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Short Communication

Paranormal believers are more prone to illusory agency detection than skeptics

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ABSTRACT

It has been hypothesized that illusory agency detection is at the basis of belief in supernatural agents and paranormal beliefs. In the present study a biological motion perception task was used to study illusory agency detection in a group of skeptics and a group of paranormal believers. Participants were required to detect the presence or absence of a human agent in a point-light display. It was found that paranormal believers had a lower perceptual sensitivity than skeptics, which was due to a response bias to 'yes' for stimuli in which no agent was present. The relation between paranormal beliefs and illusory agency detection held only for stimuli with low to intermediate ambiguity, but for stimuli with a high number of visual distractors responses of believers and skeptics were at the same level. Furthermore, it was found that illusory agency detection was unrelated to traditional religious belief and belief in witchcraft, whereas paranormal beliefs (i.e. Psi, spiritualism, precognition, superstition) were strongly related to illusory agency detection. These findings qualify the relation between illusory pattern perception and supernatural and paranormal beliefs and suggest that paranormal beliefs are strongly related to agency detection biases.

1. Introduction

Imagine yourself walking on your own through a dark forest. Each and every movement that you perceive will result in the feeling that another person or animal is present. From an evolutionary point of view, incorrectly assuming the presence of another agent while there is none (i.e. a false positive) is associated with only little costs, whereas the false belief that no other agent is present while in fact there is one (i.e. a false negative) can cost one's life. Accordingly, it has been suggested that evolution has favored the selection of a hyper-active agency detection device (HADD) and that our perceptual systems are biased towards detecting the presence of patterns and other agents, such as animals or humans in the environment (Barrett, 2000).

The perceptual mechanisms to detect patterns and agency may in turn be at the basis of belief in supernatural agents and belief in paranormal phenomena (Barrett & Lanman, 2008). The perceived presence of other agents in ambiguous situations and the anthropomorphic interpretation of ambiguous information may reinforce people's belief in the continuous presence of external agents, such as ghosts, spirits or gods. Examples of anthropomorphism abound: people have reported seeing the face of Jesus in clouds, buildings and even on a cheese sandwich. Experimental studies on illusory agency perception indicate that the tendency to detect meaningful patterns in random noise is quite high, with face detection rates above 40% (Rieth, Lee, Lui, Tian, & Huber, 2011) and with substantial individual variation in the tendency to report illusory faces (Gosselin & Schyns, 2003).

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Several studies have shown that paranormal believers are indeed more biased towards detecting faces in scrambled pictures or in artifact pictures than skeptics (Krummenacher, Mohr, Haker, & Brugger, 2010; Riekki, Lindeman, Aleneff, Halme, & Nuortimo, 2013). This finding fits with other studies indicating that paranormal believers compared to skeptics tend to perceive more meaningful patterns in ambiguous information (Blackmore & Moore, 1993; Brugger et al., 1993; Gianotti, Mohr, Pizzagalli, Lehmann, & Brugger, 2001). However, three important issues regarding the relation between paranormal beliefs and pattern perception remain to be elucidated.

Many studies have used static pictures and focused on face perception and the detection of meaningful patterns in meaningless noise (Krummenacher et al., 2010; Riekki et al., 2013). However, from an evolutionary point of view detecting agency from movement related information (e.g. does a movement signal the presence of another animal?) is at least equally important for survival as pattern recognition. A well-established experimental paradigm to study the perception of agency is the use of point-light-walker displays, in which participants are required to detect the presence of a walking human in a cloud of moving dots (e.g. Troje & Westhoff, 2006). Accordingly, in the present study the relation between belief in parapsychology and agency detection was investigated, by using point-light stimuli.

A related advantage of using point-light stimuli is that it allows determining the boundary conditions for illusory agency detection to occur, by varying the amount of randomly moving dots. Previous studies have used scrambled or distorted pictures to measure pattern perception in believers (Krummenacher et al., 2010; Riekki et al., 2013). In the present study the amount of ambiguity in the stimulus could be systematically manipulated, by including stimuli with both a low and a high number of visual distractors. In this way it could be investigated whether illusory agency detection occurs only for stimuli that are intermediately ambiguous (cf. Blackmore & Moore, 1993) or irrespectively of the level of stimulus ambiguity.

Finally, it remains to be determined which aspects of parapsychological belief are relevant for illusory agency detection. The 'paranormal' is a fuzzy concept that involves different aspects, such as belief in Psi, superstition, belief in spirits and magical thinking among other things (see: Lindeman & Svedholm, 2012, for review). As described above, the notion of the HADD predicts that illusory agency detection should be primarily related to the belief in supernatural agents (Barrett & Lanman, 2008). In the present study the revised paranormal belief scale was used (Tobacyk, 2004) and the relation between the different subscales (e.g. measuring traditional religious belief, belief in Psi, spiritualism, etc.) and illusory agency detection was determined.

2. Method

2.1. Participants

A total of 67 (48 women, mean age = 28.3 years) healthy participants with normal or corrected-to-normal vision were included in this study. 38 participants were recruited from the student population of the University of Amsterdam and they participated for course credits or for a financial remuneration. The other 29 participants were recruited at a paranormal fair (i.e. Paraview, Amsterdam, the Netherlands; www.paraview.nl) and were offered a financial remuneration for participation.

2.2. Stimuli

The point-light stimuli were generated using the software package PointLightLab (http://www.pointlightlab.com/). The target stimulus consisted of an animated-point-set of 12 points, representing a human avatar walking on a treadmill at a pace of about 1 step cycle per 2 s. Animated-noise-point populations were generated by using the motion drawn from the same animation source and by randomly scrambling the location of each individual dot across the display. In 50% of the stimuli an unscrambled walker was presented and in 50% of the stimuli a scrambled walker was presented. The walker could appear at 5 different horizontal locations (i.e. $-10°$, $-5°$, $0°$, $5°$ and $10°$ with respect to the center of the screen) and could be walking in a leftward- or rightward direction. 6 different levels of animated-noise-points were added to each stimulus (12, 24, 48, 96, 192 and 384 noise points). Thus in total 120 different stimuli were used in the experiment, according to the following factors: Walker (Unscrambled vs. Srambled), Location ($-10°$, $-5°$, $0°$, $5°$ and $10°$), Direction (Left vs. Right) and Noise (12, 24, 48, 96, 192, 384). Each stimulus was presented once and accordingly for each noise level there were 10 trials in which a signal was present (unscrambled walker) and 10 trials in which no signal was present (scrambled walker). Stimuli were presented against a black background at a resolution of 1024×768 pixels and each stimulus was presented for 2 s.

2.3. Experimental setup and procedure

Participants were instructed that they were going to see short movies in which a human walking figure could be present or not. In order to establish that all participants were able to correctly identify the walker, before the start of the experiment an example movie of an unscrambled walker was shown, until participants indicated that they recognized the walking human figure. During the experiment each movie was presented for 2 s after which the participant was required to indicate whether he or she believed that a walking human figure was present or not, by pressing the left or the right button on the computer keyboard (mapping of response buttons was counterbalanced across participants). In the instructions it was emphasized that in case of uncertainty, participants should trust their first impression of the stimulus and not think too long.