Reality monitoring performance and the role of visual imagery in visual hallucinations

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ABSTRACT

Background: Auditory Hallucinations may arise from people confusing their own inner speech with external spoken speech. People with visual hallucinations (VH) may similarly confuse vivid mental imagery with external events. This paper reports two experiments exploring confusion between internal and external visual material.
Method: Experiment 1 examined reality monitoring in people with psychosis; those with visual hallucinations (n = 16) and those without (n = 15). Experiment 2 used two non-clinical groups of people with high or low predisposition to VH (HVH, n = 26, LVH, n = 21). All participants completed the same reality monitoring task. Participants in Experiment 2 also completed measures of imagery.
Results: Psychosis patients with VH demonstrated biased reality monitoring, where they mis-remembered items that had been presented as words as having been presented as pictures. Patients without VH did not show this bias. In Experiment 2, the HVH group demonstrated the same bias in reality monitoring that psychosis patients with VH had shown. The LVH group did not show this bias. In addition, the HVH group reported more vivid imagery and particularly more negative imagery.
Conclusions: Both studies found that people with visual hallucinations or prone-ness to such experiences confused their inner visual experiences with external images. Vivid imagery was also related to proneness to VH. Hence, vivid imagery and reality monitoring confusion could be contributory factors to understanding VH.

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1. Introduction

Visual hallucinations (VH) are ill understood in comparison to auditory hallucinations (AH) particularly in people with psychosis (McCarthy-Jones et al., 2017). Cognitive models propose that AH arise owing to inner experiences (thoughts or inner speech) being confused with external experiences (someone's actual speech; Bentall, 1990). This inner-outer confusion is thought to result from reality monitoring difficulties, which is the ability to recognise whether information is a true perception or imagined (Johnson, Hashtroudi, & Lindsay, 1993).

Psychosis patients with current hallucinations have difficulties with reality monitoring in comparison to psychosis patients without hallucinations (Brookwell, Bentall, & Varese, 2013) and there is consistent evidence that internally generated experiences (inner speech) are misattributed to an external source in clinical populations with AH (Jones, 2010). By extension it has been proposed that VH arise owing to internal mental images being mis-attributed as external perceptions (Brébion, Ohlsen, Bressan, & David, 2012).

In the only study to date that directly tests reality monitoring in psychosis patients with VH, Brébion, Ohlsen, Pilowsky, and David (2008) compared the performance of psychosis patients with VH against clinical (psychosis patients without VH) and non-clinical controls. Participants were presented with word/picture items (e.g., the word CAR, or a picture of a bicycle). After a short delay participants had to indicate whether items read from a list (including distractor items) were previously presented as a picture, a word, or not at all. This first stage established recognition

accuracy. The second stage tested reality monitoring; as only the original target items were read out and participants identified whether the items had been presented as a word or a picture.

In the recognition phase people without VH demonstrated a picture superiority effect, and recognised pictures better than words. However, participants with VH showed the opposite pattern and recognised words better than pictures (a word superiority effect). It was proposed that VH patients were more likely to develop a vivid image when presented with a word and that this accounts for the absence of the usual picture superiority effect. In the reality monitoring stage, patients with VH differed from the other groups, by making more misattributions of words to pictures than people who did not report VH. Once again this implied VH were associated with heightened visual processes whereby words generated images readily and so were more easily confused with actual externally presented images.

This is an important study, that may reveal processes that lead to the experience of VH, that could feasibly be the target of therapeutic interventions (Smailes, Alderson-Day, Fernyhough, McCarthy-Jones, & Dodgson, 2015), but the findings must be interpreted cautiously. First, only a small number of participants with VH (n = 8) took part, meaning the finding may be unreliable. Second, the control group of psychosis patients without VH (n = 33) included people with and without other forms of hallucinations. Thus, differences in reality monitoring between the 'VH present' and 'VH absent' groups could be owing to reduced frequency of any hallucinations in the 'VH absent' group, rather than specifically relating to the presence of VH. Brébion et al.'s (2008) findings, therefore, require replication in a larger sample of psychosis patients, using a 'VH absent' group who report hallucinations in another modality.

In addition, the reality monitoring literature on AH suggests that processes involved in the development of clinical AH are also involved in non-clinical AH-like experiences (Badcock & Hugdahl, 2012; Laroi, Van der Linden, & Marczewski, 2004; but see Garrison et al., 2016, for two non-replications of this finding). However, the equivalent domain specific misattribution has not yet been demonstrated in relation to non-clinical VH.

Finally, Brébion et al. (2008) supposes that performance on the task and the apparent confusion as to the origin of material is owing to vivid mental imagery. Imagery is an important process in experiencing hallucinations in clinical (Aleman, Böcker, Hijman, De Haan, & Kahn, 2004) and non-clinical groups (Aleman, Nieuwenstein, Böcker, & De Haan, 2000). However, imagery was not measured by Brébion et al. (2008) and so it is unclear if this may account for the findings in relation to VH.

This present research consists of two studies investigating psychological processes leading to VH. This is important as VH are associated with high levels of distress, and disability (Mueser, Bellack, & Brady, 1990) and there is scant mention of how to treat VH in psychosis with either medication or psychological therapy (Wilson, Collerton, Freeston, Christodoulides & Dudley, 2015). Experiment one is a replication of Brébion et al.'s (2008) study, comparing reality monitoring performance of psychosis patients with VH compared to patients with AH, but without VH. Experiment two extends Brébion et al.'s work (2008) by investigating reality monitoring in non-clinical participants who are predisposed to VH, and examines the same hypotheses as experiment one which were based on Brébion et al.'s (2008) findings. First, it was predicted that people without VH would show the picture superiority effect, whereas those with VH will show the opposite and will recognise words more than pictures (a word superiority effect). Second, it was predicted that participants with VH would demonstrate a bias in reality monitoring where they misremember items that were presented as words as having been presented as pictures,

more than participants without VH.

2. Method

2.1. Participants

Thirty three participants were recruited (20 males, 13 females) from Early Intervention in Psychosis and Psychosis Community Mental Health teams. Two people were excluded owing to difficulty understanding task requirements and establishing group membership. The VH group consisted of 16 people (age $M = 25.75$, $SD = 6.35$, 7 M, 9 F). The non-VH group consisted of 15 people (age $M = 26.33$, $SD = 9.12$, 12 M, 3 F). All of those in the VH group also experienced AH, whereas the non-VH group experienced AH only. The groups did not differ in age (VH: $M = 25.75$, $SD = 6.35$, non-VH: $M = 26.13$, $SD = 8.45$, $t(29) = -0.14$, $p = 0.89$ but did for gender X^2 $(1, N = 31) = 4.38$, $p = 0.04$. All of the non VH group and 10 in the VH group were on antipsychotic medication. Of the six in the VH who were not on antipsychotic medication; two were on antidepressants; two were not on medication and two were unable to verify if they were taking medication. Diagnosis included first episode psychosis, paranoid schizophrenia, psychosis not otherwise specified, emotionally unstable personality disorder, and bipolar disorder with psychotic features. The inclusion criteria were; that the person was aged 18 years or more, reported hallucinations within the last six weeks, was in receipt of care, could give capacity to consent, and where they were prescribed antipsychotic medication, this was stable for at least 3 months. Exclusion criteria were; a history of substance abuse in the preceding 6 months, drug-induced hallucinations or psychosis owing to brain injury or organic disorders.

2.2. Sample size considerations

Brébion et al. (2008) reported large effect sizes for the difference between VH and non-VH groups on the reality monitoring task (Cohen's d = 0.99). Using G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) the required sample size for a mixed model ANOVA with between-within subjects interaction ($p = 0.05$), and f value of 0.25, was 34 (17 per group) with power of 0.87.

2.3. Measures

2.3.1. Scale for the Assessment of Positive Symptoms. (SAPS; Andreasen, 1984)

This is a clinician-rated scale assessing positive symptoms of schizophrenia. It rates experiences from '0-None' to '5-Severe'. The scale demonstrates good psychometric properties with Cronbach's alpha of 0.66–0.87 and inter-rater reliability of 0.70–71 (Sajatovic & Ramirez, 2012). For this study's purpose, only the 7-item hallucinations subscale was administered.

2.3.2. North East Visual Hallucination Interview, 2008. (NEVHI; Mosimann et al., 2008)

The NEVHI is a 20-item semi-structured interview to assess for phenomenology of VH and their emotional, social and behavioural impact. Responses are scored on a 3-point likert scale ranging from 0 (little effect) to 2 (negative impact). It demonstrates good reliability ($\alpha = 0.71$; $\kappa = 0.83$) and content validity (Mosimann et al., 2008).

2.3.3. Psychotic Symptom Rating Scales. (PSYRATS; Haddock, McCarron, Tarrier, & Faragher, 1999)

The PSYRATS is a clinician administered semi-structured interview used to assess AH and delusions. Only the AH subscale (11