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Exploring the perceptual biases associated with believing and disbelieving in paranormal phenomena

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ABSTRACT

Ninety-five participants (32 believers, 30 disbelievers and 33 neutral believers in the paranormal) participated in an experiment comprising one visual and one auditory block of trials. Each block included one ESP, two degraded stimuli and one random trial. Each trial included 8 screens or epochs of "random" noise. Participants entered a guess if they perceived a stimulus or changed their mind about stimulus identity, rated guesses for confidence and made notes during each trial. Believers and disbelievers did not differ in the number of guesses made, or in their ability to detect degraded stimuli. Believers displayed a trend toward making faster guesses for some conditions and significantly higher confidence and more misidentifications concerning guesses than disbelievers. Guesses, misidentifications and faster response latencies were generally more likely in the visual than auditory conditions. ESP performance was no different from chance. ESP performance did not differ between belief groups or sensory modalities.

1. Introduction

> "meaning in randomness, and, more particularly, attributing mental states where none are indicated, may be important factors in the formation of paranormal and delusional beliefs" (Fyfe, Willaims, Mason, & Pickup, 2008).

One of the dominant frameworks for understanding paranormal cognition is that believers in the paranormal and those prone to experiencing paranormal/anomalous phenomena are biased toward the detection of signals or patterns in randomness *where none are there*. This is known as apophenia or the tendency to make a Type I error (*c.f.,* Brugger, 2001), which results in seeing things that are not actually there (hallucinations), making connections between random events and a proneness to find meaning and significance in random events. This translates to real world examples of subjective paranormal experiences occurring against a random backdrop; for example, reading the tea leaves to predict the future, scrying, crystal gazing, seeing ghosts in the shadows of an old room and hearing electronic voice phenomena amid static/white noise. This also refers to the wider process of perceiving meaningful coincidences between an event in the real world and some aspect of one's mental world (e.g., Houran, Wiseman, & Thalbourne, 2002), or between one's mental world and the mental world of another individual or between more than one aspect of the external world which are labeled as having a psychic explanation.

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These biases are associated with an increased tendency toward making loose cognitive associations (Gianotti, Mohr, Pizzagalli, & Brugger, 2001). This is underpinned by reduced neural and cognitive inhibition which results in rapid spreading activation within the person's semantic network, which is more prevalent in the activity of the right cerebral hemisphere. In fact, belief in the paranormal relates to greater fluctuating asymmetry in the body (e.g., in terms of digit length) which may relate to variability in other asymmetries (including cerebral lateralisation) (Schulter & Papousek, 2008). Other research has found that paranormal belief is associated with anomalies in brain lateralisation and cognitive functioning, such that there is a right hemispheric bias in attention and cognitive processing (e.g., Brugger, 2001).

The tendency to associate or think apophenically appears to be distributed on a continuum that is synonymous with positive schizotypy (Brugger, 2001) and may underpin creative and paranormal thinking – the tendency to display paranormal beliefs and report experiences (Farias, Claridge, & Lalljee, 2005; Fyfe et al., 2008; Gianotti et al., 2001). Creativity is generally noted to be beneficial, while researchers are mixed in their views of paranormal belief. Some theorists claim that paranormal beliefs are maladaptive and evidential of a watered down pathology (Gianotti et al., 2001). Other work suggests that, instead, there is evidence for the existence of a healthy *and* less healthy anomaly-prone person (Goulding, 2004, 2005) and that, in fact, anomaly-proneness is neutral in terms of mental health and should be considered in conjunction with other variables which may play a role in their pathologization (*c.f.* Simmonds-Moore, 2012). Interestingly, apophenic tendencies are often elicited in perceptually ambiguous or stressful situations (Beitman, 2009). It has been suggested that they might be elicited when there is a high uncertainty [of success] (Malinowski, 1954 cited in Gianotti et al., 2001) and reflect a cognitive style that occurs when it is not possible to think rationally. This may also occur in mild altered states such as hypnagogia; accordingly, it might be better to consider apophenia as both state and trait, with anomaly-prone people more likely to experience these biases (Simmonds-Moore, 2012). Most research has focused on those scoring at one end of the apophenia continuum; the strong believer, with little work exploring the psychology of the strong disbeliever (Kennedy, 2003). The systematic exploration of the biases associated with so-called Type II error would significantly add to this literature.

1.1. Prior studies exploring apophenia and anomaly-proneness

Several experimental studies have explored pattern detection among anomaly-prone people. Anomaly-prone people are more likely to report a meaningful pattern when presented with random noise (Jakes & Hemsley, 1986) for both visual (Feelgood & Rantzen, 1994; Jolley, Jones, & Hemsley, 1999; Krummenacher, Mohr, Haker, & Brugger, 2010) and auditory senses (Young, Bentall, Slade, & Dewey, 1987) and perceive causal relationships between unrelated events (Brugger & Graves, 1997; Fyfe et al., 2008). Where a stimulus is actually presented, more *false alarms* occur in addition to *hits* (Bentall & Slade, 1985). Decisions that a signal is present are accompanied by greater confidence, irrespective of accuracy (Nuchpongsai, Arakaki, Langman, & Ogura, 1999). Interestingly, people are also prone to actually experiencing false perceptual experiences in addition to exhibiting a loose response criterion (Tsakanikos & Reed, 2005).

When presented with degraded visual stimuli which gradually become clear, anomaly-prone people report complex sensations (Williams, 1997) and generate more guesses which turn out to be both correct and incorrect (Blackmore & Moore, 1994; Rogers & Prophet, 2008; Williams, 1997). In Blackmore and Moore's study, participants completed a paranormal belief questionnaire and were then presented with twelve sets of 4 black and white pictures of everyday objects (e.g., horse). These included the original picture with no noise added and 3 identical pictures with increasing levels of noise added (corresponding to 7.8%, 19.6% and 27.5% of the total dynamic range; 0–32). The participants were exposed to the most noisy image first, followed by increasingly clearer (less noisy) images and were asked whether they could recognize and identify the stimulus after each successive presentation. Believers were more likely to say they could identify something when presented with very noisy stimuli. In this study, there was also a non-significant trend toward greater accuracy (in target identification) among disbelievers, suggesting that believers may be more prone toward misidentifications (non paranormal events may be mislabeled as paranormal).

In some studies, it was also found that rapid decisions about the identity of the target were made at the expense of accuracy (see Rogers & Prophet, 2008) which might persist when presented with clearer perceptual information (Blackmore & Moore, 1994; Williams, 1997). Blackmore and Moore noted that some of these tendencies may be attributed to expectation effects associated with perceiving the study as a Rorschach, or noticing that the same image gradually became more clear. A similar tendency was also observed in a semantic study (a Bridge the Associative Gap BAG, task, Gianotti et al., 2001) where participants were presented with pairs of semantically unrelated (e.g., umbrella and theater) and remotely related words (e.g., cheese and cat) and asked to produce a word which described the association between them. Response latencies to produce the word were measured alongside an assessment of the originality of the associations made. Although latencies were not significantly different, believers responded slightly faster than disbelievers. In addition, believers demonstrated more originality in their responses, and a general tendency to report the presence of a relationship between two unrelated words (Gianotti et al., 2001). All of the aforementioned findings might be considered in the light of signal detection theory. Such studies ask a person to report when they perceive a given stimulus (or "signal"), and participants can either respond to say that a stimulus is present or absent and can be correct (a hit or correct rejection) or incorrect (a false alarm or miss). In the Gianotti example, the relationship between two unrelated words corresponds to a "signal". Signal detection theory discusses two main factors which are influential in determining a person's experience of what he or she perceives. The first is a cognitive bias known as response bias, while the second is sensitivity or d′ (how well one can physically sense a