



Client experiences of blending a coping-focused therapy for auditory verbal hallucinations with smartphone-based ecological momentary assessment and intervention

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ABSTRACT

This study explored participants' experiences of a novel intervention blending ecological momentary assessment and intervention (EMA/I) digital technologies with four face-to-face therapy sessions to improve coping in people who experience persisting auditory verbal hallucinations (hear voices). A smartphone app was used to deliver prompts to facilitate both self-monitoring and self-management of voices. Analysis of data recorded by the app was also used in-session to develop an idiographic formulation of antecedents of and responses to voice-hearing episodes. Semi-structured interviews were conducted with 12 participants who completed the blended therapy. A thematic approach was used to analyse the data, generating four main themes, with associated subthemes: (1) Therapy experience changed by digital technology; (2) Valuing face-to-face component; (3) Preference for different phases of the digital technology; (4) Not as bothered by voices. Key findings revealed that participants perceived EMA/I technology as helping capture their experience more accurately and communicate this more effectively to the therapist, which, in combination with coping prompts developed in-session, deepened the therapeutic relationship. These findings add to the emerging literature that shows blended therapy can play an important role in the treatment of people with psychosis, and suggest potential of EMA/I as a technology for other clinical populations.

1. Introduction

Persisting auditory verbal hallucinations, or hearing voices, are a core symptom of schizophrenia-spectrum disorders, and are also observed in a number of other clinical populations (Waters and Fernyhough, 2017), as well as in the general community (Linscott and van Os, 2013). In non-organic clinical groups, hearing voices is the usual form of hallucinatory experience, with it being rare for people to experience hallucinations in other modalities without voices also being present (McCarthy-Jones et al., 2014; Nayani and David, 1996). In clinical populations, this is often found distressing and interfering with day-to-day functioning (Steel et al., 2007), making it a major target for treatment (Sommer et al., 2012). Although antipsychotic medication remains the first line treatment (Sommer et al., 2012), it is not always effective, resulting in hearing voices frequently being a focus of psychological interventions (Thomas et al., 2014).

Psychological approaches for hearing voices have tended to involve

cognitive-behavioural approaches, targeting changes in behaviour (e.g., responses to hearing voices), and cognition (e.g., distress-related appraisals of voices) in order to help people be less distressed by this experience (Thomas et al., 2014). A key component of therapy is supporting people in developing and implementing a more effective repertoire of coping strategies (Farhall et al., 2007; Fowler et al., 1995; Thomas et al., 2014). A systematic protocol for doing this, called coping strategy enhancement (CSE; Tarrrier et al., 1990; Tarrrier, 1992), involves developing an individualized functional analysis of the person's experience of hearing voices, to identify factors that influence individual variation in them. These include antecedents/triggers (e.g., stress, noise, rumination), and responses that may maintain the voices (e.g., withdrawal, shouting at voices). This analysis is used to inform the systematic introduction and reinforcement of individualized coping strategies. Two trials of CSE with people diagnosed with schizophrenia found reduced symptom severity compared with both treatment-as-usual and supportive counselling (Tarrrier et al., 1993, 1998). A brief

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four-session format specifically targeting voices appears feasible, and has been associated with reduced hallucination-related distress post-treatment (Hayward et al., 2018; Paulik et al., 2018).

Hence, CSE provides an efficiently delivered manualised intervention to promote self-management. However, development of the functional analysis is dependent upon recall of voice-hearing episodes, and coping is dependent upon the client implementing changes in day-to-day life following sessions. There is potential for smartphone-based digital tools to provide a means of supporting both collection of information on voice-hearing episodes, and implementation of coping behaviours outside the consultation room (Jongeneel et al., 2018; Smerlor et al., 2019; Thomas et al., 2019). A blended approach (Erbe et al., 2018) may be helpful in increasing the potency of the intervention, increasing engagement, and fostering independent self-management (Lal and Adair, 2014).

Ecological momentary assessment (EMA; Shiffman et al., 2008) and ecological momentary intervention (EMI; Heron and Smyth, 2010), are two overlapping technologies that have potential here. Originally used for research data collection, EMA involves participants being prompted by notifications several times a day to complete a series of questions via a mobile device such as a smartphone. Data collected reflects an individual's momentary experiences at a given time point in the context of their daily life, improving ecological validity of assessment data and overcoming memory deficits and recall biases (Shiffman et al., 2008). Because additional information can be collected alongside symptom data, like context and mood, temporal relationships between variables (e.g., antecedents of symptoms) can also be examined (Oorschot et al., 2012). These data can provide a more nuanced understanding about a person's experiences (Torous et al., 2018; Van Os et al., 2013). EMI involves the use of technology similar to EMA, such as a smartphone application or SMS text messaging systems, to deliver prompts for self-management and psychosocial functioning (Heron and Smyth, 2010; Proudfoot, 2013).

A recent systematic review identified nine studies of EMA/I in the treatment of psychotic disorders, finding satisfactory acceptability, feasibility, and preliminary evidence for improved clinical outcomes (Bell et al., 2017). For example, in FOCUS (Ben-Zeev et al., 2014), participants were prompted to complete three assessments daily (EMA) for a month, which automatically generated tailored in-the-moment interventions (EMI): for instance, if EMA item responses indicated the participant was feeling anxious, a follow up EMI statement would suggest a brief exercise that they could do to relax. Participants rated this type of intervention as highly acceptable and usable and participants engaging with the tool on 86% of days (Ben-Zeev et al., 2014). A more recent pilot randomized controlled trial (RCT) found that a CBT-based smartphone app incorporating EMI components was acceptable for people with early psychosis, with good engagement and evidence for improvements in overall symptom severity (Bucci et al., 2018).

These studies demonstrate viability of using EMA to monitor symptom fluctuations for relapse prevention, and of using EMI to deliver general self-management prompts in people with psychotic disorders. However, yet to be explored is therapeutic use of EMA data to inform cognitive-behavioural formulation of patterns of variation in symptoms within psychological therapy, and the potential to use EMI to develop corresponding individually tailored coping prompts. An exception is a trial in depression, which found that providing summaries of daily fluctuations in affect was experienced as empowering (Simons et al., 2015) and led to reduced depressive symptoms (Simons et al., 2015).

The current study reports from a research program developing and trialling a blended, smartphone-supported, coping-focused intervention, which uses EMA/I to support functional analysis of voices and implementation of coping strategies (Bell et al., 2018a, 2018b, 2019). The intervention blended four face-to-face therapy sessions with a smartphone technology both for collection of data on day-to-day variations in a person's voices using EMA and to support day-to-day coping

using EMI.

Enquiring about the participant's experiences of the intervention is a crucial component in understanding the potential benefits and disadvantages of this type of treatment. Qualitative methods can be used to give a voice to users, and to understand aspects of "patient experience" that are not captured by quantitative measures. Consumer perspectives about intervention acceptability, feasibility, processes and outcomes can be explored, potentially leading to the further refinement of therapy (Elliott, 2010). The qualitative study aimed to explore participants' experiences of the smartphone-supported coping intervention, and to understand the impact of blending digital technology with a face-to-face intervention for distressing psychotic experiences from a user's perspective.

2. Method

2.1. The main trial

The current qualitative study was nested in a pilot randomized controlled trial comparing a four-session smartphone-supported coping intervention, versus treatment-as-usual (TAU), for people who hear persisting and distressing voices. The trial methods are described in detail in Bell et al. (2018b, 2019). In brief, this was a two-arm trial with two measurement points (baseline and end of treatment). Participants were recruited via referral from a specialist voices clinic (Thomas et al., 2011) and wider publicity. Inclusion criteria for the trial were: (1) over 18 years old; (2) proficient English language; (3) experiencing current, frequent (at least four times per week or, if less, lasting 1 h or more) and distressing auditory verbal hallucinations for at least six months; (4) comfortable using a smartphone or willing to learn. Exclusion criteria were (1) unable to provide informed consent; (2) intellectual disability; (3) initiation of a new antipsychotic medication in the previous 8 weeks; (4) hallucinations reported to occur solely in response to substance use; (5) distress or agitation displayed during baseline assessment; and (6) requiring active crisis management. Seventeen participants were randomized to the intervention arm of the trial. The movisensXS app (<https://xs.movisens.com/>) was used to deliver EMA surveys and EMI prompts. The intervention involved four semi-manualized face-to-face cognitive-behavioural therapy sessions with smartphone application monitoring and support between sessions. The delivery window was eight weeks. In the first face-to-face therapy session the therapist (IB) oriented the participant to the overall intervention, including how to use the application. Next, during the EMA phase, participants monitored their voice hearing experiences by completing a survey sent to their smartphone at 10 random time points across six consecutive days. The presence and intensity of voices was assessed with the item "Right before the beep, I could hear voices/s that other people couldn't hear" (rated *not at all* to *a lot*). Questions covered different triggers to voices, such as environment (e.g., "Right before the beep my surroundings were noisy"), affect (e.g., "Right before the beep, I felt anxious"), and focus of attention (e.g., "Right before the beep I was focused on what I was doing") and various responses to the voices (e.g. talking to the voices, using distraction). Distress and interference were also used to index impact (e.g., "It was hard for me to do something because of the voice/s", "I was distracted by the voice/s", "The voices were distressing me"). The therapist analysed and summarized the inputted data to identify factors influencing changes in voice intensity and discussed this feedback with the participant in therapy session two. This discussion, along with patterns noticed by the participant during the monitoring period, provided the functional analysis of voice activity.

The therapist and participant collaboratively developed personalized coping strategies from the analysis in session 2, which were embedded into the application as prompts or reminders and then used in the EMI phase of the intervention. Examples included "Do something creative or express yourself", "Exercise or go outside", and "Keep calm

and let go". Between sessions 2 and 3, participants received coping strategy prompts five times a day for 10 days and were asked to reflect on their voices and coping over the day by completing a short survey in the evening. Session three offered an opportunity to reflect on and adapt the strategies if needed, with the therapist providing a feedback summary of the daily surveys. The revised coping strategy prompts and daily reflective survey were then continued for a further 10 days. The fourth and final therapy session reflected on the program and included discussions pertaining to maintaining the coping strategies.

2.2. The qualitative study

2.2.1. Participants

Participants in the intervention arm of the trial were invited to a semi-structured interview once they had completed all components of the RCT, including post-intervention quantitative data collection. All participants who were allocated to the intervention were invited in order to explore a range of experiences. The qualitative interviews were conducted with 12/17 (71%) participants, which included one of the three participants who did not complete the intervention. The five who did not take part either did not respond to the invitation, were unavailable, or cancelled their interview and were unable to reschedule. Three men and nine women participated. They were aged 25 to 60 and at entering the trial had been assessed with the Mini International Neuropsychiatric Interview (Sheehan et al., 1998) as having a diagnosis of schizophrenia ($n = 8$) or schizoaffective disorder ($n = 4$). Most participants had not completed further or higher education (up to year 12: $n = 10$; diploma level: $n = 2$; graduate: nil). None were employed full-time, two were employed casually and two were part-time students. Three identified as being from a minority ethnic group. At the outset of the trial, all but one were taking antipsychotic medication, with a mean chlorpromazine-equivalent dose of 577 mg (SD 292 mg), and their mean Psychotic Symptom Rating Scales–Auditory Hallucinations (Haddock et al., 1999) total score was 29.42 (SD 4.78).

2.2.2. Data collection

A semi-structured interview was selected due to its capacity for gathering in-depth descriptive data (Hill and Lambert, 2004). An interview guide (see Supplementary material) was developed in consultation with a panel of people with lived experience of mental illness and the research team, and drawing on literature about the lived experience of psychosis. Examples questions included "At the start of therapy you answered questions about your voices on the smartphone app 10 times a day for six days. What was that experience like for you?"; "This therapy combined a smartphone app with face-to-face sessions with a therapist. How did you find this combination?" The semi-structured nature of the interview provided direction within the interview to answer the research questions, while permitting flexibility to further explore a participant's responses and follow-up ideas from one interview to the next (Smith, 1995).

Interviews were conducted by the first author, a female Masters student in clinical psychology, who received training and supervision from researchers with expertise in qualitative methods (AW) and psychological interventions for distressing voices (NT). She conducted the interviews within two weeks of each participant completing the intervention, except for one participant who was interviewed one month after completing the trial. Five participants elected to conduct the interview over the telephone, and seven met the interviewer face-to-face at the clinic where they had received the intervention. Interviews lasted between 40 and 75 min, with an average of 54 min, and were audio recorded. There were no pre-existing relationships between the interviewer and participants, and the interview was framed as being to find out their experiences of the therapy they had received as part of the trial. No non-participants were present during the interviews.

2.2.3. Data analysis

Qualitative data analysis occurred concurrently with data collection. The analysis, completed by the first author, followed the process of *thematic analysis* identified by Braun and Clarke (2006). To become familiar with the data, interviews were transcribed verbatim and subsequently read and re-read multiple times. To generate initial codes, data were initially coded line-by-line, at its most basic level of segmentation (e.g. phrase, content, intent) to ensure all content was coded, whether it was significant or not. The codes were then grouped into categories. Identifying important categories that captured key aspects of the experience as discussed by the participants followed. Concurrent memos were written to help define categories, allowing reflection on recurring and contrasting codes. Analytical questions were followed up in subsequent interviews. This process was repeated iteratively to identify the themes that best captured the essential qualities of participants' experiences. Codes and themes were developed independently by the first author, with sample codings and emergent themes being reviewed on a regular basis by researcher AW, plus consultation on themes with NT and IB.

2.2.4. Quality assurance

Procedures recommended by Hill and Lambert (2004) supported the trustworthiness of this study. An expert reference group consisting of four people with lived experience of mental ill-health contributed to developing the semi-structured interview by providing feedback on an initial draft of the interview questions. The first author transcribed interviews to maximize familiarity with the data at each stage of the coding process and engaged in continual reflective practice on the potential influence of gender, professional and personal perspectives on theme development (Berger, 2015). This included discussion with the other researchers during supervision meetings. Although not present in the interviews, it should be noted that potential biases of the broader research team included research interests in blended uses of digital technology (NT, AW), and psychological interventions for hearing voices (IB, NT), and included the researchers who conceptualised and developed the intervention (IB, NT). The study has been reported in line with the Consolidated Criteria for Reporting Qualitative Research (COREQ; Tong et al., 2007).

2.2.5. Ethics

Ethical approval for the qualitative component of the study was included in the overall project approval. Participants consented to participate in writing at the outset of the trial and this was confirmed verbally at the commencement of the qualitative interview. Interview participants received an AUD\$30 (approximately US\$20) gift card in recognition of their time and contribution to the research.

3. Results

Qualitative analysis of the interviews with 12 participants generated four overarching themes. Three themes relate to the experience of using the smartphone-supported coping intervention alongside four meetings with a therapist: digital technology enhances therapy; face-to-face sessions vital; and variable preference for different phases of digital technology. The fourth theme relates to changes in voice hearing after using the intervention: "not as bothered by voices". Themes and their subthemes are summarized in Table 1.

3.1. Experiences of the intervention

3.1.1. Therapy experience changed by digital technology

The experience of using a smartphone-supported coping intervention alongside four meetings with a therapist was different to "traditional" psychological therapies for people who hear voices. Three differences were identified: fast tracked rapport; fast tracked treatment; and being more supported.

Table 1
Table of themes and subthemes.

Research question	Theme	Subtheme
Experience of the intervention	1. Therapy experience changed by digital technology	1.1 “Fast-tracked” rapport 1.2. “Fast-tracks treatment” 1.3. “More supported”
	2. Valuing face-to-face component	2.1. Face-to-face component essential 2.2 Challenges of meeting with the therapist
	3. Preference for difference phases of the digital technology	3.1. Monitoring most useful for learning about voices 3.2. Coping reminders “worked wonders for me”
Changes in voice hearing experience	4. “Not as bothered by voices”	4.1. Increased personal understanding 4.2. Improved control over experience 4.3. Change in voice symptoms

3.1.1.1. “Fast-tracked” rapport

“Due to the nature of the app, it allows from that therapist-client relationship to develop a lot faster.”

(P6, female, aged 29)

Participants reported that the data they inputted to the digital technology influenced the speed of developing a therapeutic relationship with the therapist. The data accrued through their daily monitoring and reflections enabled the therapist to quickly develop understanding about their voice hearing experience. The therapist learnt about patterns in their voices, common triggers, severity of the experience, and the impact the voices had on the person's daily functioning. For example, participant 9 (male, 30) explained that the application helped the therapist “better understand how frequently I am hearing the voices and how distressed I am by them.”

Another factor that contributed to “fast tracked” rapport was participants' perception that the data corroborated their own reports of their symptoms between sessions, giving their experiences credibility. They felt more “believed” by the therapist. Participant 2 (female, 45) described finding comfort when they recalled the therapist referring to the data and saying “I know you're telling the truth”.

3.1.1.2. “Fast-tracks treatment”

“Fast tracks treatment because it shows you things to work on [...] it's getting insight quicker. And then you make progress faster.”

(P9, male, 30)

Using the application to track their voice hearing experience and completing daily reflections in the EMA phase enhanced participants' ability to recall and communicate their voice hearing symptoms, leading to them experiencing fast-tracked treatment. The app facilitated shared responsibility with the therapist to recall information about their lived experience, taking the pressure off the participant. The intervention contrasted with previous difficulty participants had communicating their voice hearing experience to others articulately and accurately. Participant 6 (female, 29) explained:

“The app, that kind of information building is happening quicker [...] you are not wasting half the session collecting background information [...] digitally it is so much easier to track, and compare and contrast different themes, different triggers, different coping mechanisms.”

The EMA monitoring phase was conducted over a period of six days. While overall the digital technology feasibly integrated into their daily lives, participants said that the monitoring “took me a couple of days to get used to” (P2, female, 45), and was “tedious towards the end”, but overall “manageable” (P6, female, 29). Despite these issues, participants persevered with monitoring because they perceived that they were collecting meaningful data that would facilitate treatment.

3.1.1.3. “More supported”

“Even when you were sitting there feeling lonely and it [the app] would go off and it would make you feel special.”

(P2, female, 45)

A common experience shared by participants was feeling “more supported” between sessions with the therapist. They described the application as a “useful sort of lifeline to have there” (P1, female, 50), and as “something outside of therapy hours that was a positive thing for me” (P3, male, 46). The randomized monitoring of voices (EMA), and the coping strategies reminders and daily reflections (EMI) contributed to an increased sense of connection. Participant 8 (female, 31) stated:

“Loneliness is a big part of my life, so it's like, you know. I am always on my own. But it [the app] is something that interrupts and it's like checking in. Which is a very rare thing in my day.”

Individuals who had these experiences noted they were aware that they were not interacting directly with a person in these moments. However, this did not lessen their sense of being supported, as Participant 11 (female, 40) indicated:

“I knew she [therapist] was the one who was going to read the information. And it sort of felt every night that, almost like she was tucking me into bed. I didn't feel like I was being a statistic. I was a person. And I was talking to a person. Okay it was via a machine and she wouldn't get it for another week, but I never thought about it as she wouldn't get it for another week. It was, as I said, like telling [therapist], this is how my day has been. Good night.”

Participants also expressed feeling more supported as using the digital technology promoted calmness and personal reflection:

“It made me better each time I used the app. Each time it went off it comforted me and just made me think about me and who I was. As a person, not just what ... my enemies or family might think of me.”

(P10, female, 60)

3.1.2. Valuing the face-to-face component

All participants identified that the face-to-face sessions, including having the space to speak openly with the therapist, were a vital component of the therapy experience. Two sub-themes were identified: face-to-face component is essential; and challenges of meeting with the therapist.

3.1.2.1. Face-to-face component essential

“You know you can't have the app by itself, I think face-to-face made it more helpful.”

(P4, female, 49)

Participants spoke about benefiting from the face-to-face element of the intervention, commenting “it would be too hard to cope with” (P5,

female, 38) if there was no face-to-face element. The data the therapist accessed from participant's EMA/EMI informed the feedback provided in-session. Participant 3 said the data-driven feedback was "a new experience. The counsellor gave me an objective opinion of what was actually happening for me." The objective perspective provided by the therapist's data analysis instilled participants with confidence that their experiences were being heard:

"I was talking to her about my week, she'd (therapist) go 'that's exactly what got down on your page' [...] it makes you feel special, you feel wanted. You feel like someone is really listening to you."
(P2, female, 45)

The face-to-face sessions were integral in learning about the patterns that the data revealed. Even if a pattern did not emerge, discussing the data with the therapist was valuable:

"there wasn't a real clear pattern that emerged. It was still good. It was still really good talking to [therapist] about the voices though because I hadn't talked to anyone about the voices before."
(P7, male, 38)

3.1.2.2. Challenges of meeting with the therapist

"I found it very tiring discussing what was going on for me"... "it was mentally draining."
(P3, male, 46)

Some participants identified that the face-to-face sessions could also be challenging, including being tiring or overwhelming. Participant 5 (female, 38) reported having no prior experience of talking therapies and that she felt "scared" and "overwhelmed." Seeing the therapist made her "mainly scared about the voices, if the voices were really strong and they'd tell me to harm myself". Despite these challenges, sessions with the therapist remained important for participants to make sense of their experiences and supported their motivation to continue with the program.

The therapist's qualities supported participants to engage in both the face-to-face sessions and the digital technology, including when any component was challenging. The therapist was said to be understanding, inviting to talk to, and non-judgmental:

"I found it easy to just talk to her ... she was really understanding, very caring and understanding and listened."
(P5, female, 38)

"She was caring and she showed that, you know, we have to go through this, me and you, and that was really a good sign ... She knew what she was doing. To me, she looked professional."
(P4, female, 49)

3.1.3. Preference for different phases of digital technology

In contrast to all participants valuing the face-to face component of the intervention, variations occurred in which application components participants found useful. Two sub-themes were identified: monitoring most useful for learning about voices; and coping reminders "worked wonders for me." Participants could find one, or both these components useful.

3.1.3.1. Monitoring most useful for learning about voices

"I found the first part [EMA] the most useful though. Answering questions about how distressed I was and all that. All those questions, that was probably most helpful, the monitoring phase. It just made me, it kept me aware of where I was at during the day and how I was coping."
(P7, male, 38)

Participants who found the EMA monitoring phase useful developed new insights into their voices. For example, Participant 1 (female, 50) found the process of "rating how I felt each day, helped me learn when the voices were most problematic." Engaging and responding to the monitoring questions helped Participant 12 (female, 25) develop awareness by considering her momentary experience from "an outsider's perspective, rather than me thinking about me all the time. So it made me think, 'Oh this is what's happening right now.'"

The importance of the monitoring phase to these participants was not affected by their voice hearing experiences while being monitored. Participant 7 (male, 38) shared that monitoring "didn't make the voices worse" while participant 2 (female, 45) found that "the voices calmed down a bit. Like I said, it [monitoring] occupies the mind." While this was the more common experience, others noticed their voices more when monitoring them:

"They (voices) were getting louder but I was doing my best to ignore them [...] So, while I was monitoring them I was aware of them but not very often engaging with them. So they didn't quite like that, but they liked that I was monitoring them."
(P11, female, 40)

Despite experiencing increased voice presence, participants who became more aware of their voices persisted with the monitoring because they saw the value in the data contributing to understanding the experience and potentially helping them to better manage it.

3.1.3.2. Coping reminders "worked wonders for me"

"I found it really helpful the reminders. Like, honestly the reminders sort of got me out of moods.... example was like I was really not motivated and stuff and I just saw a reminder telling me to go outside and exercise."
(P12, female, 25)

Coping reminders and the daily survey in the EMI phase stood out for some participants because they were personalized and they assisted with motivation outside the face-to-face sessions. Participants spoke favorably about being involved in the tailoring of the coping strategy reminders, participant 3 noting that the experience "was good because it was all about me. It wasn't like general. It was more personalized." Tailoring included choosing strategies and the frequency of receiving reminders. Some participants welcomed the opportunity that random reminders provided to check-in with themselves. Others preferred having self-directed access to the coping strategies. Participant 2 (female, 45) said:

"It was really handy actually 'cos I could always flash back to my coping strategies when I needed to [...] on the spur of the moment you could just look up and then I could relax and let the weight off my shoulders."

Personalizing how often reminders were received was also important as they could become "redundant over time [...] the reminders were less effective as I was using them already" (P7, male, 38).

Receiving the personalized prompts and the daily survey enhanced participants' engagement with the intervention and influenced their motivation. The survey, sent at the end of each day during the EMI phase, contributed to engagement. Participant 6 (female, 29) stated:

"reflecting on how the day went and kind of, it was like a...kind of like a debriefing ... I felt like, like to decompress [...] like I could enter the prompting questions and 'ok, that's all done and dusted'."

Only one participant said that the "the reminders" were least helpful, which he attributed to unexpected technology issues with the application (P7, male, 38).

3.2. Changes in voice hearing experiences: “Not as bothered by voices”

Participants who used the smartphone-supported coping intervention alongside four meetings with a therapist reported changes to their relationship with their voices; they were not as bothered by them. The three sub-themes identified: changes to personal understanding; improved control over experience; and change in voice symptoms, reflect changes participants attributed to the intervention.

3.2.1. Changes to personal understanding

“Whether the voices were coming from internally or externally. I had never thought of that before.”

(P3, male, 46)

Participants noted that their understanding of their voice hearing experience increased. New understanding included the patterns of their voices, triggers and the relationship between activities and hearing voices. Participant 11 (female, 40) commented that tracking the voices facilitated learning about which strategies worked:

“Was an eye opener because what I, what I was thinking was just random, actually did fall into a bit of a pattern. Such that we found in fact that one of the interventions was being counter-productive. So that was really interesting. Because I didn't have any sense of that at the time”.

3.2.2. Improved control over experience

“I've learnt not to battle with the voices... [not to] argue with them.”

(P5, female, 38)

The power participants had over their experience changed. They attributed this change to a shift occurring in how they appraised their voices, which was evident in the growing acceptance participants experienced:

“It's a lot of feeling like, I don't know, feeling like just acceptance. So just like, not being angry with everything. At myself or the voice. Just being very calm. So I am just reacting differently. I'm not like, sort of dwelling on them.”

(P12, female, 25)

The process of reducing the voices' power involved reevaluating the voices, with participants questioning and challenging the ways they had previously thought about their voices:

“I am just kind of thinking, ‘where is the evidence?’ in terms of what they are saying [...] that clarity isn't, doesn't happen every time I hear the voices. But knowing that it can be actually quite empowering. Knowing that I do, I can kind of not control them but control my investment in them, there is a difference”.

(P6, female, 29)

They also recognized what they could do to improve their experience of hearing voices, including becoming “more disciplined about intervening when I'm feeling very distressed” (P1, female, 50).

3.2.3. Change in voice symptoms

“They are probably less frequent. [...] They don't bother me as much. They still disturb me sometimes but I'm getting used to them now.”

(P7, male, 38)

Most participants noted some change in their voice symptoms, with changes being individual and predominantly positive. Participant 2 indicated a reduction in the frequency of the voices from “seven to five days, to once” weekly. Participants 3 and 5 experienced a reduction in voice intensity, and participant 2 reported that the focus of the voices changed from “talking about me” to “talking about other people.” In contrast, Participant 11 experienced a negative change, with the voices

becoming stronger. However, she questioned “are they (voices) stronger or am I giving them more attention?” This participant also noted that since completing the trial the voices were “actually trying harder to be heard and listened to”.

4. Discussion

This study examined participants' experiences of a novel blended therapy that used EMA/I to support a traditional in-person therapy for auditory verbal hallucinations. Previous studies have used EMA/I digital technology in the treatment of psychosis more broadly, for example in monitoring symptom fluctuations over time, or delivering EMI symptom management strategy prompts according to how an EMA item is completed (Ben-Zeev et al., 2014; Bucci et al., 2018; Ly et al., 2015); this study's use of a brief period of monitoring to gather data to inform in-session cognitive behavioural formulation in this stream of work was novel. Overall the results support that digital technology was feasible to use in this way, with participant feedback indicating that it supported the therapy process and led to positive changes in experiences of hearing voices. The findings that participants actively engaged with a process of recording and collaboratively reviewing EMA feedback is consistent with work conducted in depression that found that feedback on variation in depression symptoms led to improvements in self-empowerment and depression (Kramer et al., 2014; Simons et al., 2015). Findings are also consistent with literature that has found EMA/I technology feasible to use in psychosis populations (Granholm et al., 2008; Kimhy et al., 2006; Palmier-Claus et al., 2012) This also adds to a growing literature that digital technology is feasible and acceptable in the treatment of people with psychotic experiences (Granholm et al., 2008; Johnson et al., 2009; Kimhy et al., 2006; Palmier-Claus et al., 2012; Thomas et al., 2016), including the small number of studies that have used EMA and EMI technologies in this population (Bell et al., 2017).

Participants' separate responses to both EMA and EMI elements within the intervention suggest that both elements were found to have value. Clinicians and participants collaboratively using EMA to explore patterns in voice-hearing variation is novel, but fits with the popular use of tools such as “voices diaries” to track these experiences. Participant responses suggest that it may not merely be the learning obtained, but also the process of monitoring itself that may be therapeutic and lead to changes in symptom experience. While unclear what mechanisms are involved, it has been observed that hallucinations reduce when participants are engaged in activity as opposed to being passive (e.g., Delespaul et al., 2002), and the monitoring process may foster a metacognitively aware relationship with hallucinatory experience (Howard et al., 2011) that contrasts with less effective strategies such as seeking to avoid voices or responding to them with hostile dialogue (Farhall et al., 2007).

The EMI elements were also valued and found to be helpful in living with hearing voices. In comparison to prior EMI studies, the current intervention involved personalisation of EMI prompts, informed by the EMA-derived functional analysis. Participants reported this personalisation was important, aiding engagement and motivation with the intervention. While the EMA component was useful in eliciting information that could inform this tailoring, the tailoring might be achieved more directly by involving users in developing the specific wording of the EMI prompting, without the need for the EMA phase.

A notable feature of the intervention was that it used a smartphone-based tool as a bridge between the consultation room and the person's daily environment, both in providing assessment information and in supporting implementation of self-management strategies (Bell et al., 2018a). Experiences reported by clients supported the aim of an app being useful for both data collection and for coping strategy implementation. What was unexpected, however, was the extent to which clients felt that this enhanced the therapeutic relationship. In addition to making the assessment process more efficient, participants felt that

the smartphone monitoring helped them to feel their experiences were better understood by the therapist. The in-vivo data collection may have provided an avenue for clients to portray a subjective experience that can be difficult to articulate, due to both difficulties with poor recall common in this population, and the challenges of describing inherently unusual experiences (Aleman et al., 1999; Brenner and Ben-Zeev, 2014; Shiffman et al., 2008; Myin-Germeys et al., 2009; Trull and Ebner-Priemer, 2009). Additionally, it appeared that the ongoing monitoring helped clients feel as if their therapist had a presence via the app during the assessment phase, as well as them being “with them” while they were trying to self-manage their experiences between sessions. In this way, the smartphone may have functioned as an extension of the therapist, providing a sense of them being more connected with the person's life. This phenomenon requires further examination, although apps enhancing mental health relationships has been observed in other populations (Richards and Simpson, 2015), and is consistent with observations that therapeutic relationships may develop with mental health apps themselves (Henson et al., 2018). Overall it was notable that the blended therapy was perceived to facilitate rapport with the clinician and make their treatment progress more efficient, with the theme of “fast-tracking” being prominent. This is in direct contrast with concerns that practitioners can express that if they were to use digital devices with clients it could interfere with their therapeutic relationship (e.g., Williams et al., 2018).

All participants reflected that they had experienced some change in their voices (such as a reduction in frequency or less provocative content) or the way they related to them, and this was largely associated with a decrease in distress. These positive changes were attributed to a range of factors associated with the intervention, including the insights gained through EMA self-monitoring, the EMI coping strategy reminders, the EMI evening reflections, and the data-driven feedback and therapeutic discussion. These responses provide validation of the presumed therapeutic elements of the intervention, although it is notable that there was significant variability from person to person in terms of which elements of the intervention they found most beneficial. Participants who spoke about having a changed relationship with their voices also verbalised a new level of acceptance and understanding of these experiences, which has been emphasised as important in living with the experience by the consumer-led Hearing Voices Movement (Corstens et al., 2014).

The report of some increase in awareness of voices or increase in voice activity in response to prompts during the week of EMA monitoring is important to note. This is consistent with other reports that EMA prompts can sometimes increase paranoia, bring back memories or distressing experiences, or lead to rumination or worry about relapse (Ben-Zeev et al., 2016; Bradstreet et al., 2019). Of the participants in this study, only one reported a worsening of symptoms in response to EMA prompts, with others noting changes in awareness of or presence of their voices without regarding it problematic. Consistent with other studies that have explored service users' perceptions on psychological therapies for psychosis (Kilbride et al., 2013), participants reported being willing to experience these changes when seen as potentially helpful. Nonetheless it should be noted that there is potential for adverse effects of monitoring interventions, and that participants might have bypassed this stage and utilised a less systematically prompted period of reflecting on patterns in hearing voices, or even just in-session reflection to develop coping prompts. This underlines the importance of contextualising EMA as being a tool the person can use as part of a collaborative process of exploring their experiences, which may have advantages and disadvantages on an individual basis. The individual who had a negative experience highlighted that they had a number of additional stresses in their life while participating that may have contributed to this happening, which emphasises the importance of considering the context to any such intervention.

Limitations to this exploratory qualitative study include the small number of pilot study participants, greater proportion of female participants, their experiences of EMA/I all being with the same therapist, and

the intervention being delivered through a specialist voices clinic, which may not necessarily reflect more routine service delivery environments. It should also be noted that therapist time was required for analysis of the EMA data outside of sessions, and further development of software would be required to automate this in order to make the intervention model scalable. As the therapist was heavily involved in development of the intervention this additionally made it difficult to incorporate therapist views alongside client views in an unbiased way, which could have allowed a fuller consideration of the impact on the therapeutic relationship. There was also not the opportunity to check themes directly with respondents, although codes were interpreted with input from a lived experience reference panel. Nonetheless these findings illuminate the potential use of smartphone-based EMA/I with persons who hear voices and in demonstrating their value to them, indicate that EMA/I may also have potential with wider clinical populations.

Declaration of competing interest

The authors declare that they have no conflicts of interest.

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Appendix A. Supplementary data

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