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A systematic review and discussion of symptom specific cognitive behavioural approaches to delusions and hallucinations

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ABSTRACT

Studies on cognitive behavioural therapy for psychosis (CBTp) have developed from evaluating generic approaches to focusing on specific symptoms. The evidence for targeted studies on delusions and hallucinations was reviewed. We included randomized controlled trials (RCTs) examining the effect of individualized CBT-based interventions focusing either on delusions or on hallucinations. Twelve suitable RCTs were identified. Four RCTs focused on delusions, of which three took a focused approach targeting mechanisms assumed causal to persecutory delusions. Eight RCTs focused on hallucinations, a common component of these studies being a focus on the perceived power imbalance between the voice(s) and the voice-hearer, to reduce distress and dysfunction. Only three RCTs were powered adequately; the remainder were pilot trials. All trials reported effect sizes against treatment-as-usual above $d = 0.4$ on at least one primary outcome at post-therapy, with several effects in the large range. Effects on the primary outcome were maintained for five of the seven studies that had significant outcomes and reported a follow-up comparison, but most of the follow-up periods were brief.

Although targeted studies are still in their infancy, the results are promising with a tendency towards higher effects compared to the small-to-moderate range found for generic CBTp. In clinical practice, CBTp will need to continue including a range of approaches that can be adapted to patients in a flexible manner according to the primary goals and prevalent combination of symptoms. However, symptom-focused and causal-interventionist approaches are informative research strategies to evaluate the efficacy of separate components or mechanisms of generic CBTp.

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1. Introduction

Cognitive Behaviour Therapy for psychosis (CBTp) is an accepted, adjunct psychological therapy for individuals suffering from distressing psychotic symptoms. The main instrument of change in CBTp involves reframing appraisals and modifying behavior related to psychotic symptoms, to reduce distress and improve functioning and well-being. Therapy is collaborative, based on a shared formulation, and uses a normalizing philosophy (Morrison and Barratt, 2010). It is geared towards achieving the person's personal valued goal(s), with paramount importance being given to the therapeutic relationship and empowerment, maintaining the person's self-esteem, and providing hope (Brabban et al., 2017). Due to the heterogeneity of presentation in psychosis, a range of therapy approaches have been developed, reflected in the many books and manuals currently available (see Johns et al., 2014).

Randomized controlled trials (RCTs) of CBTp have tended to comprise composite CBTp approaches for heterogeneous groups of patients,

addressing different types of symptoms. To date, there have been >20 meta-analyses reviewing up to 50 RCTs. The effect sizes across these meta-analyses range from 0.09 (Velthorst et al., 2015) to 0.93 (Gould et al., 2001), depending on the permutations of trials included, for instance whether they focused on specific populations (e.g., treatment resistant patients, Burns et al., 2014), type of therapy (e.g., formulation-based therapies, van der Gaag et al., 2014), outcomes (e.g., negative symptoms, Lutgens et al., 2017), assessment time-point (e.g., end of therapy, Jauhar et al., 2014), or comparison group (e.g., active control, Turner et al., 2014). For the primary outcome (generally an overall symptomatology measure) the average effect is in the small to moderate range ($d = 0.40$; Wykes et al., 2008), with smaller effects in methodologically rigorous trials (Jauhar et al., 2014).

However the value of combining highly heterogeneous trials with different foci has been questioned (Byrne, 2014; Peters, 2014), since such analyses reflect an over-simplification of the complexities of psychosis presentations and of the range of psychological interventions encompassed within a broad CBTp framework (Thomas, 2015). Meta-analyses focusing on individually tailored, formulation-based approaches (van der Gaag et al., 2014), and reporting effect sizes for

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individual symptoms (Mehl et al., 2015; Naeem et al., 2016; van der Gaag et al., 2014), have been more informative about the specific effects of CBTp on delusions and hallucinations. These analyses are consistent in showing small-to-moderate effect sizes for hallucinations (0.44, van der Gaag et al., 2014; 0.45, Naeem et al., 2016) and delusions (0.36, van der Gaag et al., 2014; 0.56 Naeem et al., 2016), although the results are less consistent for the smaller number of trials comparing CBTp with other psychological interventions (Turner et al., 2014).

One limitation is that even in the meta-analyses reporting effect sizes on specific symptoms, the studies selected were not necessarily RCTs where the therapy focused on a particular symptom, but included mostly trials with heterogeneous patients and generic CBTp approaches, with secondary outcome measures of delusions and hallucinations. The findings may therefore underestimate effects, since the studies may not have been powered for the secondary outcomes. Moreover, it is possible that presenting symptoms may not have been targeted by the therapy, depending on the individual's goals. One meta-analysis looking at outcomes on delusions (Mehl et al., 2015) compared generic CBTp approaches to newer studies taking a 'causal-interventionist approach' (Freeman, 2011). They found a difference of 0.33 in mean effect sizes in favor of the newer studies, where patients were selected for the presence of persecutory delusions, the therapy focused specifically on hypothesized maintenance factors, and the primary outcomes assessed the actual focus of therapy.

In this paper, we review and discuss the empirical evidence for 'targeted' studies on delusions and hallucinations; i.e., trials that evaluate components of generic CBTp focusing on specific symptoms. In order to facilitate the interpretation of any differences in outcome, we sought to increase the comparability of studies in terms of the type of interventions used, and only included studies where the approach was entirely individualized to the patient rather than relying on a manualized training approach or being group-based; the therapy focused on formulating and changing either hallucinations or delusions, or factors closely associated with the symptom, such as distress (e.g. hallucination related distress), behavior (e.g. acting on hallucinations), or maintenance process (e.g., worry); and the primary outcome(s) reflected the focus of therapy. Third wave and 'new' approaches were included if they exhibited similar goals to CBTp, i.e., disrupting the associations between the presence of psychotic symptoms and their emotional and behavioural sequelae, even if the 'road-map' to achieving these changes diverged from traditional CBTp. As the number of studies was small and studies differed in the type and intensity of the intervention employed, we opted for a discursive review rather than a quantitative effect-integration. This approach is more suitable when the main aim is to reflect on the differences between therapeutic approaches and their outcomes and to derive implications for future research.

2. Method

Suitable peer-reviewed articles in English were identified in March 2017 by conducting two separate literature searches (delusion- and hallucination-focused) in electronic databases (MEDLINE and PsycINFO) via Ovid. The following search terms were used:

("CBT", "cognitive behavio*", or "cognitive-behavio*", or "intervention", or "therapy", or "training" or "treat*" or "trial") were either combined with ("delusion", or "paranoia") or with ("hallucination*" or "voice*").

Moreover, reference lists of previous meta-analyses and book chapters on psychological approaches to psychosis were screened for suitable studies. In a second and third step, titles followed by abstracts were screened for relevance. The remaining articles were examined in detail regarding the predefined inclusion and exclusion criteria. Inclusion criteria encompassed (a) English studies describing (b) RCTs examining the effect of (c) individualized CBT-based interventions focusing on (d) delusions or hallucinations. Criterion (d) was considered fulfilled if 1) the description of the intervention clearly described the focus to be

on either delusions or hallucinations rather than on psychopathology in general, and if 2) the trial EITHER used a measure of delusions or hallucinations as a primary outcome OR excluded participants below a predefined cut-off score for delusions and hallucinations. Exclusion criteria were (a) subclinical or at-risk samples, (b) group-therapy, (c) manualized training protocols.

Controlled effect sizes are those reported in the original studies, and are based on the post- or follow-up differences between the intervention and the control group with or without controlling for pre-assessment scores. Where controlled effect sizes were not reported but mean values and standard deviations, or odd ratios, were provided, the Cohen's *d* effect sizes were calculated (see Tables 1 and 2).

3. Results

The literature search revealed 507 peer-reviewed studies for delusions and 1293 for hallucinations after removing duplicates. After the selection process (see Fig. 1), four studies on delusions and six on hallucinations met the full inclusion criteria. A further two studies were trial protocols at the time of the literature search, but were published during the revision process and thus included, making a total of eight RCTs for hallucinations. Details on studies, including sample sizes, target population, therapy format, measurement time points, dropout-rates and effect sizes for primary and key secondary outcomes are provided in Tables 1 (delusions) and 2 (hallucinations).

Of the 12 studies included, eight used a treatment-as-usual (TAU) control group, one used a waitlist control, one used an attention control, one used a supportive counselling control, and one used both a waitlist and a placebo control (befriending) condition. Nine included a follow-up¹ (range: 1 to 9 months).

The sample sizes across all studies varied from 24 to 197. The dropout rate from the CBT interventions varied from zero to 35% (mean: 20.5% hallucinations; 11% delusions). In the following sections we provide a brief summary of the design, the intervention and the main results of each of the selected studies.

3.1. Studies focusing on delusions

O'Connor et al. (2007) compared an individualized CBT approach to an attention placebo group in a small sample of patients diagnosed with delusional disorder. The intervention followed early descriptions of CBTp (Chadwick and Lowe, 1994; Garety et al., 1994) and consisted of up to 24 sessions with a focus on cognitive reframing and reality testing. In support of the main hypothesis that 'dimensions of delusional beliefs and associated distress' (primary outcome) would improve, significant benefits of the CBT over the control condition were found for 1/3 of the items of the Maudsley Assessment of Delusions Scale (MADS; Wessely et al., 1993), including subjective strength of conviction, reactions to and acting on beliefs. The effect sizes of these items were in the small to medium range. However since there was a 50% attrition rate in the control group, and neither a specific primary outcome dimension on the MADS nor a criterion of success were predefined in this trial, it is difficult to interpret the overall success of the intervention.

Freeman et al. (2015a) evaluated the effect of six sessions of individual worry-focused CBT compared to TAU on worry (primary outcome I and hypothesized mediator) and overall delusions (primary outcome II). This study was preceded by a small pilot trial (Foster et al., 2010) that focused on worry and paranoia distress as primary outcomes. The intervention included psychoeducation, reviewing of positive and negative beliefs about worry, increasing awareness of the initiation of worry and identification of worry-triggers, learning to let go of worry,

¹ One of the nine studies (Leff et al., 2013) included a follow-up assessment but did not present any comparisons between groups at that time-point.

implementation of worry periods, problem-solving and relaxation exercises. In both trials worry scores reduced in the intervention group at post-treatment compared to TAU, and improvement was maintained, with medium-to-large and small effect sizes in the two-months follow-up in the pilot trial and the four-month follow-up in the main trial, respectively. Moreover, there were large and small-to-medium effect sizes for the Psychotic Symptoms Rating Scale (PSYRATS) delusions subscale (Haddock et al., 1999) in the pilot and main trial, respectively, although the pilot trial did not show the expected effect on its primary outcome, paranoia distress. The main trial also found small effects for several of the secondary outcome measures, including delusion distress. Worry mediated the intervention effect on delusions, accounting for 66% of the change.

In an early phase II trial, Freeman et al. (2014) investigated the effect of a six-session CBT intervention focused on reducing negative thoughts and enhancing positive thoughts about the self, and increasing positive activities, compared to TAU. Negative thoughts were normalized, made understandable within the person's life context, and reviewed. Patients were encouraged to increase valued activities, and positive thoughts were encouraged by reviewing strengths and keeping a diary of positive events. The therapy was supported between sessions by telephone calls, texts and supportive visits from a graduate student. There was a small non-significant effect for negative self-concepts (primary outcome I, hypothesized mediator) and a moderate non-significant effect for paranoia (primary outcome II). There were significant moderate to large effects in several of the secondary outcomes (e.g. positive self-concepts, self-esteem, social-rank), but none of the benefits was maintained four weeks later.

3.2. Studies focusing on hallucinations

The largest studies to date are the COMMAND (Birchwood et al., 2014) and Avatar Therapy (Craig et al., in press) trials, both of which were preceded by pilot trials (Leff et al., 2013; Trower et al., 2004). The remaining four studies are all pilot trials.

The focus of Cognitive Therapy for Command Hallucinations (CTCH, Birchwood et al., 2014) was to reduce harmful compliance behavior through reducing the power imbalance between the voice(s) and the voice-hearer. This was achieved by enhancing coping strategies to increase perceived controllability over the voices, modifying appraisals about the power of the voices to carry out their malevolent intent, reducing safety behaviours and 'appeasement' of the voices, and addressing subordinate interpersonal schema (see Meaden et al., 2013, for a fuller description). CTCH was delivered over 9 months for approximately 25 sessions. Both the pilot and main study found significant reductions in compliance behavior (primary outcome) in the therapy compared to the TAU group, with large and small-to-medium effect sizes, respectively, for up to 9 months post-therapy. As predicted, both studies also showed significant differences between the groups post-therapy on the Voice Power Differential scale (VPD; Birchwood et al., 2004), which was demonstrated to be the mediator of change in the main trial (Birchwood et al., 2017). However, contrary to expectations, there was either no significant impact on voice-related distress (Birchwood et al., 2014), or post-therapy reductions were not maintained at the six months follow-up (Trower et al., 2004).

One other, smaller study also targeted command hallucinations (Treatment of Resistant Command Hallucinations; TORCH; Shawyer et al., 2012), using a CBTp protocol aimed at changing power beliefs, as well as beliefs about the self and associated delusions when applicable. Therapy was augmented with Acceptance and Commitment Therapy (ACT; Bach and Hayes, 2002) strategies, such as just noticing and accepting voices and associated thoughts, rather than believing or acting on them; accomplishing valued goals despite voices; and mindfulness exercises. TORCH was delivered for approximately 15 weekly sessions with two follow-up sessions, and compared to both waiting-list and befriending. In contrast to the COMMAND trial, no differences

were found between the TORCH and befriending groups on command hallucination compliance, resistance or coping (primary outcomes) or on any of the secondary outcomes. The TORCH group showed increased confidence in coping with command hallucinations compared to the waiting-list group, with a large effect size, but both TORCH and befriending produced pre-post therapy gains on that measure, which were not maintained at the six months follow-up. However, these results should be interpreted with caution, since 42% of the participants showed no compliance at baseline, which undermines both the focus of the therapy and the primary outcome measures used.

The other five trials focused on distressing, persistent voices across diagnostic groups. Avatar therapy is an innovative therapy that uses computer technology to create an Avatar of each individual's voice, which is then controlled by the therapist in interaction with the patient (see Leff et al., 2014 and Craig et al., 2016 for a fuller description). The Avatar enables a powerful but safe 'exposure' to the persecuting voice, leading to an increased sense of control and mastery over the voice as the Avatar changes from being abusive to supportive. In addition, Avatar therapy includes making links between low self-esteem and the content of critical voices, with a focus on the individual's strengths and capabilities. Both the pilot and main trials reported that six weekly sessions (plus one assessment (main trial) or follow-up (pilot trial) session) produced a large and significant effect on the total score of the PSYRATS-auditory hallucinations (AH) subscale (Haddock et al., 1999) (primary outcome), compared to the control group (a delayed therapy group in the pilot, and supportive counselling in the main trial), at the end of therapy (12 weeks). The main trial also found significant effects on voice frequency and distress, on the omnipotence (but not the malevolent) scale of the Beliefs about Voices Questionnaire (BAVQ-R; Chadwick et al., 2000), and on the Voice Acceptance and Action Scale (Shawyer et al., 2007) (secondary outcomes), but not on affective or other psychotic symptoms. However none of the 24-weeks follow-up group comparisons on either primary or secondary outcomes was significant.

Making links between low self-esteem and the content of critical voices was the main focus of competitive memory training (COMET; van der Gaag et al., 2012). In the COMET trial, memories associated with positive self-esteem were retrieved and strengthened. The activation of this positive self-image was then used to weaken the negative content of voices and enhance self-confidence. The aim was to change the submissive relationship to the voices, through reappraising their meaning and reducing their emotional impact. In contrast to Avatar Therapy, seven sessions of COMET did not affect the total PSYRATS-AH score post-therapy, although a medium effect size was reported for the cognitive interpretation of voices dimension compared to TAU (secondary outcome) (van der Gaag et al., 2012). Importantly, the authors found a medium-to-large effect on depressive symptoms, their primary outcome. This effect was fully mediated by self-esteem and acceptance of voices, and partially mediated by the attributed power to the voices and the social ranking of oneself in relation to the voices, which were all hypothesized mediators.

Two small pilot trials examined Relating therapy (Hayward et al., 2014) and a guided self-help approach based on the 'Overcoming Distressing Voices' book (Hayward et al., 2012). The Relating Therapy RCT (Hayward et al., 2017) was delivered over 16 sessions, and aimed to change subordinate and negative styles of relating to the voice(s) through assertiveness training, in relation to both voices and other individuals in the person's social environment, and drawing on the individual's history of interpersonal attachment patterns. A guided self-help CBT for voices (CBTv; Hazell et al., in press) consisted of eight sessions over a maximum of 12 weeks, with each session linked to a specific chapter in the self-help book and accompanying workbook. Therapy aimed to reduce voice impact through 'modules' targeted at coping with voices, reducing negative beliefs about self and voices, and increasing assertiveness in relationships. These two trials reported the highest effect sizes of all the reviewed studies on their primary outcomes at the

Table 1
Details on reviewed studies with focus on delusions.

Reference	Country	N	Patient population	Intervention (n)	Therapy format	Measurement time points	Blinded study	Dropout ^a	Controlled effect sizes for primary outcome measure(s) ^b	Controlled effect sizes for key secondary outcome measures ^b
O'Connor et al. (2007)	Canada	24	Outpatients with a diagnosis of delusional disorder and no other psychotic or other major problems on Axis I or II of DSM-IV	Intervention group (12) = CBT aimed at challenging delusions (cognitive challenge and reality testing) Attention placebo control group (12; APC) to control for therapeutic encounters and nonspecific supportive effects	Individual, 24 weekly sessions Administered by: licensed clinical psychologists specialized in CBT for delusional disorder	- Baseline - Post-treatment (24 weeks after baseline)	Yes	Lost to post-treatment: CBT: 8% APC: 50% Drop-out from therapy: CBT: 17–25% ^e APC: 50%	MADS dimensions (all single items) - Subjective conviction: $\eta_p^2 = 0.16^d$ - Decrease in idiosyncratic emotion: $\eta_p^2 = 0.26^d$ - Acting against the belief: $\eta_p^2 = 0.28^d$ - Reaction to belief: trend in favor of CBT; $\eta_p^2 = 0.18^d$ (trend, $p = .05$) - Harm attempted due to belief: $\eta_p^2 = 0.28^d$	BAI: n.s. ^c BDI: $\eta_p^2 = 0.74^d$ Other measures used: BABS (served only as check on reliability), SSEI
Foster et al. (2010)	UK	24	Inpatients and outpatients with a diagnosis of schizophrenia, schizoaffective disorder, or delusional disorder, a significant level of worry (PSWQ ≥ 45) and persistent persecutory delusions (>6 months)	Intervention group (12) = brief CBT aimed at reducing worry by targeting beliefs about worry and worry related behavior TAU ^f (12)	Individual; 4 sessions over one month Administered by: first author with supervision	- Baseline (before randomization) - End of treatment (1 month after randomization) - Follow up (2 months after randomization)	No	Lost to post-treatment: CBT: 25% TAU: 8% Lost to follow up: CBT: 17% TAU: 17% Drop-out from therapy: 8%	No significant effects found for the other 10 MADS items Additionally calculated controlled effect sizes ^b PSWQ: $d = 0.67$ (at 1 month) $d = 0.99$ (at 2 months) GPTS-distress: $d = 0.30$ (at 1 month); n.s. $d = 0.71$ (at 2 months); n.s.	PSYRATS-Delusions total: $d = 1.49$ (at 1 month) $d = 1.35$ (at 2 months) GPTS-persecution: $d = 0.22$ (at 1 month); n.s. $d = 0.57$ (at 2 months); n.s. Other measures used: WTAR

Freeman et al., 2014	UK	30	Outpatients (18–70 years) with a diagnosis of schizophrenia, schizoaffective disorder, or delusional disorder, negative beliefs about the self (assessed in the BCSS) and current persecutory delusions (PSYRATS delusion conviction ≥ 3)	Intervention group (15) = brief CBT aimed at improving self-confidence by targeting beliefs about self and enhancing positive activity TAU ^f (15)	Individual; 6 sessions over 8 weeks Administered by: clinical psychologists with support from graduate psychologist	- Baseline - Post-treatment (8 weeks after baseline) - Follow-up (12 weeks after baseline)	yes	lost to post-treatment: CBT: 0% TAU: 7%	Post-assessment: BCSS-negative: d = 0.24 n.s. GPTS: d = 0.59 n.s.	PSYRATS-delusions total: d = 0.91 n.s. BCSS-positive: d = 1.00 SCS: d = 0.88 RSQ: d = 0.62 Other measures used: WEMWBS, BAI, BDI-II
Freeman et al. (2015b)	UK	150	Inpatients and outpatients with a diagnosis of schizophrenia, schizoaffective disorder, or delusional disorder, a significant level of worry (PSWQ ≥ 45) and persisting persecutory delusions (>6 months; PSYRATS delusion conviction ≥ 3).	Intervention group (73) = aimed at reducing worry by targeting beliefs about worry and worry related behavior TAU ^f (77)	Individual; 6 sessions over 8 weeks Administered by: clinical psychologists with supervision	- Baseline - Post-treatment (8 weeks after baseline) - Follow up (24 weeks after baseline)	Yes	Lost to post-treatment: CBT: 4% TAU: 5%	Differences in average outcome across post and follow-up assessment PSWQ: d = 0.47 PSYRATS-delusions: d = 0.49	Differences in average outcome across post and follow-up assessment GPTS: d = 0.45 PSYRATS-distress: d = 0.41 PANSS: d = 0.42 PTQ: d = 0.32 Other measures used: CHOICE, WEMWBS

Note: BAI = Beck Anxiety Inventory (Beck and Steer, 1993); BABS = Brown Assessment of Beliefs Scale (Eisen et al., 1998); BCSS = Brief Core Schema Scale (Fowler et al., 2006); BDI = Beck Depression Inventory (Beck et al., 1996); CHOICE = Choice of Outcome in CBTp (Greenwood et al., 2010); GPTS = Green et al. Paranoid Thoughts Scale (Green et al., 2008); MADDS = Maudsley Assessment of Delusion Schedule (Wessely et al., 1993); PANSS = Positive and Negative Syndrome Scale for Schizophrenia (Kay et al., 1989); PSWQ = Penn State Worry Questionnaire (Startup and Erickson, 2006); PSYRATS-delusion = Psychosis Rating Scales-delusion (Haddock et al., 1999); PSYRATS-distress = Psychosis Rating Scales-distress (Haddock et al., 1999); PTQ = Perseverative Thinking Questionnaire (Ehring et al., 2011); RSQ = Robson Self-Concept Questionnaire (Robson, 1989); SCS = Social Comparison Scale (Allan and Gilbert, 1995); SSEI = Social Self-Esteem Inventory (Lawson et al., 1979); WEMWBS = Warwick-Edinburgh Mental Well-being scale (Tenant et al., 2007); WTAR = Wechsler Test of Adult Reading (Wechsler, 2001).

^a As calculated from flow-chart (lost from randomization to post-assessment; lost from randomization to follow up) for therapy and control group, for primary outcome; drop-out rates from therapy are also reported separately (includes treatment refusers (post-randomization) + drop-out from therapy (pre-defined definitions for minimum number of sessions were used if those were reported in paper)).

^b The scale/subscales defined as primary outcomes are underlined. Effect sizes are as reported in original papers; if no effect size was reported, additional controlled effect sizes were calculated as mean group 1 – mean group 2 at post-treatment or follow-up/pooled standard deviation of both groups at baseline.

^c Exact effect size not reported in paper.

^d Effect sizes reported in paper are partial eta-squared: weak = 0.17, medium = 0.24, strong = 0.51, very strong = 0.70.

^e Conflicting rates are reported in the paper.

^f TAU = treatment as usual/standard care.

Table 2
Details on reviewed studies focusing on hallucinations (presented chronologically).

Reference	Country	N	Patient population	Intervention (n)	Therapy format	Measurement time points	Blinded study	Dropout ^a	Controlled effect sizes for primary outcome measure(s) ^b	Controlled effect sizes for secondary outcome measures ^b
Trower et al. (2004)	UK	38	Patients with schizophrenia or related condition having experienced command hallucinations for at least 6 months with recent history of harm to self or others, or major social transgressions as a result of the commands	Intervention group (18) = cognitive therapy for command hallucinations (CTCH; as Birchwood et al., 2014) TAU ^c (20)	as Birchwood et al., 2014	- Baseline - Post-treatment (6 months after baseline) - Follow up (12 months after baseline)	Yes	Post-treatment CTCH: 17% TAU: 15% Follow-up CTCH: 22% TAU: 25% Drop-out from therapy: 27%	VCS: $d = 1.1$ (6 months) Additionally calculated effect sizes ^b $d = 3.40$ (12 months) ^d	Additionally calculated effect sizes ^b VPD total: $d = 1.42$ (6 months); $d = 1.70$ (12 months) BAVQ-malevolence: $d = 0.19$ (6 months; n.s.); $d = -0.13$ (12 months; n.s.) BAVQ-omniscience: $d = 0.37$ (6 months); $d = 0.30$ (12 months) PSYRATS-control (1 item): $d = 1.33$ (6 months); $d = 1.48$ (12 months) PSYRATS-distress (1 item): $d = 1.11$ (6 months); $d = 0.48$ (12 months; n.s.) Other measures used: PSYRATS-AH (loudness, frequency, all 1 item), PANSS, CDS TORCH vs. Befriending PANSS-total: $d = 0.60$ (endpoint; n.s.); $d = 0.09$ (6 months; n.s.) PSYRATS-AH distress (2 items: intensity + amount): $d = -0.37$ (endpoint; n.s.); $d = -0.06$ (6 months; n.s.) PSYRATS-AH disruption (1 item): $d = -0.52$ (endpoint; n.s.); $d = -0.06$ (6 months; n.s.) TORCH vs. Waitlist PANSS total: $d = 1.01$ PSYRATS-distress: $d = -0.13$ (n.s.) PSYRATS-distraction: TORCH vs. Waitlist $d = 0.51$ (n.s.) other measures used: modified-GAF, Voice-related distress (single item from SHER), QoL-ESQ: Process measures: VAAS, BAVQ-R, RSQ, voice-related preoccupation and insight (single items from SHER), BIS
Shawyer et al. (2012)	Australia	43	Patients (18–65 years) with schizophrenia or related condition having experienced command hallucinations within the previous 6 months causing distress or dysfunction (NB presence of current compliance behavior was not an inclusion criteria)	Intervention group (21) = treatment of resistant command hallucinations (TORCH). CBT aimed at changing voice power beliefs, augmented with Acceptance & Commitment Therapy (ACT) strategies (noticing/accepting voices; accomplishing valued goals; mindfulness exercises) Placebo control group (22) = befriending Waitlist control group (17; subsample: before randomization)	Individual: 15 weekly sessions + 2 follow-up sessions; 50 min./session Administered by: therapists trained according to TORCH or Befriending manuals under supervision	- Baseline - Post-treatment (6 months after end of treatment)	Yes	Post-treatment TORCH: 5–10% (dependent on outcome) Befriending: 14% Follow-up TORCH: 14–24% (dependent on outcome) Befriending: 18–23% (dependent on outcome) Drop-out from therapy: TORCH = 5% Befriending = 9%	Adapted interview on compliance and coping with harmful command hallucinations (compliance; coping; resistance (single items); Shawyer et al., 2008) TORCH vs. Befriending compliance: could not be analyzed (only 18/43 complied at baseline) Resistance: $d = -0.07$ (endpoint; n.s.) $d = -0.05$ (6 months; n.s.) Coping: $d = -0.31$ (endpoint; n.s.) $d = 0.04$ (6 months; n.s.) TORCH vs. Waitlist Befriending = 9% Coping: $d = 1.07$	

van der Gaag et al. (2012)	Netherlands	77	Patients with schizophrenia-spectrum disorder with persistent auditory verbal hallucinations of daily occurrence (PSYRATS-AH item 1 ≥ 2), with at least moderately intense suffering (PSYRATS-AH item 9 ≥ 2) and at least moderate disturbance of daily living (PSYRATS-AH item 10 ≥ 2)	Intervention group (39) = competitive memory training (COMET). Therapy aimed at enhancing self-esteem and changing relationship between voice and voice-hearer from submissive to distant through experientially changing negative content of voice and its association with self-esteem TAU ^c (38)	Individual; 7 sessions Administered by: no information	- Baseline - Post-treatment (2 months after baseline)	Yes	Post-treatment COMET: 28% ^c TAU: 0% Drop-out from therapy: 28%	BDI-II: <i>d</i> = 0.64 PSYRATS-AH total: <i>d</i> = 0.30 (n.s.) PSYRATS-AH (3-factor version (Haddock et al., 1999)): cognitive interpretation (3 items): <i>d</i> = 0.63 Other measures used: PSYRATS-AH (physical characteristics 4 items: frequency, duration; location, loudness); negative emotional content (4 items: negative content, distress) None
Leff et al. (2013)	UK	26	Patients (14–75 years) hearing persecutory voices for at least 6 months (irrespective of diagnosis) and not responded to medication	Intervention group (14) = computer-assisted therapy for medication-resistant auditory hallucinations (avatar therapy; as Craig et al., in press). TAU ^c /delayed therapy (12)	Individual; 6 weekly sessions + 1 follow-up session; 30 min/session Administered by: first author	- Baseline - Post-treatment for immediate therapy group/pre-treatment for delayed therapy group (7 weeks after baseline) - Follow up (3 months after treatment)	Yes	Post-treatment Immediate therapy: 43% Delayed therapy group (during TAU): 0% Delayed therapy group (post-treatment): 33% Follow-up: no information	additionally calculated controlled effect sizes ^{a,f,e} PSYRATS-AH total: <i>d</i> = 1.62 BAVQ-R: <i>d</i> = 0.26 CDS: <i>d</i> = 0.04 (n.s.) No follow-up (post-treatment): between-group comparison
Birchwood et al. (2014)	UK	197	Patients (16 or older) with schizophrenia, schizoaffective or mood disorders and a history of harmful command hallucinations for at least 6 months, with recent (<9 months) history of harm to self or others, or major social transgressions as a result of the commands, or appeasement of voices	Intervention group (98) = cognitive therapy for command hallucinations (CTCH), CBT aimed at reducing harmful compliance through changing voice power and control appraisals and reducing power differential between voice and voice-hearer (see Meaden et al., 2013) TAU ^c (99)	Individual; about 25 sessions over a maximum of 9 months; 1 h/session Administered by: nine cognitive therapists under supervision by a lead clinician with expertise in CBTp	- Baseline - Post-treatment (9 months after baseline) - Follow up (18 months after baseline; primary time-point for VCS)	Yes	Drop-out from therapy: 35% Post-treatment CTCH: 13% TAU: 10% Follow-up CTCH: 19% TAU: 14% Drop-out from therapy: 19%	VCS: OR ^g = 0.45 (18 months) OR ^g = 0.57 (common to 9 + 18 months) Additionally calculated controlled effect sizes ^b VPD total: <i>d</i> = 0.37 (common to 9 + 18 months) VPD power: <i>d</i> = 0.41 (common to 9 + 18 months) No other measure significant Other measures used: BAVQ-R, PSYRATS-AH total, PSYRATS-AH distress (2 items: intensity + amount), PKQOS, CDS, BHS, BSSI
Hayward et al. (2017)	UK	29	Patients (18 years or older) with distressing auditory hallucinations for at least one year (irrespective of diagnosis); scoring 3 or 4 on either the intensity of distress item or the amount of distress item on the PSYRATS-AH at time of consent; currently receiving specialist mental health care	Intervention group (14) = relating therapy. Therapy aimed at reducing voice distress and power differential between voice and voice-hearer through changing interpersonal 'relating' with voice and assertiveness training (see Hayward et al., 2014)	Individual, up to 16 weekly sessions; 1 h/session Administered by: four clinical psychologists and one nurse consultant (two	- Baseline - Post-treatment (16 weeks after baseline) - Follow up (36 weeks after baseline)	Yes	Post-treatment Relating therapy: 0% TAU: 13% Follow-up Relating therapy: 14% TAU: 7%	PSYRATS-AH total ^h : <i>d</i> = 1.4 (16 weeks); <i>d</i> = 1.2 (36 weeks) CHOICE-satisfaction ^h : <i>d</i> = 0.7 (16 weeks); <i>d</i> = 0.5 (36 weeks) CHOICE-severity ^h : <i>d</i> = 0.9 (16 weeks); <i>d</i> = 0.7 (36 weeks) HADS-anxiety ^h : <i>d</i> = 1.4 (36 weeks)

(continued on next page)

Table 2 (continued)

Reference	Country	N	Patient population	Intervention (n)	Therapy format	Measurement time points	Blinded study	Dropout ^a	Controlled effect sizes for primary outcome measure(s) ^b	Controlled effect sizes for key secondary outcome measures ^b
Hazell et al. (in press)	UK	28	Patients (18 years or older) with distressing auditory hallucinations for at least one year (irrespective of diagnosis); scoring at least 3 on either item 5, 6 or 7 (voice interference; distress; impact on self) of HPSVQ, at time of consent; currently receiving specialist mental health care	TAU ^c (15) Intervention group (14) = guided self-help CBT for voices (CBTV). Therapy was based on 'Overcoming Distressing Voices' self-help book (Hayward et al., 2012), with accompanying workbook. Therapy aimed to reduce voice impact through 'modules' targeted at coping with voices, reducing negative beliefs about self and voices, and increasing assertiveness in relationships. Wait list TAU ^c (14)	Individual, up to 8 sessions over 12 weeks; 1 h/session Administered by: clinical psychologists with extensive CBTp experience	- Baseline - Post-treatment (12 weeks after baseline)	Yes	Post-treatment Guided self-help CBTV: 7% TAU: 0% Drop-out from therapy: 14%	Voice-impact subscale of HPSVQ (4 items; from factor analysis by Kim et al., 2010) d = 1.78	d = 0.4 (16 weeks); d = 0.2 (36 weeks) HADS-depression ^h ; d = 0.7 (16 weeks); d = 0.9 (36 weeks) Other measures used: PSYRATS-AH (other 3 components from 4-factor version; frequency (3 items; frequency; duration; disruption); attributions (2 items; location; origin); loudness (1 item) Process measures used: VAY, PROQ3 total HPSVQ total; d = 1.20 CHOICE-severity; d = 1.40 CHOICE-Goals (2 items); d = 1.54 HADS-anxiety; d = 0.94 HADS-depression; d = 0.27 (n.s.) Other measures used: SWEMWBS, RSES ⁱ Process measures used: BCSS (self-scale), PROQ3 total, VAY, BAVQ-R, HPSVQ phenomenology subscale ^e

Craig et al. (in press)	UK	150	Patients (18 years or older) with schizophrenia, schizoaffective or mood disorders (ICD-10 F20-39) and distressing auditory hallucinations for at least 12 months despite antipsychotic medication	Intervention group (75) = computer-assisted therapy for medication-resistant auditory hallucinations (avatar therapy). Therapy aimed at reducing voice power, increasing control and self-esteem, and reducing power differential between voice and voice-hearer through exposure to assertive dialogue with voice (through avatar) (see Leff et al., 2014; Craig et al., 2016)	Individual; 1 assessment session/setting up of avatar + 6 weekly sessions; 50 min/session	Administered by: experienced clinicians skilled in psychological therapies; training provided by 1st author of pilot study (Leff)	<p>Individual; 1 assessment session/setting up of avatar + 6 weekly sessions; 50 min/session</p> <p>Administered by: experienced clinicians skilled in psychological therapies; training provided by 1st author of pilot study (Leff)</p> <p>Placebo control group (75) = supportive counselling</p>	<p>yes</p> <p>- Baseline</p> <p>- Post-treatment (12 weeks after baseline)</p> <p>- Follow up (24 weeks after baseline)</p>	<p>Post-treatment</p> <p>Avatar: 16% Counselling: 19%</p> <p>Follow-up</p> <p>Avatar: 24% Counselling: 33%</p>	<p>PSYRATS-total at t1: $d = 0.8$ (12 weeks) $d = 0.3$ (24 weeks; n.s.)</p>	<p>PSYRATS-subscales (4-factor version): Woodward et al., 2014; all at 12 weeks (no significant effects at 24 weeks) PSYRATS-Frequency: $d = 0.6$ PSYRATS-Distress: $d = 0.8$ BAVQ-R omnipotence: $d = 0.5$ BAVQ-R malevolence: $d = 0.3$ n.s.) VAAS Acceptance: $d = 0.5$ VAAS Action: $d = 0.6$ VPDS total: $d = 0.4$ (n.s.)</p>
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Other measures used:
BAVQ-R total, VPDS subscales, SAPS, SANS, PSYRATS-Delusions, DASS-21, CDS, RSES, MANSA, MAP

BAVQ-R = Beliefs About Voices Questionnaire-Revised (Chadwick et al., 2000); BDI-II = Beck Depression Inventory-II (Beck et al., 1996); BHS = Beck Hopelessness Scale (Beck, 1988); BSSI = Beck Scale for Suicidal Ideation (Beck et al., 1979) BCSS = Brief Core Schema Scale (Fowler et al., 2006); CDS = Calgary Depression Scale for Schizophrenia (Addington et al., 1993); CHOICE = Choice of Outcome in CBTp (Greenwood et al., 2010); DASS-21 = Depression Anxiety and Stress Scale (Lovibond and Lovibond, 1995); GAF = Modified-Global Assessment of Functioning Scale, DSM-IV version (Hall, 1995a; Hall, 1995b); HADS = Hospital Anxiety and Depression Scale (Zigmond and Snaith, 1983) HPSVQ = Hamilton Program for Schizophrenic Voices Questionnaire (Van Lieshout and Goldberg, 2007); MANSA = Manchester Short Assessment of Quality of Life (Pribe et al., 1999) MAP = Maudsley Addiction Profile (Marsden et al., 1998); PKOOS = Personal Knowledge Questionnaire and Omniscience Scale (Birchwood et al., 2004); PROQ3 = Person Relating to others Questionnaire (Birchnell et al., 2013); PSYRATS-AH = Psychosis Rating Scales-Auditory Hallucination (Haddock et al., 1999); PSYRATS-delusion = Psychosis Rating Scales-delusion (Haddock et al., 1999); PANSS = Positive and Negative Syndrome Scale for Schizophrenia (Kay et al., 1989); QoL-ESQ = Quality of Life Enjoyment and Satisfaction Questionnaire (Endicott et al., 1993); RSES = Rosenberg Self-Esteem Scale (Rosenberg, 1965); RSQ = Recovery Style Questionnaire (Drayton et al., 1998); SAPS = Scale for the Assessment of Positive Symptoms (Andreasen, 1984b); SANS = Scale for the Assessment of Negative Symptoms (Andreasen, 1984a); SHER = Single Hallucination Episode Record (Farhall, 2005); SWEMWBS = Short Warwick-Edinburgh Mental Well-being Scale (Tenmant et al., 2007); VAAS = Voice Acceptance and Action Scale (Shawyer et al., 2007); VAY = Voice and You (Hayward et al., 2008); VCS = Voice Compliance Scale (Beck-Sander et al., 1997); VPD = Voice Power Differential Scale (Birchwood et al., 2004).

^a As calculated from flow-chart (lost from randomization to post-assessment; lost from randomization to follow up) for therapy and control group, for primary outcome; drop-out rates from therapy are also reported separately (includes treatment refusers (post-randomization) + drop-out from therapy (pre-defined definitions for minimum number of sessions were used if those were reported in paper)).

^b The scales/subscales defined as primary outcome are underlined. Effect sizes are as reported in original papers; if no effect size was reported, additional controlled effect sizes were calculated as mean group 1 – mean group 2 at post-treatment or follow-up/pooled standard deviation of both groups at baseline. When ORs rather than means were reported (Birchwood et al., 2014), they were converted to Cohen's d using calculator provided in http://www.psychometrica.de/effect_size.html #frskratio.

^c TAU = treatment as usual/standard care.

^d The reason for the large discrepancy between the effect size reported in the original paper at 6 months, and the one calculated for the purposes of this review at 12 months, relates to the post-therapy sd having been used in the calculation for the former, and the baseline sd for the latter. Effect size for 6 months using baseline sd : $d = 2.6$; effect size for 12 months using follow-up sd : $d = 1.2$.

^e Flow chart is unclear: it is reported that 11 participants out of 39 'withdrew consent', although all received allocated treatment and 0 were lost to follow-up. Sample sizes at follow-up assessments are not provided in tables, although it is reported that 10/28 attained recovery from depression, implying these 11 participants withdrew consent from study as well as therapy, although intention-to-treat analyses were carried out.

^f An effect size of 0.8 is reported in the article, but it is not clear what measure it refers to and whether it is a pre-post or a controlled effect size.

^g OR = odds ratio. An OR of 0.45 means CTCH nearly halved the rate of compliance (46% in CTCH vs. 28% in TAU).

^h No information provided on significance of effects.

ⁱ RSES is listed as 'other measure used' in text, but as 'mechanism measure' in results table, and vice-versa for HPSVQ phenomenology subscale.

^j Effect size obtained from study authors.

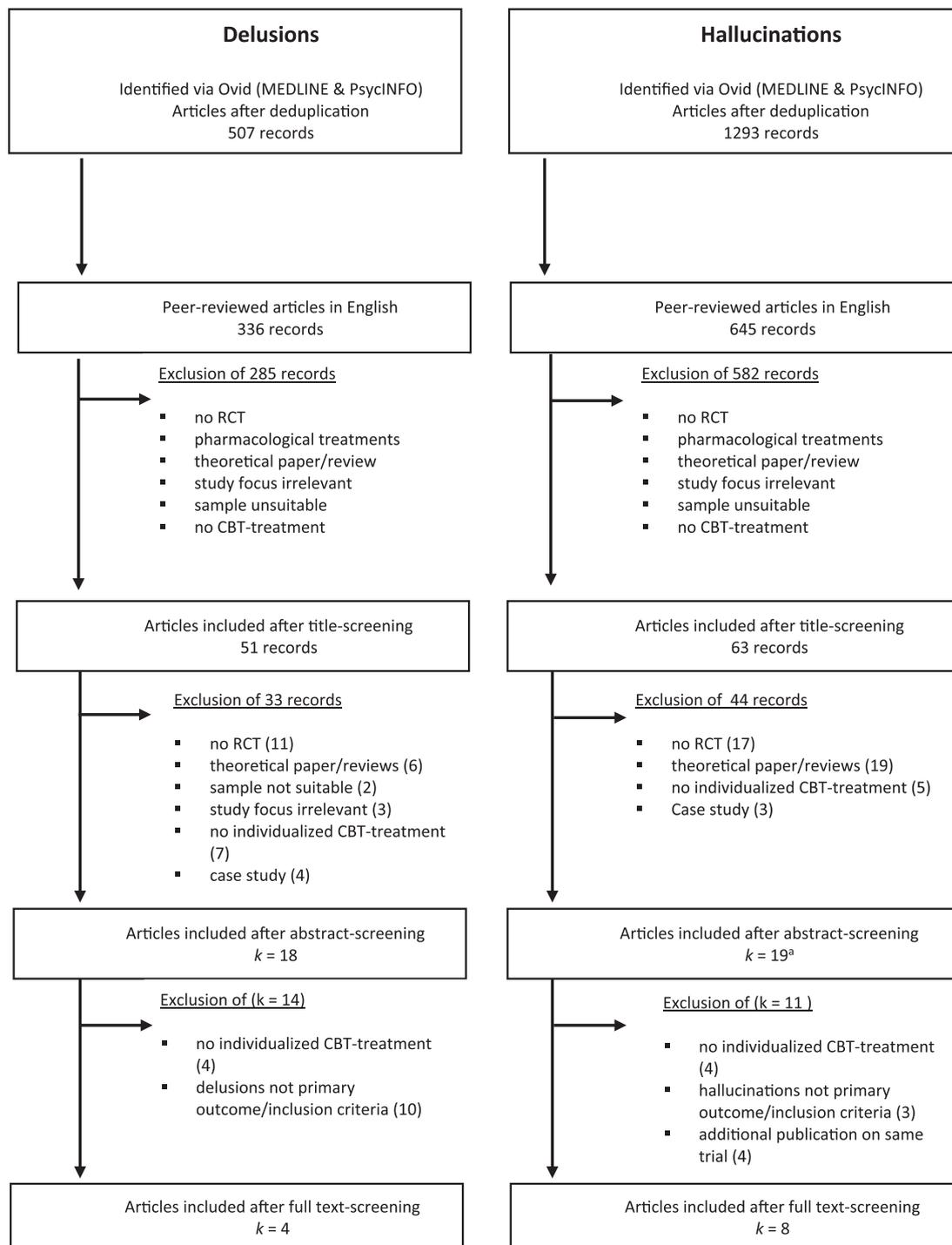


Fig. 1. Description of the selection process of studies to be included in the review. ^aTwo of these studies reported on trial protocols at the time of the literature search but were published during the revision process.

end of therapy, namely voice-related distress and voice-impact, respectively. The large effect size on voice-related distress for Relating Therapy was maintained 20 weeks later, with other improvements being evident at both time points on a number of secondary outcomes, including depression and well-being (effect sizes ranging from small to large). Similarly, the guided self-help CBTv also found a range of improvements on secondary and mechanism outcomes at the end therapy (no follow-up was done). However for both studies a large number of secondary outcomes were looked at, which, coupled with the small sample size, mean that these positive results need to be interpreted with caution.

4. Discussion

This review synthesized research evaluating the effect of targeted, individualized cognitive behavioural interventions focusing specifically on delusions and hallucinations. This research strategy is in its infancy, with only 12 studies adopting this approach, of which nine were pilot trials. Nevertheless, the results are highly promising. All trials reported effect sizes against treatment-as-usual above $d = 0.4$ on at least one primary outcome at post-therapy and several effects in the large range, indicating a tendency towards higher effects compared to the small-to-

moderate range found for generic CBTp trials (Wykes et al., 2008; Jauhar et al., 2014). The effects were generally maintained at follow-up, but follow-up periods were brief. Overall, the findings suggest that targeted individualized CBT for delusions and hallucinations is effective in reducing its target outcomes.

4.1. Main findings

With regards to the studies focusing on delusions, it is notable that, with the exception of an older study by O'Connor et al. (2007), the studies were all conducted in one research group. All took the approach of targeting 'causal' psychological factors, and all targeted persecutory delusions exclusively. The pilot and main trial targeting worry were both successful in reducing persecutory delusions (Foster et al., 2010; Freeman et al., 2015a), making this a robust finding, but longer follow-up periods would be informative to test for stability of effects. The intervention focusing on self-concepts found no effects on negative self-cognitions and a moderate but non-significant effect on paranoia. Moreover, secondary benefits on positive self-concepts were short-lived. A similar pattern of findings was found in an experimental study testing the effect of a compassionate image intervention in patients with delusions (Ascone et al., 2017). In both cases, the authors conclude that the intervention needs to be intensified, since negative self-related beliefs in patients with paranoia are likely to be deeply engrained. Thus, while targeting worry via brief interventions seems a promising approach to reduce delusions, effective interventions to reduce persistent negative self-concepts are unlikely to be brief, and may require booster sessions to ensure enduring change.

The results of the eight hallucinations studies reviewed were generally positive, with effect sizes on primary outcomes ranging from small-to-moderate (0.44; Birchwood et al., 2014) to very large (1.78; Hazell et al., in press). In the studies that included a follow-up group comparison the effects were generally maintained, but the follow-up periods were relatively brief (nine months post-therapy being the longest (Birchwood et al., 2014)). Effects on secondary outcomes were more varied. All studies found effects on at least one measure assessing power beliefs, supporting the view that changing the power imbalance and omnipotence appraisals is a common ingredient to all the interventions. However, with some notable exceptions, fewer studies impacted on voice-related distress, depression, general psychopathology, or functioning.

Two studies on hallucinations (Craig et al., in press; Shawyer et al., 2012) and one on delusions (O'Connor et al., 2007) included an active control, but only the Avatar trial (Craig et al., in press) was powered for an active control comparison. Even against a supportive counselling group, this brief intervention was significantly superior, with group differences on almost all of the auditory hallucinations outcome measures at the end of treatment. Furthermore, the effect size on their primary outcome (0.8) was larger than the effects achieved by generic CBTp in relation to voices compared to TAU (0.44; van der Gaag et al., 2014). However, although the improvements were maintained at the 24-weeks follow-up, the supportive counselling group showed a small improvement post-therapy, such that group effects were no longer significant. Future research will need to test whether additional sessions of Avatar Therapy or a more intensive focus on specific mechanisms may provide longer-term benefits, or whether the type of 'augmented' supportive counselling offered in the control group, provided by experienced psychosis clinicians, may be sufficient to address distressing persecutory voices.

4.2. Comparisons across trials

It is difficult at this stage to draw firm conclusions about the relative superiority of one approach over others, since only one of the delusions studies (Freeman et al., 2015a) and two of the hallucinations studies (Birchwood et al., 2014; Craig et al., in press) were sufficiently powered,

and several subscale and /subscale and time-point. The possibility to pick and choose between subscales and time-points can create a bias towards an over-optimistic interpretation of findings. As would be expected, generally the pilot studies reported larger effect sizes than the more methodologically robust and larger trials. Another source of bias is the fact that with one exception (O'Connor et al., 2007), all the interventions were developed by those leading or involved in the trial, potentially leading to allegiance effects. These sources of bias need to be kept in mind when comparing the studies to each other, and especially when comparing the effect sizes to those found in recent meta-analyses of generic CBTp that include numerous trials, in which allegiance effects have become less relevant over time.

Nevertheless, there are some tentative observations in relation to the hallucinations trials that will be worth following up. Although CTCH almost halved the rate of compliance with command hallucinations, which was mediated by a change in power differential between the voice and voice-hearer (Birchwood et al., 2017), voice-related distress did not differ across groups (Birchwood et al., 2014). In contrast, Avatar Therapy reduced both the frequency and distress associated with voices. Relating Therapy and a guided self-help CBTv intervention also showed large effects on distress and impact of voices, respectively, albeit in pilot trials with much smaller samples. It is possible that these discrepancies were partly due to the severity of the command hallucinations in the COMMAND trial, which may be inherently more distressing than non-command hallucinations. However, the 'exposure' to an avatar of patients' personified voice is likely to be a uniquely powerful tool in reducing fear and distress associated with persecutory voices, similarly to exposure-based therapies in Post-Traumatic Stress Disorder (PTSD; Grey et al., 2002), although its technological requirements may make it difficult to implement in routine services. The emphasis on 'homeworks', through instructions to listen to audio-recordings of sessions in Avatar Therapy, and the use of a workbook in guided self-help CBTv, may have also facilitated reductions in the emotional impact of voices. Another possibility is that not enough emphasis was given in CTCH to addressing subordinate schema and wider interpersonal relationships, since not all patients reached that stage of the therapy, which came late in the protocol (see Meaden et al., 2013). Changing the negative 'relating' to voices and other people in their social world is the main focus of Relating Therapy, and both COMET and the guided self-help CBTv protocol also focused on increasing assertiveness in wider relationships. It is possible that these factors represent the crucial component for distress and depression to be reduced, although it remains unclear whether such improvements are maintained over longer time periods.

Length of therapy diverged widely across studies, ranging from 4–8 sessions (Avatar Therapy; COMET; guided self-help CBTv; focused interventions for paranoia) to 24 or 25 sessions (CBT for delusional disorder; CTCH). It would be imprudent to draw any conclusions about the relative benefits of brief versus lengthy interventions. Two recent meta-analyses attempted to address this issue by selecting trials with fewer than 16 sessions (10 trials; Hazell et al., 2016) or lasting less than four months (7 trials; Naem et al., 2016). Both reported moderate effect sizes for the shorter interventions, with the authors suggesting that such interventions could be used in their own right to increase access. However both studies confounded brevity with targeted therapies, meaning it was not possible to disentangle whether the positive effects were due to brief therapies being equally effective as more traditional, lengthy CBTp, or due to the research strategy of focusing on an isolated outcome/process being more effective than the evaluation of a generic therapy in heterogeneous samples. Nevertheless, some of the briefer interventions reviewed here (Avatar Therapy; guided self-help CBTv) showed some of the highest effect sizes, although further work needs to establish the longevity of their effects. Overall, our review suggests that targeted interventions might not necessarily have to be long to be effective, at least on specific outcomes addressed by the therapy.

There was a wide range of dropout rates from therapy across RCTs, but in the three trials that included a therapy control group drop-out was consistently higher in the control therapy. Drop-out rates were generally higher in the hallucination compared to the delusion trials, potentially due to the highly distressing and often shaming content of voices making such patients more ambivalent about therapy. Alternatively, the focus on causal factors, such as worry and self-concept in the delusion trials, may have made these interventions less daunting than a direct focus on distressing beliefs, and therefore more acceptable to patients.

4.3. Comparisons across interventions

While the interventions for delusions have focused primarily on the causal mechanisms approach, the symptom-focused approaches to hallucinations have taken a somewhat different route. The tendency has been for each group to have a new label for their therapy, with varying degrees of distancing itself from the traditional CBT model. Close inspection of the different interventions revealed that they have more in common than they have differences, although the therapeutic procedures utilized to bring about change differed across studies. It seems clear that the main aim of all interventions for voices was to modify the perceived power imbalance of what is essentially an interpersonal relationship between the voice(s) and the voice-hearer, and hypothesized to lead to distress and dysfunction. They all also included experiential elements embedded in the therapy to facilitate cognitive and emotional change, be that through the use of behavioural experiments (CTCH), mindfulness exercises (TORCH), assertiveness training and role-plays (Relating Therapy), imaginal re-living (of counter-memories; COMET), use of a workbook (guided self-help CBTv), or a computerized visual and auditory representation of the voice (Avatar Therapy).

However, the different therapies diverge in terms of emphasis on specific therapeutic target(s), ranging from a central focus on changing omnipotence appraisals and reducing harmful compliance and safety behaviours (CTCH), through improving wider social relationships (Relating Therapy), to reducing the noxious impact of the negative content of voices (Avatar Therapy; COMET). There are also subtle variations in terms of the particular hallucinations dimension used as primary outcome, reflecting the differing therapeutic emphasis of the studies. Of note, the only therapy to make any claims about its potential in reducing the actual severity and frequency of hallucinations is Avatar Therapy, which did indeed demonstrate a significant decrease in voices frequency at the end of treatment (Craig et al., *in press*). Birchwood and colleagues (Birchwood and Trower, 2006) have previously argued that psychological therapies are not 'pseudo-neuroleptics', and are only likely to impact on the psychological dimensions associated with voices such as behaviour, appraisals and distress. It remains to be seen whether the use of powerful digital technology may enable the actual hallucinatory experience to be altered over a sustained period of time.

4.4. Limitations of the review

Our strict inclusion criteria meant that some potentially relevant studies were not included. For instance, reasoning biases are another factor associated with delusions and have been targeted by reasoning training (see Ward and Garety, *in press*) and meta-cognitive training (Eichner and Berna, 2016). These approaches share common principles with CBTp, which can also operate at the 'process' level, but were excluded as they typically consist of a manualized training approach. Another causal mechanism is sleep, which was improved successfully in a pilot trial by Freeman's group (Freeman et al., 2015b), with inconclusive effects on delusions and hallucinations. This study did not fulfil our inclusion criteria due to its broader focus. There have also been some promising findings on the impact of Mindfulness-Based Cognitive Therapy on voice-related distress and mood (Chadwick, 2014; Chadwick et

al., 2016), which were not included due to the therapy being group-based rather than individual.

Although we report effect sizes to attempt to establish some comparability between trial outcomes, several issues need taking into account. One is that effect sizes are influenced by the heterogeneity of the sample, with small standard deviations producing larger effect sizes. Thus, it is not clear whether studies with targeted interventions have higher effect sizes than generic CBTp because the interventions are more effective, or because the samples are more homogeneous. Another issue is the heterogeneity in outcome measures used. For instance, although all but one of the trials focusing on voices used the PSYRATS-AH, the way that the scores were calculated diverged across studies, with some using single items, others using the total and subscales scores reported in the original scale, and yet others using the dimensions derived by Woodward et al. (2014). The voice-impact subscale of the HPSVQ (Van Lieshout and Goldberg, 2007) is a promising outcome measure that warrants further attention, bearing in mind the very large effect size found by the one study that used it instead of the PSYRATS-AH as its primary outcome (Hazell et al., *in press*). Thus, although the choice of inclusion criteria, measures, delivery and outcome time-points generally was well justified in the studies, the heterogeneity of research designs makes it difficult to compare the efficacy of approaches even within a highly focused review such as this one.

4.5. Future research directions

There are a number of other potential maintenance or causal factors, for both hallucinations and delusions, which could be targeted by future trials. For instance, building on the crucial role of stress-sensitivity (Myin-Germeys and van Os, 2007), the effect of targeting physiological stress-regulation (e.g. heart-rate variability) has been piloted in several brief biofeedback interventions in a range of samples, and found promising for both physiological stress adaptation and paranoia (Breitborde et al., 2015; Clamor et al., 2016). A crucial factor in maintaining distressing beliefs is the use of safety behaviours. Freeman et al. (2016a) used a Virtual Reality experimental study to demonstrate that it was the dropping of safety behaviours, rather than exposure to the feared environment alone, which led to large reductions in delusional conviction and distress. Such approaches could also be used to test the impact of dropping safety and appeasement behaviours on voice power appraisals and compliance behaviour.

Taken together, the interventionist-causal model approach (Kendler and Campbell, 2009) seems a promising research strategy in terms of both evaluating the efficacy of specific components or processes of psychological interventions for psychotic symptoms, and improving our understanding of mechanisms central to their maintenance. However, it can also potentially be a laborious approach, given the multi-faceted aetiology of both delusions and hallucinations, and several candidate mechanisms remain to be evaluated. One of the next steps currently being undertaken is to combine the effective stand-alone interventions into a more comprehensive therapy (Freeman et al., 2016b). While this approach returns to the original starting point of CBTp i.e., adapting the content of therapy flexibly according to patients' heterogeneous presentations, it has the benefit that each component has been demonstrated to be efficacious empirically, unlike generic CBTp.

There were no studies focusing on delusions other than persecutory beliefs, and hallucinations other than voices. It therefore remains to be seen whether the approaches reviewed here would be equally effective for other types of delusions, such as grandiose or religious delusions, or other types of hallucinations, such as visions or somatic hallucinations, or whether new variants need to be developed.

A strength of the studies reviewed is that most have moved away from using symptom severity as the most relevant outcome to measure, thereby bringing the research in line with the focus taken in clinical practice, which is to target distress and dysfunction. To increase comparability beyond symptoms, it would also be helpful for the CBTp

research community to agree on including in all trials a common outcome relating to the overarching aims of therapy, such as well-being or social and occupational functioning.

Finally, the symptom focused research offers an opportunity to move beyond psychosis diagnoses, and target delusions and hallucinations in other disorders. Such a transdiagnostic approach has already been espoused by most of the hallucinations trials in this review, which included individuals with affective disorders diagnoses with psychotic symptoms (ICD-10 F30-39). Future trials may wish to widen their inclusion criteria to individuals with borderline personality disorder or PTSD, among others, where hallucinations are prominent (Kelleher and DeVylder, 2017) and tend to go untreated, or have no diagnostic inclusion criteria at all, such as in the trials by Hayward et al. (2017) and Hazell et al. (in press).

4.6. Clinical implications

It is important not to confuse a research strategy that takes a symptom-approach, and targets one component of therapy at a time to determine the effective ingredients of therapeutic change, with the development of 'new' or 'low-intensity' treatments. The approaches reviewed here all draw on cognitive behavioural models of psychosis and share similar underlying principles. Thus, in our view it is more helpful to present this body of work to clinicians as representing different foci of therapeutic work that have been demonstrated to be effective, rather than being sold as new and briefer treatments that are more effective than CBTp, while keeping in mind that some of the approaches reviewed here need further and more rigorous evaluation before disseminating them at all. Furthermore, in clinical practice delusions and hallucinations generally do not occur in isolation from each other, and the interventions reviewed here are thus probably best used in combination, according to the formulation for different presentations and identified barriers to the person's personal valued goal (s).

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Conflict of interest

Tania Lincoln has written treatment manuals and given paid workshops on cognitive behavior therapy for psychosis. Emmanuelle Peters is the Director of a specialist psychological therapies service for psychosis patients (Psychological Interventions Clinic for outpatients with Psychosis; PICuP), South London and Maudsley NHS Foundation Trust, which also provides training. Other than that neither of the authors have a conflict of interest including any financial, personal or other relationships with other people or organizations within three years of beginning the work submitted that could inappropriately influence, or be perceived to influence, their work.

Contributors

Both authors contributed to the manuscript in equal proportions and have approved the final manuscript.

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