**Supplementary Materials**

**iMAgery focused psychological therapy for persecutory delusions in PSychosis (iMAPS): an experimental multiple baseline case series**

**List of Supplementary Materials and Methods**

* Full Details of Measures
* Additional Participant Descriptions
* Results of YSQ and SMI Measures

**Measures**

**Psychotic symptoms.**

The Psychotic Symptom Rating Scales (PSYRATS; Haddock et al. 1999) is a clinician administered semi-structured multidimensional interview of delusions and hallucinations. Hallucinations subscale (11-items) and delusions subscale (6-items) are assessed on a 0-4 scale, with higher scores representing greater symptom severity. The auditory hallucinations subscale was used at initial assessment and end of therapy assessment. The delusions subscale was used at each session. An additional measure used at initial and end of therapy assessment was the Positive and Negative Syndrome Scale Positive subscale (PANSS; Kay, Fiszbein, & Opler, 1987). This is a clinician administered interview measure which assesses positive and negative symptoms of psychosis and general psychopathology. To reduce participant burden, we administered only the positive symptom scale. The items are scored between 1 and 7 (not present to severe), with higher scores indicating greater severity. It has good validity and reliability (Kay, Opler, & Lindenmayer, 1988).

**Depression.**

We measured depression at initial assessment and end of therapy using the Calgary Depression Rating Scale for Schizophrenia (CDSS), which distinguishes between the overlap of depressive features and negative symptoms of psychosis (Addington, Addington, & Schissel, 1990).

**Mental imagery.**

Imagery was assessed using an interview schedule which assessed frequency of image, duration, subjective units of distress (SUD)s 0-100. This is adapted from an imagery interview previously used in social phobia (Hackmann et al.1998; Ison et al. 2014). We assessed any images the participant was reporting, including those related to past events and to imagined future events (“flash-forwards”). To aid the imagery interview, we used an adapted measure which we called the Mental Imagery in Psychosis Questionnaire (MIPQ) for each image. These were visual analogue scales rated by the participant on a scale 1-10 from “not at all” to “extremely”, including “*How compelling was the image*?”, “*How real was the image?*”, “*How vivid was the image?*”, “*How absorbing was the image*?” and “*How preoccupying was the image?*”*.* This was based on an earlier version of a mental imagery questionnaire developed by Holmes et al. (2016). In the current study, the Cronbach’s alpha of the MIPQ at the initial assessment was good (α = 0.90). In addition, two imagery ratings were also assessed at each visit “*To which extent could you understand the role that the image(s) play in changing your mood?*” and “*To what extent could you find helpful/positive ways of coping with your images?”.* We have reported the main image that was formulated. This measure was used at each contact.

The Spontaneous Use of Imagery Scale (SUIS; Reisberg, Pearson, & Kosslyn, 2003) which is a measure of how individuals use imagery day-to-day. It was used at at baseline and repeated at end of therapy. The self-report questionnaire has 12 items, for example *“When I hear a radio announcer or DJ I’ve never actually seen, I usually find myself picturing what they might look like”*. The items are rated on a 5 point scale (1 = never appropriate and 5 = always completely appropriate), with higher scores indicating higher use of imagery. In a non-clinical group, the measure has been reported to have excellent internal consistency of α = .98 (Reisberg et al., 2003).

**Schematic beliefs.**

Three measures of schema were utilised. The Brief Core Schema Scales (BCSS; Fowler et al., 2006) are a 24-item, five-point self-report scales that assesses beliefs about self and others. It has four subscales: Negative-self, positive-self, negative-other, positive-other. The Young Schema Questionnaire-Short Form (YSQ-S: Young et al. 2003) is a self-report questionnaire which measures 18 early maladaptive schemas. Each item is phrased as a negative core belief regarding oneself or relationships with others and is rated on a 6 point scale. Adequate psychometrics have been reported (Waller, Meyer and Ohanian, 2001; Rijkeboer , 2012). The Schema Mode Inventory (SMI; Lobbestael et al. 2010) is a 124 item self-report questionnaire designed to assess 14 schema modes. The SMI has been shown to possess satisfactory psychometric properties, in a study examining it across non-clinical controls (*n* = 319), Axis I (*n* = 136) and Axis II disorders (*n* = 236) (Lobbestael et al. 2010). The BCSS, YSQ-S and SMI were each used at initial assessment and end of therapy assessment.

**Therapeutic alliance.**

The Working Alliance Inventory (WAI-SR; Hatcher & Gillaspy, 2006) short version contains 12 items with ratings on a 1-5 scale. This assesses therapeutic alliance on the basis of Bordin’s three theoretical components of alliance: goals, tasks and bond (Bordin, 1979). The client version has maximum scores on each of the three subscales of 20 and thus a total score is summed out of 60. The therapist version has ten items on a 1-5 point scale, with a total score of 50. Both client and therapist versions were administered at therapy session three and end of therapy assessment.

**Adverse effects of psychotherapy.**

At end of therapy assessment, we asked all participants who completed therapy (and any who withdraw early and agreed), to complete a self-report measure of potential adverse effects, the Adverse Effects in Psychotherapy (AEP) measure. The measure was developed for a large trial of CBT for psychosis for clozapine unresponsive symptoms (Hutton, 2013) to measure broad categories: worsening difficulties, poor engagement (including low motivation), situational change, no benefit from therapy, stigma, conflict with others (family, care team) and feeling better (Pyle et al., 2016). This was completed at the end of therapy assessment.

**Participant Case Descriptions**

**Participant 1.**

Participant 1 was an 18-year-old female receiving treatment from early psychosis intervention services, experiencing auditory hallucinations and persecutory delusions. She reported these experiences beginning around the age of 16, when her parents split and she had some other stressful life events. She reported an intrusive mental image of a friend who she said she had found having ended her own life two years previously. This image was understandably distressing and was associated with a fear that others were going to hurt her in some way. At initial assessment, she reported high levels of negative-self and negative-other beliefs, and low levels of positive beliefs about self and others. She was not currently taking any medication. She had not previously undertaken psychological therapy. She reported some occasional, excessive, alcohol use but no other drug use.

**Participant 2.**

Participant 2 was a 20-year-old male meeting criteria for early intervention services, experiencing auditory hallucinations and persecutory delusions. He had a history of low mood in his mid-teens, and previously had attended a group CBT intervention for low mood. He reported an intrusive mental image related to what he described as “featureless figures”. These were visual hallucinatory experiences which would also re-appear in his mind’s eye. They appeared distinct and “real” but without faces or features. He reported below average negative self-beliefs but high levels of negative-other beliefs. Positive-self beliefs were extremely low and positive-other beliefs were also low. He also reported social anxiety difficulties, including eating in public places. He was taking Sertraline 200mg daily when he consented to take part. His medication was not changed during the study.

**Participant 3.**

Participant 3 was a 19-year-old male with a diagnosis of schizophrenia receiving care from early intervention services. He reported both auditory and visual hallucinations for over one year. He believed that he was a “devil puppet”, experiencing an image of a devil’s face and his voices (auditory hallucinations) told him his death was imminent. He also experienced a flash-forward intrusive mental image that his bedroom would be broken into and he would be viciously attacked by unknown assailants. He had previously received two courses of psychological therapy, one as a teenager and one as an inpatient some months before. His first episode appeared to be precipitated during his first year at University when, in addition to alcohol and cannabis he began using a wide range of drugs including tramadol, co-codamol, ketamine, LSD and other psychedelics. At initial assessment, he reported slightly below average negative-self beliefs and high negative-other beliefs. His positive-self beliefs were very low (possibly reflecting his low mood) and positive-other beliefs also low. When he began participating, he was taking Olanzapine 20mg and fluoxetine 20mg. His dose was increased during baseline phase to 25 mg (above British National Formulary prescribing recommended dose) then reduced again a few weeks later. An inpatient admission, unrelated to the intervention, happened between session 1 and session 2, accounting for the slightly higher PSYRATS scores at this point.

**Participant 4.**

Participant 4 was a 34-year-old male who reported persecutory delusions. He had a diagnosis of delusional disorder and had experienced these beliefs for around three years when he began therapy. He believed with very high conviction that he had experienced an assault. He struggled with poly-drug misuse including heroin use. He denied drug use while participating in the study, although his care coordinator and therapist had some concerns that he was using drugs during therapy. He was taking Olanzapine 5 mg and Mirtazapine 15mg throughout his participation. He scored high on negative-self beliefs and very high on negative-other schematic beliefs. Participant 4’s positive-self beliefs were low and his positive-other beliefs were also low. He reported intrusive mental images related to the assault. He was currently living in bail hostel, awaiting a court appearance for a charge of assault. His mother was unwell with cancer, which was also a source of concern to him. At end of therapy, participant 4 reported a drop in positive-other beliefs. The therapist believed this drop in positive-other beliefs was linked to the participant’s care coordinator challenging him directly about his “delusional” belief, which came across in the end of therapy assessment interview and the impending court appearance for assault.

**Participant 5.**

Participant 5 was a 27-year-old female who had experienced a first episode of psychosis approximately three years previously. She struggled with longstanding auditory hallucinations, and persecutory delusions. Participant 5 had experienced a sexual assault as a young teenager, numerous physical assaults as a child and reported being stalked for several years when she was undergraduate student. It was around this time that her psychotic experiences first developed. She struggled with intrusive images of the sexual assault (post-traumatic flashbacks) and intrusive images of a neighbour’s dogs, which she believed were possessed. She also had several chronic, physical health problems which involved having surgery every 3- 4 months and frequent outpatient appointments and for which she was prescribed a range of medications. Participant 5 had a course of counselling and CBT as a teenager for other mental health problems. She had completed a course of at least 16 sessions of CBT in the previous year, gaining some benefit from this but still reported extremely high (100%) conviction regarding her belief that she would be hurt or attacked by unknown assailants. She was not currently taking any psychiatric medications but had previously been prescribed chlorpromazine 75mg twice daily, zopiclone, clomipramine, sertraline 100mg and temazepam 10mg. Two additional issues are of relevance with this client were: 1) frequently reported chronic insomnia lasting days to weeks at a time 2) in session five she disclosed for the first time an intrusive flash-forward mental image which began at night-time, related to unknown assailants breaking into her home and killing her partner, and mum and dad. The therapist and participant worked with this image in therapy but were unable to establish to what extent this had helped reduce the imagery characteristics and/or the delusional belief (as she declined the final assessment appointment).

**Therapy Duration**

Participant one’s treatment lasted four months, with no cancelled appointments and two DNA appointments. Participant two’s therapy lasted four months with two cancelled appointments and no DNA appointments. For participant three, assessments, baseline and therapy lasted three months, with no cancelled or DNA appointments. Participant 4’s participation in the study took four months in total, with six cancelled appointments between sessions two and three and one DNA. Participant 5’s participation lasted three months, with several cancelled appointments rescheduled for the same week and no DNA appointments. Thus, duration of the assessments and interventions varied from three to four months in total.

Table 3

*Measures of early maladaptive schema and measures of schema modes*

|  |  |  |  |
| --- | --- | --- | --- |
|  | Initial Ax(*N* = 5) M (SD) | End of treatment(*N* = 4) M (SD) | D |
| YSQ-S |  |  |  |
| Emotional deprivation | 16.60 (8.91) | 18.75 (5.12) | 0.23 |
| Abandonment | 23.20 (5.89) | 17.50 (8.19) | 0.94 |
| Mistrust/abuse | 26.60 (3.05) | 23.75 (5.73) | 0.34 |
| Social isolation | 25.20 (3.70) | 21.75 (5.91) | 0.63 |
| Defectiveness/shame | 20.40 (6.67) | 18.25 (4.92) | 0.21 |
| Failure | 20.60 (6.58) | 17.75 (7.27) | 0.08 |
| Incompetence/dependence | 15.60 (5.27) | 13.50 (1.73) | 0.08 |
| Vulnerability to harm | 24.20 (2.59) | 22.50 (4.36) | 0.17 |
| Enmeshment | 17.60 (4.16) | 12.00 (5.83) | 0.78 |
| Subjugation | 17.20 (3.70) | 12.50 (3.31) | 1.43 |
| Self-sacrifice | 21.20 (5.63) | 16.00 (7.07) | 1.70 |
| Emotional inhibition | 21.20 (7.19) | 19.50 (8.74) | 0.53 |
| Unrelenting standards | 19.80 (7.19) | 21.50 (9.26) | -1.46 |
| Entitlement | 19.80 (7.19) | 11.25 (1.71) | 1.21 |
| Insufficient self-control | 14.80 (3.70) | 10.50 (4.20) | 2.06 |
| Admiration seeking | 11.60 (3.78) | 10.00 (1.83) | 0.71 |
| Pessimism | 25.20 (5.36) | 18.00 (5.83) | 0.96 |
| Self-punitiveness | 19.20 (7.53) | 15.50 (7.68) | 0.17 |
| SMI |  |  |  |
| Vulnerable Child | 4.72 (0.53) | 3.32 (0.43) | 2.41 |
| Angry Child | 3.60 (1.05) | 3.00 (0.37) | 0.42 |
| Enraged Child | 2.90 (1.44) | 1.80 (0.53) | 0.77 |
| Impulsive Child | 2.71 (0.67) | 2.39 (0.53) | 0.21 |
| Undisciplined Child | 3.03 (0.56) | 2.50 (0.36) | 0.76 |
| Contented Child | 2.10 (0.58) | 2.48 (0.70) | -1.81 |
| Compliant Surrender | 3.20 (0.37) | 2.68 (0.14) | 1.10 |
| Detached Protector | 3.82 (0.69) | 3.03 (0.57) | 1.51 |
| Detached Self Soother | 3.65 (0.91) | 3.13 (0.88) | 0.35 |
| Self-Aggrandiser | 2.36 (0.64) | 2.35 (0.53) | -0.06 |
| Bully & Attack | 2.36 (0.65) | 1.97 (0.32) | 0.08 |
| Punitive Parent | 3.84 (1.06) | 2.92 (1.05) | 0.65 |
| Demanding Parent | 3.94 (0.78) | 3.10 (0.64) | 2.28 |
| Healthy Adult | 3.50 (0.86) | 3.83 (0.99) | -0.19 |

Table 4

*Potential Adverse Effects of Psychotherapy Measure (AEP)*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Questionnaire Item |  |  | Scale Rating |  |
|  | Not at All | Very Little | A Little | Quite a lot | Very Much |
| 1 Taking part hasn’t helped me with my problems. | 4 | 0 | 0 | 0 | 0 |
| 2 Taking part made my problems worse. | 4 | 0 | 0 | 0 | 0 |
| 3 Taking part made me feel more anxious. | 1 | 2 | 1 | 0 | 0 |
| 4 Taking part took up too much time.  | 4 | 0 | 0 | 0 | 0 |
| 5 Taking part led to my mood becoming very low. | 2 | 0 | 2 | 0 | 0 |
| 6 Taking part made me feel more angry and irritable. | 3 | 1 | 0 | 0 | 0 |
| 7 I didn’t feel ready to talk about my problems. | 4 | 0 | 0 | 0 | 0 |
| 8 Taking part made me think too much about bad things that have happened in the past. | 1 | 1 | 2 | 0 | 0 |
| 9 Taking part meant I stopped looking after myself properly. | 4 |  0 | 0 | 0 | 0 |
| 10 Taking part made me feel more suspicious.  | 1 | 2 | 1 | 0 | 0 |
| 11 Taking part required too much energy or motivation. |  4 | 0 | 0 | 0 | 0 |
| 12 Taking part increased my thoughts of killing myself. | 4 | 0 | 0 | 0 | 0 |
| 13 Taking part made my voices or visions worse. | 2  | 1 | 1  | 0 | 0 |
| 14 Taking part was making me fall out with my family or friends. | 3 | 1 | 0 | 0 | 0 |
| 15 Taking part was having a bad effect on my self-esteem.  |  3 | 1 | 0 | 0 | 0 |
| 16 Taking part was making me want to harm myself. | 4 | 0 | 0 | 0 | 0 |
| 17 I felt embarrassed talking about my problems with people I had not met before. | 0 | 2 | 2 | 0 | 0 |
| 18 Taking part made me have thoughts of harming other people. | 4 | 0 | 0 | 0 | 0 |
| 19 Taking part was making me feel hopeless about the future. | 4 | 0 | 0 | 0 | 0 |
| 20 Taking part meant I had to increase my medication in order to cope. | 4 | 0 | 0 | 0 | 0 |
| 21 Taking part involved too much hard work.  | 4 | 0 | 0 | 0 | 0 |
| 22 Taking part made me worry that people would think badly of me because of my diagnosis. |  2 | 1 | 0 | 1 | 0 |
| 23 Taking part made me fall out with my doctor or care team. | 4 | 0 | 0 | 0 | 0 |
| 24 Taking part made me worry about losing control of my mind. |  2 | 0 | 2 | 0 | 0 |
| 25 My problems have improved to the point whereby I no longer feel I need help. | 1 | 1 | 2 | 0 | 0 |
|  |  |  |  |  |  |