regarding this study at any time (either during or after the project) please contact Theresa Taylor, Trainee Clinical Psychologist:

[Theresa.taylor3@nhs.net](mailto:Theresa.taylor3@nhs.net).

**Appendix D**  
**Family member (or friend/carer) ICU psychological wellbeing questionnaire**

This questionnaire is for completion by the family member/friend/carer of the person who was in ICU (they have also been asked to complete a questionnaire about their experiences).

Once you have read the **Information Sheet** that was sent with this questionnaire:

- 6) Please **complete the consent form and this questionnaire**. This should take about 10 minutes. You can complete the paper versions and return them in the post **OR** you can complete them online via this link:



[https://bathpsychology.eu.qualtrics.com/jfe/form/SV\\_4Ga0a9ED14gBcVg](https://bathpsychology.eu.qualtrics.com/jfe/form/SV_4Ga0a9ED14gBcVg)

- 7) Please do not write your name on the consent form nor questionnaire as we want them to be anonymous and confidential.
- 8) Please put any completed paper consent forms and questionnaires in the envelope provided, seal it and post it.

- 9) Please only complete one questionnaire per person. Please do not complete the online questionnaire if you have already completed the paper version (and vice versa) as this will be a duplication.

If you have any questions or concerns regarding this study at any time (either during or after the project) please contact Theresa Taylor, Trainee Clinical Psychologist:  
[Theresa.taylor3@nhs.net](mailto:Theresa.taylor3@nhs.net).

**Please turn over to start the questionnaire**

**Questions****Section A. Background information**

- 1) What is your relationship to the person who was in ICU? Please circle or tick one answer.
  - Partner
  - Parent
  - Child
  - Sibling
  - Friend
  - Other, please state:
  
- 2) How old is the person who was in ICU? Please circle or tick one answer.
  - 18-24
  - 25-34
  - 35-44
  - 45-54
  - 55-64
  - 65-74
  - 75 or older
  
- 3) What is your age? Please circle or tick one answer.
  - 18-24
  - 25-34
  - 35-44
  - 45-54
  - 55-64
  - 65-74
  - 75 or older
  
- 4) What length of time was the person in ICU (please answer about their most recent stay, if there has been more than one)? Please circle or tick one answer.
  - Less than 3 days
  - 3-10 days
  - 11- 30 days
  - More than 30 days

**Please turn over to continue answering the questionnaire**

**Section B. Please complete the below questions regarding your own mental wellbeing**

Over the last 2 weeks, how often have you been bothered by any of the following problems? Please circle or tick one answer per question.

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3

**If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?**

**Not difficult at all**

**Somewhat difficult**

**Very difficult**

**Extremely difficult**

**Please turn over to continue answering the questionnaire**

**Section C. Please complete the below questions regarding your own mental wellbeing**

Over the last 2 weeks, how often have you been bothered by the following problems? Please circle or tick one answer per question.

	Not at all	Several days	Over half the days	Nearly every day
1. Feeling nervous, anxious, or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it's hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3

**If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?**

**Not difficult at all**

**Somewhat difficult**

**Very difficult**

**Extremely difficult**

**Please turn over to continue answering the questionnaire**

**Section D. Please complete the below questions regarding your own mental wellbeing**

Please consider the following reactions, which sometimes occur after a traumatic event. This questionnaire is concerned with your personal reactions to the potentially traumatic event - the ICU stay of your family member/friend. Please indicate (by ticking the box) whether or not you have experienced any of the following **AT LEAST TWICE IN THE PAST WEEK**.

	Yes, at least twice in the past week	No
11. Upsetting thoughts or memories about the event (the ICU admission) that have come into your mind against your will		
12. Upsetting dreams about the event		

13. Acting or feeling as though the event were happening again		
14. Feeling upset by reminders of the event		
15. Bodily reactions (such as fast heartbeat, stomach churning, sweatiness, dizziness) when reminded of the event		
16. Difficulty falling or staying asleep		
17. Irritability or outbursts of anger		
18. Difficulty concentrating		
19. Heightened awareness of potential dangers to yourself and others		
20. Being jumpy or being startled at something unexpected		

Section E. Regarding your answers to Sections B, C and D - please rate your level of agreement with the following statement:

2) Any difficulties I have indicated above with my mental health are because of my family member's/friend's ICU stay or were significantly impacted by their stay in ICU. Please circle or tick one answer.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree
- Can't say/Not sure

**Please turn over to continue answering the questionnaire**



**Section F. Your experiences whilst your family member/friend was on the ICU.**

Please circle or tick the option that best indicates your level of agreement with the below statements in relation to your family member's/friend's ICU stay. Please note these questions are in relation to the time your family member/friend was on the ICU and not during a prior or subsequent general ward stay or to your family member/friend's post-discharge care.

- 1) **During** the ICU stay, a member of the family/friend received daily communication from the ICU about the patient's condition and/or care and treatment.
  - Strongly disagree
  - Disagree
  - Neutral
  - Agree
  - Strongly agree
  - Can't say/Not sure
  
- 2) **During** the stay, I was given or sign-posted to information about how an ICU stay might impact my family member's/friend's mental health and wellbeing.
  - Strongly disagree
  - Disagree
  - Neutral
  - Agree
  - Strongly agree
  - Can't say/Not sure
  
- 3) **During** the stay, I was given or sign-posted to information about how my family member's/friend's ICU stay might impact on my mental health and wellbeing
  - Strongly disagree
  - Disagree
  - Neutral
  - Agree
  - Strongly agree
  - Can't say/Not sure
  
- 4) I found information given or sign-posted to me about possible impacts on mental health and wellbeing to be helpful
  - Strongly disagree
  - Disagree
  - Neutral
  - Agree
  - Strongly agree
  - Can't say/Not sure

**Please turn over to continue answering the questionnaire**

- 5) **During** their ICU stay, my family member/friend was offered the opportunity to speak to a member of the ICU team or mental health specialist about their mental health and wellbeing.
  - Strongly disagree
  - Disagree
  - Neutral

- Agree
  - Strongly agree
  - Can't say/Not sure
- 6) **During** my family member's/friend's ICU stay, I was offered the opportunity to speak to a member of the ICU team or mental health specialist about mental health and wellbeing.
- Strongly disagree
  - Disagree
  - Neutral
  - Agree
  - Strongly agree
  - Can't say/Not sure
- 7) A diary provided by the ICU team, was kept by us and/or the ICU team to document my family member's/friend's ICU stay
- Strongly disagree
  - Disagree
  - Neutral
  - Agree
  - Strongly agree
  - Can't say/Not sure
- 8) I found this diary to be helpful for the mental wellbeing of my family member/friend in the ICU
- Strongly disagree
  - Disagree
  - Neutral
  - Agree
  - Strongly agree
  - Can't say/Not sure
- 9) I found this diary to be helpful for my mental health and wellbeing
- Strongly disagree
  - Disagree
  - Neutral
  - Agree
  - Strongly agree
  - Can't say/don't know

**Please turn over to continue answering the questionnaire**

- 10) I was aware of the practical facilities for families/friends at the ICU, such as the waiting room, parking and accommodation, and these were sufficient
- Strongly disagree
  - Disagree
  - Neutral
  - Agree
  - Strongly agree
  - Don't know/Can't say
- 11) Covid-19 related procedures, rules and restrictions negatively impacted my experience of my family member's/friend's ICU stay

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree
- Don't know/Can't say

12) Covid-19 related procedures, rules and restrictions negatively impacted the support I received from the ICU team

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree
- Don't know/Can't say

13) I know how to seek support from services for my own mental health and wellbeing, following my family member's/friend's ICU stay (even if this is not currently necessary for me)

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree
- Don't know/Can't say

**Please turn over to continue answering the questionnaire**

- 14) Please tell us more about the things you found particularly helpful in supporting you with the emotional and psychological aspects of having a family member/friend in ICU. Please feel free to expand on your answers to the above multiple-choice statements and give more detail.
- 15) Please tell us more about the things you didn't find helpful in supporting you with the emotional and psychological aspects of having a family member/friend in ICU. Please feel free to expand on your answers to the above multiple-choice statements.
- 16) Do you think there is any support you weren't provided by the ICU team that would have been helpful for you or your family member's/friend's emotional and psychological wellbeing during the ICU stay?

**Thank you for completing this important questionnaire.**

Please put any completed paper consent forms and questionnaires in the envelope provided, seal it and post it.

Please only complete one questionnaire per person. Please do not complete the online questionnaire if you have already completed the paper version (and vice versa) as this will be a duplication.

If you have any questions or concerns regarding this study at any time (either during or after the project) please contact Theresa Taylor, Trainee Clinical Psychologist:

[Theresa.taylor3@nhs.net](mailto:Theresa.taylor3@nhs.net).

### Appendix E

**Question: Any difficulties I have indicated above with my mental health are because of my ICU stay or were significantly impacted by my stay in ICU**

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Can't say/Don't know/Not answered
	13%	12%	25%	25%	25%	0%
Patient						
	20%	20%	30%	10%	10%	10%
Family						

### Appendix F

**Percentage of patients who reported experiencing depression, anxiety or PTSD in the 6 months prior to admission**

	Yes	No	Can't say/not sure/not answered
In the 6 months prior to your ICU admission did you experience depression, anxiety, or post-traumatic stress disorder (PTSD)?	8%	86%	6%

**Appendix G**  
**Patient report on mental health information and emotional support provided by staff during their ICU stay**

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Can't say/Don't know/Not answered
During my ICU stay, I was given or sign-posted to information about how my ICU stay might impact my mental health and wellbeing.	5%	9%	11%	14%	42%	19%
During my ICU stay, I found the information given or sign-posted to me about possible impacts on my psychological wellbeing to be helpful.	40%	40%	20%	0%	0%	0%
During my ICU stay, members of the ICU team noticed when I was distressed and attempted to make me more comfortable, if they could	17%	41%	11%	8%	9%	14%

**Appendix H**  
**Family report on mental health information and emotional support provided by staff during their relative's ICU stay**

	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree	Can't say/Don't know/Not answered
During the ICU stay, a member of the family/friend received daily communication from the ICU about the patient's condition and/or care and treatment.	33%	33%	17%	7%	7%	3%
During the stay, I was given or sign-posted to information about how an ICU stay might impact my family member's/friend's mental health and wellbeing.	7%	10%	14%	48%	21%	0%
During the stay, I was given or sign-posted to information about how my family member's/friend's ICU stay might impact on my mental health and wellbeing	4%	10%	14%	38%	31%	3%
I found information given or sign-posted to me about possible impacts on mental health and wellbeing to be helpful	25%	50%	0%	0%	0%	25%
During their ICU stay, my family member/friend	0%	21%	14%	24%	24%	17%

was offered the opportunity to speak to a member of the ICU team or mental health specialist about their mental health and wellbeing.

During my family member's/friend's ICU stay, I was offered the opportunity to speak to a member of the ICU team or mental health specialist about mental health and wellbeing.

0%

10%

14%

41%

28%

7%



### Appendix I

**Question: I know how to seek support from services for my mental health and wellbeing, following my ICU stay (even if this is not currently necessary for me)**

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Can't say/Don't know/Not answered
Patient	17%	36%	17%	9%	8%	14%
Family	18%	34%	14%	11%	10%	14%

### Appendix J

**Percentage of Family reporting an impact of Covid-19 on the ICU Admission and their Awareness of ICU Practical Facilities**

	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree	Can't say/Don't know/Not answered
I was aware of the practical facilities for families/friends at the ICU, such as the waiting room, parking and accommodation, and these were sufficient.	7%	34%	10%	14%	17%	17%
Covid-19 related procedures, rules and restrictions negatively impacted my experience of my family member's/friend's ICU stay	21%	31%	10%	27%	7%	3%
Covid-19 related procedures, rules and restrictions negatively impacted the support I received from the ICU team	7%	17%	21%	34%	11%	10%

**Appendix K**  
**Percentage of Patients Indicating that a Diary was kept by the Family and/or Healthcare Team**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Can't say/Don't know/Not answered
During my time in ICU, a diary recording my ICU stay was completed for me by staff and/or family/friends	8%	3%	4%	26%	26%	33%

## **Appendix L**

### **Semi structured interview format**

Thank you for agreeing to take part in this interview. It should take up to 60 minutes, can I check you are happy to go ahead? As you know I'm hoping that the conversations we have will tell us more about how you experienced working the STOP App. I'm very grateful for your time today. I'll explain how the interview will work and then you can ask any questions you have before we start. The interview will be recorded over Microsoft Teams, and it will also produce a transcription as we go along, this means a written recording of what we are saying. We keep all interviews secure and only members of the study team will have access to them. Once we have checked the transcripts for accuracy the recordings will be deleted, and transcripts will be anonymised. Everything you say is confidential. The only reason we would have to break confidentiality is if we are worried about your immediate safety. We would always talk to you first. If you would like to receive a copy of the results of the research let me know and I can email you that. We will use short quotes from some interviews, but we will always make sure to remove identifying information. After the study is completed, the anonymised transcripts will be stored in a data archive and may be used for further research. The interview will involve talking about your experience of working with the Stop App and how connected/what working relationship you had with that app. Throughout these questions consider the app's features, for example its videos, activities, assessments, word tasks, questions, content, interface, menus, calendar, reminders, colour scheme, branding/logo, badges, trivia etc. You do not have to answer any questions you are uncomfortable with; you can stop the interview at any time and withdraw, take a break, or continue at another time. You can take your time with the questions; it can take time to reflect and that's okay. I might sometimes ask if you'd like more time. At times I may interrupt you because there is something I want to know more about or am curious about. I hope that is okay. Do you have any questions?

#### **Was the STOP app helping you to do things that were working towards your mental health goals?**

- Did the exercises it asked you to do seem suited to your thinking patterns, behaviours and life experiences? How did that impact your connection/working relationship with the app?
- Were the things you were asked to do in the app manageable and meaningful in achieving your goals? How did the app do this? (For example, features, language, breaking things down)
- Did any features of the app encourage you to keep working towards your goals?

#### **Did you trust the app?**

- Was there anything the app did or said that made you feel this was an app with expertise?
- Did the app look and feel credible?
- How did this impact on your connection/working relationship with the app?

#### **Was the app able to motivate you to continue when you may have discontinued treatment?**

- How did the app do this (for example praising you, tracking your progress reminding you to do sessions?)
- How did this impact your connection/working relationship with it?

**In this app there was not any opportunity in the app to connect with others with similar experiences or users of the app. For example, a forum or chat function where you could speak to other users of the app, read the anonymized stories of others who found the app helpful, or a leader board where you could compare your use of the app with others.**

- Is that something you found helpful for your connection or working relationship with the app?

**Have you had therapy before with a human being?**

**Why did you choose mental health apps instead of seeing therapist?**

- Was there anything the app was able to provide that a human therapist might not have?
- What do you think are the differences between your connection/working relationship with the therapist and this app?
- What do you think are the similarities between your connection/working relationship with the therapist and this app?
- Would you describe what you experienced with the app as a relationship/connection?
- Would you want to see a therapist and use the app simultaneously?
- How would you experience working alone with the app without a person being involved?

**Was there anything else you wanted to discuss today?**

- How did you find this interview?
- Any questions for me?
- I know there's been some emotional things we have discussed. To help you transition to the next part of the day I want to check how you are doing. I'm going to send you the debrief form with some ideas of resources to look at following our call.
- I will send your voucher and debrief sheet
- Do they want to be informed of the results of the study?

## Appendix M

### Ethics application for Main Research Project



Research Governance and Compliance

Vice-Chancellor's Office

University of Bath

Bath BA2 7AY

08/08/2023

Dear Theresa

**Ethics application reference number:** 0179-552

**Project title:** Experiences of feeling connected to a wellbeing or mental health app

The above application has been considered by the Social Sciences Research Ethics Committee. Please accept this letter as confirmation that the application has been given a **favourable opinion** on behalf of the committee. This favourable opinion is in place for/until 31/05/2024.

You can view the application and any comments here: <https://ethics.bath.ac.uk/Project/Index/179>

The documents reviewed and approved by the committee were:

Document Type	File Name	Date	Version
C1.5 Recruitment materials	Recruitment poster	16/06/2023	1
H1 Other documentation	Demographic data form	16/06/2023	2
C1.7 Participant information sheets	Participant Information Sheet updated 1907	20/07/2023	4
C2.5 Consent forms	Consent form 20th July 2023	20/07/2023	3
H1 Other documentation	Risk Standard Operating Procedure 20 07	20/07/2023	1
C3.7 Debriefing materials	Debrief Sheet 20 07	21/07/2023	3
H1 Other documentation	Topic guide Digital Therapeutic Alliance Study 20 07	21/07/2023	2
H1 Other documentation	Ethics Ref 0179-353 Summary of Response to Reviewer Comments	21/07/2023	1
H1 Other documentation	Doctoral_Data_Management_Plan_Theresa Taylor 20 07	21/07/2023	3

The project may now commence in line with application documents above.

If there are any changes to this project (including amendments to the design, sample, or start/end dates etc.), you will need to submit an amendment via the online system.

If you have any queries, please contact [social-science-rc@bath.ac.uk](mailto:social-science-rc@bath.ac.uk)

## Appendix N

### Quality Improvement team approval for Service Related Project



**Royal United Hospitals Bath**  
NHS Foundation Trust

Research and Deployment  
Wolfson Centre  
Royal United Hospital  
Combe Park  
Bath  
BA1 3NG

Tel: 01225 82 4160

[Kelly.Spencer@nhs.net](mailto:Kelly.Spencer@nhs.net)  
[www.ruh.nhs.uk](http://www.ruh.nhs.uk)

6<sup>th</sup> July 2022

Dr Rachel Paskell  
Clinical Psychologist (Hon)  
Intensive Care Unit  
Royal United Hospitals, Bath  
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Lecturer and Director of Studies  
Doctorate in Clinical Psychology  
University of Bath  
[r.g.paskell@bath.ac.uk](mailto:r.g.paskell@bath.ac.uk)

Dear Rachel

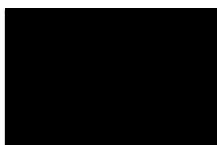
**Project: NHS improvement project: Working with patients and their family members/friends/carers to understand and reduce the impact of an ICU admission on psychological wellbeing.**

**SE 0058**

Your project methodology has been reviewed and I can confirm that this study should not be classed as research and can be conducted as a service evaluation. This is a single site study only. Given this, you are not required to seek an NHS Research Ethics Committee opinion or gain R&D Management approval.

I would like to take this opportunity to wish you luck with the project. Please keep R&D informed of the outcome of this interesting piece of work.

Yours sincerely



**Dr Kelly Spencer PhD**  
Research Manager – Operations

Chair:  
Alison Ryan

Chief Executive:  
Cara Charles-Barks

