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Analytic cognitive style predicts paranormal explanations of anomalous experiences but not the experiences themselves: Implications for cognitive theories of delusions

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ABSTRACT

Background and objectives: It has been proposed that delusional beliefs are attempts to explain anomalous experiences. Why, then, do anomalous experiences induce delusions in some people but not in others? One possibility is that people with delusions have reasoning biases that result in them failing to reject implausible candidate explanations for anomalous experiences. We examine this hypothesis by studying paranormal interpretations of anomalous experiences.

Methods: We examined whether analytic cognitive style (i.e. the willingness or disposition to critically evaluate outputs from intuitive processing and engage in effortful analytic processing) predicted anomalous experiences and paranormal explanations for these experiences after controlling for demographic variables and cognitive ability.

Results: Analytic cognitive style predicted paranormal explanations for anomalous experiences, but not the anomalous experiences themselves.

Limitations: We did not study clinical delusions. Our attempts to control for cognitive ability may have been inadequate. Our sample was predominantly students.

Conclusions: Limited analytic cognitive style might contribute to the interpretation of anomalous experiences in terms of delusional beliefs.

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1. Introduction

In a series of influential publications (e.g., Maher, 1974, 1988, 1999), Maher defended the hypothesis that delusional beliefs are generated by attempts to explain anomalous experiences. Given that anomalous experiences are widespread in the general population (Bell, Halligan, & Ellis, 2006; Bell, Halligan, Pugh, & Freeman, 2011; Pechey & Halligan, 2011), a topic of considerable debate is why only a small minority of people develop clinical delusions. One possibility is that people with delusions have reasoning biases or deficits that result in them failing to reject implausible candidate explanations for anomalous experiences (Coltheart, Langdon, & McKay, 2011; Stone & Young, 1997). Although this proposal has

considerable promise, no clear consensus has emerged concerning what specific reasoning biases, if any, are involved (Coltheart, Menzies, & Sutton, 2010; Davies & Egan, 2013; Dudley, Taylor, Wickham, & Hutton, 2016; Garety & Freeman, 2013; Maher, 1999; McKay, 2012; McLean, Mattiske, & Balzan, 2016; Ross, McKay, Coltheart, & Langdon, 2015; So, Siu, Wong, Chan, & Garety, 2016).

Recently, it has been proposed that relationships between reasoning biases and delusions can be elucidated using dual process theories of normal reasoning (Aimola Davies & Davies, 2009; Freeman, Evans, & Lister, 2012; Freeman, Lister, & Evans, 2014; Gold & Gold, 2014; Ross et al., 2016; So et al., 2016; Speechley & Ngan, 2008). According to dual process theories, the human mind utilizes two qualitatively different reasoning processes (Evans & Stanovich, 2013; Evans, 2010; Kahneman, 2011; Stanovich, 2011): Type 1 or “intuitive” processes that do not require working memory, are relatively fast, high capacity, automatic, and operate in parallel; and Type 2 or “analytic” processes that require working memory, are relatively slow, low capacity, deliberative, and operate

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serially. An important assumption of most dual process theories is that Type 1 processes provide default responses that can be altered if Type 2 processes intervene (Evans, 2007; Pennycook, Fugelsang, & Koehler, 2015b). Consider, for instance, the “bat and ball problem” (Frederick, 2005): “A bat and a ball cost \$1.10 in total. The bat costs \$1 more than the ball. How much does the ball cost?” On first encountering this problem, an intuitively appealing response comes to mind: 10 cents. However, engaging in effortful analytic thinking reveals that this response is incorrect and the solution is actually 5 cents. Research using the bat and ball problem and other problems with intuitively appealing, yet incorrect, lures supports the hypothesis that people not only vary in terms of cognitive ability, but also in “analytic cognitive style”—their *willingness* or *disposition* to re-examine intuitive outputs from Type 1 processing using effortful Type 2 processing (Stanovich, 2011; Stanovich & West, 2008; Toplak, West, & Stanovich, 2011, 2013). Analytic cognitive style has been implicated in a variety of everyday outcomes from religious belief, to creativity, to smartphone use (Pennycook, Fugelsang, & Koehler, 2015a; Pennycook, Ross, Koehler, & Fugelsang, 2016).

A large body of evidence points to psychotic experiences being on a continuum with psychosis-like phenomena in the general population (Heriot-Maitland & Peters, 2015; Larøi, Raballo, & Bell, 2015; Linscott & van Os, 2013). Of particular relevance to cognitive theories of delusions is evidence that anomalous experiences and delusion-like beliefs tend to co-occur (Bell et al., 2006). Nevertheless, the existence of an association does not demonstrate that anomalous experiences play a causal role in the establishment of delusion-like beliefs, and some evidence suggests that anomalous experiences are not in fact necessary (Bell, Halligan, & Ellis, 2008). It is difficult to rigorously examine the evidence for a causal relationship using existing measure of delusion-like belief because they do not ask frank questions about whether delusion-like beliefs are responses to anomalous perceptual experiences. Consider the Peters et al. Delusions Inventory (PDI; Peters, Joseph, Day, & Garety, 2004; Peters, Joseph, & Garety, 1999), the most widely used measure of delusion-like beliefs suitable for use with non-clinical populations. The PDI was developed by rewording items from a clinical measure of psychosis, with the language about beliefs being “toned down,” typically by adding the expression “as if” to descriptions of clinical delusions (Peters et al., 1999). For example, one item from the PDI asks, “Do you ever feel as if you are being persecuted in some way?” This is not a direct inquiry about belief, so it is not clear how participants interpret the question (David, 2010). Participants might, for example, interpret the question as concerning imaginings or perceptual experiences, rather than beliefs. One of the three follow up questions of the PDI probes beliefs more directly, but no direct inquiries are made about whether the beliefs are grounded in anomalous perceptual experiences.

A potentially fruitful approach for studying the relationship between anomalous experiences and delusion-like beliefs is to ask participants about paranormal beliefs since they can be examined directly with frank questions about belief. There is evidence that delusion-like beliefs and paranormal beliefs share overlapping cognitive foundations (Irwin, Dagnall, & Drinkwater, 2012a, 2012b; Cella, Vellante, & Preti, 2012; Irwin, Drinkwater, & Dagnall, 2014; Lawrence & Peters, 2004), and the distinction between the two categories is somewhat porous, with measures of delusion-like belief and paranormal belief frequently including overlapping items.

Recently, scholars have begun to tease apart the relationship between anomalous experiences and paranormal beliefs in the context of dual process theories of reasoning. A study of anomalous experiences generated in the laboratory found that participants

who were low in analytic cognitive style were more likely to endorse paranormal explanations for these experiences (Bouvet & Bonnefon, 2015). This is an intriguing result. Nevertheless, it is not certain that transient beliefs about anomalous experiences generated in the laboratory adequately model the formation and maintenance of long-standing paranormal beliefs. A survey has been developed that is well-suited to this task: the Survey of Anomalous Experience (SAE), which teases apart anomalous experiences and beliefs about the causes of these experiences (Irwin, Dagnall, & Drinkwater, 2013). For each item in this survey participants are asked to report whether they have ever had a particular anomalous experience (e.g., dreams that subsequently turned out to be accurate). If they indicate that they have had the experience then they are asked to choose between a paranormal explanation for that experience (e.g., telepathy or E.S.P.) and a naturalistic explanation (e.g., coincidence) as being the most probable. A study using the SAE found that a self-report measure of “intuitive-experiential thinking style” (roughly, a propensity to engage in Type 1 processing) predicted both anomalous experiences and paranormal explanations for these experiences, while “rational thinking style” (roughly, a propensity to engage in Type 2 processing)¹ predicted neither (Irwin & Wilson, 2013). This result ought to be treated with some degree of caution because a self-report measure was used to index cognitive style, and the extent to which people have introspective access to their reasoning style is uncertain (Hodgkinson & Sadler-Smith, 2014). Indeed, due to concerns about self-report measures of thinking style, contemporary research on analytic cognitive style and its everyday consequences tends to focus on performance-based measures (Pennycook et al., 2015a, 2016).

In the present study, we investigated whether performance-based measures of analytic cognitive style predict paranormal explanations for anomalous experiences indexed using the SAE. Influential two-factor theories of delusions argue that reasoning biases play a role in the interpretation of anomalous experiences, but not in the generation of anomalous experiences themselves (Coltheart et al., 2011). For this reason we hypothesized that analytic cognitive style would predict paranormal explanations for anomalous experiences more strongly than it would predict the anomalous experiences themselves. In addition, we examined the relationship between analytic cognitive style and the PDI. Because the PDI does not clearly tease apart experience and belief (David, 2010), we hypothesized that analytic cognitive style would predict paranormal explanations for anomalous experiences indexed using the SAE more strongly than it would predict PDI scores.

2. Methods

2.1. Participants

Participants were recruited via the Online Recruitment System for Economic Experiments (ORSEE; Greiner, 2015) of the Laboratory for Decision Making & Economic Research (EconLab) at Royal Holloway, University of London. Approximately 99% of people in this participant pool are students, and more than 90% of the students are undergraduates who are majoring in a diverse range of disciplines. Data were collected for the present study and an unrelated study during the same testing sessions, and participants received a base payment of £4 for participation in both studies (which could vary depending on outcomes in the other study). Sessions lasted approximately 45 min.

¹ The cognitive style questionnaire used in this study is based on Cognitive-Experiential Self-Theory (Pacini & Epstein, 1999), which is somewhat different to the dual process theories that we focus on here.

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