



Brief report

Seeing words that are not there: Detection biases in schizotypy

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Objective. The present study introduced a novel word-detection paradigm to examine detection biases as a function of different schizotypy dimensions in a sample of undergraduate students.

Method. The participants ($N = 80$) were asked to detect fast moving (8 frames/second) words among simultaneously moving non-words.

Results. Positive schizotypy was associated with a tendency to report words that never appeared in the trials. This effect was independent of task order, impulsivity and social desirability. None of the schizotypy measures were associated with correct words (detection accuracy).

Conclusions. A bias to report events in the absence of corresponding events may constitute a cross-modal mechanism responsible for translating internally generated experiences into perceptual experiences.

Both hallucinations and delusions have been associated with information-processing biases in various tasks. Deluded patients require less information than controls before reaching a conclusion (Dudley, John, Young, & Over, 1997; Garety, Hemsley, & Wessely, 1991; Huq, Garety, & Hemsley, 1988), although they do not appear to be impaired in their general reasoning ability (Kemp, Chua, McKenna, & David, 1997). Patients with hallucinations, as well as undergraduate students who score highly on measures of hallucinatory experiences, tend to demonstrate a bias towards believing that a certain type of stimulus is present, in the absence of such a stimulus (false alarms) although their perceptual accuracy (correct responses) remains intact (Bentall & Slade, 1985; Jakes & Hemsley, 1986; Rankin & O' Carroll, 1995). People with hallucinations also tend to make premature judgments when asked to guess the meaning of perceptually ambiguous words (Heilbrun & Blum, 1984).

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A recently proposed, multi-factor model of psychotic symptoms (Garety, Kuipers, Fowler, Freeman, & Bebbington, 2001) has suggested that cognitive biases constitute one potential factor contributing to symptom maintenance. The demonstration of a bias to hear a certain type of stimulus in the absence of such a stimulus (Bentall & Slade, 1985; Cahill, Silbersweig, & Frith, 1996; Rankin & O' Carroll, 1995) is consistent with the fact that hallucinations in schizophrenia typically occur in the auditory modality. Nonetheless, a bias to see non-existing events, as well as non-existing relationships between events, is a common characteristic in both hallucinations and delusions. Little is known as to whether such a bias represents a modality-specific (limited to auditory events) or a supra-modality mechanism. If the latter possibility were true, a bias to see events would be associated with the positive symptomatology of schizophrenia. The present study employed an analogue sample in order to address this question. The main reason for studying an analogue sample (i.e. undergraduate students assessed with schizotypy measures) rather than schizophrenia patients was to avoid potential confounds, such as effects of hospitalisation and antipsychotic medication.

Method

Participants

Eighty undergraduate students (32 males and 48 females) recruited from University College London campus took part in the study. The average age was 20.2 years, ranging from 18 to 27 years. All the participants had normal or corrected-to-normal vision (i.e. glasses or contact lenses).

Schizotypy measures

The Oxford-Liverpool Inventory for Feelings and Experiences (O-LIFE; Mason, Claridge, & Jackson, 1995) consists of 159 items selected based on factor-analytic studies. The first three scales correspond to a three-factor model of schizophrenia (Liddle, 1987): positive (unusual experiences), negative (introverted anhedonia), and disorganized (cognitive disorganization). The positive schizotypy scale consists of items assessing mainly unusual perceptual experiences and beliefs. The fourth scale (impulsivity non-conformity) refers to the impulsive, aggressive and asocial aspects of psychosis (Eysenck & Eysenck, 1975). The lie scale of the Eysenck Personality Questionnaire (EPQ; Eysenck & Eysenck, 1975) was also included to assess the tendency towards socially desirable responding.

Stimuli and apparatus

Each participant received 64 trials as a continuous sequence of short animated images. Half of the trials contained a word among non-words (word trials) and half of them contained only non-words (non-word trials). Each trial depicted a display of four round blocks (one in each quadrant of a computer screen) that were identical in size to one another. The animations were constructed on a three-dimensional model package (3-D Studio), and were presented with a multimedia animator player (SoundScript).

The animations produced an impression of motion, such that the four-block configuration appeared to loom from a distance towards the observer. Each animation was composed of 74 frames, and was presented at a rate of nine frames per second. The word stimuli were five-letter words of concrete nouns (Brain, Bread, Brick, Drain,

Elbow, Glove, Grain, Honey, Label, Movie, Pilot, Plate, Shirt, Skirt, Thigh, and Tooth). The non-word stimuli were meaningless strings of five consonants.

Procedure

At the time of testing, the experimenter was unaware of the schizotypy status of the participants. Half of the participants received the schizotypy inventory followed by the visual detection task. The rest of the participants were tested in the opposite order. They were asked to ignore the non-words and read aloud any real word they could see. Detailed information about the purpose of the study was given after the end of the session.

Results

The number of correctly reported words (mean = 15.01, $SD = 8.02$) did not correlate significantly ($r = -.04$, $p > .30$) with the number of incorrectly reported words (mean = 1.52, $SD = 2.21$). The difference between correctly reported words and incorrectly reported words was statistically significant; $t(79) = 14.01$, $p < .001$. The effect of task-order on the dependent measures was not significant (t values < 1). The correlation between social desirability and incorrectly reported words was not significant ($r = .11$, $p > .30$).

In order to examine whether schizotypy scores could predict falsely reported words in non-word trials, while controlling for possible inter-correlations, a multiple regression analysis was performed (SPSS version 11.1; method:Enter). In this analysis, scores on the O-LIFE scales were the predictor variables, and number of incorrectly reported words in non-word trials was the dependent variable. The overall regression equation was significant; $F(4, 79) = 3.56$, $p < .01$, accounting for about 11% of the variance (adjusted R^2). The partial correlation coefficients (pr) from this analysis suggested that falsely reported words in non-word trials were significantly correlated with unusual experiences ($pr = .34$, $p < .001$), but not with any other schizotypy measure (introvertive anhedonia, $pr = .14$; cognitive disorganisation, $pr = -.10$; impulsive nonconformity, $pr = -.15$; all values of $p > .20$).

A second multiple regression analysis with schizotypy scores as predictor variables and falsely identified words in the word trials as the dependent variable was then performed. The overall regression was not statistically significant nor was any individual pr significant (all values of $p > .20$). Similarly, a third regression analysis with the O-LIFE scales as predictor variables, and correctly detected words as dependent variable, failed to yield significant results (all values of $p > .20$).

Discussion

The data obtained suggest that a bias to perceive non-existing events is not a modality-specific (i.e. limited to the processing of auditory events) but a supra-modality mechanism, possibly linked to the overall positive symptomatology of schizophrenia. These findings are also consistent with previous studies that, unlike the present study, employed non-verbal, abstract visual stimuli (Feelgood & Rantzen, 1994; Jakes & Hemsley, 1986), suggesting that the observed bias is not a stimulus-specific phenomenon. Such a supra-modality mechanism might constitute a biased attributional process, activated when dealing with an ambiguous situation.

It has been suggested (Garety *et al.*, 2001) that schizophrenic patients are inclined to accept the possibility that an experienced event (e.g. a 'voice') is an external input rather than an internally generated event. In the present task, simultaneous presentation of fast moving non-words may have generated past associations and verbal representations of words on the basis of some superficial similarity to the non-words. Such a cognitive experience could be interpreted either as an externally generated event or as an internally generated experience. Participants scoring highly in positive schizotypy were probably inclined to translate an internally generated experience (i.e. verbal representations) into a perceptual experience (i.e. false perception of a word). An alternative explanation is that the present findings might reflect a 'jumping-to-conclusions' bias (i.e. a data-gathering bias as less data are gathered before reaching a conclusion). However, this explanation seems less probable because a bias of this type would also influence other aspects of performance, such as accuracy and number of incorrect responses in word trials. The analysis suggested that positive schizotypy was only associated with number of incorrect responses in non-word trials

The possibility that the observed bias constitutes a cross-modal mechanism responsible for translating verbal representations into perceptual experiences may also explain why, in reading tasks, people with schizophrenia tend to remember words that were actually absent (Franck *et al.*, 2000). Reading words aloud has been shown to reduce reports of auditory hallucinations in schizophrenia patients (Gallagher, Dinan, & Baker, 1995), probably because it interferes with such a top-down process.

Top-down (cognitive processing → sensory perception) mechanisms are central to many recent theoretical models of hallucinations (e.g. Behrendt, 1998; Boecker, Hijman, Kahn, & De Haan, 2000; Grossberg, 2000). The notion that cognitive biases contribute to the positive symptoms is further supported by the fact that these symptoms can be modified through cognitive-behavioural techniques (e.g. Garety, Fowler, & Kuipers, 2000). The present findings further suggest that such cognitive biases are neither modality-specific nor stimulus-specific, properties that perhaps should be taken into account when designing cognitive-behavioural interventions. Further understanding of the nature of such biases can contribute to the development of effective cognitive-behavioural interventions targeting positive symptoms of schizophrenia.

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