



## LJMU Research Online

Drinkwater, KG, Dagnall, N, Denovan, A and Williams, C

**Differences in Cognitive-Perceptual Factors Arising From Variations in Self-Professed Paranormal Ability**

<http://researchonline.ljmu.ac.uk/id/eprint/23549/>

### Article

**Citation** (please note it is advisable to refer to the publisher's version if you intend to cite from this work)

**Drinkwater, KG, Dagnall, N, Denovan, A and Williams, C (2021) Differences in Cognitive-Perceptual Factors Arising From Variations in Self-Professed Paranormal Ability. *Frontiers in Psychology*, 12.**

LJMU has developed **LJMU Research Online** for users to access the research output of the University more effectively. Copyright © and Moral Rights for the papers on this site are retained by the individual authors and/or other copyright owners. Users may download and/or print one copy of any article(s) in LJMU Research Online to facilitate their private study or for non-commercial research. You may not engage in further distribution of the material or use it for any profit-making activities or any commercial gain.

The version presented here may differ from the published version or from the version of the record. Please see the repository URL above for details on accessing the published version and note that access may require a subscription.

For more information please contact [researchonline@ljmu.ac.uk](mailto:researchonline@ljmu.ac.uk)

<http://researchonline.ljmu.ac.uk/>



# Differences in Cognitive-Perceptual Factors Arising From Variations in Self-Professed Paranormal Ability

Kenneth Graham Drinkwater\*, Neil Dagnall, Andrew Denovan and Christopher Williams

Department of Psychology, Manchester Metropolitan University, Manchester, United Kingdom

## OPEN ACCESS

### Edited by:

Antonino Raffone,  
Sapienza University of Rome, Italy

### Reviewed by:

Alejandro Parra,  
Instituto de Psicología Paranormal,  
Buenos Aires, Argentina  
Malcolm Schofield,  
University of Derby, United Kingdom

### \*Correspondence:

Kenneth Graham Drinkwater  
k.drinkwater@mmu.ac.uk

### Specialty section:

This article was submitted to  
Consciousness Research,  
a section of the journal  
Frontiers in Psychology

**Received:** 16 March 2021

**Accepted:** 18 May 2021

**Published:** 10 June 2021

### Citation:

Drinkwater KG, Dagnall N, Denovan A  
and Williams C (2021) Differences in  
Cognitive-Perceptual Factors Arising  
From Variations in Self-Professed  
Paranormal Ability.  
*Front. Psychol.* 12:681520.  
doi: 10.3389/fpsyg.2021.681520

This study examined whether scores on indices related to subclinical delusion formation and thinking style varied as a function of level of self-professed paranormal ability. To assess this, the researchers compared three groups differing in personal ascription of paranormal powers: no ability, self-professed ability, and paranormal practitioners (i.e., Mediums, Psychics, Spiritualists, and Fortune-Tellers). Paranormal practitioners (compared with no and self-professed ability conditions) were expected to score higher on paranormal belief, proneness to reality testing deficits, emotion-based reasoning, and lower on belief in science. Comparable differences were predicted between the self-professed and no ability conditions. A sample of 917 respondents (329 males, 588 females) completed self-report measures online. Multivariate analysis of variance (MANOVA) revealed an overall main effect. Further investigation, using discriminant descriptive analysis, indicated that paranormal practitioners scored higher on proneness to reality testing deficits, paranormal belief, and emotion-based reasoning. Belief in science did not meaningfully contribute to the discriminant function. Overall, results were consistent with previous academic work in the domains of paranormal belief and experience, which has reported that paranormal-related cognitions and perceptions are associated with factors related to subclinical delusion formation (i.e., emotion-based/intuitive thinking).

**Keywords:** delusion formation, thinking style, paranormal ability and belief, reality testing, emotion-based reasoning, belief in science

## INTRODUCTION

Surveys report that belief in the paranormal endures within modern Western societies (Ipsos MORI, 1998, 2003; Newport and Strausberg, 2001; Moore, 2005). They note also that people frequently disclose paranormal experiences (Dagnall et al., 2016). This observation aligns closely with the classic work of significant parapsychological researchers such as Wilhelm Heinrich Carl Tenhaeff and Sybo Schouten (e.g., Tenhaeff, 1972; Schouten, 1994), who observed that paranormal experiences were an important feature of existence meriting empirical investigation. Despite interest in belief and experience, relatively few academic studies have examined psychological factors associated with self-professed paranormal ability.

Those that have, note that ascription of ability is linked to certain cognitive-perceptual characteristics. For instance, Krippner et al. (1998) examined the psychological profiles of several participants who had undertaken consciousness training delivered by Ramtha, a discarnate entity. Psychological tests indicated that participant profiles were characterised by thin boundaries and high levels of absorption (i.e., susceptibility to immersive and self-altering experiences) and dissociation (i.e., temporary inhibition of threatening perceptions/memories). Typically, individuals with thin boundaries do not repress or isolate uncomfortable material. These elements manifest as creativity and the tendency to get lost in fantasy. Relatedly, Parra and Carlos Argibay (2012) found that alleged psychics (vs. controls) scored higher on dissociation, absorption, and fantasy proneness.

Under reporting of self-professed supernatural powers is counter-intuitive because prominent paranormal measurement instruments have historically acknowledged the importance of ability alongside belief and experience. For instance, the Australian Sheep Goat Scale (Thalbourne and Delin, 1993), which is one of the most used instruments to assess belief in the paranormal, contains items indexing belief (e.g., “I believe in the existence of ESP”), experience (e.g., “I believe I have had personal experience of ESP”), and ability (e.g., I believe I am psychic). Similarly, the Anomalous Experiences Inventory (AEI) comprises subscales assessing Anomalous/Paranormal Experiences, Beliefs, Fear, and Ability (Gallagher et al., 1994).

The inclusion of self-professed ability demonstrates that it is often conceptualised as a significant facet of paranormality (i.e., the state of being paranormal). Although, it is important to note that while ability is related to belief and experience, it also represents a discrete construct. This is illustrated by consideration of zero-order correlations between AEI subscales, which reveal a series of medium-large associations. Indeed, Ability shares only 15% variance with Belief and 38% with Experiences. Ability also relates differently to variables such as neuroticism and general sensation seeking. In both cases, Experiences and Beliefs correlate positively, whereas there is no relationship with Ability (Gallagher et al., 1994).

Despite widescale belief in the paranormal and relatively frequent reporting of concomitant experiences, there remains only limited, highly contested empirical evidence to support the existence of supernatural phenomena (Bressan, 2002; Dagnall et al., 2007). Acknowledging this, from a rational, scientific standpoint, critics, and sceptics contend that the designation of paranormal ability arises from mundane conventional processes. From a psychological perspective, a prevailing explanation for self-professed psychic ability is faulty attribution. Specifically, the misattribution of event outcome (s) to mysterious forces, powers, and entities (Wiseman and Watt, 2006).

This explanation is consistent with Irwin et al. (2013), who posit that personal validation of paranormality arises from two distinct but connected stages. Stage one involves conscious awareness of an inexplicable anomaly (unusual occurrence), in the form of a stimulus or event for which there is no apparent, rational explanation. Stage two requires the percipient to assign paranormal causation to the occurrence (Lange et al., 2019).

Thus, the reification of paranormal ability results from personal interpretation, and the desire to comprehend anomalous events and incidences. Once established, the attributional framework structures ensuing happenings and stimuli. This aligns with the notion of worldview, which is a set of high order beliefs that influence appraisal of existence and reality (Zusne and Jones, 1982, 1989; Koltko-Rivera, 2004; Dagnall et al., 2015). Accordingly, belief in paranormal ability facilitates the search for outcomes and evidence that validate the supposition of “ability” and negate inconsistent information. Consequently, paranormal believers tend to demonstrate susceptibility to confirmation bias (Drinkwater et al., 2012; Irwin et al., 2012b).

The notion that self-professed psychic ability in the general population arises from active misinterpretation of causation, is consistent with the notion that uncorroborated paranormal inferences represent sub-clinical delusions (e.g., van Os, 2003; Unterrassner et al., 2017). Hence self-professed psychic ability in the absence of empirical support, is located on the same continuum as full-blown psychosis, and accordingly manifests similar features such as odd beliefs/behaviours and anomalous perceptions (Unterrassner et al., 2017).

Furthermore, a defining feature of delusions is that they are formed without due consideration of alternatives and lack rigorous, rational scrutiny of the evidence from which they derive (Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, DSM-5; American Psychiatric Association, 2013). Corresponding with this definition a key characteristic of delusional thinking is inadequate reality testing. Thus, delusions are rigid beliefs that persist in the face of contradictory evidence (Irwin et al., 2012a). Noting this, researchers have explained belief in the paranormal in terms of reality testing failures (Irwin, 2003, 2004). These are best defined as deficiencies in the capacity to differentiate self from non-self, intrapsychic from external stimuli, and to maintain empathy with ordinary social criteria of reality (Kernberg, 1996).

Irwin et al. (2012b) contend that another important feature of delusions is that they are persistent beliefs endorsed on their emotional (rather than) rational appeal. This concurs with the clinically informed notion of delusions as beliefs arising from faulty interpretation of anomalous experiences (Garety and Freeman, 1999), and/or inadequate evidence (Coltheart et al., 2010; Irwin et al., 2012b). The relationship between emotion-based reasoning and belief in the paranormal is well-established (Sappington, 1990; Irwin et al., 2012a).

Proneness to reality testing deficits and inclination to emotion-based reasoning are also principal characteristics of intuitive-experiential thinking (Denovan et al., 2017). This thinking style features in various dual processing models. Although these differ, they agree on the concept that thinking/information processing is best conceptualised as two fundamentally different modes. A prominent dual processing model that researchers have applied to the study of paranormal belief and experience is cognitive-experiential self-theory (CEST; Epstein et al., 1996). Congruent with subclinical delusions the experiential system is self-evidently valid; based on associationistic connections; automatic, affective oriented; mediated by experience; resistant to change; holistic;

encodes reality in concrete images, metaphors, and narratives. In contrast, the rational system is driven by external, objective evidence; based on logical connections; intentional; reason oriented; mediated by conscious appraisal of events; analytical; and encodes reality in abstract symbols, words, and numbers.

Accordingly, these two systems are associated with different preferential processing styles. Individuals high in experiential thinking place an emphasis on intuitive (subjective based) data, whereas greater levels of rational thinking manifest as a drive for analytical (objective based) evidence. Consistent with the dual processing framework, studies have robustly demonstrated that intuitive processing is positively correlated with paranormal belief (e.g., Irwin and Young, 2002; Aarnio and Lindeman, 2005; Dagnall et al., 2017) and experience (Drinkwater et al., 2020). Although some researchers report that increased critical thinking reduces belief in the paranormal (Barberia et al., 2018; Wilson, 2018), others have found no effects (Irwin et al., 2013). Noting this, instead of a measure of critical thinking, the present paper included the Belief in Science Scale (Farias et al., 2013) as an index of predilection for objective (vs. subjective) evidence.

## THE PRESENT STUDY

Drawing on preceding research, this study investigated whether scores on indices related to subclinical delusion formation and thinking style varied as a function of level of self-professed paranormal ability. To ensure that the full range of ability was considered, paranormal practitioners (i.e., Mediums, Psychics, Spiritualists, and Fortune-Tellers) were compared with those declaring ability, and respondents with no stated supernatural facilities. The focus on perceived ability and graded comparisons between levels of self-professed ability (practitioners vs. personally endorsed supernatural powers) signified a novel and innovative approach. It was hypothesized that paranormal practitioners would score higher on variables associated with delusional and intuitive thinking (i.e., paranormal belief, proneness to reality testing, and emotion-based reasoning) and lower on an index of analytical-rational (i.e., belief in science) than the ability group, who in turn should differ similarly to the no ability condition.

Consideration of paranormal practitioners was important because they are typically sincere in their beliefs. Particularly, they represent a group of people who not only believe they possess paranormal abilities, but also consider themselves able to produce their psychic powers in a systematic, focused manner. This active approach generally contrasts with people professing ability, as they generally view their abilities as less defined and more spontaneous. These factors suggest that psychic practitioners will demonstrate higher levels of confidence in their abilities than those who merely profess supernatural powers.

## METHOD

### Respondents

The sample consisted of 917 respondents (Mean age,  $M = 33.25$  years,  $SD = 14.75$ , range 18–83. There were 329 males (36%),  $M = 37.34$  years,  $SD = 15.55$ , range 18–82; and 588

females (64%),  $M = 30.97$  years,  $SD = 13.78$ , range 18–83. Respondent recruitment occurred through Bilendi, an online data management platform. The only exclusion criterion was that respondents must be at least 18 years of age.

## Measures

### Self-Professed Paranormal Abilities (Drinkwater et al., 2020)

Respondents completed a series of items determining whether they were paranormal practitioners (i.e., Medium, Psychic, Spiritualist, and Fortune-Teller). Each category contained a definition (i.e., Mediums, possess the ability to receive, and relay information from deceased people to the living; Psychics, perceive energy left behind from people who have died; Spiritualists, provide information regarding the transition of the human spirit from the physical body to the afterlife; or Fortune-Tellers, have the ability to foretell future event). This was followed by a “Yes/No” option, and an item asking respondents to indicate the extent to which they believed they possessed each ability (0–100 percent). In addition, respondents could also indicate “Other” if their self-professed ability fell outside the cited categories. Collectively, these items embody core receptive elements of belief in the paranormal (Drinkwater et al., 2018).

### Belief in the Paranormal

Belief in the paranormal was assessed using the Manchester Metropolitan University New (MMU-N). Several previous studies have used this scale (Dagnall et al., 2014; Drinkwater et al., 2020). The MMU-N contains 50-items related to (haunting, superstition, religious belief, alien visitation, extrasensory perception, psychokinesis, astrology, and witchcraft) (Dagnall et al., 2010a,b; Dagnall et al., 2011). This measure was employed in preference to the widely used Revised Paranormal Belief Scale (Tobacyk, 2004) and Australian Sheep Goat Scale (Thalbourne and Delin, 1993) because it samples greater intra dimension phenomena and a wider range of construct content (Dagnall et al., 2010a,b). Respondents responded via a seven-point Likert scale (ranging from 1, strongly disagree, to 7, strongly agree). The MMU-N has demonstrated excellent internal reliability and validity (face and concurrent), indicating that it is both conceptually coherent and psychometrically robust (Drinkwater, 2017). In this study, the MMU-N demonstrated excellent internal reliability,  $\alpha = 0.96$ .

### Reality Testing

The reality testing subscale of the Inventory of Personality Organization (IPO-RT; Lenzenweger et al., 2001) measures the capacity to differentiate self from non-self, intrapsychic from external stimuli, and maintain empathy with ordinary social criteria of reality (Kernberg, 1996). Commensurate with this delineation, the IPO-RT is an established scale for assessing preference for intuitive-experiential processing (subjective thinking) (Denovan et al., 2017), and proneness to reality testing deficits (Irwin, 2004; Drinkwater et al., 2012; Dagnall et al., 2017). The IPO-RT comprises 20-items presented as statements (e.g., “When I’m nervous or confused, it seems like the things in the outside world don’t make



sense either”). Respondents indicated agreement via a five-point Likert scale (1 = never true to 5 = always true). Higher scores are indicative greater reliance on intrapsychic activity (i.e., intuitive-experiential thinking) (Dagnall et al., 2018). The IPO-RT possesses good internal and external reliability, and construct validity (Lenzenweger et al., 2001; Drinkwater et al., 2012; Dagnall et al., 2018). IPO-RT possessed excellent internal reliability in the current study,  $\alpha = 0.93$ .

### Belief in Science

The Belief in Science Scale (BISS; Farias et al., 2013) evaluates the degree to which science is valued as a source of superior knowledge. The scale comprises ten statements (e.g., “The only real kind of knowledge we can have is scientific knowledge”). Respondents specify agreement using a six-point Likert scale (1 = Strongly Disagree to 6 = Strongly Agree). Thus, total scale scores range from 10 to 60; these are expressed as an average (1.0–6.0). Higher scores indicate greater faith in the scientific approach. The BISS performs well-psychometrically; possesses validity, and high internal consistency (Farias et al., 2013; Dagnall et al., 2019). High alpha reliability was evident in this study,  $\alpha = 0.92$ .

### Emotion-Based Reasoning

The degree to which decision-making is based upon affective reactions was measured using the Emotion-Based Reasoning (EBR) subscale of the Cognitive Biases Questionnaire (CBQ) (Peters et al., 2014). The EBR comprises 6-items, framed within brief vignettes. Respondents specify one of three options that best epitomises their feelings. Options are recorded on a three-point scale and include, 1 = absence of bias; 2 = presence of bias with some qualification; and 3 = presence of bias. Totalling EBR items produced a score ranging from 6 to 18; high scores represent greater affect-based decision-making. The CBQ has established psychometric properties (e.g., internal reliability,  $r = 0.89$ ; and test-retest reliability,  $r = 0.92$ ) (Peters et al., 2014). In the present study, the EBR produced an acceptable alpha coefficient of  $\alpha = 0.61$  (Nunnally and Bernstein, 1994; Ursachi et al., 2015).

### Procedure

Potential respondents clicked a web-link to receive study information. After providing informed consent, respondents then progressed to the actual online survey. At this point, instructions informed respondents to carefully read and complete all questions, respond honestly, and work through items at their own pace. The survey comprised sections demographic characteristics (i.e., age and preferred gender), self-professed paranormal abilities, and the measurement scales (i.e., MMU-N, BISS, IPO-RT, and EBR). Sections and measurement scales rotated across respondents to prevent order effects. At the end of the survey respondents received the debrief.

Data collection occurred at one point in time. A frequent criticism of this cross-sectional approach is its proneness to common method variance (CMV) (Spector, 2019). To prevent CMV the study employed procedural remedies (Krishnaveni and Deepa, 2013). Explicitly, section instructions created psychological distance between scales by accentuating differences between constructs and measures (Podsakoff et al., 2003).

Moreover, instructions reduced the potential for evaluation apprehension and social desirability effects by telling respondents that there were no right or wrong responses, and that they should answer questions honestly.

### Ethics Statement

The Manchester Metropolitan University Faculty of Health, Psychology and Social Care Ethics Committee (October 2018) provided ethical approval for a series of studies examining psychological and neuropsychological factors associated with self-professed psychic ability/mediumship.

## RESULTS

### Preliminary Analyses

Initial data examination used the professed ability (i.e., ability vs. no ability) and practitioner group (i.e., Mediumship, Psychics, Spiritualists, and Fortune-Telling) responses. This provided comparisons in terms of frequencies and percentages (see **Table 1**), and revealed that the number of paranormal practitioners was consistent across specialities (i.e., Mediumship,  $n = 17$ ; Psychic,  $n = 19$ ; Spiritualist,  $n = 22$ ; and Fortune-Tellers,  $n = 14$ ).

Practitioners (vs. non-practising) demonstrated greater confidence in their self-professed paranormal abilities. It was not, however, possible to test this difference because practitioners differed in the number of services they provided (practised in one domain,  $n = 16$ , 46%; two domains,  $n = 6$ , 17%; three domains,  $n = 8$ , 23%; and all four domains,  $n = 5$ , 14%). Moreover, it was difficult to interpret this trend since it was unclear whether practising resulted in higher confidence, or greater conviction informed the motivation to practise.

Subsequently, to produce an overall condition for comparison with non-practising and no ability conditions, it was necessary to combine the practitioner groups. Collapsing practitioner groups revealed,  $n = 35$  (4% of the total sample) were practising,  $n = 373$  (41%) non-practising, and  $n = 509$  (56%) no self-professed ability.

Descriptive information for paranormal belief, reality testing, emotion-based reasoning, and belief in science scores as a function of ability condition appears in **Table 2**. The practising group scored highest on belief in the paranormal, proneness to reality testing deficits and emotion-based reasoning, followed by the non-practising and the no ability groups. The opposite trend existed for belief in science.

### Comparisons

Multivariate analysis of variance (MANOVA) tested whether ability scores (no ability, ability, practicing) were significantly different across measures. Prior to performing MANOVA, data screening occurred. Consideration of skewness and kurtosis indicated satisfactory results (i.e., all values fell within the range of  $-2$  to  $+2$ ; Byrne, 2010). Data points signified outliers if they had an absolute studentized residual  $>4$  and a Cook's distance  $> 4 / (n-k-1)$ , where  $n$  is the sample size and  $k$  is the quantity of independent variables. No outliers existed using

**TABLE 1** | Frequencies (and percentages in brackets) of professed ability and practitioner groups.

Practitioner Group	Ability		Status		Total	Ability Ratings			
	Yes	No	Practising	Non-practising		Practising		Non-practising	
						M	SD	M	SD
Mediumship	285 (31.1)	632 (68.9)	17 (6.0)	268 (94.0)	285	60.59	33.81	35.52	26.21
Psychic	299 (32.6)	618 (64.7)	19 (6.4)	280 (93.6)	299	61.58	28.73	35.96	25.91
Spiritualist	255 (27.8)	662 (72.2)	22 (8.6)	233 (91.4)	255	59.55	34.15	35.92	25.73
Fortune-Teller	244 (26.6)	673 (73.4)	14 (5.7)	230 (94.3)	244	55.71	28.48	31.38	23.71

**TABLE 2** | Means and standard deviations for paranormal belief, reality testing, emotion-based reasoning, and belief in science as a function of ability.

Ability	N	Variable							
		Paranormal belief		Belief in science		Reality testing		Emotion-based reasoning	
		M	SD	M	SD	M	SD	M	SD
Practising	35	226.14	43.02	36.05	11.32	61.34	18.50	10.0	2.12
Ability	373	200.65	43.38	36.88	10.12	48.64	13.52	9.09	2.25
No ability	509	151.63	52.08	40.80	11.84	36.26	10.91	7.53	1.73

these criteria. However, examining homogeneity of variance-covariance matrices *via* Box’s test revealed a significant result (144.34,  $p < 0.001$ ), possibly due to unequal cell sizes. When this occurs, Tabachnick et al. (2007) recommend using the more robust Pillai’s criterion rather than Wilk’s lambda.

The results of the MANOVA revealed a significant main effect of ability scores on paranormal belief, reality testing, emotion-based reasoning, and belief in science, Pillai’s criterion = 0.33,  $F_{(8, 1824)} = 44.99$ ,  $p < 0.001$ . A medium effect size existed,  $\eta^2 = 0.17$ . A *post-hoc* descriptive discriminant analysis examined how ability conditions manifested across paranormal belief, reality testing, emotion-based reasoning, and belief in science. One significant discriminant function existed,  $\lambda = 0.67$ ,  $\chi^2_{(8)} = 361.69$ ,  $p < 0.001$ . This explained 98.4% of variance, canonical  $R^2 = 0.57$ . According to the standardized canonical discriminant functions and structure coefficients (Table 3), reality testing, paranormal belief and emotion-based reasoning were important in discriminating between levels of ability. Specifically, all evidenced structure coefficients  $> 0.32$  (Tabachnick et al., 2007). Reality testing contributed most to group separation (i.e., the discriminant function), followed by paranormal belief, and emotion-based reasoning. Centroid means indicated that the practicing condition (1.59) exhibited greater levels of reality testing, paranormal belief, and emotion-based reasoning than the ability (0.66) and no ability (−0.59) conditions.

## DISCUSSION

Analysis revealed differences between self-professed ability groups on belief in the paranormal, proneness to reality testing deficits, and emotion-based reasoning. Specifically, paranormal practitioners possessed higher scores on these variables compared with self-professed ability and no ability

**TABLE 3** | Standardized canonical discriminant function coefficients and structure matrix of ability.

Variable	Co-efficient	$r_s$
Reality testing	0.54	0.83
Paranormal belief	0.50	0.78
Emotion-based reasoning	0.25	0.61
Belief in science	−0.05	−0.26

groups. The no ability group evidenced the lowest scores. This pattern of results was consistent with the notion that paranormal practitioners score higher on indirect indices of delusion proneness and propensity to intuitive thinking (Irwin et al., 2012a,b). These outcomes also generally aligned with study hypotheses. Belief in science, however, did not meaningfully contribute to differences in self-professed ability.

Overall, these results concurred with studies that have identified a typical profile associated with paranormal-related cognitions and perceptions (see Krippner et al., 1998; Parra and Carlos Argibay, 2012). Within the current paper, this comprised higher proneness to reality testing deficits and greater reliance on emotion-based/intuitive thinking. These factors are associated with delusion formation and maintenance in subclinical populations (Irwin et al., 2012b).

The failure to observe the full range of group-based differences across comparisons for belief in science, an index of preference for objective (vs. subjective) based evidence, aligned with prior work on critical thinking (see Wiseman and Watt, 2006). Although some researchers report that increased critical thinking reduces belief in the paranormal (Barberia et al., 2018; Wilson, 2018), others have observed no effects

(Irwin et al., 2013). Discrepancies may arise from the fact that studies have used an array of measures. Additionally, indirect self-report instruments, such as the Belief in Science Scale, may not accurately index formal analytical reasoning. This is because they rely on the validity of individual responses and awareness of processes that are not fully available to consciousness.

Furthermore, accuracy is difficult to establish as data is collected at a separate point in time to performance, meaning that judgments derive from memory. Additional problems are that individuals interpret questionnaire items differently; base their conclusions on readily accessed personal contexts, and information triggered within the testing situation can influence responses. These and other limitations explain why self-reported metacognitive measures often poorly predict actual performance (Jacobse and Harskamp, 2012).

Regardless, critical thinking is a difficult construct to assess due to variations in definition and conceptualisation (i.e., evidence of multidimensionality) (Bensley and Murtagh, 2012). Noting these concerns, alongside belief in science (i.e., preference for objective data), future research should include direct, measures of rational processing (see Pennycook et al., 2016). This will indicate the degree to which belief in science is associated with critical thinking and determine whether these factors interact to reduce paranormal factors (belief, ability, and experience).

Factors such as these may explain why preceding academic work using the dual processing framework has found stronger and more consistent effects for intuitive-experiential thinking/processing (vs. analytical-rational). A further factor to consider, which is rarely acknowledged in prior work, is that these two systems work in parallel (Epstein et al., 1996). Thus, differences may reflect the tendency to engage in intuitive processing rather than a deficit in critical thinking. This is an important notion since it suggests that variations in thinking style are domain specific rather than general. To test this supposition, subsequent research could investigate whether self-professed paranormal ability is associated with explicit cognitive errors such as confirmation bias and misrepresentation of chance. Nonetheless, findings overall suggest that intuitive thinking plays a more important role in paranormal attributions than weaknesses in analytical-rational processing.

The present paper found that within practitioner group comparisons were conflated by the fact that individuals frequently professed multiple abilities. This indicated that future research should base contrasts on alternative distinctions. In this context, qualitative work with Mediums, Psychics, Spiritualists, and Fortune-Tellers advocates that they do not find these categorisations useful or appropriate. Instead, individuals prefer to qualify their abilities in terms of their perceived phenomenology. These decisions are frequently axiologically motivated, deriving from value judgments and ethics, and influence practice. For instance, practitioners frequently self-classify as “sensitive” or “intuitive.” Although

these terms lack precise operationalisation, they denote different paranormal attributions. Sensitives are receptive to psychic information, which they interpret, whereas intuitives believe that they possess awareness of things that have or could occur. Practitioners also make distinctions between spontaneous and controlled abilities (external vs. internal). Subsequent studies could better define these terms and examine whether these perceived distinctions manifest as profile variations. This seems possible, as practitioners perceive paranormal phenomena in diverse ways. Key examples being a strong reliance on either visual or auditory stimuli.

This approach will enable the identification of important dissimilarities in the psychological and psychopathological profiles of paranormal practitioners. This will potentially reveal whether high self-professed believers represent a homogeneous group. Another research advance is to combine self-professed ability with factors likely to reinforce convictions. For example, confidence ratings of own psychic facilities, length and breadth of practice, perceived success, client numbers, etc. Identifying factors that predict self-professed ability would enable the development of class profiles. These, combining key attributes, would allow researchers to determine whether practitioners differ in subtle, yet important ways.

A potential criticism of the present study was that it focussed on only a restrictive range of paranormal practises. These were selected because they reflected psychic phenomena associated with anomalous mental phenomena (psi) and communication with the dead (psychic occurrence, mediumship, spiritualism, telepathy, precognition, premonition, etc.), and represented core tenets of parapsychology as defined by the Society for Psychical Research (SPR). The SPR focuses on the nature and causes of psi and survival research (i.e., whether aspects of consciousness or personality survive bodily death). These elements are correspondingly encapsulated within the Australian Sheep Goat Scale, which is a frequently used measure of paranormal belief (Drinkwater et al., 2018). In this context, the practice areas were well-grounded, and sampled adequate domain content.

Acknowledging the existence of practitioners in other paranormal and scientifically unsubstantiated areas (i.e., pseudoscience and New Age Philosophy), follow-up studies should investigate whether these individuals possess similar psychological characteristics to those reported in this article. Consideration of these areas is important because they derive from different beliefs that may influence propensity to subclinical delusion formation and thinking style. For example, endorsement of pseudoscience derives from the incorrect assumption that a phenomenon is supported by the scientific method (Hines, 1988). Contrastingly, New Age Philosophy originates from the notion that humans are entering into a time of higher-level consciousness that will transform individuals and society, and rejects science, realism, and objectivity (Sjöberg and Wählberg, 2002). This line of work could also examine if

training increases faith in ability and this expresses as heightened delusion proneness.

## DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

## ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Manchester Metropolitan University Faculty of Health, Psychology and Social Care Ethics Committee. The

patients/participants provided their written informed consent to participate in this study.

## AUTHOR CONTRIBUTIONS

KD and ND provided the theoretical focus, developed content, and produced the initial article. KD was responsible for data collection. AD performed data analysis and wrote up the results. All authors were involved in the final submission of the article.

## FUNDING

We would like to thank the BIAL Foundation (Project ID: 082/2018) for their support with this research.

## REFERENCES

- Aarnio, K., and Lindeman, M. (2005). Paranormal beliefs, education, and thinking styles. *Personal. Individ. Diff.* 39, 1227–1236. doi: 10.1016/j.paid.2005.04.009
- American Psychiatric Association (2013). *Diagnostic and Statistical Manual of Mental Disorders, 5th Edn.* Washington, DC. doi: 10.1176/appi.books.9780890425596
- Barberia, I., Tubau, E., Matute, H., and Rodríguez-Ferreiro, J. (2018). A short educational intervention diminishes causal illusions and specific paranormal beliefs in undergraduates. *PLoS ONE* 13:e0191907. doi: 10.1371/journal.pone.0191907
- Bensley, D. A., and Murtagh, M. P. (2012). Guidelines for a scientific approach to critical thinking assessment. *Teach. Psychol.* 39, 5–16. doi: 10.1177/0098628311430642
- Bressan, P. (2002). The connection between random sequences, everyday coincidences, and belief in the paranormal. *Appl. Cognit. Psychol.* 16, 17–34. doi: 10.1002/acp.754
- Byrne, B. M. (2010). *Structural Equation Modeling With AMOS: Basic Concepts, Applications, and Programming.* Routledge/Taylor and Francis Group.
- Coltheart, M., Langdon, R., and McKay, R. (2010). Delusional belief. *Annual Rev. Psychol.* 62, 271–298. doi: 10.1146/annurev.psych.121208.131622
- Dagnall, N., Denovan, A., Drinkwater, K., and Parker, A. (2019). An evaluation of the Belief in Science scale. *Front. Psychol.* 10:861. doi: 10.3389/fpsyg.2019.00861
- Dagnall, N., Denovan, A., Drinkwater, K., Parker, A., and Clough, P. J. (2017). Urban legends and paranormal beliefs: the role of reality testing and schizotypy. *Front. Psychol.* 8:942. doi: 10.3389/fpsyg.2017.00942
- Dagnall, N., Denovan, A., Parker, A., Drinkwater, K., and Walsh, R. S. (2018). Confirmatory factor analysis of the inventory of personality organization-reality testing subscale. *Front. Psychol.* 9:1116. doi: 10.3389/fpsyg.2018.01116
- Dagnall, N., Drinkwater, K., and Parker, A. (2011). Alien visitation, extra-terrestrial life, and paranormal beliefs. *J. Sci. Explorat.* 25, 699–720.
- Dagnall, N., Drinkwater, K., Parker, A., and Clough, P. (2016). Paranormal experience, belief in the paranormal and anomalous beliefs. *Paranthropology* 7, 4–14. doi: 10.3389/fpsyg.2016.01045
- Dagnall, N., Drinkwater, K., Parker, A., Denovan, A., and Parton, M. (2015). Conspiracy theory and cognitive style: a worldview. *Front. Psychol.* 6:206. doi: 10.3389/fpsyg.2015.00206
- Dagnall, N., Drinkwater, K., Parker, A., and Rowley, K. (2014). Misperception of chance, conjunction, belief in the paranormal and reality testing: a reappraisal. *Appl. Cognit. Psychol.* 28, 711–719. doi: 10.1002/acp.3057
- Dagnall, N., Parker, A., and Munley, G. (2007). Paranormal belief and reasoning. *Personal. Individual Diff.* 43, 1406–1415. doi: 10.1016/j.paid.2007.04.017
- Dagnall, N., Parker, A., Munley, G., and Drinkwater, K. (2010a). Common paranormal belief dimensions. *J. Sci. Explorat.* 24, 477–494.
- Dagnall, N., Parker, A., Munley, G., and Drinkwater, K. (2010b). The relationship between belief in extra-terrestrial life, UFOs-related beliefs and paranormal belief. *Soc. Psychical Res.* 74, 1–14.
- Denovan, A., Dagnall, N., Drinkwater, K., Parker, A., and Clough, P. (2017). Perception of risk and terrorism-related behavior change: dual influences of probabilistic reasoning and reality testing. *Front. Psychol.* 8:1721. doi: 10.3389/fpsyg.2017.01721
- Drinkwater, K., Dagnall, N., and Parker, A. (2012). Reality testing, conspiracy theories, and paranormal beliefs. *J. Parapsychol.* 76, 57–77.
- Drinkwater, K., Denovan, A., Dagnall, N., and Parker, A. (2018). The Australian sheep-goat scale: an evaluation of factor structure and convergent validity. *Front. Psychol.* 9:1594. doi: 10.3389/fpsyg.2018.01594
- Drinkwater, K. G. (2017). *Belief in the Paranormal: Measurement Development and Evaluation.* Ph.D. Doctoral Thesis. Accessed via e-space.mmu.ac.uk/
- Drinkwater, K. G., Denovan, A., and Dagnall, N. (2020). Lucid dreaming, nightmares, and sleep paralysis: Associations with reality testing deficits and paranormal experience/belief. *Front. Psychol.* 11:471. doi: 10.3389/fpsyg.2020.00471
- Epstein, S., Pacini, R., Denes-Raj, V., and Heier, H. (1996). Individual differences in intuitive-experiential and analytical-rational thinking styles. *J. Personal. Soc. Psychol.* 71, 390–405. doi: 10.1037/0022-3514.71.2.390
- Farias, M., Newheiser, A. K., Kahane, G., and de Toledo, Z. (2013). Scientific faith: Belief in science increases in the face of stress and existential anxiety. *J. Exp. Soc. Psychol.* 49, 1210–1213. doi: 10.1016/j.jesp.2013.05.008
- Gallagher, C., Kumar, V. K., and Pekala, R. J. (1994). The anomalous experiences inventory: reliability and validity. *J. Parapsychol.* 58, 402–428. doi: 10.1037/t14244-000
- Garety, P. A., and Freeman, D. (1999). Cognitive approaches to delusions: a critical review of theories and evidence. *Br. J. Clin. Psychol.* 38, 113–154. doi: 10.1348/014466599162700
- Hines, T. (1988). *Pseudoscience and the Paranormal: A Critical Examination of the Evidence.* Prometheus Books.
- Ipsos MORI (1998). *Paranormal Survey.* Available online at: <https://www.ipsos.com/ipsos-mori/en-uk/paranormal-survey> (accessed November 11, 2020).
- Ipsos MORI (2003). *Three in Five 'Believe in God'.* Available online at: <https://www.ipsos.com/ipsos-mori/en-uk/three-five-believe-god> (accessed: November 11, 2020).
- Irwin, H. J. (2003). Reality testing and the formation of paranormal beliefs. *Eur J Parapsychol.* 18, 15–28.
- Irwin, H. J. (2004). Reality testing and the formation of paranormal beliefs: a constructive replication. *J Soc Psych Res.* 68, 143–152.
- Irwin, H. J., Dagnall, N., and Drinkwater, K. (2012a). Paranormal belief and biases in reasoning underlying the formation of delusions. *Austr. J. Parapsychol.* 12, 7–21.
- Irwin, H. J., Dagnall, N., and Drinkwater, K. (2012b). Paranormal beliefs and cognitive processes underlying the formation of delusions. *Austr. J. Parapsychol.* 12, 107–126.
- Irwin, H. J., Dagnall, N., and Drinkwater, K. (2013). Parapsychological experience as anomalous experience plus paranormal attribution: a questionnaire



- based on a new approach to measurement. *J. Parapsychol.* 77, 39–54. doi: 10.1037/t31377-000
- Irwin, H. J., and Young, J. M. (2002). Intuitive versus reflective processes in the formation of paranormal beliefs. *Euro. J. Parapsychol.* 17, 45–53.
- Jacobse, A. E., and Harskamp, E. G. (2012). Towards efficient measurement of metacognition in mathematical problem solving. *Metacogn. Learn.* 7, 133–149. doi: 10.1007/s11409-012-9088-x
- Kernberg, O. F. (1996). “A psychoanalytic theory of personality disorders,” in *Major Theories of Personality Disorder*, eds J. F. Clarkin, and M. F. Lenzenweger (New York, NY: Guilford Press), 106–140.
- Koltko-Rivera, M. E. (2004). The psychology of worldviews. *Rev. General Psychol.* 8, 3–58. doi: 10.1037/1089-2680.8.1.3
- Krippner, S., Wickramasekera, I., Wickramasekera, J., and Winstead, C. W. (1998). The Ramtha phenomenon: psychological, phenomenological, and geomagnetic data. *J. Am. Soc. Psychical Res.* 92, 1–24.
- Krishnaveni, R., and Deepa, R. (2013). Controlling common method variance while measuring the impact of emotional intelligence on well-being. *Vikalpa* 38, 41–48. doi: 10.1177/0256090920130104
- Lange, R., Ross, R. M., Dagnall, N., Irwin, H. J., Houran, J., and Drinkwater, K. (2019). Anomalous experiences and paranormal attributions: psychometric challenges in studying their measurement and relationship. *Psychol. Consciousness* 6, 346–358. doi: 10.1037/cns0000187
- Lenzenweger, M. F., Clarkin, J. F., Kernberg, O. F., and Foelsch, P. A. (2001). The inventory of personality organization: psychometric properties, factorial composition, and criterion relations with affect, aggressive dyscontrol, psychosis proneness, and self-domains in a nonclinical sample. *Psychol. Assessment* 13, 577–591. doi: 10.1037/1040-3590.13.4.577
- Moore, D. W. (2005). *Three in Four Americans Believe in Paranormal: Little Change From Similar Results in 2001*. Gallup Poll News Service. Available online at: <http://www.gallup.com/poll/16915/Three-Four-Americans-Believe-Paranormal.aspx> (accessed February 24, 2021).
- Newport, F., and Strausberg, M. (2001). *Americans’ Belief in Psychic and Paranormal Phenomena is up Over Last Decade*. Gallup Poll News Service: Poll analyses. Available online at: <http://www.gallup.com/poll/4483/Americans-Belief-Psychic-Paranormal-Phenomena-Over-Last-Decade.aspx> (accessed February 24, 2021).
- Nunnally, J. C., and Bernstein, I. R. (1994). *Psychometric Theory*, Ed. ke-3, New York, NY: McGraw-Hill.
- Parra, A., and Carlos Argibay, J. (2012). Dissociation, absorption, fantasy proneness and sensation-seeking in psychic claimants. *J. Soc. Psychical Res.* 76, 193–203.
- Pennycook, G., Cheyne, J. A., Koehler, D. J., and Fugelsang, J. A. (2016). Is the cognitive reflection test a measure of both reflection and intuition? *Behav. Res. Methods* 48, 341–348. doi: 10.3758/s13428-015-0576-1
- Peters, E. R., Moritz, S., Schwannauer, M., Wiseman, Z., Greenwood, K. E., Scott, J., et al. (2014). Cognitive biases questionnaire for psychosis. *Schizophr. Bull.* 40, 300–313. doi: 10.1093/schbul/sbs199
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., and Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *J. Appl. Psychol.* 88, 879–903. doi: 10.1037/0021-9010.88.5.879
- Sappington, A. A. (1990). The independent manipulation of intellectually and emotionally based beliefs. *J. Res. Personal.* 24, 487–509. doi: 10.1016/0092-6566(90)90035-5
- Schouten, S. A. (1994). An overview of quantitatively evaluated studies with mediums and psychics. *J. Am. Soc. Psych. Res.* 88, 221–254.
- Sjöberg, L., and Wählberg, A. A. (2002). Risk perception and new age beliefs. *Risk Analysis* 22, 751–764. doi: 10.1111/0272-4332.00066
- Spector, P. E. (2019). Do not cross me: optimizing the use of cross-sectional designs. *J. Business Psychol.* 34, 125–137. doi: 10.1007/s10869-018-09613-8
- Tabachnick, B. G., Fidell, L. S., and Ullman, J. B. (2007). *Using Multivariate Statistics* (Vol. 5). Pearson.
- Tenhaeff, W. H. C. (1972). *Telepathy and Clairvoyance: Views of Some Little Investigated Capabilities of Man*. Charles C Thomas Pub Limited.
- Thalbourne, M., and Delin, P. (1993). A new instrument for measuring sheep-goat variable: its psychometric properties and factor structure. *J. Soc. Psych. Res.* 59, 172–186.
- Tobacyk, J. J. (2004). A revised paranormal belief scale. *Int. J. Transpersonal Stud.* 23, 94–98. doi: 10.24972/ijts.2004.23.1.94
- Unterrassner, L., Wyss, T. A., Wotruba, D., Ajdacic-Gross, V., Haker, H., and Rössler, W. (2017). Psychotic-like experiences at the healthy end of the psychosis continuum. *Front. Psychol.* 8:775. doi: 10.3389/fpsyg.2017.00775
- Ursachi, G., Horodnic, I. A., and Zait, A. (2015). How reliable are measurement scales? External factors with indirect influence on reliability estimators. *Proc. Economics Finance* 20, 679–686. doi: 10.1016/S2212-5671(15)00123-9
- van Os, J. (2003). Is there a continuum of psychotic experiences in the general population? *Epidemiol. Psichiatria Soc.* 12, 242–252. doi: 10.1017/S1121189X00003067
- Wilson, J. A. (2018). Reducing pseudoscientific and paranormal beliefs in University students through a course in science and critical thinking. *Sci. Educ.* 27, 183–210. doi: 10.1007/s11191-018-9956-0
- Wiseman, R., and Watt, C. (2006). Belief in psychic ability and the misattribution hypothesis: a qualitative review. *Br. J. Psychol.* 97, 323–338. doi: 10.1348/000712605X72523
- Zusne, L., and Jones, W. H. (1982). *Anomalistic Psychology: A Study of Extraordinary Phenomena of Behavior and Experience*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Zusne, L., and Jones, W. H. (1989). *Anomalistic Psychology: A Study of Magical Thinking, 2nd Edn*. Hillsdale, NJ: Lawrence Erlbaum Associates.

**Conflict of Interest:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright © 2021 Drinkwater, Dagnall, Denovan and Williams. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.