The Cognitive Behaviour Therapist (2017), vol. 10, e10, page 1 of 20
doi:10.1017/S1754470X17000174

ORIGINAL RESEARCH REPORTS

Cognitive behavioural therapy for visual hallucinations: an investigation using a single-case experimental design

Christina Thomson[1,2], Rea Wilson[2], Daniel Collerton[3], Mark Freeston[1,4] and Robert Dudley[1,2]*

[1]*School of Psychology, Newcastle University, Newcastle upon Tyne, UK*
[2]*Early Intervention in Psychosis Service, Northumberland, Tyne and Wear NHS Foundation Trust, Newcastle upon Tyne, UK*
[3]*Northumberland, Tyne and Wear NHS Foundation Trust, Bensham Hospital, Gateshead, UK*
[4]*Newcastle Cognitive ane Behavioural Therapies Centre, Northumberland, Tyne and Wear NHS Foundation Trust, Newcastle upon Tyne, UK*

Abstract. There has been limited application of cognitive behavioural therapy (CBT) to the treatment of distressing visual hallucinations (VH) in people with psychosis. Preliminary research applying interventions to a novel presenting issue are enhanced by utilizing designs that allow strong inferences to be made about the effect of the intervention. Hence, this study aimed to measure change in appraisal, affect, and behaviour as a consequence of CBT VH, to improve understanding of the process of change. A multiple-baseline experimental single-case design methodology was used with five participants who received a CBT VH treatment package. Participants used daily diary measures to record appraisals, affect, and behaviours related to the distressing VH. Standardized measures were completed at each phase change. Four individuals completed therapy. Formal visual analysis of the data supported by statistical analysis indicated significant changes for appraisal and affect, with replication across three participants. Changes in frequency of VH were reported in two cases. Change was not evident on the standardized measures. This study replicates and extends the findings in showing potential value of CBT VH. Further research should consider alternative methods of capturing behavioural change. Attempts should also be made to replicate across therapists and centres.

Key words: cognitive behavioural therapy, psychosis, visual hallucinations

Introduction

Background

Visual hallucinations (VH) are relatively common, with around 27% of individuals with a diagnosis of schizophrenia (Waters *et al*., 2014) reporting VH. The presence of VH is linked to increased disability and greater likelihood of in-patient status (Meuser, Bellack and Brady,

*Author for correspondence: Robert Dudley, Early Intervention in Psychosis service, Tranwell Unit, Queen Elizabeth Hospital, Gateshead NE10 9RW (email: rob.dudley@ncl.ac.uk)

1990; Waters *et al*., 2014). Given the prevalence, distress and impact of VH there is a need for effective treatments. However, there is an absence of evidence of specific benefit of medication for VH (Collerton, Mossimann and Perry, 2015) or for psychological therapies (Waters *et al*., 2014). There are a few case reports using cognitive behavioural therapy for psychosis (CBTp) (Callcott, Dudley, Standardt, Freeston and Turkington, 2010; Hutton, Morrison and Taylor, 2012; O'Brien and Johns, 2013). Whilst interesting as case studies, there is little in the reports to show that the VH specifically were targeted in treatment, and further evidence is required before it is possible to conclude that there is evidence of effective treatment for distressing VH.

Cognitive behavioural therapy for VH

Collerton and Dudley (2004) adapted the cognitive model of distressing auditory hallucinations (AH) (Morrison, 2001) to help understand and treat distressing VH. The key aspects of this model are that the person appraises a VH as a threat to their physical or psychological wellbeing (Gauntlett-Gilbert and Kuipers, 2003, 2005), which understandably leads to fear or anxiety, and in turn leads to the use of safety seeking behaviours (such as avoidance and escape) to prevent the feared outcome. This may inadvertently lead to the maintenance of the appraisal and the distress, as the person does not learn that they are actually safe and will not be hurt.

Some empirical support for the model exists (Dudley, Wood, Spencer, Brabban, Mossiman and Collerton, 2012; Aynsworth, Nemat, Collerton, Smailes and Dudley, 2017b), and its treatment utility was considered in a multiple baseline single-case ($n = 4$) study of CBT for distressing VH (Wilson, Collerton, Freeston, Christodoulides and Dudley (2016)). Single-case methods were used as they are ideally suited to novel treatment development. Where there is replication across cases there is greater confidence that the treatment is beneficial. Also, staggered baselines imply that it is the addition of the intervention, rather than external events or time alone, that accounts for change. Finally, single-case methods often use daily recording by the participant of key variables specified in the model (appraisals, emotional reactions and behaviours). This helps to determine if any change in the VH is associated with changes in theoretically important mediators. Hence, such approaches can inform not only if the treatment works, but can help identify the possible mechanism by which it works; the neglect of which is a criticism of the research on CBT for psychosis (Thomas, 2015). Wilson *et al*. (2016) reported that the treatment was acceptable, and individuals who had good outcomes showed the expected change on appraisals of threat. However, the work was limited in terms of the therapy and methodology.

Limitations in therapy

(1) People were not only distressed about their VH owing to appraisals about harm, but in some cases because of the content of what they saw (i.e. gruesome and violent images) or the sheer persistence of the experience ('it will go on for ever', 'I have no control', etc.). Consequently, the impact of content and appraisals about persistence were incorporated into a revised model of VH in psychosis.

(2) The treatment offered in the study by Wilson *et al*. (2016) was brief (8–10 sessions). Typically more sessions are required for this population (Rodriguez-Sanchez *et al*., 2007; NICE, 2014). Hence a larger dose of treatment was offered in the revised treatment protocol.

Limitations in the methodology

(1) There is an absence of validated VH specific measures that are sensitive to change (Aynsworth, Collerton and Dudley, 2017a).

(2) A strength of single-case approaches is the use of daily recordings, but in Wilson *et al.* (2016) there were difficulties in achieving baseline stability, which reduces confidence that any subsequent change was attributable to the treatment package. Hence, changes were made to increase the likelihood of establishing baseline stability. Improved methods to increase completion of the daily diary were also developed, through the use of a wage-payment model for participants in recognition of their efforts in completing the diaries.

(3) Improvements were also made to the sensitivity of the diary measure as Wilson *et al.* (2016) reported it was difficult to identify subtle safety behaviours used in response to the VH, and these were not captured in the daily recordings. Hence changes were made to the process of eliciting behaviours for the diary, and to improve the understanding of the exact function of a behaviour during the early stages of diary recording (which helps establish it is a safety seeking behaviour).

To help address issues of design, measurement, intervention and statistical analysis the Clearing House Single-Case Design Technical Guidance (Kratochwill *et al.*, 2010) was used to ensure a standard of quality within the methodology.

Aims

The primary aims of this study were to:

(1) Examine the value of the refined CBT for VH treatment package in reducing the specific distress associated with experiencing VH.
(2) Consider in more detail patterns of variability in the baselines using more advanced methods of analysis, to help ensure stability is achieved prior to intervention phase, and is offered to help allow more meaningful conclusions to be made as to the value of treatment.
(3) Improve the sensitivity of standardized measures and diaries, improving specification of behaviours.

Method

Design

A multiple-baseline single-case design was used (Blampied, 1999). It consisted of baseline (A), intervention (CBT for VH) (B), and follow-up (C).

Baseline length

A minimum baseline period of 3 weeks (27 days) was set to ensure sufficient data points for each phase, and to improve the likelihood of capturing stable baseline data (Kratochwill *et al.*, 2010). To establish the presence of stability, the researcher considered variability, trend and cyclicity (Kratochwill *et al.*, 2010). Given that baseline data might have high variability (Wilson *et al.*, 2016) rather than randomize the baseline length, sufficient time was allowed for stability to be achieved. Stability was established at different time points for each participant, leading to differing baseline lengths.

Participants

Six participants were approached, and five were recruited into the study. Four people completed the full treatment, while one person began therapy but disengaged. Participants were aged between 18 and 30 years and met the following criteria: aged over 18 years; currently experiencing psychosis of which distressing VHs were a predominant symptom; in receipt of care co-ordination from the Early Intervention in Psychosis (EIP) Service; has capacity to give informed consent and stable on medication for the last three months. Exclusion criteria were: reporting suicidal intention; dependent upon alcohol or other illegal substances; received psychological therapy within the last six months.

Participant details

Participant 1. Josh met criteria for psychotic disorder unspecified, and did not take medication. Josh reported VH since the age of 13. Josh described the main target VH for therapy as fantastical creatures such as gargoyles. The VH differed on each occasion. The presence of the VH left Josh feeling anxious and thinking 'I'm losing control'. To cope, Josh would often distract himself. Following a baseline phase of 3 weeks, he received 13 sessions of CBT for VH, with one review session during the follow-up phase.

Participant 2. Sarah met criteria for paranoid schizophrenia, post-traumatic stress disorder and social anxiety. She had a clinical diagnosis of unspecified non-organic psychosis. She chose not to take medication. Sarah reported VH from the age of 14. The target VH was identified as a vision of an old woman. This VH often left Sarah feeling terrified, and although she was aware the VH was not a real person she worried that the VH 'might hurt the people I love'. To manage, Sarah relied on avoidance behaviours. After a baseline phase of 4 weeks Sarah received four sessions of CBT for VH. At this point Sarah disengaged with therapy owing to health issues affecting a close family member.

Participant 3. Leanne met diagnostic criteria for paranoid schizophrenia and social anxiety. She was not prescribed medication. Leanne had been seeing VH for six months and experienced three different VH daily; all of which were insects or spiders. The main target VH was a talking insect. The presence of this VH caused Leanne to have the thought 'I'm going crazy', often leaving her feeling highly anxious. At times Leanne was talking back to the VH to manage her feelings of anxiety. Following a baseline phase of 4 weeks, Leanne received 16 sessions of CBT for the target VH. Following the CBT VH intervention, Leanne received additional therapy focusing on emotion regulation, and then a further six sessions of CBT for VH for a different target VH. Follow-up data were collected.

Participant 4. Andy met criteria for paranoid schizophrenia, previously having been diagnosed with emotionally unstable personality disorder. Andy was prescribed Olanzapine, and the dosage of this was increased during the initial-therapy phase. Andy reported VH from the age of 12. The target VH for therapy was a male figure that he saw daily. The presence of this VH often led to thoughts of 'I'm going crazy', which left Andy feeling anxious, and trying to distract himself. Andy completed a baseline phase of 4 weeks. Early in the intervention phase Andy had significant difficulties with managing feelings of anger, which led to a focus on risk assessment and anger management for the first eight sessions of therapy. This led to the addition of an extra phase in the design for this case. The VH focused intervention phase began from session 9, where Andy completed 12 sessions using a CBT

for VH treatment approach. Andy was commenced on Clozapine medication and he and his family began concurrent family interventions in the latter phases of the VH treatment.

Participant 5. Lauren met criteria for paranoid schizophrenia and post-traumatic stress disorder. Lauren was prescribed Quetiapine, and was on a Methadone programme. Lauren had reported VH three years previously, which had lasted a year. However, the VH had recurred for the last six months. She experienced two types of VH daily (shadow creatures and moving objects). The main target VH was the moving objects which Lauren described as a disturbance within her visual field, with everything in her vision constantly moving. Her appraisal was she was 'losing control', and she felt stressed and overwhelmed. Often Lauren would close her eyes to cope with their presence. Following a baseline phase of 5 weeks, Lauren received 12 sessions of CBT for VH.

Measurements

Idiosyncratic measures to track daily change

An individual daily diary was the primary outcome measure for this study. To improve the specification of key appraisals and behaviours for the diary measure a newly developed workbook (based on the *Distressing Visions Workbook*, available on request from the corresponding author) and Appraisals and Reactions to Visual Hallucinations Interview; Dudley *et al*., 2012) was used. A preliminary psychological formulation was developed by the researcher (C.T.) and a consultant clinical psychologist (D.C.) who was not involved in treatment but who has extensive experience of CBT and VH. The diary measure was then developed from the assessment information, the workbook and the formulation. The proposed diary was discussed with participants and amended in light of their feedback.

A numerical rating scale was agreed with participants (with four participants opting for a 0–10 scale, and one participant using a 0–5 scale) to capture daily ratings of conviction of appraisal, strength of affect, and use of safety behaviours. For the baseline phase, the researcher met weekly with participants to support use of the diary and to ensure the sensitivity and accuracy of the diary. All participants received daily text message reminders to complete their diary.

Standardized measures

The following measures were undertaken with participants by the researcher (C.T.), who was independent, but not blind, to the delivery of the treatment. Figure 1 outlines when each measure was completed.

North-East Visual Hallucinations Interview III (NEVHI) (Mosimann *et al*., 2008). The revised version of the NEVHI (Mosimann *et al*., 2008) was used to establish the presence of distressing VH, and to gather a detailed description of characteristics.

The Structured Clinical Interview for DSM-IV-TR Axis I Disorders (SCID-I) (First *et al*., 2007). This measure was administered to establish distressing or disabling psychosis features and to confirm diagnosis.

The following three measures were completed at each phase change (pre-baseline, pre-therapy, post-therapy, and follow-up):

The Psychotic Symptom Rating Scales (PSYRATS) (Haddock *et al*., 1999). The PSYRATS gathers details on the experiences of positive symptoms within psychosis (Haddock *et al*.,

1999). As there is no equivalent measure for VH, the PSYRATS-VH scale was adapted and piloted by Wilson (2012). This measure was used to capture levels of distress associated with the VH at the start of the baseline phase, and then again at each phase change.

The Schizophrenia Change Scale (SCS). The SCS is a subscale of the Comprehensive Psychopathological Rating Scale (CPRS) (Montgomery *et al*., 1978). The SCS consists of 12 items that assess such things as sadness, disrupted thoughts, commenting voices, delusions, etc.

Work and Social Adjustment Scale (WSAS) (Mundt *et al.*, 2002). This is a simple 5-item self-report measure, which assesses the impact of a person's mental health difficulties on their overall functioning.

Post-treatment interview

A semi-structured interview was used to capture the participants' experiences of therapy, including acceptability, and any beneficial or adverse effects of treatment. It was based on The Change Interview (Elliot *et al*., 2001) and the work of Wilson *et al*. (2016). The interview was completed once at the end of the intervention phase.

Procedure

The procedure was similar to Wilson *et al*. (2016) and is outlined in Fig. 1. Participants were recruited from EIP teams. The care team approached potential participants and gathered consent to be contacted. The researcher then contacted potential participants and collected consent to participate.

Participants were compensated for their time completing daily diary measures through a wage-payment model (Dickert and Grady, 1999). Compensation was provided in the form of gift vouchers for the calculated amount earned, and given to participants on a monthly basis.

Therapy intervention

Two therapists delivered the intervention (R.W. and R.D.). Both are clinical psychologists with postgraduate training in CBT and experience of working with individuals with psychosis. Audio-recorded therapy sessions and therapy record sheets were used alongside the Cognitive Therapy Scale-Revised (CTSR; Blackburn *et al*., 2001) within regular supervision meetings to help ensure fidelity of treatment.

The CBT treatment package for VH was adapted to address the limitations identified in Wilson *et al*. (2016). The target VH and associated appraisals are addressed using cognitive and behavioural approaches.

Ethical approval

A favourable ethical opinion was received from an NHS ethics committee, and the project was registered with the local NHS Trust Research and Development Department. All participants gave their informed consent for information to be included within the write-up of this study. To protect confidentiality, names and non-essential details have been changed or removed.

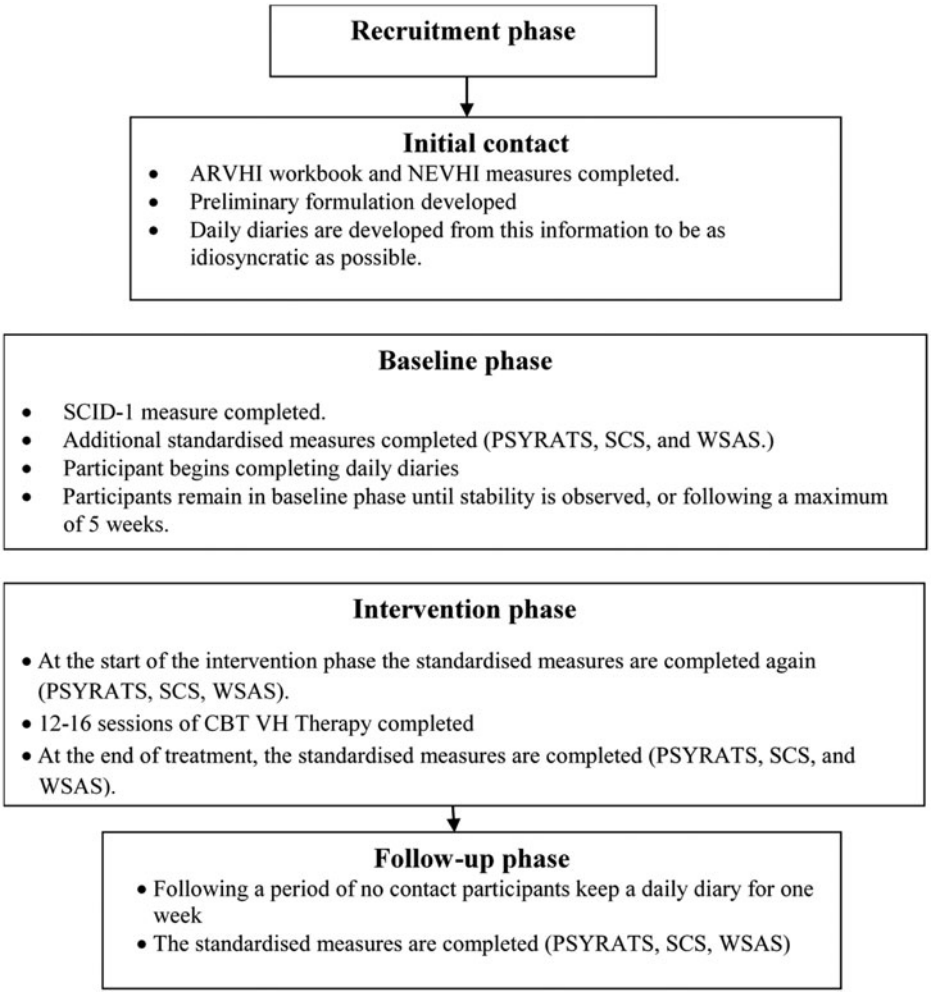

Figure 1. Flow chart of the research procedure

All descriptions were shared with participants prior to write-up, and their feedback was incorporated into the final version.

Data analytic strategy

Visual analysis. Visual analysis is the main form of data analysis in single-case approaches. A formal visual inspection of the data was carried out by the researcher and an independent rater, both trainee clinical psychologists. The key factors, as defined by Kratochwill *et al.* (2010), were considered for each phase and phase change, with inter-rater agreement at 99%. Disagreements were resolved through discussion, and a consensus reached. Missing data are reported for each variable but were not replaced, as this may have distorted the visual analysis.

Table 1. Frequency data

		Baseline		Intervention	
Participant	Vision	No. of data points recorded	No. of times vision seen (%)	No. of data points recorded	No. of times vision seen (%)
Josh	Fantastical creatures	24	6 (25%)	165	**5 (3%)***
Sarah	Old woman	28	48 (171%)	44	70 (159%)
Leanne	Talking insect	29	39 (134%)	153	166 (108%)
Andy	Male figure	28	150 (536%)	19	91 (478%)
Lauren	Moving objects	32	33 (103%)	76	76 (100%)
	Shadow people	32	97 (303%)	76	6 **(8%)***

*Frequency = less than weekly.

Statistical analysis. Where indicated by the data, Tau-U was the statistical method chosen to support the visual analysis. This method is based on the principals of non-overlapping data across phases, and was chosen as it is a robust method of analysis to control for baseline trend (Parker *et al*., 2011). Tau-U values between 0.2 and 0.5 represent a small effect size; values between 0.5 and 0.8 are moderate to large (Galletta and Vogel-Eyny, 2015). An online calculator was used to determine Tau-U (Vannest *et al*., 2011). The Tau-U statistic allows for a correction of baseline trend when this is indicated (details of this are provided in Parker *et al*., 2011). This correction was applied using the online calculator when significant trend values were reported to be higher than 0.3, as this is the point at which trend is considered problematic (Parker *et al*., 2011; Vannest and Ninci, 2015).

Reliable and clinically significant change. The Leeds Reliable Index change calculator was used to calculate reliable (Morley and Dowzer, 2014) and clinically significant change (Jacobson and Truax, 1991) for the results of the standardized measures for each participant (accessed at: http://medhealth.leeds.ac.uk/info/2692/research/1826/research/2).

Results

Frequency

For Lauren, the shadow creatures VH, which were present daily during the baseline phase, showed a large decrease in frequency following intervention. Similarly, for Josh his VH were experienced on a weekly basis during the baseline phase. Following the introduction of the intervention the frequency reduced to between fortnightly and monthly. With two exceptions, from day 65 onwards the VH became non-existent. Both Lauren and Josh experienced this decrease in the frequency of their VH during therapy as an important and positive change. Table 1 shows frequency data for all participants.

Owing to low frequency reporting of the VH for Josh, and the VH (shadow creature) for Lauren, they are not included in the visual analysis.

Comparison across the majority of participants showed a similar process of change for appraisals (Fig. 2). Baseline data were stable for all participants, except Andy. Andy's data reached stability over the additional 'stabilization' phase included in his therapy. There was

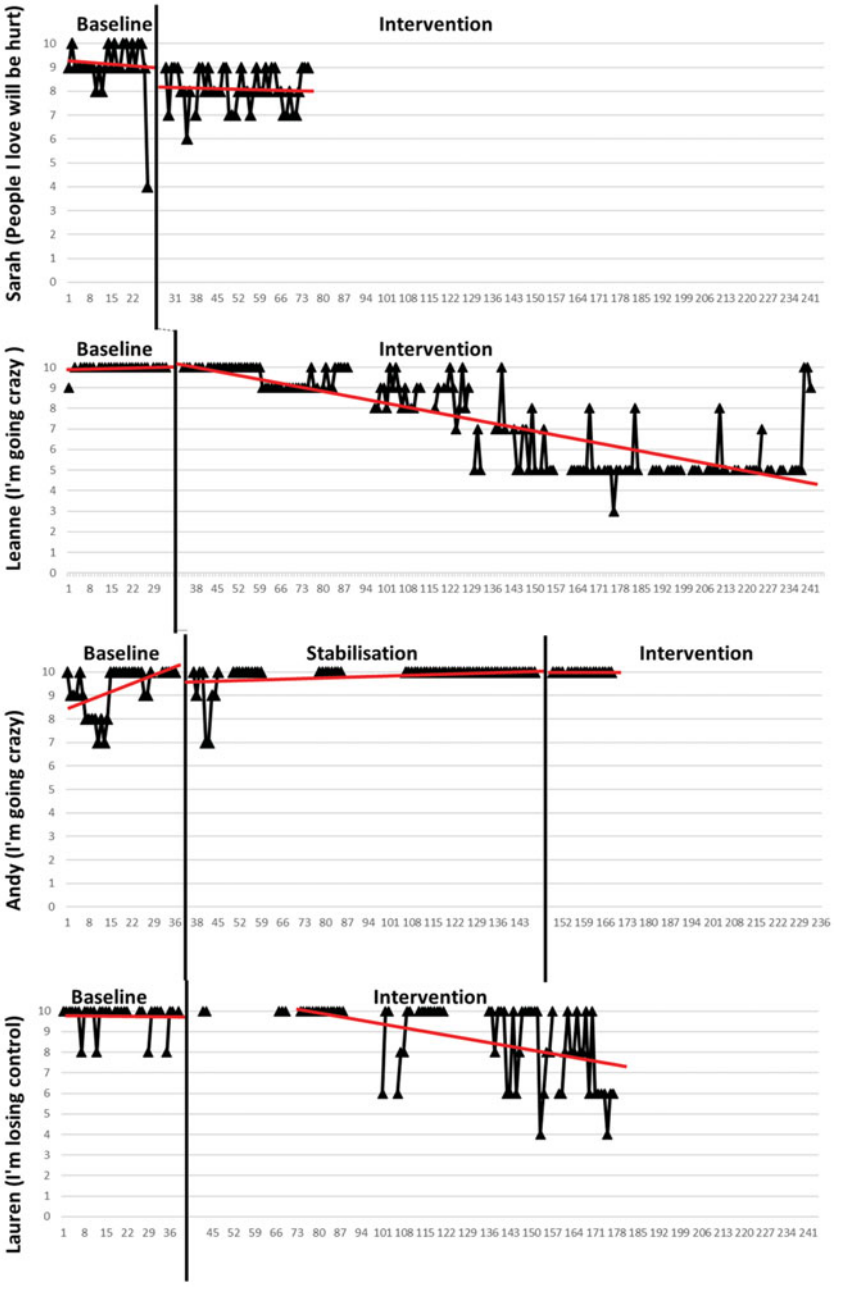

Figure 2. Appraisals

Table 2. Summary of Tau analysis for appraisals

	Participant	Tau	SD_{Tau}	*p*-value	85% confidence interval
Intervention (phase change)	Sarah	**–0.736***	0.143	0.001	–0.859, –0.448
	Leanne	**–0.842***	0.134	0.001	–0.908, –0.570
	Andy	0.260	0.168	0.270	–0.057, 0.427
	Lauren	**–0.529***	0.122	0.001	–0.624, –0.274

*Significant change.

no significant trend in the baseline data for the majority of participants ($p > .20$.); however, Andy's baseline did show significant trend (Tau-U = –0.35, $p < 0.02$). This was corrected for using the Tau-U statistic.

For the intervention data there is evidence of a gradual change in level, with a decreasing trend over a period of time in most cases. Sarah is an exception to this, in that a change in level happened more abruptly following the introduction of the intervention phase. The change in data pattern was significant across three cases (Table 2). Andy's data showed no significant change.

Comparison across the participants showed a slightly different process of change for affect (Fig. 3). Baseline data were again stable for all participants, except Andy. All participants showed higher variability in their level of affect than in their strength of appraisal. There was no significant trend in the baseline data for the majority of participants ($p > .20$.), except for Andy's data that had trend to a significant degree, which was corrected for in the intervention phase (Tau-U = –0.61, $p < 0.0001$). From discussion with Andy, it was felt that this might relate to him scoring the emotion of 'anger' very highly during the baseline period, which was a trigger for his VH experience, rather than a response to it. It took some time during the stabilization phase to support Andy in identifying the differences between these emotional responses, and this may account for the gradual increase in his recording of the emotion anxiety.

For the intervention data there is evidence of a gradual change in level, with a decreasing trend over a period of time in all cases. There is evidence of some variability within this trend in most cases. Again, Sarah is an exception to this, in that a change in level happened more abruptly following the introduction of the intervention phase. The change in data pattern was significant for Leanne, Sarah and Andy (Table 3). For Andy, however, affect increased from baseline. There was evidence of change for Lauren, but not to a significant degree.

All cases show high variability and less stability in the baseline data for the behavioural domain, with a number of participants using this scale in a more categorical manner (Fig. 4). However, none of the cases showed trend to a significant level in the baseline phase ($p > .20$).

For the intervention phase the data remained variable for all participants, and the majority of participants showed no significant change in pattern (Table 4). The exception to this is Leanne, where there was a significant change observed, and which reflected a period of days where she stopped the behaviour entirely. Leanne felt that the graphs accurately captured her behaviour, and thought that the shift co-occurred with her being on holiday and the absence of an opportunity to be alone to 'talk back' to the VH. With highly variable data across all participants it is difficult to draw conclusions about change across the baseline and intervention phases.

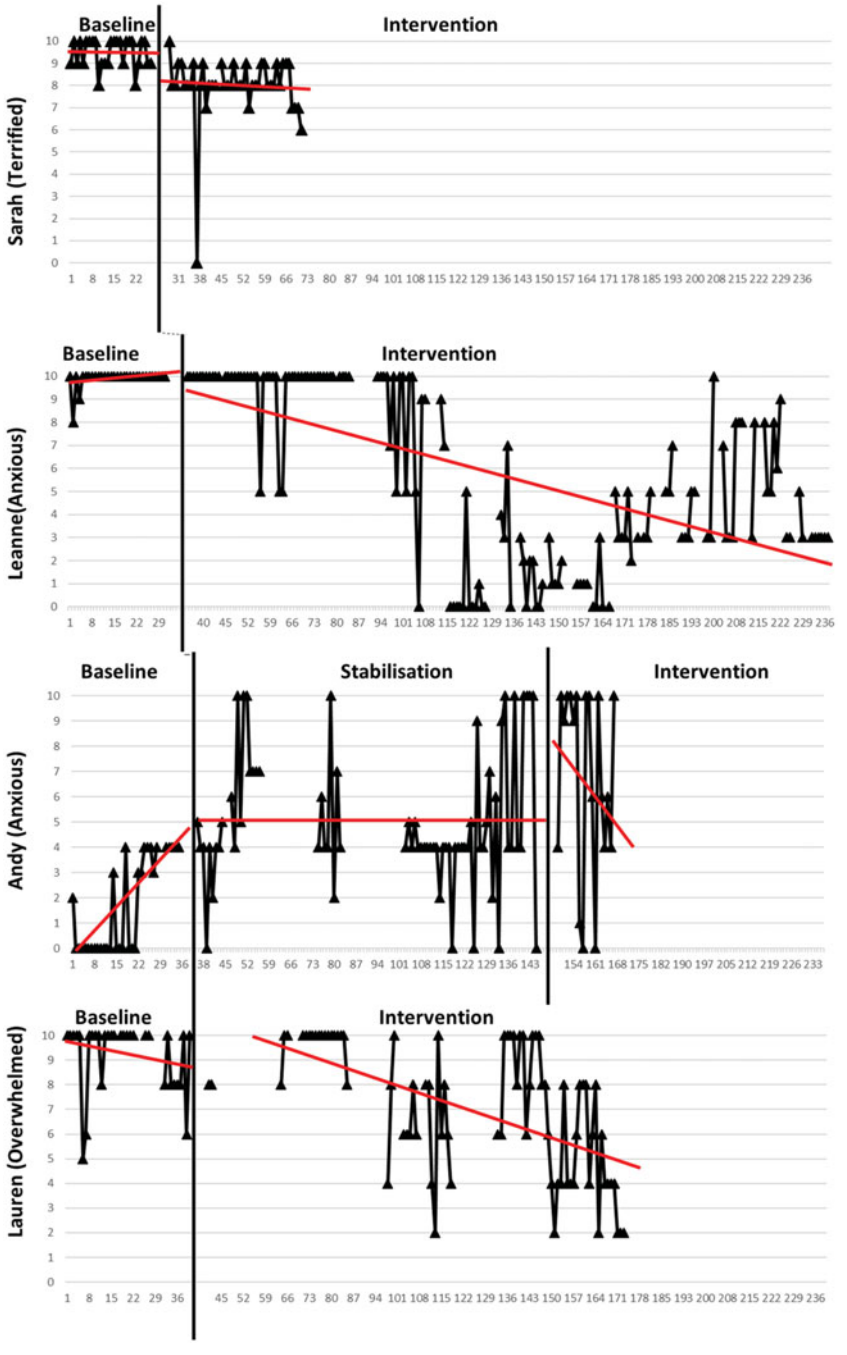

Figure 3. Affect

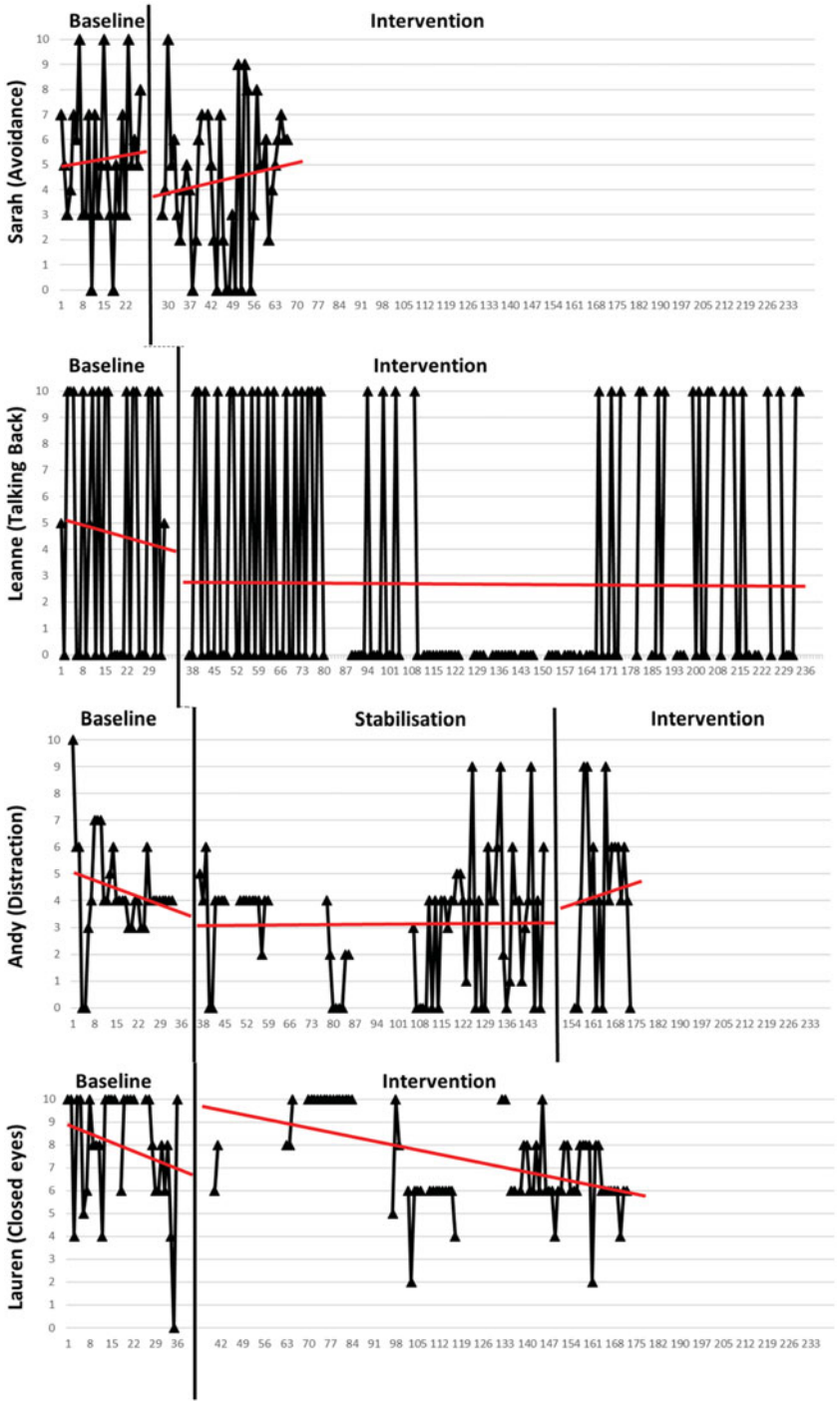

Figure 4. Behaviours

Table 3. Summary of Tau analysis for affect

	Participant	Tau	SD_{Tau}	*p*-value	85% confidence interval
Baseline (baseline trend)	Sarah	0.145	0.137	0.404	–0.083, 0.311
	Leanne	0.129	0.131	0.599	–0.120, 0.258
	Andy	0.606**	0.122	0.001	0.313, 0.665
	Lauren	–0.208	0.124	0.224	–0.330, 0.028
Intervention (phase change)	Sarah	**–0.840***	0.143	0.001	–0.977, –0.566
	Leanne	**–0.842***	0.134	0.001	–0.908, –0.570
	Andy	**0.359***	0.168	0.043	0.098, 0.581
	Lauren	–0.248	0.122	0.075	–0.394, –0.042

*Significant change; **baseline correction.

Table 4. Summary of TAU analysis for behaviours

	Participant	Tau	SD_{Tau}	*p*-value	85% confidence interval
Intervention (phase change)	Sarah	–0.150	0.143	0.320	–0.348, 0.063
	Leanne	**–0.842***	0.134	0.001	–0.908, –0.570
	Andy	0.055	0.168	0.768	–0.192, 0.291
	Lauren	–0.368	0.122	0.032	–0.437, –0.086

*Significant change.

Standardized measures

Table 5 displays the raw scores on the standardized measures and indicates whether clinically significant or reliable change was present. There was no significant change in the standardized measures during the baseline phase for any participant. For the majority of participants the change on standardized measures was not clinically significant or reliable. The only exception was for Lauren, who showed a significant change on the PSYRATS-VH measure. As Sarah did not continue with therapy there are no measures of reliable and clinically significant change to report for the intervention period.

Follow-up data were gathered from three of the participants who remained in the study. Sarah discontinued her involvement in the early stages of therapy and declined to give follow-up data. Lauren did not provide follow-up data.

The data gathered from Josh showed that his improvements were maintained across all measures following 1 month of no therapy. For Leanne, the results of the PSYRATS showed a return to baseline, but both the SCS and WSAS scores showed that results were maintained and continued to improve following the additional six sessions of therapy, but also following 1 month of no therapy. The follow-up data for Andy continues to show no change on any of the standardized measures.

Discussion

This study considered the process of change in the treatment of distressing VH. It addressed key limitations of a previous study (Wilson *et al*., 2016) in that the treatment was revised by considering the impact of the content of VH and their persistence, and the dose of treatment

Table 5. Raw scores for standardized measures

	PSYRATS-VH				SCS				WSAS			
Participant	Phase A	Phase B	Phase C	Clinically significant or reliable?	Phase A	Phase B	Phase C	Clinically significant or reliable?	Phase A	Phase B	Phase C	Clinically significant or reliable?
Leanne	29	30	27	No	18	22	19	No	24	25	31	No
Lauren	28	27	0	Yes	23	21	11	No	39	33	36	No
Josh	20	22	20	No	2	3	2	No	6	2	2	No
Sarah	31	31	No data		21	19	No data		29	37	No data	
Andy	26	35	30	No	22	20	16	No	28	36	31	No

Phase A, initial baseline; phase B, pre-intervention; phase C, post-intervention.

was increased. In addition, there were improvements to aspects of single-case design through close attention to ensuring baseline stability, as well as refinements to the diary measure and utilization of more advanced methods of analysis. There was also greater specification of safety behaviours including a detailed assessment at the beginning of treatment. These changes improved the quality of the single-case design methodology (Vohra *et al*., 2015; Tate *et al*., 2016).

The increased dose of treatment appeared to be acceptable with participants generally receiving between 12 and 16 sessions of CBT for VH. The results of the visual and statistical analysis indicate significant changes in the self-reported daily recordings of appraisal and affect in three participants. Two people reported reduced frequency of VH. Replication across cases, using multiple baselines, increases confidence that this change did not happen by time alone or by chance. Only one participant showed no beneficial change (Participant 4), which was also the case after he had been treated with Clozapine and engaged in family interventions. In contrast to the changes consistently observed in appraisal and affect, there was no evidence of change replicated within the behavioural domain.

The current treatment package appears to have a positive impact for most people experiencing distressing VH, and the change is consistent with theoretically important mediators. This suggests that targeting the specific VH symptom could be a useful approach (Freeman, 2007; McCarthy-Jones *et al*., 2014). The results also indicate a link between reduction in distress and appraisal, with no case showing change in affect in the absence of change in conviction of appraisal. There is some evidence that frequency of VH may also be related to this process. Such changes have been shown in CBT for AH (Morrison *et al*., 2014), and would seem to support the CBT model of VH (Collerton and Dudley, 2004). However, the positive findings from visual and statistical analysis of personal daily diary data were not reflected to a reliable or clinically significant level in the standardized measures. One case demonstrated change on the PSYRATS-VH measure, but this was where frequency of VH substantially reduced. This suggests the PSYRATS-VH may be sensitive to changes in frequency more than distress. It is also evident that there was not a change across non-targeted but related areas, such as voices, paranoia or mood (Joorman *et al*., 2005; Birchwood and Trower, 2006). The findings of Wilson *et al*. (2016) were similar in that there was not an apparent generalization of benefit to non-targeted symptoms, and such issues may need to be addressed separately.

It is also of interest that changes were not observed in the recorded behaviours. There are two likely explanations for this. First, it may be that this is related to a measurement issue in that behaviours are rated categorically (either present or not). Future studies need to consider alternative methods, such as activity monitors (Lyons *et al*., 2014), or behavioural analysis approaches such as frequency recording (Cooper *et al*., 2007), to monitor behaviours more objectively. A second issue is that the function of a behaviour may mean that its frequency is not the key issue. If a person copes with visions by avoiding going out, they may only need to avoid going out once a day, so frequency of a behaviour may be less directly related to the distress than appraisal. Methods to establish the purpose, and perceived importance of the behaviour may be more important than recording frequency.

Limitations

This is only the second single-case experimental design study evaluating the treatment of distressing VH in psychosis. Whilst these results encourage further refinement and testing

of the treatment approach, a number of limitations need to be addressed. First, there is no immediate change in level or slope following the introduction of the intervention, which makes it more difficult to attribute change to this. However, this is not unexpected and is in line with our understanding of the processes of therapy (see Rachman, 1999) where change occurs incrementally.

Second, as discussed, changes were not observed in the recorded behaviours. It is possible that the improvements to the treatment package still do not fully address behavioural change.

The variability in the characteristics of the sample in terms of diagnoses, differences in the VH and the resultant distress and disability may make it difficult to characterize the target population. This may affect the generalizability of the findings. Of course, psychosis is a broad construct and even a diagnosis like schizophrenia has been critiqued as any two people with the diagnosis may have few if any symptoms/experiences in common. Hence, there is an issue about the generalizability of any investigation of treatments for psychosis and/or psychotic symptoms. However, all our participants experienced distressing VH and more broadly met entry criteria for EIP services that would encourage us to consider them as representative of the EIP population. In fact, we consider it unlikely that someone with such frequent and distressing visual hallucinations would be considered to have another non-psychotic disorder. Another factor that encourages us to think our work is generalizable is that we approached six service users and five agreed to participate. Given the high uptake it would encourage us to think that we were not seeing an unrepresentative sample of people in EIP services with distressing VH.

A final limitation is regarding Andy's participation, as the amount of VH treatment he actually received and the interpretation of the data are complicated by clinical need dictating changes to initial treatment focus, managing additional issues within therapy to support him, and adding concurrent treatment (medication and family therapy). We have retained Andy within the series to maintain transparency and reflect the realities of research within this population.

Future research

To further develop our understanding of the process of change, future single-case experimental designs may help demonstrate further replication across other centres and therapists (Horner and Kratochwill, 2012). Similarly, single-case methods used with VH could track appraisals not targeted in treatment to demonstrate specific change on theoretically important variables, and a lack of change on these non-targeted appraisals which would test further the model of VH. Of course, future research may consider evaluating CBT for VH in a larger trial that addresses whether treatment can be offered by other therapists to a wider population. For a larger trial of this nature, the development of a standardized and validated measure that is sensitive and specific to change in VH is needed to improve the likelihood of detecting meaningful clinical change.

Conclusions

We can conclude that CBT to manage distress associated with visual hallucinations shows promise as a potentially effective treatment. Further research is needed to refine its effectiveness and to show that it has delivered on that promise.

Main points

(1) Distressing visual hallucinations (VH) are a relatively common but often under recognized symptom of psychosis.
(2) VH seem to be associated with greater impairment and disability, but we have no specific treatment.
(3) Cognitive behavioural therapy for VH has shown some encouraging results, but is limited to case studies/case series.
(4) A refined cognitive behavioural therapy for VH was valuable in reducing distress, and in some cases reducing frequency of VH.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. It was completed as part of the Doctorate in Clinical Psychology educational degree.

Conflicts of interest

C.T. and M.F. have no conflicts of interest. R.D. has received royalties for books, or book chapters on the topic of cognitive therapy, and has received payment for leading workshops in cognitive therapy for visual hallucinations. R.W. has received payment for workshops in CBT for psychosis. D.C. is supported by a grant from the Great Britain Sasakawa Foundation.

Recommended follow-up reading

Collerton D, Dudley R (2004). A cognitive behavioural framework for the treatment of distressing visual hallucinations. *Behavioural and Cognitive Psychotherapy* **32**,443–455.

McCarthy-Jones S, Smailes D, Corvin A, Gill M, Morris DW, Dinan TG *et al.* (2017). Occurrence and co-occurrent of hallucinations by modality in schizophrenia spectrum disorders. *Psychiatry Research* **252**, 154–60.

Wilson R, Collerton D, Freeston M, Christodoulides T, Dudley R (2016). Is seeing believing? The process of change during cognitive behavioural therapy for distressing visual hallucinations. *Clinical Psychology and Psychotherapy* **23**, 285–97. doi: 10.1002/cpp

References

Aysnworth C, Collerton D, Dudley R (2017a). Measures of visual hallucinations: review and recommendations. *Clinical Psychology Review* https://doi.org/10.1016/j.cpr.2017.05.001

Aynsworth C, Nemat N, Collerton D, Smailes D, Dudley R (2017b). Reality monitoring performance and the role of visual imagery in visual hallucinations. *Behaviour Research and Therapy* **97**, 115–122. https://doi.org/10.1016/j.brat.2017.07.012

Birchwood M, Trower P (2006). The future of cognitive-behavioural therapy for psychosis: not a quasi-neuroleptic. *British Journal of Psychiatry* **188**, 107–108.

Blackburn IM, James IA, Milne DL, Baker C, Standart S, Garland A, Reichelt FK (2001). The revised cognitive therapy scale (CTS-R): psychometric properties. *Behavioural and Cognitive Psychotherapy* **29**, 431–446.

Blampied NM (1999). A legacy neglected: restating the case for single-case research in cognitive-behaviour therapy. *Behaviour Change* **16**, 89–104.

Callcott P, Dudley R, Standardt S, Freeston M, Turkington D (2010). Treating trauma in the context of psychosis: a case series. In Hagen , Turkington , Berge and Grawe (eds), *CBT for Psychosis: A Symptom Based Approach*. Routledge.

Collerton D, Dudley R (2004). A cognitive behavioural framework for the treatment of distressing visual hallucinations in older people. *Behavioural and Cognitive Psychotherapy* **32**, 443–455.

Collerton D, Mosimann UP, Perry E (eds) (2015). *The Neuroscience of Visual Hallucinations*, John Wiley & Sons.

Cooper JO, Heron TE, Heward WL (2007). *Applied Behavior Analysis*, New Jersey: Pearson.

Dickert N, Grady C (1999). What's the price of a research subject? Approaches to payment for research participation. *New England Journal of Medicine* **341**, 198–203.

Dudley R, Wood M, Spencer H, Brabban A, Mosimann UP, Collerton D (2012). Identifying specific interpretations and use of safety behaviours in people with distressing visual hallucinations: an exploratory study. *Behavioural and Cognitive Psychotherapy* **40**, 367–375

Elliot R, Slatick E, Urman M (2001). Qualitative change process research on psychotherapy: alternative strategies. *Psychologische Beitrage* **43**, 69–111.

First MB, Spitzer RL, Gibbon M, Williams JBW (2007). Structured Clinical Interview for DSM-IV-TR Axis I Disorders-Patient Edition. New York: Biometrics Research Department.

Freeman D (2007). Suspicious minds: the psychology of persecutory delusions. *Clinical Psychology Review* **27**, 425–457.

Galletta EE, Vogel-Eyny A (2015). Translational treatment of aphasia combining neuromodulation and behavioral intervention for lexical retrieval: implications from a single case study. *Frontiers in Human Neuroscience* **9**, 447.

Gauntlett-Gilbert J, Kuipers E (2003). Phenomenology of visual hallucinations in psychiatric conditions. *Journal of Nervous and Mental Disorders* **191**, 203–205.

Gauntlett-Gilbert J, Kuipers E (2005). Visual hallucinations in psychiatric conditions: appraisals and their relationship to distress. *British Journal of Clinical Psychology* **44**, 77–87.

Haddock G, McCarron J, Tarrier N, Faragher EB (1999). Scales to measure dimensions of hallucinations and delusions: the psychotic symptom rating scales (PSYRATS). *Psychological Medicine* **29**, 879–889.

Horner RH, Kratochwill TR (2012). Synthesizing single-case research to identify evidence-based practices: some brief reflections. *Journal of Behavioral Education* **21**, 266–272.

Hutton P, Morrison AP, Taylor H (2012). Brief cognitive behavioural therapy for hallucinations: can it help people who decide not to take antipsychotic medication? A case report. *Behavioural and Cognitive Psychotherapy* **40**, 111–116.

Jacobson NS, Truax P (1991). Clinical significance: a statistical approach to defining meaningful change in psychotherapy research. *Journal of Consulting and Clinical Psychology* **59**, 12–19.

Joormann J, Kosfelder J, Schulte D (2005). The impact of comorbidity of depression on the course of anxiety treatments. *Cognitive Therapy and Research* **29**, 569–591.

Kratochwill TR, Hitchcock J, Horner RH, Levin JR, Odom SL, Rindskopf DM, Shadish WR (2010). Single-case design technical documentation. Retrieved on 22 October 2014, from What Works Clearinghouse website: https://ies.ed.gov/ncee/wwc/Document/229

Lyons EJ, Lewis ZH, Mayrsohn BG, Rowland JL (2014). Behavior change techniques implemented in electronic lifestyle activity monitors: a systematic content analysis. *Journal of Medical Internet Research* **16**, e192. http://doi.org/10.2196/jmir.3469

McCarthy-Jones S, Trauer T, Mackinnon A, Sims E, Thomas N, Copolov DL (2014). A new phenomenological survey of auditory hallucinations: evidence for subtypes and implications for theory and practice. *Schizophrenia Bulletin* **40**, 231–235.

Morley S, Dowzer CN (2014). Manual for the Leeds Reliable Change Indicator: simple Excel (tm) applications for the analysis of individual patient and group data. Leeds, UK: University of Leeds. Retrieved 2 February 2016 from website: http://medhealth.leeds.ac.uk/info/2692/research/1826/research/2

Montgomery SA, Taylor P, Montgomery D (1978). Development of a schizophrenia scale sensitive to change. *Neuropharmacology* **17**, 1061–1063.

Morrison AP (2001). The interpretation of intrusions in psychosis: an integrative cognitive approach to hallucinations and delusions. *Behavioural and Cognitive Psychotherapy* **29**, 257–276.

Morrison AP, Turkington D, Pyle M *et al.* (2014). Cognitive therapy for people with schizophrenia spectrum disorders not taking antipsychotic drugs: a single-blind randomised controlled trial. *The Lancet* **383**, 1395–1403.

Mosimann UP, Collerton D, Dudley R, Meyer TD, Graham G, Dean JL, Bearn D, Killen A, Dickinson L, Clarke MP, McKeith IG (2008). A semi-structured interview to assess visual hallucinations in older people. *International Journal of Geriatric Psychiatry* **23**, 712–718.

Mueser KT, Bellack AS, Brady EU (1990). Hallucinations in schizophrenia. *Acta Psychiatrica Scandinavia* **82**, 26–29.

Mundt JC, Marks IM, Shear MK, Greist JM (2002). The Work and Social Adjustment Scale: a simple measure of impairment in functioning. *British Journal of Psychiatry* **180**, 461–464.

National Institute of Health and Clinical Excellence (NICE) (2014). *Psychosis and Schizophrenia in Adults: Prevention and Management*. London: National Institute of Health and Clinical Excellence.

O'Brien P, Johns L (2013). A graded exposure intervention for distressing visual hallucinations in schizophrenia. *Behavioural and Cognitive Psychotherapy* **28**, 1–5.

Parker RI, Vannest KJ, Davis JL, Sauber SB (2011). Combining nonoverlap and trend for single-case research: Tau-U. *Behavior Therapy* **42**, 284–299.

Rachman S (1999). Rapid and not-so-rapid responses to cognitive behavioral therapy. *Clinical Psychology: Science and Practice* **6**, 293–294.

Rodriguez-Sanchez JM, Crespo-Facorro B, Gonzalez-Blanch C, Perez-Iglesias R, Vazquez-Barquero JL (2007). Cognitive dysfunction in first-episode psychosis: the processing speed hypothesis. *British Journal of Psychiatry* **191**, s107–110.

Tate RL, Perdices M, Rosenkoetter U, Shadish W, Vohra S, Barlow DH *et al.* (2016). The Single-Case Reporting Guideline In BEhavioural Interventions (SCRIBE) 2016 Statement. *Aphasiology* **30**, 862–876.

Thomas N (2015). What's really wrong with cognitive behavioural therapy for psychosis? *Frontiers in Psychology* **6**, 323. doi: 10.3389/fpsyg.2015.00323

Vannest KJ, Ninci J (2015). Evaluating intervention effects in single-case research designs. *Journal of Counseling and Development* **93**, 403–411.

Vannest KJ, Parker RI, Gonen O (2011). *Single case research: web based calculators for SCR analysis* (version 1.0) [Web-based application]. College Station, TX: Texas A&M University. Retrieved 17 March 2016 from: singlecaseresearch.org

Vohra S, Shamseer L, Sampson M, Bukutu C, Schmid CH, Tate R *et al.* (2015). CONSORT extension for reporting N-of-1 trials (CENT) 2015 Statement. *Journal of Clinical Epidemiology* **350**, h1738.

Waters F, Collerton D, Jardri R, Pins D, Dudley R, Blom JD *et al.* (2014). Visual hallucinations in the psychosis spectrum and comparative information from neurodegenerative disorders and eye disease. *Schizophrenia Bulletin* **40** (suppl 4), S233–245.

Wilson R, Collerton D, Freeston M, Christodoulides T, Dudley R (2016). Is seeing believing? The process of change during cognitive-behavioural therapy for distressing visual hallucinations. *Clinical Psychology and Psychotherapy* **23**, 285–297.

Learning objectives

(1) To understand the prevalence, nature and impact of visual hallucinations for people in early intervention in psychosis services.
(2) To understand the role of appraisals and safety behaviour in the maintenance of distressing visual hallucinations.
(3) To understand how to utilize sophisticated single-case experimental designs to help investigate the process of change in targeted, symptoms-specific therapy.