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Paranormal belief, thinking style preference and susceptibility to confirmatory conjunction errors

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ABSTRACT

This study examines the extent to which belief in extrasensory perception (ESP), psychokinesis (PK) or life after death (LAD), plus need for cognition (NFC) and faith in intuition (FI), predict the generation of confirmatory conjunction errors. An opportunity sample ($n = 261$) completed sixteen conjunction problems manipulated across a 2 event type (paranormal vs. non-paranormal) × 2 outcome type (confirmatory vs. disconfirmatory) within subjects design. Three Generalised Linear Mixed Models – one per paranormal belief type – were performed. With respondent gender and age controlled for, ESP, PK and LAD beliefs were all associated with the making (vs. non-making) of conjunction errors both generally and specifically for confirmatory conjunctive outcomes. Event type had no impact. Individuals high in NFC were less likely to commit the fallacy. The role thinking style plays in shaping paranormal believers' susceptibility to confirmatory conjunction biases is discussed. Methodological issues and future research ideas are also considered.

1. Introduction

Belief in non-theistic paranormal phenomena has been linked to various cognitive "deficits" including errors of probabilistic reasoning (Rogers, 2015; Wiseman & Watt, 2006; see also French & Stone, 2014; Irwin, 2009). One such error is the conjunction fallacy – the tendency to misjudge two independent yet co-occurring ('conjunctive') events as being more likely than either constituent event alone (Tversky & Kahneman, 1983)[1] – with several studies suggesting paranormal believers make more conjunction errors (CEs) than non-believers (Brotherton & French, 2014; Dagnall, Drinkwater, Denovan, Parker & Rowley, 2016; Prike, Arnold & Williamson, 2017; Rogers, Davis, & Fisk, 2009; Rogers, Fisk & Wiltshire, 2011; Rogers, Fisk & Lowrie, 2016; 2017). However, significant paranormal belief × CE associations have not always been found (Dagnall, Denovan, Drinkwater, Parker, & Clough, 2016; Dagnall, Drinkwater, Parker & Rowley, 2014; Dagnall, Parker & Munley, 2007) with some researchers claiming this is explained by

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[1] In their original "Linda problem" Tversky and Kahneman (1983) describe the fictitious Linda as being "31 years old, single, outspoken, and very bright, who majored in philosophy and who, as a student, had been deeply concerned with issues of discrimination and social justice and who had participated in antinuclear demonstrations". Participants were asked to rank the likelihood of eight eventualities including that "Linda is an active feminist", that "Linda is a bank teller" and that "Linda is a bank teller *and* an active feminist (italics added). The first two statements serve as constituent events with the latter the conjunctive term. Accordingly, a conjunction error is made whenever the conjunctive term is judged more likely than one or both constituent(s) alone. Tversky and Kahneman found over 80% of participants succumbed to the fallacy despite this being normatively impossible. Subsequent research confirms this is a robust effect (see Fisk, 2017).

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believers' broader tendency to misperceive randomness as measured by their judgment of, say, coin toss sequences (e.g. which of HHHHHH, HHHTTT or HTHHTT is most likely to occur) (e.g., Dagnall et al., 2014; 2017). Other researchers claim individual differences in believers' preference for intuitive-experiential over rational-analytic thinking offers at least a partial explanation for their heightened CE proneness (e.g., Prike et al., 2017). Another factor that seems relevant to believers' fallacy proneness is whether the second constituent confirms *or* disconfirms the first (Rogers et al., 2016). Relevant studies are now discussed.

1.1. Paranormal belief & confirmatory conjunction errors

In the aforementioned study, Rogers et al. (2016) examined the extent to which believers' tendency to make CEs differed for confirmatory over disconfirmatory conjunctions, reasoning that because believers often present strong pro-paranormal confirmation biases (e.g., Russell & Jones, 1980; Wiseman, Greening & Smith, 2003), they would make more errors for paranormal confirming (belief-congruent) over paranormal disconfirming (belief-incongruent) as well as non-paranormal (belief-neutral) conjunctions.[2] Sceptics, in contrast, would reject the paranormal premise and be less prone to paranormal confirming conjunctive biases. This argument drew on Tentori's *Confirmation-Theoretical Framework* (CTF; Tentori, Crupi, & Russo, 2013) whereby CE generation is said to be shaped, not by constituent probability estimates (i.e. subjective judgements of each event's individual likelihood) as originally proposed by Tversky and Kahneman (1983), but instead by the degree to which background information increases the perceived credibility (i.e. "inductively confirms") the second constituent. Several possibilities exist. If believers and non-believers perceive background evidence as being equally credible, they will be equally prone to making CEs for non-paranormal events regardless of outcome type.[3] Alternatively, if believers perceive background evidence as being more credible in general they will make more CEs for confirmatory over disconfirmatory CEs (relative to non-believers) regardless of event type. Findings from Rogers et al., (2009; 2011) suggest this is the case. Finally, if believers perceive background evidence as being more credible in relation to paranormal events only, they will make more CEs for paranormal confirming over paranormal disconfirming conjunctions.

To formally test these ideas, Rogers et al. (2016) modified paranormal and non-paranormal conjunctive scenarios originally employed in Rogers et al. (2011) such that now, the second constituent either confirmed *or* disconfirmed the first. For example, background evidence in the paranormal [non-paranormal] version of Rogers et al.'s (2016) revised "motorway" scenario read as follows:

> Erica is a 37 year old businesswoman who lives near Manchester. In her spare time Erica attends psychic awareness [car maintenance] classes where she is currently learning how to use precognition to 'see into the future' [keep her car 'safe and roadworthy']. Erica has arranged to meet a new client in London some 250 miles away.

Respondents were then asked to rate the probability ("chances in 100") that each of three statements – the two constituent events plus their conjunction – would occur. Here, the first constituent event [statement (a)] was identical in all four (2 event type × 2 outcome type) experimental conditions. The second constituent [statement (b)] – and by extension, the conjunctive term [statement (c)] – was manipulated to reflect one of two outcome types, such that it either confirmed or disconfirmed the first constituent event. For example, respondents who read the confirmatory version of the (revised) motorway case were asked to rate the likelihood that:

(a) Erica feels uneasy driving her car for such a long distance.
(b) Whilst on the motorway, Erica's car breaks down.
(c) Erica feels uneasy driving her car for such a long distance and

whilst on the motorway, Erica's car breaks down. Here, the first constituent describing Erica's sense of uneasiness is confirmed by the second which depicts her car as breaking down on the motorway. Respondents who read the disconfirmatory version were instead asked to rate these three statements:

(a) Erica feels uneasy driving her car for such a long distance.
(b) Whilst on the motorway, Erica's car works perfectly.
(c) Erica feels uneasy driving her car for such a long distance and

whilst on the motorway, Erica's car works perfectly. Here, the first constituent describing Erica's sense of uneasiness is disconfirmed by the second which depicts her car as working perfectly and thus *not* breaking down. In all cases, a conjunction error was made whenever the conjunctive term [statement (c)] was deemed more likely than either or both the constituent event(s) alone (cf. Tversky & Kahneman, 1983).

Rogers et al. (2016) found stronger paranormal believers made more CEs than weaker believers, with this the case regardless of whether events depicted an ostensibly paranormal or a clearly non-paranormal event. This suggests stronger paranormal believers are more prone to context free conjunctive biases further supporting the generality of their fallacy proneness (Rogers et al., 2009; 2011).

As hypothesised, stronger believers also made more CEs when the second constituent confirmed rather than disconfirmed the first,

[2] In the present context, belief neutral conjunctions are those that have no obvious relevance to ostensibly paranormal phenomena. By comparison, belief *in*congruent conjunctions are those that actively disconfirm the veracity of alleged paranormal events.

[3] By definition, non-believers should dismiss the credibility of any background evidence suggestive of a genuine paranormal event.