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# Covariation assessment for neutral and emotional verbal stimuli in paranoid delusions

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**Objectives.** Selective processing of emotion-relevant information is considered a central feature in various types of psychopathology, yet the mechanisms underlying these biases are not well understood. One of the first steps in processing information is to gather data to judge the covariation or association of events. The aim of this study was to explore whether patients with persecutory delusions would show a covariation bias when processing stimuli related to social threat.

**Design and methods.** We assessed estimations of covariation in-patients with current persecutory (CP) beliefs ($N = 40$), patients with past persecutory (PP) beliefs ($N = 25$), and a non-clinical control (NC) group ($N = 36$). Covariation estimations were assessed under three different experimental conditions. The first two conditions focused on neutral behaviours (Condition 1) and psychological traits (Condition 2) for two distant cultural groups, while the third condition included self-relevant material by exposing the participant to either protective social (positive) or threatening social (negative) statements about the participant or a third person.

**Results.** Our results showed that all participants were precise in their covariation estimations. However, when judging covariation for self-relevant sentences related to social statements (Condition 3), all groups showed a significant tendency to associate positive social interaction (protection themed) sentences to the self. There were no statistically significant differences among participating groups in their covariation judgments.

**Conclusions.** Our results showed that there was no specific covariation assessment bias related to paranoid beliefs. Both NCs and participants with persecutory beliefs showed a similar pattern of results when processing neutral or social threat-related sentences. The implications for understanding of the role of self-referent information processing biases in delusion formation are discussed.

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### *Covariation estimations and psychopathology*

The ability of humans to detect that two events tend to co-occur is important to understand the world we live in, and to anticipate what might happen in the future. Thus, tasks that assess the ability to assess covariation provide a privileged scenario to analyse the way that people combine and gather information for subsequent use in further cognitive operations (Allan, 1993; Cheng, 1997). For instance, the analysis of covariation between binary outcomes is a critical process used to form causal explanations (White, 2000). This is reflected in the well-known 'principle of covariation' formulated by Harold Kelley: 'An effect is attributed to one of its possible causes with which, over time, it covaries' (Kelley, 1973, p. 108).

The study of covariation assessment in various disorders has revealed interesting results. Using an experimental paradigm, where fear-relevant visual stimuli are randomly matched with aversive or neutral stimuli (e.g. a noise), an overestimation of the association between fear-relevant stimuli and negative outcomes was found in panic patients (Wiedemann, Pauli, & Dengler, 2001), phobic patients (De Jong, Merckelbach, & Arntz, 1995; Pauli, Wiedemann, & Montoya, 1998; Pury & Mineka, 1997), high-fear participants (Amin & Lovibond, 1997; Tomarken, Sutton, & Mineka, 1995), and panic-prone participants (Pauli, Montoya, & Martz, 1996). Consistent mood-congruent covariation biases have also been found in anxiety and depression (Allan, Siegel, & Hannah, 2007; Fu, Koutstaal, Fu, Poon, & Cleare, 2005; Vázquez, 1987).

Research on selective processing of information has also been extended to the study of psychoses. A series of studies have consistently found that patients with persecutory delusions show biases in attention, memory, and attribution tasks when processing stimuli related to social threat (Bentall, 2003; Garety & Freeman, 1999). However, little is known about the origins of these biases. It has been suggested that the reasoning biases consistently found in deluded persons might be based on biases in the way that these patients gather and combine information (Garety, Bebbington, Fowler, Freeman, & Kuipers, 2007; Garety & Freeman, 1999; Garety *et al.*, 2005), but more evidence from diverse types of experimental tasks is required. In a study addressing the assessment of reasoning mechanisms in schizophrenia, Brennan and Hemsley (1984) found that paranoid individuals were more likely than controls to perceive association between pairs of words that, in fact, were not correlated (i.e. an illusory correlation phenomenon). Although the authors reported that this tendency was independent of the word content (i.e. neutral words vs. paranoia-related threatening words), a reanalysis of the data (see Chadwick & Taylor, 2000) suggested that illusory correlations in paranoid participants were restricted to threatening material. In sum, although the evidence of covariation biases in-patients with delusional beliefs is still scarce, preliminary data suggest that there may be a cognitive bias for materials congruent with the themes of patients' delusions.

The present study was designed to explore the covariation assessments made by patients with persecutory beliefs of self-relevant stimuli, as current theories of delusion formation hypothesize that attributional biases may largely depend upon cognitive biases in the initial stages of processing information (e.g. Bentall, Corcoran, Howard, Blackwood, & Kinderman, 2001).

### *Study hypotheses*

To explore participants' covariation assessments, we applied a paradigm successfully used in social psychology to assess covariation biases (i.e. 'illusory correlations') in the

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domain of stereotype construction (Hamilton & Gifford, 1976). Consistent with previous research in delusion formation (Bell, Halligan, & Ellis, 2006; Freeman, Garety, Kuipers, Fowler, & Bebbington, 2002), and following a content-specific formulation, we generated two main hypotheses. Our first prediction, according to the current cognitive models of delusional thinking that propose that people with delusional beliefs will not show generalized cognitive deficits (Bentall, 2003; Bentall *et al.*, 2001), was that delusional patients would not show illusory correlations in conditions in which no self-relevant information is presented, whether or not the information is emotionally relevant. Overall, no group differences in tasks that do not involve self-relevant information are expected.

Also, consistent with preliminary results showing that self-referent information is crucial for understanding deluded people's schemas (Dagnan, Trower, & Gilbert, 2002) and that emotionally relevant information may exacerbate the reasoning biases found in individuals with delusional beliefs (see a review in Green & Phillips, 2004), our second hypothesis stated that participants with delusional persecutory beliefs would show illusory correlations in conditions where self-relevant social threat-related (i.e. negative social interaction) sentences are used. More specifically, we hypothesized that the patients with CP beliefs would show a judgment of covariation bias consisting of self-assigning proportionately more self-referent threat-related sentences than non-threatening sentences whereas, the opposite bias would be observed in the NC group. Finally, to determine whether cognitive biases in covariation tasks are associated with the patients' clinical state or, on the contrary, are stable and independent of the presence of active symptoms, we also included a group of patients with PP delusions. Given that relatively few studies in the field include this sample, we did not state any specific hypothesis for this group.

## Methods

### *Participants*

All participants volunteered to collaborate in the study after reading and signing a consent form. Three groups of participants were formed:

(1) *CP beliefs* (Group CP) included 40 in-patients (27 men and 13 women) in a psychiatric service of a general hospital, currently suffering from persecutory delusions as assessed by the Present State Examination (PSE-10-SCAN, Sections 18 and 19, WHO, 1992). According to the *Diagnostic and statistical manual of mental disorders* (4th ed. text revision; American Psychiatric Association, 2000), patients met the following categories: paranoid schizophrenia ($N = 26$); schizoaffective disorder ($N = 3$); brief psychotic disorder ($N = 9$); and bipolar disorder ($N = 2$). All patients were receiving antipsychotic medication at the time of the study.

(2) *PP beliefs* (Group PP). This psychiatric comparison group comprised 25 participants (21 men and 4 women) who had suffered from non-affective paranoid delusions in the past, but not within the last 6 months, as assessed by the PSE-10-SCAN. All participants were recruited from out-patient clinics and from psychosocial rehabilitation centres. According to *DSM-IV-TR* (text revision; APA, 2000) criteria, the sample consisted of patients who had received the following diagnoses: paranoid schizophrenia ($N = 19$); schizoaffective disorders ($N = 2$); and bipolar disorder with history of paranoid delusions ($N = 4$). All participants within this group were still receiving antipsychotic medication.

(3) *NC group* (Group NC). A NC group, composed of 36 participants (21 men and 15 women), was recruited via informal contacts. Participants in this group were university students or hospital staff who volunteered to participate. Age and sex were controlled so the samples would be equivalent in these two variables. No participant had ever suffered either clinical delusions or major depression episodes, as assessed by the computerized version of the quick diagnostic interview schedule (Q-DIS) – Marcus, Robins, and Bucholz (1990) – and none had ever required psychological assistance for any mental disorder.

All participants in the three groups were within an 18–65 age range and were excluded if they had a history of substance abuse or dependency. All those who were initially assessed continued their participation in the study with the exception of four participants in Group CP (all of them with a diagnosis of paranoid schizophrenia) who refused to continue.

### *Clinical evaluation*

The severity of psychopathology was assessed by the 18-item version of the *brief psychiatric rating scale* (BPRS, Guy, 1976) – $\alpha = .76$ for the total score in our study. For the clinical assessment of positive symptoms of psychosis, we used the (*PSE-10, SCAN*, WHO, 1992, Sections 18 and 19).

### *Covariation task*

We used three experimental covariation tasks that combined different types of attributes and referents. Each of the three participant groups (*CP, PP,* and *NP)* were exposed to the three experimental conditions which were based on the standard procedure described by Hamilton and Gifford (1976). In each of the three conditions 39 consecutive statements resulting from the combination of two different variables derived from a $2 \times 2$ contingency table. Given the particular combination of frequencies (see Table 1), the correlation between the two variables included in the contingency table was always zero.

**Table 1.** $2 \times 2$ sentences presented to participants in the three experimental conditions

Condition 1

Other-referent

| | Thais | Inuits | |
|---|---|---|---|
| Neutral activities (Drinking) | 18 a | 9 b | 27 |
| Neutral activities (Eating) | 8 c | 4 d | 12 |
| | 26 | 13 | |

Condition 2

Other-referent

| | Thais | Inuits | |
|---|---|---|---|
| Positive traits | 18 a | 9 b | 27 |
| Negative traits | 8 c | 4 d | 12 |
| | 26 | 13 | |

Condition 3

Self- and other-referent

(Social threat)

| | Other-referent | Self-referent | |
|---|---|---|---|
| Positive social interaction (Protection themes) | 18 a | 9 b | 27 |
| Negative social interaction (Threat themes) | 8 c | 4 d | 12 |
| | 26 | 13 | |

*Note*. Each condition was comprised of the same number of sentences in each cell, but the contents varied in the three experimental conditions. In all conditions, the actual contingency value is zero.

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All participants were exposed to the following sets of 2 × 2 contingency tables (see Table 1):

(1) Condition 1: Other-referent sentences (referring to Thais or Inuit people) describing *neutral activities* concerning eating (e.g. 'Inuits eat bread', 'Thais eat vegetables') or drinking (e.g. 'Thais drink lemonade', 'Inuits drink coffee'). These two groups of people were selected because they are not common within the cultural context where this research took place. Thus, it was thought that their mention would not elicit any type of emotional bias.
(2) Condition 2: Other-referent sentences (i.e. Thais vs. Inuit) describing *negative psychological traits* (e.g. 'Inuits are lazy, 'Thais are untidy') and *positive psychological traits* (e.g. 'Inuits are peaceful', 'Thais are honest').
(3) Condition 3: Self- and other-referent sentences (oneself vs. a third person) describing *negative* ('threat themes') and *positive* ('protection themes') social interaction. The defining aspect of this third condition is that the threat and protection theme statements are not about two cultural groups but about the participant and a third person (named Jacob). For example, threat theme, other referent sentences would be 'People persecute Jacob', 'There is a plot against Jacob', and protection theme, other referent statements would be 'Jacob is nice to people', 'People are excited to see Jacob'. Likewise, threat theme, self-referent sentences would read 'People laugh behind my back', 'People are not honest with me' and protection theme, self-referent sentences would be 'I can trust people', 'People like to talk with me'.

Sentences were presented one by one to participants on a computer monitor in a fixed, random order. Each sentence was presented on the screen for 5 seconds. Social threat-related sentences were constructed based on emotional verbal stimuli used in experiments with paranoid patients (Bentall, Kaney, & Bowen-Jones, 1995). The three lists of sentences used in this experiment are available from the authors.

After finishing each of the three conditions, participants were asked to perform an *assignment task* (Hamilton & Gifford, 1976). Participants were presented with a list of 39 questions asking them to indicate the group membership of the person who had performed each behaviour (following Condition 1) or who had each attribute (following Condition 2) – for example, 'Who are honest?' Inuits–Thais. Following Condition 3, participants were asked to assign the person (self or a third person) who had each attribute that was presented on the screen. An example question is 'Who is persecuted by people?' (Jacob–Me). The recognition data gathered were used to estimate a covariation index for each participant in each experimental condition.

### *Procedure*

All tests were administered individually in a quiet room and the order of presentation of tasks was the same for all participants (i.e. clinical assessment first and then the experimental tasks). In the assessment of covariation tasks, the order of presentation of the four experimental conditions was counterbalanced.

### *Statistical analyses*

A series of ANOVAS and ANCOVAS for repeated measures were performed after verifying the required assumptions. The Brown–Forsythe correction was used when the criterion

of homogeneity of variances was not met. *Post hoc* analyses of means were tested with the Bonferroni method when variances were not statistically different or with the Tamhane method when variances were not equal. Data analyses were conducted with SPSS version 12.0.

## Results

### *Demographic and clinical data*

A summary of participant characteristics is presented in Table 2. A test of age and sex differences among groups revealed no statistically significant differences. Regarding years of education, a one-way ANOVA showed a significant main effect for group, *Brown–Forsythe* $(2, 65.41) = 28.70$, $p < .0001$. *Post hoc* analyses showed that the only significant difference was that the NC group had more years of education than the two clinical groups.

**Table 2.** Demographic and clinical data for the participants (*SD*s in brackets)

| Characteristics | Current persecutory beliefs ($N = 40$) | Past persecutory delusions ($N = 25$) | Non-clinical controls ($N = 36$) |
|---|---|---|---|
| Mean age in years | 33.3 (8.4) | 31.1 (4.9) | 30.4 (7.4) |
| Gender (% male) | 67.5 | 84.0 | 58.3 |
| Mean duration of illness in years | 8.1 (7.3) | 8.4 (5.7) | – |
| Mean years of education | 11.75 (3.8) | 13.3 (3.9) | 17.50 (1.8) |
| BPRS Total score | 19.0 (8.13) | 3.8 (3.4) | 0.91 (1.13) |

*Note.* BPRS, Brief psychiatric rating scale.

In order to explore symptom severity among participants, a one-way ANOVA conducted on the BPRS total score (a sum of the 18 items) showed a significant effect for group, *Brown–Forsythe* $(2, 55.77) = 142.33$, $p < .0001$. As expected, Tamhane tests revealed that the CP beliefs group showed more severe psychopathology than the NC and PP beliefs groups. In addition, the latter groups did not differ significantly in symptom severity.

### *Assessment of covariation*

To quantify covariation estimations based on our $2 \times 2$ contingency tables, we used the correlation coefficient Phi ($\Phi$) – see Arkes and Harkness (1983) and White (2002) – derived from the participant's recognition performance after the four 39-sentence presentations (assignment task). Phi is a correlation coefficient which is used to assess the degree of association between dichotomous variables in contingency tables. In our study, $\Phi$ was calculated from each patient's frequency estimations for each cell within the contingency table. When indicating $\Phi 1$, $\Phi 2$, and $\Phi 3$, we thus refer to the estimates of correlation for the three experimental conditions, respectively (see Table 1). A value close to zero means that participants made an unbiased estimation of covariation.

In order to evaluate our hypothesis about content-specific covariation biases, a two-way $3 \times 3$ (group $\times$ experimental conditions) repeated measures ANOVA on the $\Phi$ indexes derived from the assignment task was conducted. This analysis yielded only a significant effect for condition, $F(2, 97) = 12.85$, $p < .0001$, $\eta^2 = .21$. *Post hoc* tests revealed that, in the two control conditions (Conditions 1 and 2), all groups had

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similar Φ values but they were lower than those found in the social-threat condition (Condition 3) – see Φ1, Φ2, and Φ3 in Table 3. An ANCOVA on the Φ indexes using years of education as covariate yielded the same results. As can be seen in Table 3, all groups showed positive, not negative, Φ3, which, given the distribution of the cells (see Table 1), indicates a general tendency to perceive an illusory correlation between positive attributes related to threat themes and oneself.

**Table 3.** Mean and standard deviation values (in brackets) in the 2 × 2 contingency tasks

| | Current persecutory beliefs ($N = 40$) | Past persecutory delusions ($N = 25$) | Non-clinical controls ($N = 36$) |
|---|---|---|---|
| Covariation task | | | |
| Covariation estimates (Φ) | | | |
| Condition 1 (Neutral actitivities, other-referent) | −0.12 (0.31) | −0.06 (0.27) | −0.02 (0.15) |
| Condition 2 (Psychological traits, other-referent) | −0.03 (0.19) | −0.01 (0.16) | 0.01 (0.18) |
| Condition 3 (Social interaction, self- and other-referent) | 0.13 (0.45) | 0.16 (0.26) | 0.19 (0.32) |
| Estimations of total number of self-referent sentences (Cells $b+d$) | | | |
| Condition 3 | 17.3 (8.60) | 14.5 (4.5) | 13.8 (4.41) |

Our results revealed an absence of group differences in the global correlation estimations measured with Φ. But, given that the specific analysis of self- versus hetero-referent information is very relevant to analyse covariation judgements (Vázquez, 1987), we proceeded to analyse whether or not the participants' performance in the assignation of self-referent sentences (i.e. assignation of sentences ascribed to oneself) and hetero-referent (i.e. assignment of sentences referring to Jacob) was the same for all groups. To analyse the weight of self- versus hetero-referencing processes that might be involved in participants' covariation estimations, we conducted a one-way ANOVA on the groups' estimation of the number of self-referent sentences (i.e. sum of cells $b+d$ in Table 1) assigned by participants in Condition 3. This analysis revealed a significant main effect for group, $F(2, 98) = 4.12$, $p < .01$, $\eta^2 = .08$. *Post hoc* tests showed that group CP made higher estimations than the rest of the groups. An ANCOVA on the self-referent sentences using years of education as covariable yielded the same pattern of results.

We also explored whether the estimation of self-referent sentences departed from the objective performance criterion (i.e. $9+4 = 13$ sentences). Contrast tests showed that only group CP departed from the criterion by overestimating the number of self-referent sentences, $t(39) = 3.98$, $p < .0001$. Both the group of patients with PP beliefs, $t(24) = 1.68$, $p = .10$, and the NC group, $t(35) = 0.17$, $p = .25$ made a precise estimation of the number of self-referent sentences.

## Discussion

Our results fully confirmed our first hypothesis, that deluded patients process other-referent sentences in a way similar to NC participants when the content is related to

neutral activities (Condition 1) or to general psychological traits (Condition 2). Furthermore, in these two other-referent conditions, all participants made accurate covariation estimations. In the case of deluded participants, this finding supports the contention that patients with delusional beliefs (as with other forms of psychopathologies) are not characterized by showing a general cognitive deficit but rather specific cognitive biases that may arise when processing self-relevant emotional information (Freeman *et al.*, 2004).

Our second hypothesis stated that patients with persecutory beliefs would show covariation biases when required to process *threat themed* social interaction sentences (Condition 3). Our results did not confirm this hypothesis. There were no significant differences among participating groups in their judgements of covariation in this condition. The illusory correlation showed by all groups is explained by a tendency to associate positive sentences to oneself (i.e. the Φ values for all groups were positive), indicating a tendency to associate protection themed sentences to oneself. It is interesting to observe that this similar direction in the results in-patients with current or PP beliefs and NC participants has also been found in other tasks such as causal attributions (Bentall, Kinderman, & Kaney, 1994; Diez-Alegría, Vázquez, Nieto, Valiente, & Fuentenebro, 2006), illusion of control tasks (Kaney & Bentall, 1992), memory for emotional words (Bentall *et al.*, 1995), the emotional Stroop task (Bentall & Kaney, 1989; Kinderman, 1994), and memory for self-relevant information (Vázquez, Diez-Alegría, Hernández-LLoreda, & Nieto, in press).

According to current theories of delusion formation (Bentall, 1994; Bentall *et al.*, 2001; Garety & Freeman, 1999), biases in gathering information may be associated with delusional beliefs. Our results provide only some support for this idea. Although the patients with CP beliefs did not show an overall covariation bias, they nonetheless did show an interesting bias related to the gathering of self- versus other-referent information. Our results reveal a specific bias in the patients with CP beliefs, as this was the only group that overestimated the number of self-relevant sentences in Condition 3. This type of specific estimation bias would imply that the self-schemas of patients with acute paranoid delusions are over-activated when processing threatening information. This is consistent with the hypothesis that self- versus other-schemas are important in the cognitive structures and contents of people with delusional beliefs (Dagnan *et al.*, 2002). Further research should analyse whether this selective bias in gathering information about the self could be related to other well-established cognitive biases (see Garety *et al.*, 2007) or even to some clinical characteristics of paranoid patients associated with the activation of a self-referent mechanism (e.g. delusions of reference).

It is possible that deluded patients' difficulties in providing situational causal explanations and in accounting for situational cues (see Freeman *et al.*, 2004) may be due, at least in part, to failures or difficulties in gathering the available information in an unbiased way (Bentall & Kaney, 1989; Bentall *et al.*, 1995; David & Gibson, 2000; Fear, Sharp, & Healy, 1996).

Our study has some limitations, in that it deals with types of information that can be formulated in terms of discrete, binary elements (e.g. threat vs. protection, eat vs. drink). This type of information, although relevant, is only one of several types of information that human beings process daily (White, 2000). It is also likely that different subtypes of paranoid patients would show different cognitive strategies to gather and combine information (see Freeman & Garety, 2000). Further studies might shed some light on this conceptual diagnostic issue.

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Finally, it should be stressed that the advantages of analysing cognitive processes in delusion, by looking for content-specific rather than general cognitive deficits (Chadwick & Taylor, 2000), is changing the way these disorders are viewed, bringing them closer, both conceptually and methodologically, to research on anxiety or other psychopathologies (Freeman & Garety, 2000; Freeman *et al.*, 2002). This represents the inclusion of psychoses in the fruitful area of cognitive experimental psychopathology.

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## References

Allan, L. G. (1993). Human contingency judgements: Rule based or associative? *Psychological Bulletin*, *114*, 435–448.

Allan, L. G., Siegel, S., & Hannah, S. (2007). The sad truth about depressive realism. *Quarterly Journal of Experimental Psychology*, *60*, 482–495.

Alloy, L. B., & Abramson, L. Y. (1979). Judgements of contingency in depressed and nondepressed students: Sadder but wiser. *Journal of Experimental Psychology*, *108*, 441–485.

American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders* (4th ed. text revision). Washington, DC: APA.

Amin, J. M., & Lovibond, P. F. (1997). Covariation bias and expectancy bias for biological and technological fear-relevant stimuli. *Cognition and Emotion*, *11*, 273–289.

Arkes, H. R., & Harkness, A. R. (1983). Estimates of contingency between two dichotomous variables. *Journal of Experimental Psychology: General*, *112*, 117–135.

Bell, V., Halligan, P. W., & Ellis, H. D. (2006). Explaining delusions: A cognitive perspective. *Trends in Cognitive Science*, *10*, 219–226.

Bentall, R. P. (1994). Cognitive biases and abnormal beliefs: Towards a model of persecutory delusions. In A. David & J. Cutting (Eds.), *The neuropsychology of schizophrenia* (pp. 337–370). London: Erlbaum.

Bentall, R. P. (2003). *Madness explained: Psychosis and human nature*. London: Allen Lane.

Bentall, R. P., Corcoran, R., Howard, R., Blackwood, N., & Kinderman, P. (2001). Persecutory delusions: A review and theoretical integration. *Clinical Psychology Review*, *21*(8), 1143–1192.

Bentall, R. P., & Kaney, S. (1989). Content specific information processing and persecutory delusions: An investigation using the emotional Stroop test. *British Journal of Medical Psychology*, *62*, 355–364.

Bentall, R. P., Kaney, S., & Bowen-Jones, K. (1995). Persecutory delusions and recall of threat-related, depression-related and neutral words. *Cognitive Therapy and Research*, *19*, 331–343.

Bentall, R. P., Kinderman, P., & Kaney, S. (1994). The self, attributional process and abnormal beliefs: Towards a model of persecutory delusions. *Behaviour Research and Therapy*, *32*, 331–341.

Brennan, J. H., & Hemsley, D. R. (1984). Illusory correlations in paranoid and non-paranoid schizophrenia. *British Journal of Clinical Psychology*, *23*, 225–226.

Chadwick, P., & Taylor, G. (2000). Are deluded people unusually prone to illusory correlation? *Behavior Modification*, *24*, 130–141.

Cheng, P. W. (1997). From covariation to causation: A causal power theory. *Psychological Review*, *104*, 367–405.

Dagnan, D., Trower, P., & Gilbert, P. (2002). Measuring vulnerability to threats to self-construction: The self and other scale. *Psychology and Psychotherapy: Theory, Research and Practice*, *75*, 279–293.

David, P. J., & Gibson, M. G. (2000). Recognition of posed and genuine facial expressions of emotion in paranoid and nonparanoid schizophrenia. *Journal of Abnormal Psychology*, *109*, 445–450.

De Jong, P. J., Merckelbach, H., & Arntz, A. (1995). Covariation bias in phobic women: The relationship between a priori expectancy, on-line expectancy, autonomic responding, and a posteriori contingency judgment. *Journal of Abnormal Psychology*, *104*, 55–62.

Diez-Alegría, C., Vázquez, C., Nieto, M., Valiente, C., & Fuentenebro, F. (2006). Personalizing and externalizing biases in deluded and depressed patients: Are attributional biases a stable and specific characteristic of delusions? *British Journal of Clinical Psychology*, *45*, 531–544.

Fear, C. F., Sharp, H., & Healy, D. (1996). Cognitive processes in delusional disorders. *British Journal of Psychiatry*, *168*, 61–67.

Freeman, D., & Garety, P. (2000). Comments on the content of persecutory delusions: Does the definition need clarification? *British Journal of Clinical Psychology*, *39*, 407–414.

Freeman, D., Garety, P. A., Fowler, D., Kuipers, E., Bebbington, P., & Dunn, G. (2004). Why do people with delusions fail to choose more realistic explanations for their experiences? An empirical investigation. *Journal of Consulting and Clinical Psychology*, *72*, 671–680.

Freeman, D., Garety, P. A., Kuipers, E., Fowler, D., & Bebbington, P. (2002). A cognitive model of persecutory delusions. *British Journal of Clinical Psychology*, *41*, 331–347.

Fu, T., Koutstaal, W., Fu, C., Poon, L., & Cleare, A. J. (2005). Depression, confidence, and decision: Evidence against depressive realism. *Journal of Psychopathology and Behavioral Assessment*, *4*, 243–253.

Garety, P., Bebbington, P., Fowler, D., Freeman, D., & Kuipers, E. (2007). Implications for neurobiological research of cognitive models of psychosis: A theoretical paper. *Psychological Medicine*, *5*, 1–15.

Garety, P., & Freeman, D. (1999). Cognitive approaches to delusion: A critical review of theories and evidence. *British Journal of Clinical Psychology*, *38*, 113–154.

Garety, P., Freeman, D., Jolley, S., Dunn, G., Bebbington, P., Fowler, D., *et al.* (2005). Reasoning, emotions, and delusional conviction in psychosis. *Journal of Abnormal Psychology*, *114*, 373–384.

Green, M. J., & Phillips, M. L. (2004). Social threat perception and the evolution of paranoia. *Neurosciences and Biobehavioral Reviews*, *28*, 333–342.

Guy, W. (1976). *ECDEU Assessment manual for psychopharmacology* (DHEW No. ADM 76–338). Rockville, MD: National Institute of Mental Health.

Hamilton, D. L., & Gifford, R. K. (1976). Illusory correlation in interpersonal perception: A cognitive basis of stereotypic judgments. *Journal of Experimental Social Psychology*, *12*, 392–407.

Kaney, S., & Bentall, R. P. (1992). Persecutory delusions and self-serving biases. *Journal of Nervous and Mental Disease*, *180*, 773–780.

Kelly, H. H. (1973). The processes of causal attribution. *American Psychologist*, *28*, 107–128.

Kinderman, P. (1994). Attentional bias, persecutory delusions and the self concept. *British Journal of Medical Psychology*, *67*, 53–66.

Marcus, S., Robins, L. N., & Bucholz, K. (1990). *Quick diagnostic interview schedule 3rd version 1*. St. Louis, MO: Washington University School of Medicine.

Pauli, P., Montoya, P., & Martz, G. E. (1996). Covariation bias in panic-prone individuals. *Journal of Abnormal Psychology*, *105*, 658–662.

Pauli, P., Wiedemann, G., & Montoya, P. (1998). Covariation bias in flight phobics. *Journal of Anxiety Disorders*, *12*, 555–565.

Pury, C., & Mineka, S. (1997). Fear-relevant covariation bias for blood-injury-relevant stimuli and aversive outcomes. *Behaviour Research and Therapy*, *35*, 35–47.

Tomarken, A. J., Sutton, S. K., & Mineka, S. (1995). Fear-relevant illusory correlations: What types of associations promote judgmental bias? *Journal of Abnormal Psychology*, *104*, 312–326.

Vázquez, C. (1987). Judgment of contingency: Cognitive biases in depressed and nondepressed subjects. *Journal of Personality and Social Psychology*, *52*, 419–431.

Vázquez, C., Díez-Alegría, C., Hernández-Lloreda, M. J., & Nieto, M. (in press). Implicit and explicit self-schema in active deluded, remitted deluded, and depressed patients. *Journal of Behavior Therapy and Experimental Psychiatry*.

White, P. A. (2000). Causal attribution and Mill's methods of experimental inquiry: Past, present, and prospect. *British Journal of Social Psychology*, *39*, 429–447.

White, P. A. (2002). Causal judgement from contingency information: Judging interactions between two causal candidates. *Quarterly Journal of Experimental Psychology*, *55A*, 819–838.

Wiedemann, G., Pauli, P., & Dengler, W. (2001). A priori expectancy bias in patients with panic disorder. *Journal of Anxiety Disorders*, *15*, 401–412.

World Health Organization (1992). *SCAN: Schedules for Clinical Assessment in Neuropsychiatry*. Geneva, Switzerland: World Health Organization.

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# Author Queries

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**Q1** Reference Alloy and Abramson (1979) is provided in the list but not cited in the text. Please supply citation details or delete the reference from the reference list.

**Q2** Please update the reference Vázquez, Díez-Alegría, Hernández-Lloreda, and Nieto (in press).