Cognitive and emotional predictors of predisposition to hallucinations in non-patients

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Background. This study reports the development of a self-report measure to assess interpretations of voices (Interpretations of Voices Inventory: IVI) and a revision of the Launay–Slade Hallucination Scale (RHS) to measure predisposition to hallucinations in non-patients. We aimed to test the specific hypothesis that positive interpretations of voices would predict frequency of hallucinatory experiences.

Method. There were 132 non-clinical participants who were asked to complete questionnaires assessing interpretations of voices, predisposition to hallucinations, meta-cognitive beliefs, anxiety and delusional ideation.

Results. The results showed that three empirically distinct subscales were measured by the IVI (meta-physical beliefs about voices, positive beliefs about voices and interpretations of loss of control). The RHS was also found to have three subscales (vividness of imagination and daydreaming, tendency towards experiencing visual disturbances and hallucinations, and tendency towards experiencing auditory hallucinations). The scales possessed acceptable internal consistency and were moderately stable over a period of 4–6 weeks. Consistent with predictions, it was found that positive beliefs about voices were significantly associated with predisposition to auditory hallucinations, and negative interpretations of voices were associated with endorsing the item assessing troublesome voices.

Conclusions. The theoretical and clinical implications of the findings are discussed.

Auditory hallucinations can be a normal psychological phenomenon, and there is a long tradition of viewing hallucinations as being on a continuum with normal functioning (Strauss, 1969; van Os, Hanssen, Bijl, & Ravelli, 2000). Recent research has examined the predisposition of non-psychiatric populations to hallucinations. Morrison, Wells,

and Nothard (2000) adapted the Launay–Slade Hallucination Scale (LSHS: Launay & Slade, 1981) to measure predisposition to auditory and visual hallucinations and examined the relationship between meta-cognition and predisposition in a non-psychiatric population ($N = 105$). They found that two empirically distinct but correlated hallucinatory traits (auditory hallucinations/daydreams and visual hallucinations/disturbances) were measured by the modified LSHS and that positive beliefs about unusual perceptual experiences were the best predictor of predisposition to auditory and visual hallucinations. In the present study, we aimed to devise a specific measure of positive and negative beliefs about hallucinations and to use this to investigate further the cognitive predictors of vulnerability to hallucinations.

The role of beliefs about thoughts

Wells and Matthews' (1994) self-referent executive function (S-REF) model suggests that vulnerability to psychological dysfunctions is associated with a cognitive-attentional syndrome characterized by heightened self-focused attention, attentional bias, ruminative processing and activation of dysfunctional beliefs. They predict an involvement of meta-cognitive beliefs in vulnerability to, and the maintenance of, psychopathology. Consistent with this view, positive associations have been found between positive and negative meta-cognitive beliefs and emotional disorder indices (Cartwright-Hatton & Wells, 1997). Recent work in relation to hallucinations has shown that patients experiencing auditory hallucinations scored higher on meta-cognitive beliefs concerning both positive beliefs about worry and negative beliefs about uncontrollability and danger associated with thoughts (Baker & Morrison, 1998), and Morrison *et al.* (2000) found that subjects highly predisposed to hallucination scored significantly higher on cognitive self-consciousness and negative beliefs about uncontrollability and danger associated with thoughts than those with a low predisposition.

The role of beliefs about voices

Chadwick and Birchwood (1994) have already demonstrated that beliefs about voices are meaningfully related to their emotional and behavioural consequences, and both Morrison, Haddock, and Tarrier (1995) and Wells and Butler (1997) have suggested that meta-cognitive beliefs about hallucinations will also influence emotional and behavioural responses to them. In particular, extrapolating from the Wells and Matthews (1994) model of cognitive self-regulation, Wells and Butler (1997) suggested that positive beliefs about hallucinations may be associated with efforts to engage and maintain particular hallucinatory experiences; indeed, Chadwick and Birchwood (1994) found that voices believed to be benevolent were engaged. In addition, a study examining the attitudes of 50 psychiatric in-patients to their hallucinations found that over 50% reported some positive effects of hallucinating, with the most commonly cited benefits being that the hallucinations were relaxing or soothing and that they provided companionship (Miller, O'Connor, & DiPasquale, 1993), supporting an association between positive beliefs and hallucinations. Negative beliefs about hallucinations, however, may be associated with unhelpful coping strategies. Chadwick and Birchwood (1994) found that voices believed to be malevolent were resisted by

patients. Morrison (1998) has also suggested that hallucinations can be viewed as normal phenomena and that it is the misinterpretation of such experiences as uncontrollable and dangerous that is likely to cause distress and disability. It has been suggested by Morrison *et al.* (2000) that it may be the development of negative beliefs about hallucinations that underlies the transition from normal to pathological hallucinatory experiences. A similar mechanism involving positive and negative beliefs about worry is a key feature in a recent model of generalized anxiety disorder (Wells, 1995).

The majority of research examining beliefs about voices has been conducted using the Beliefs about Voices Questionnaire (BAVQ; Chadwick and Birchwood, 1995). This instrument has been very important in demonstrating meaningful links between beliefs about voices and their emotional and behavioural consequences. However, this instrument does not assess the range of beliefs and interpretations that we hypothesize would predict vulnerability to hallucinations in non-patients. This questionnaire was designed specifically to test one cognitive model of voices, and therefore only assesses beliefs that are implicated by this model (Chadwick & Birchwood, 1995); these are power, malevolence and benevolence. Many of the BAVQ items assess behavioural and emotional consequences rather than beliefs. In addition, the factor analyses were performed on subscales that were defined prior to any analysis of the data; therefore, it is unclear whether these constructs would have emerged as distinct subscales if the questionnaire data had been factor-analysed as a whole. As the BAVQ was designed for patients, the wording of the questionnaire means it would be unsuitable for non-voice-hearers to complete, making research examining the continuum of hallucinatory experiences impossible. The belief items on the BAVQ are rated as 'true' or 'false', which does not permit assessment of level of conviction, and the wording of some items appears merely to reflect factual statements about the content of voices. Recently, a revised version of the BAVQ has appeared, which now employs a 4-point 'disagree' to 'agree strongly' response format (Chadwick, Lees, & Birchwood, 2000); however, the other points mentioned above are true for this revision also.

For the purposes of this study, a measure of positive and negative interpretations of voices was devised that attempts to accommodate these issues. In addition, we adapted the previously revised LSHS to measure vulnerability to auditory and visual hallucinations in order to examine further the factors that we have previously identified (Morrison *et al.*, 2000). This study investigated the psychometric properties of these scales and examined the relationship between meta-cognitive beliefs about thoughts, interpretations of voices and the predisposition of a non-psychiatric population to auditory and visual hallucinations. The study controls for non-specific emotional vulnerability (using trait anxiety) and will examine the specificity of beliefs about voices against more general meta-cognition. We also tested the specific hypotheses that predisposition to hallucinatory experiences in normal participants is associated with positive beliefs about such experiences and that being troubled by voices is associated with negative beliefs.

Method

Participants
The participants were 132 health service employees who volunteered to take part in

the study. No financial incentive was offered. The mean age of the group was 35.19 (SD = 10.71; range 19–59 years). The male:female ratio of the sample was 39:93.

Measures

State–Trait Anxiety Inventory (STAI; Spielberger, Gorusch, Lushene, Vagg, & Jacobs, 1983)

Trait anxiety was measured using the Trait Anxiety subscale (version Y2) of this inventory. STAI-trait scores range from 20 (almost never anxious) to 80 (almost always anxious).

Meta-cognitions Questionnaire (MCQ; Cartwright-Hatton & Wells, 1997)

This scale measures meta-cognitive beliefs and processes. The following three subscales were used for the purposes of this study: positive beliefs about worry (typical items include 'Worrying helps me to get things sorted out in my mind' and 'Worrying helps me cope'); negative beliefs about the controllability of thoughts and corresponding danger (typical items include 'Worrying is dangerous for me' and 'I cannot ignore my worrying thoughts'); negative beliefs about thoughts in general, including responsibility, punishment and superstition (typical items include 'Not being able to control my thoughts is a sign of weakness' and 'If I did not control a worrying thought, and then it happened, it would be my fault'). Items are scored from 1 to 4, whereby 1 = 'do not agree', 2 = 'agree slightly', 3 = 'agree moderately', and 4 = 'agree very much'.

Interpretations of Voices Inventory

A 34-item questionnaire was developed to measure interpretations of voices. Items were generated on the basis of clinical knowledge of patients experiencing hallucinations and included positive and negative interpretations. The questionnaire was worded hypothetically ('If I were to hear sounds or voices that other people could not hear, I would probably think that … '), and items were scored on a 4-point scale to measure conviction (1 = not at all, 2 = somewhat, 3 = moderately so, 4 = very much).

Revised Hallucination Scale (RHS)

This is a 24-item questionnaire based upon the revised Launay–Slade Hallucination Scale (see Launay & Slade, 1981; Morrison *et al.*, 2000). It was revised to incorporate additional items measuring predisposition to visual hallucination, predisposition to auditory hallucinations, vividness of imagery and daydreaming in order to examine distinctions between these phenomena in greater detail. It retained the revised method of scoring, allowing items to be endorsed using a 4-point scale to measure frequency (1 = never, 2 = sometimes, 3 = often, 4 = almost always) rather than a forced true/false response.

Peters Delusions Inventory (PDI; Peters, Joseph, & Garety, 1999)—brief form

This is a 21-item self-report scale designed to measure delusional ideation in the normal population (i.e. it is another measure of psychosis-proneness). It assesses three dimensions of delusions (distress, preoccupation and conviction) in addition to presence/absence. It has good psychometric properties including internal consistency, test–retest reliability and concurrent validity.

Procedure

Subjects completed the questionnaires in the order listed above and returned them to the research assistant. Only the first 40 participants completed the PDI (for the purposes of concurrent validation), and 29 of the participants completed the IVI and the RHS on a subsequent occasion 6 weeks later in order to examine test–retest reliability. The total battery of questionnaires took approximately 15–20 min to complete.

Data analysis

Several of the variables were not normally distributed, and were not found to be normalizable using transformations (except predisposition to auditory hallucinations). Therefore, non-parametric statistics were performed for all variables for correlational analyses involving the entire sample. The test–retest sample had some normally distributed variables; parametric statistics were used where appropriate.

Results

Psychometric properties

The psychometric properties of the IVI and the RHS were explored initially.

Predisposition to hallucination measure

Reliability and factor structure. Three subscales were identified by a factor analysis (principal components with oblimin rotation) guided by the scree plot, which clearly suggested a three-factor solution. One item was removed prior to factor analysis because of a lack of variance (all participants endorsed 'never'). Criteria for defining the factors were as follows: items were required to load above 0.4 on a factor to contribute to it, and, because the aim was to identify distinct subscales, if an item loaded over 0.4 on both factors, it only contributed to the factor it loaded highest on (if there was a difference of less than 0.1 in the loadings, such items were allocated to the subscale with which the item content was most consistent). After the application of these criteria, the three factors consisted of a 9-item subscale assessing vividness of imagination and daydreaming ($\alpha = 0.88$), a 7-item subscale measuring tendency towards experiencing visual disturbances and hallucinations ($\alpha = 0.80$) and a 4-item subscale measuring tendency towards experiencing auditory hallucinations ($\alpha = 0.62$). The factor structure matrix is shown in Table 1. These three factors accounted for 52% of the variance (31.9%, 13% and 7.1%, respectively) and were correlated.

Test–retest reliability. In order to examine the test–retest reliability of the subscales identified, 29 participants were asked to complete the measure again 6 weeks later. Correlational analyses using Spearman's rank correlations suggested that vividness of imagination and daydreaming ($r = .69$, $p < .001$) and tendency towards experiencing visual disturbances and hallucinations ($r = .62$, $p < .001$) were moderately stable across 6 weeks. Similarly, Pearson's correlation revealed that tendency towards experiencing auditory hallucinations was stable ($r = .75$, $p < .001$).

Predictive validity. In order to examine the predictive validity of this measure, correlational

Table 1. Items and factor loading for RHS

Item	Factor 1	Factor 2	Factor 3
1. I daydream about being someone else	0.67	0.18	0.33
2. I hear a voice speaking my thoughts aloud	0.56	0.14	0.37
4. I imagine myself off in far distant places	0.63	0.17	0.15
5. I fantasize about being someone else	0.65	0.11	0.35
6. In my daydreams, I can hear the sound of a tune almost as clearly as if I were actually listening to it	0.78	0.27	0.23
7. I hear the telephone ring and find that I am mistaken	0.23	0.27	0.71
8. I hear people call my name and find that nobody has done so	0.24	0.23	0.71
10. The people in my daydreams seem so true to life that I think they are real	0.48	0.59	0.22
12. I can see things strongly in my daydreams	0.79	0.32	0.07
13. I can hear music when it is not being played	0.45	0.28	0.46
14. I have seen a person's face in front of me when no one was there	0.12	0.67	−0.03
15. I can see the people in my daydreams very clearly	0.79	0.23	−0.06
17. I have a vivid imaginary life	0.66	0.34	−0.13
18. I have had the experience of hearing a person's voice and then found that there was no one there	0.08	0.6	0.39
19. When I look at things they look unreal to me	0.17	0.76	0.26
20. I see shadows and shapes when there is nothing there	0.29	0.69	0.17
21. I have been troubled by hearing voices in my head	0.16	0.45	0.59
22. When I look at myself in the mirror, I look different	0.33	0.57	0.48
23. The sounds I hear in my daydreams are generally clear and distinct	0.8	0.16	0.21
24. When I look at things, they appear strange to me	0.32	0.81	0.35

analyses were performed between the subscales of the RHS and the PDI total. The correlations between PDI total and vivid imagery and daydreaming ($r = .52$, $p < .001$), predisposition to visual hallucinations ($r = .30$, $p < .05$) and predisposition to auditory hallucinations ($r = .33$, $p < .05$) were all significant, suggesting that these subscales are valid.

Interpretations of Voices Inventory
Reliability and factor structure. Three subscales were identified by a factor analysis (principal components with oblimin rotation) guided by the scree plot, which clearly suggested a three-factor solution. Criteria for defining the factors were as follows: items were required to load above 0.4 on a factor to contribute to it, and, because the aim was to identify distinct subscales, if an item loaded over 0.4 on both factors, it only contributed to the factor it loaded highest on (if there was a difference of less than 0.1 in the loadings, such items were included on both subscales—this was only the case for 1 item). After the application of these criteria, the three factors consisted of a 14-item subscale assessing meta-physical beliefs about voices ($\alpha = 0.94$), an 8-item subscale assessing positive beliefs about voices ($\alpha = 0.80$) and a 5-item item subscale measuring interpretations of loss of control ($\alpha = 0.88$). The factor structure matrix is shown in Table 2. These three factors accounted for 60% of the variance (41.6%, 11.3% and 7.1%

respectively) and were correlated (Table 2 includes correlations between the subscales). An orthogonal (varimax) rotation yielded exactly the same three subscales.

Table 2. Items and factor loadings for IVI

Item	Factor 1	Factor 2	Factor 3
1. They are a sign that I am being punished	0.75	0.17	0.45
2. They help me keep control	0.22	0.57	0.09
3. They would make me harm someone	0.67	0.40	0.49
7. They mean I have done something bad	0.85	0.35	0.57
9. They mean that I am close to God	0.74	0.34	0.20
10. They mean I will do bad things	0.73	0.18	0.56
11. They allow me to help others	0.08	0.72	0.02
12. They mean that I have been chosen	0.76	0.33	0.21
14. They make me important	0.34	0.41	0.32
15. They will make me go crazy	0.40	0.07	0.88
16. They mean I will lose control of my behaviour	0.49	0.27	0.87
17. They will take over my mind	0.49	0.19	0.90
18. They have come from the spiritual world	0.51	0.33	0.30
19. They are a sign that I am evil	0.78	0.23	0.58
20. They will harm me physically	0.76	0.23	0.39
21. They mean I am possessed	0.92	0.32	0.49
22. They have to be obeyed	0.76	0.51	0.48
23. They make me special	0.38	0.59	0.30
24. They help me cope	0.15	0.80	0.03
25. They keep me company	0.34	0.77	0.37
26. I would not cope without them	0.37	0.50	−0.05
27. They mean I will harm myself	0.71	0.16	0.68
29. They control the way I think	0.40	0.25	0.58
31. They protect me	0.31	0.78	0.24
33. If I do not obey them, something bad will happen	0.83	0.14	0.38
34. They mean I am a bad person	0.88	0.24	0.31

Test–retest reliability. In order to examine the test–retest reliability of the IVI subscales, 29 participants were asked to complete the measure again between 4 and 6 weeks later. Correlational analyses using Spearman's rank correlations suggested that meta-physical beliefs about voices ($r = .84$, $p < .001$) and interpretations of loss of control ($r = .77$, $p < .001$) had good test–retest reliability. Similarly, Pearson's correlation revealed that positive beliefs about voices had good test–retest reliablility ($r = .73$, $p < .001$).

Predictive validity. In order to examine the predictive validity of this measure, correlational analyses were performed between the subscales of the IVI and the RHS subscales. All of these correlations were significant ($p < .05$), except that between interpretations of loss of control and predisposition to auditory hallucinations ($r = .10$, n.s.), suggesting that the subscales are valid.

Relationships between interpretations of voices, meta-cognition, trait anxiety and predisposition to hallucination

In order to examine the factors that predicted predisposition to hallucination, a series of regression analyses were conducted using two of the subscales of the RHS as the dependent variables and the IVI subscales, the MCQ subscales and trait anxiety as predictor variables.

Auditory hallucinations. Using the logarithmically transformed predisposition to auditory hallucinations as the dependent variable, a multiple regression analysis using forward variable selection was performed with the predictor variables mentioned above. The independent (or predictor) variables included in the analysis were emotional vulnerability (trait anxiety) on step 1, meta-cognitive beliefs about thoughts on step 2 (as they are hypothesized to be a generic vulnerability factor) and interpretations about voices on step 3. The results of the final multiple regression equation can be seen in Table 3.

Table 3. Multiple regression summary statistics for predisposition to auditory hallucinations

Variable	Beta	Partial r	F	Sig. of F
Trait anxiety	0.28	.28	10.33	0.002
MCQ–positive	0.17	.18	4.15	0.044
IVI–positive beliefs	0.22	.24	7.11	0.009
MCQ–SPR	−0.12	−.13	0.19	n.s.
MCQ–negative	0.09	.09	0.87	n.s.
IVI–control	0.03	.03	0.13	n.s.
IVI–meta-physical	0.11	.12	1.65	n.s.

The multiple R was .475 and significant ($F(1,120) = 11.63$, $p < .001$). The adjusted R^2 was .21, indicating that a moderate amount of the variance was accounted for by these predictor variables. An examination of the tolerances of the individual variables found them to be acceptably high, indicating that colinearity was not a problem. On step 1, with trait anxiety entered, the multiple R was .38 and significant. On step 2, when MCQ positive beliefs about thoughts entered the equation, the multiple R was .42 and significant, the adjusted R^2 was .18, and the increment in R^2 of .035 was significant ($F = 5.13$, $p < .05$). On the final step, when the positive beliefs about voices were entered, the increment in R^2 was .046 and significant ($F = 7.11$, $p < .01$). None of the negative beliefs about thoughts or voices reached significance.

Distress associated with auditory hallucinations

In order to investigate the links between interpretations of voices and auditory hallucinations, a hierarchical logistic regression analysis was performed using whether or not a person had endorsed the RHS item 'I have been troubled by hearing voices in my head' as the dependent variable (4% of the sample endorsed this item). The independent variables used in the analysis were the three subscales of the IVI and trait anxiety. On step 1 (trait anxiety), the equation generated by this analysis correctly classified 100% of those not endorsing this item and 0% of the those that did, and was non-significant ($\chi^2(1) = 1.37$). On step 2 (positive interpretations of voices), the equation generated by this analysis correctly classified 98.3% of those not endorsing this

item and 0% of the those that did. This logistic regression analysis was significant ($\chi^2(2) = 11.5$, $p < .01$). On step 3 (negative interpretations of voices), the equation generated by this analysis correctly classified 99.2% of those not endorsing this item and 77.8% of the those that did (the overall correct classification was 97.7%). This logistic regression analysis was highly significant ($\chi^2(4) = 50.99$, $p < .0001$). The only significant predictor was meta-physical beliefs about voices ($r = .22$, $p < .05$; odds ratio = 2.23, 95% confidence interval = 1.06–4.67) showing that a higher scores on these meta-physical beliefs about voices are associated with endorsing the item related to troublesome auditory hallucinations.

Visual hallucinations
In order to investigate the links between meta-cognition and predisposition to visual hallucinations, a logistic regression analysis was performed using whether or not a person had endorsed any of these RHS items (48% reported never having experienced any of these phenomena) as the dependent variable. The independent variables used in the analysis were the IVI subscales, the MCQ subscales and trait anxiety. The equation generated by this analysis correctly classified 66% of those not endorsing visual hallucination items and 68% of those that did (the overall correct classification was 67%). This logistic regression analysis was highly significant ($\chi^2(3) = 27.44$, $p < .0005$). The only significant predictors were negative beliefs about uncontrollability and danger ($r = .16$, $p < .05$; odds ratio = 1.09, 95% confidence interval = 1.02–1.17) and positive beliefs about worry ($r = .15$, $p < .05$; odds ratio = 1.09, 95% confidence interval = 1.01–1.15) showing that higher scores on these meta-cognitive beliefs are associated with endorsing items related to visual hallucinations.

Discussion
The results of this study suggest that at least three distinct subscales in relation to the interpretations people make about voices can be identified and reliably measured by the IVI. These subscales assess three dimensions of meta-physical beliefs, positive beliefs and interpretations of loss of control.

Three distinct subscales were also found for the RHS. This suggests that vividness of imagination and daydreaming, tendency towards experiencing visual disturbances and hallucinations, and tendency towards experiencing auditory hallucinations can be reliably distinguished. The finding that these subscales were correlated is consistent with the suggestion that vivid imagery and/or dreaming may be implicated in the experiencing of hallucinations (Asaad & Shapiro, 1986; Mintz & Alpert, 1972).

The IVI and RHS were used to examine emotional and cognitive predictors of predisposition to auditory and visual hallucinations. We aimed to control for trait anxiety and positive and negative beliefs about worry and intrusive thoughts in determining any unique contribution of positive and negative beliefs about hallucinations to vulnerability. The results of the multiple regression analysis showed that positive beliefs about hallucinations were positively associated with vulnerability to auditory hallucinations when covariances between these sets of beliefs, trait anxiety and beliefs about worry/intrusions were controlled. These results are consistent with the theoretical assertion that meta-cognitive beliefs about mental experiences are associated with vulnerability to psychological disorder (Wells & Matthews, 1994) and extend the findings to vulnerability to auditory hallucinations in particular, providing

additional support to earlier studies (Baker & Morrison, 1998; Morrison *et al.*, 2000).

The finding that trait anxiety also contributed to predicting auditory hallucinations is consistent with the suggestion that similar processes are involved in the development and maintenance of psychotic experiences and anxiety disorders (Morrison, 1998, 2001); indeed, the implication of meta-cognition and positive interpretations also provides support for this notion. However, it is also possible that trait negative emotion relates directly to predisposition.

The findings from the logistic regression analysis examining predisposition to visual hallucinations found that it was positive and negative meta-cognitive beliefs about worry and intrusions that predicted vulnerability. This is consistent with Wells and Matthews, (1994) S-REF model, which suggests that such beliefs represent a generic vulnerability factor for psychological dysfunction.

Whilst it has been suggested that positive beliefs may be associated with the development of vulnerability to auditory hallucinations (Morrison *et al.*, 2000), negative beliefs may mark the development of problematic types of hallucinations and contribute to vulnerability to disorder. More specifically, Morrison (1998) suggested that negative interpretations of voices will determine distress and disability associated with voices. We examined this possibility by conducting a logistic regression of IVI predictors of troublesome voices. Meta-physical beliefs emerged as the only independent predictor of distress; these are predominantly negative (the highest loading items are 'They mean I am possessed', 'They mean I am a bad person' and 'They mean I have done something bad'), thus providing some support for this notion. The finding that meta-physical beliefs predicted troublesome voices in non-patients is also consistent with Chadwick and Birchwood's (1994) suggestion of meaningful links between beliefs about voices and affect.

This study has a number of methodological limitations. Whilst analogue research is frequently used to make inferences about psychological processes in clinical populations, the generalizability of our findings is clearly reduced by using a non-patient sample. Similarly, the suggestion that the development of negative beliefs about hallucinations that underlies the transition from normal to pathological hallucinatory experiences could be used to argue that research utilizing non-patients cannot inform our understanding of patients. However, this does not suggest divergent processes between patients and non-patients, but rather that positive beliefs will be involved in the development of hallucinatory experiences for both patients and non-patients, and that it is the addition of negative beliefs to the picture that determines whether someone becomes distressed (and, therefore, seeks help, thus receiving patient status). The use of powerful multivariate statistics with a relatively insensitive dependent variable (the single item assessing troublesome voices) should also be examined with caution. Similarly, whilst the prediction equations obtained in the regression analyses clearly suggest that the cognitive and emotional factors statistically predict predisposition to hallucinations, it is possible that some unmeasured factor, such as theory of mind deficits (see Frith & Corcoran, 1996), may be implicated in all of these variables.

The clinical implications of this research should be judged cautiously, since the population examined was a non-patient sample. However, it would seem reasonable to encourage clinicians to assess the nature of patients' interpretations of their voices in the three domains identified using the IVI, and if these beliefs appear to be mediating the distress and disability caused by the voices, such interpretations could be regarded as suitable targets for intervention as suggested by Morrison (1998). The meta-physical beliefs, in particular, appear likely to result directly in distress and should therefore be

targeted. Examining positive beliefs about worry and negative beliefs about uncontrollability and danger is also indicated, particularly for people experiencing visual hallucinations.

It is also likely to be important to examine positive beliefs for a number of reasons. Our findings suggest that positive interpretations are involved in the development and/ or maintenance of auditory hallucinations. This could be via influence on behaviour that may increase the likelihood of people experiencing hallucinations (e.g. some patients take substances that they know will cause them to hallucinate for this very reason). In addition, holding such beliefs is likely to cause some ambivalence towards therapy and change, and failure to acknowledge (and possibly modify) them will reduce the possibility of therapy achieving maximum gains (Morrison & Renton, 2001)—unless, of course, patients are not distressed by their voices, in which case, intervention would not be indicated. If the voices serve a positive function for the person (such as providing company or protection, helping someone to cope or making someone special—all of which are assessed by the IVI), it is very important to provide an alternative source of this benefit (e.g. help someone to develop a social network to provide company or conduct a positive data log to demonstrate 'specialness').

Further research is clearly needed to examine the presence of these interpretations in patients that experience auditory hallucinations and to determine the relationship of such beliefs to the development and maintenance of these symptoms and their affective and behavioural responses. It is hoped that the development of these measures will facilitate such research examining psychological processes involved in clinical and non-clinical hallucinations.

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