Final Scientific Report:
Psychometric validation of a questionnaire for assessing paranormal health beliefs and statistically modelling the effects of the construct on health outcomes longitudinally

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Background

Paranormal beliefs are convictions in phenomena that are believed to exist outside the scope of scientific explanation and are often associated with the supernatural, psychic abilities, or other unexplained occurrences. Yarritu et al. (2015) suggest that the relationship between paranormal belief and health indicates the existence of self-serving illusions; explicitly, unproven beliefs protective of personal emotional security (Irwin, 1993). The concept of 'paranormal health beliefs' underwent development from Petrillo and Donizzetti (2012) and relate to illusory beliefs regarding health. Specifically, the belief that health can be affected by actions/thoughts (of a supernatural origin, e.g., wearing an amulet or lucky charm) that are not causally linked with the outcome (health promotion and/or preservation).

Petrillo and Donizzetti (2012) recognised the significance of illusory supernatural beliefs (attributed to health) and devised the 31-item Paranormal Health Beliefs Scale. The measure captures adherence to illusory beliefs about health using a multifaceted classification, extending from the magical and superstitious to those covering the influence of the mind and healers, as well as traditional religious convictions.

The scale possessed a suitable factorial structure alongside satisfactory internal reliability, discriminant, and convergent validity (Donizzetti & Petrillo, 2017). Nonetheless, confirmation used an Italian sample with items specific to this culture (e.g., 'Kissing the relic or the statue of a saint bodes well for health'). Additionally, significant validation tests including analysis of item difficulty relative to sample, and assessment of measurement bias were not implemented. Moreover, an English-speaking version of the scale exists, but it is unclear if this was applied in the validation studies. These concerns weaken confidence in the rigour and quality of the scale and possibly impede its application within wider research. This is problematical because the scale is the only publicly accessible measure that captures heath specific supernatural credence.

The paranormal health beliefs construct is significant because research confirms the existence of meaningful relationships between this and health outcomes including illness (Donizzetti, 2018; Donizzetti & Petrillo, 2017). The authors furthermore proposed that knowledge of paranormal health beliefs could usefully contribute understanding to factors that influence the adoption (or otherwise) of healthy behaviours and adherence to medical therapy. However, since 2018 research has not been published on the topic. This is concerning because paranormal health beliefs can potentially lead to benefits related to psychological well-being and health as

a function of their illusory nature (e.g., increased longevity affiliated with optimistic bias; Makridakis & Moleskis, 2015).

Furthermore, paranormal health beliefs can theoretically result in negative health consequences. For instance, the belief that a pseudoscientific treatment improves health, when there is no scientific evidence (causal link), can undermine the effectiveness of other scientifically validated treatments (Yarritu et al., 2015). Explicitly, the illusory health conviction could influence the person to reject the validated treatment and suffer the consequences of this. Indeed, Petterson and Olsen (2007) showed that paranormal beliefs significantly predicted positive attitudes to pseudoscientific treatment (Complementary and Alternative Medicine, CAM). CAM providers are prevalent throughout the developed world, and use of CAM among the public has increased in popularity over the past three decades (Tobbia et al., 2019). CAM treatments are frequently harmless and offer relief in palliative care (Gayatri et al., 2021). Nonetheless, risks include the rejection of evidence-based approaches (e.g., vaccination; Attwell et al., 2018).

Thus, it is critical to understand potential ways that paranormal health beliefs associate with either mainstream healthcare use (including the adoption of recommended healthy behaviours) or use of CAM. An individual's health-oriented belief represents a potential mechanism. For instance, Stosic et al. (2021) found that belief in science linked with compliance to medical advice whereas researchers including Lie and Boker (2004) established that positive convictions regarding CAM predicted use of alternative therapies.

Another potential mechanism includes health-based locus of control (Wallston, 1992). Specifically, greater internal health locus (belief in personal accountability for health / illness) is affiliated with increased engagement with health recommendations from medical professionals (e.g., improved exercise habits; Marr & Wilcox, 2015). However, external locus (belief that powerful others or chance determine health) represents a risk factor for adequate health behaviour (Grotz et al., 2011). Donizzetti and Petrillo (2017) identified a positive relationship between paranormal health beliefs and an external locus, and a negative link with an internal locus. Relatedly, external locus of control is predictive of greater paranormal belief endorsement.

Accordingly, locus of control may facilitate explanation of how paranormal health beliefs affiliate with health outcomes. Specifically, individuals possessing greater levels of paranormal health beliefs should be more inclined to possess an external health-related locus of control and engage less with health recommendations. With regards to CAM, a mixed literature exists concerning whether an internal or external locus of control predicts its use (Bishop et al., 2007). Thus, a key objective included clarifying the ways that paranormal health beliefs and locus of control interacted with CAM use.

Aims

Collectively, this project focused on devising a valid assessment tool of paranormal health beliefs for use with English-speaking samples and advancing the research literature by examining how these beliefs impact health-related outcomes. Thus, there existed two aims: 1) to psychometrically validate the Paranormal Health Beliefs Scale with an English-speaking sample; and 2) to develop and test a model assessing how paranormal health beliefs relate to health-associated outcomes over a sustained period (multiple points).

The researchers realised project aims through two distinct but related overarching phases. Phase 1 validated the Paranormal Health Beliefs Scale with an English-speaking sample. Phase 2 explored how paranormal health beliefs, and potential mediating variables, associated with health-related outcomes over time. The project addressed these objectives via a combination of cognitive interviewing and administration of self-report (questionnaire) measures. Self-report (questionnaire) measures were presented online via the hosting platform Qualtrics. Cognitive interviewing techniques evaluated item comprehension, concept equivalence, and aspects in need of refinement. Standardised questionnaires for phase 1 assessed convergent and discriminant validity. Phase 2 employed the modified Paranormal Health Beliefs Scale alongside psychometrically robust measures indexing health locus of control, belief in science, belief in complementary and alternative medicine, a range of health behaviours (recommended diet, use of healthcare resources, preventive self-care, and vaccine hesitancy), and use of complementary and alternative medicine. Phase 2 comprised three assessment points (baseline, 2 months, and 4 months) reflecting a longitudinal study design.

Understanding the ways paranormal health beliefs interact with allied factors and influence wellbeing is essential because scientifically unsubstantiated beliefs prevail within modern society, affect people's worldview and mental health, and influence life choices/behaviour. The project advanced preceding literature by utilising sophisticated methods of analysis, which addressed inherent limitations in studies. Explicitly, the paucity of research examining paranormal health beliefs alongside insufficient development of the scale designed to capture these.

Method

This project investigated the two overarching phases via four studies. The researchers recruited participants through Bilendi Ltd., a recognised supplier of quality data. The use of Bilendi enabled the researchers to access a representative United Kingdom-based sample, comprising a range of ages (minimum 18 years) and an equal gender split. Additionally, it ensured effective management of retention, minimising sample attrition. Bilendi distributed the study link to potential participants within their panel. The Health and Education Research Ethics and Governance Committee at Manchester Metropolitan University (ID #52313) approved the project.

Study 1: Involved conducting cognitive interviews in relation to the Paranormal Health Beliefs Scale to identify items that were unclear, unapplicable, or in need of modification. Data collation included semi-structured interviews with a small purposive sample of 14 participants (eight males, six females). Testing was conducted in two rounds, the first (Round 1) assessed the original Paranormal Health Beliefs Scale and the second (Round 2) evaluated the effectiveness of modifications. Each round terminated when saturation was achieved (i.e., no new issues were evident). In both rounds, participants were also asked to recommend how unclear items could be phrased more appropriately. In the second round, the research asked participants to suggest additional statements. Data were coded and analysed using Tourangeau's framework (1984, modified by Willis, 1999). This considers four significant cognitive aspects of question answering. Explicitly, 'comprehension' (understanding), 'retrieval' (how information is accessed from memory), 'decision' (deriving answers), and 'response' (the extent to which responses occur without error/obstruction). Outcomes informed the need to rename the scale as the Illusory Health Beliefs Scale.

Study 2: Psychometrically assessed the emergent Illusory Health Beliefs Scale using exploratory factor analysis, reliability and convergent validity analyses (focusing on belief in the paranormal, magical thinking, faith in scientifically unsubstantiated notions, and forms of

self-referential, intuitive causation), and Rasch analysis. A total of 850 participants (360 males, 482 females, eight non-binary) completed study measures.

Study 3: Extended latent structure analysis of the Illusory Health Beliefs Scale by employing exploratory structural equation modelling and multidimensional Rasch analysis. Additionally furthered convergent validity testing of Study 2 by examining relationships of the Illusory Health Beliefs Scale with related health-based constructs (health locus of control and beliefs about complementary and alternative medicine). Health locus of control included four dimensions capturing internal and external sources of control for health status: internal (believing in personal responsibility for health), chance (ascribing health to luck or fate), powerful others (regarding doctors and health professionals as responsible for health), and God (viewing God as responsible for health status). A sample of 2,138 took part (1,016 males, 1,113 females, seven non-binary, two preferred not to disclose).

Study 4: Extended preceding studies by examining the Illusory Health Beliefs Scale in the context of health outcomes. Specifically, adherence to recommended health behaviours (e.g., lifestyle, diet, vaccines), trust in healthcare professionals, and use of complementary and alternative medicine. The study also considered how health-oriented belief and health-based locus of control mediated links between illusory health belief and health outcomes. Thus, Study 4 used sequential mediation to assess the contribution of illusory health beliefs to health outcomes over time. A sample of 1,507 (734 males, 768 females, 7 non-binary) completed measures on three occasions.

Results

Study 1: Cognitive interviews in Round 1 (the evaluation stage) identified issues with culturally particular content / points of reference, phraseology, and wording of the original Paranormal Health Beliefs Scale. For instance, in terms of comprehension participants struggled to relate to items reflecting Catholicism and Italian culture and regarded several items as ambiguous in meaning and unrelated to health. These issues impacted the ability of participants to retrieve topic relevant information from memory (i.e., they could not relate to items) and respond to / rate the items on the response scale. Indeed, some failed to respond to such items, whereas others provided uncertain answers. To address these issues a modified version of the measure was produced. This included amending culturally specific references to enhance relevance to a UK audience (e.g., changing 'Friday 17th' to 'Friday 13th'), adding more health-based items, and rewording ambiguous phrases.

Round 2 (the modification stage) then examined the effectiveness of changes. Analysis revealed fewer concerns (particularly, no issues with culturally specific items), although difficulties with ambiguity, complex terminology, and response scale appropriateness persisted. Consequently, changes based on participant feedback included resolving ambiguity, changing complex phrases (e.g., 'mental forces' to 'psychic forces'), and altering the response scale to engender more conviction in answers (i.e., changing the option 'Do not know' to 'Neither agree nor disagree'). Lastly, participant feedback indicated that the Paranormal Health Beliefs Scale was assessing illusory rather than paranormal health beliefs, and pseudoscientific practices allied to health should be included. These were attended to prior to Study 2 by changing the scale name to Illusory Health Beliefs and devising items focusing on pseudoscience health techniques.

Study 2: With the emerging Illusory Health Beliefs Scale, exploratory factor analysis revealed the existence of five meaningful dimensions/subfactors: Religious / Spiritual, Superstition, Precognitive, Health Myths, and Skepticism. Labels derived from conceptual interpretation of factor content. 'Religious/Spiritual' captured holy/spiritual beliefs about health. 'Superstition'

comprised health-related items linked to prediction and ritual. 'Precognitive' contained items referencing the ability to influence/affect health via psychic forces. 'Health Myths' consisted of well-being falsehoods. 'Skepticism' included negatively worded items that reflected disbelief in illusory health beliefs. The health pseudoscience items coalesced as one subscale, as expected, labelled as Health Pseudoscience.

Convergent validity analyses revealed that these subfactors appropriately shared variance with scales, which independently assessed belief in the paranormal, magical thinking, faith in scientifically unsubstantiated notions, and forms of self-referential, intuitive causation. Rasch analysis at the subfactor level revealed good item/person fit and item/person reliability, unidimensionality, and equivalency of items across subgroups (gender and religious affiliation).

Study 3: Exploratory structural equation modelling of the six-dimension solution obtained in Study 2 indicated that this latent structure represented a strong approximation of the Illusory Health Beliefs Scale. Indeed, excellent data-model fit existed. All dimensions exhibited internal consistency and large associations with one another (aside from Skepticism). This corroborated the findings from Study 2 using an independent sample alongside a more advanced analysis of latent structure. Convergent validity established that health-based locus of control dimensions correlated positively with illusory health beliefs.

Multidimensional Rasch analysis revealed that the majority of scale items functioned efficiently, measuring the dimensions they were modelled with consistently across individuals. Aligning with the ESEM outcomes, high correlations existed among the six dimensions inferring that these were empirically related. Multidimensional Rasch analysis did, however, identify some issues with the Illusory Health Beliefs Scale. Specifically, most items were not too difficult nor too easy to endorse. Items should range in difficulty to enable a more accurate assessment of a wide range of endorsement. Moreover, the Skepticism dimension / subscale did not perform as effectively as the other subscales and findings supported the need to revise Skepticism content and generate additional items in future research.

Study 4: Path analysis indicated that illusory health beliefs generally predicted higher levels of vaccine hesitancy and use of complementary and alternative medicine, and lower trust in health professionals and adherence to recommended health behaviours. Health-based locus of control (aside from Chance beliefs) and belief in science tended to positively mediate (strengthen) the illusory health beliefs and adherence to health recommendations and trust in health professional relationship. These variables also typically mediated (weakened) the link between illusory health beliefs and vaccine hesitancy. Belief regarding complementary and alternative medicine efficacy and Chance beliefs (from health-based locus of control) positively mediated the relationship between illusory health beliefs and vaccine hesitancy and use of complementary and alternative medicine. Chance also negatively mediated (weakened) the relationship with trust in health professionals.

Discussion

Prior research by Donizzetti and Petrillo established the construct of paranormal health beliefs, devised a tool for measurement (the Paranormal Health Beliefs Scale), and established that these beliefs aligned with important health outcomes (e.g., illness) (c.f. Donizzetti, 2018; Donizzetti & Petrillo, 2017). Unfortunately, development of the Paranormal Health Beliefs Scale did not include significant psychometric tests (e.g., scrutiny of item difficulty), and items suffered from cultural specificity when generalising to a UK audience. Moreover, no work has been published on the topic of paranormal health beliefs since 2018. This is concerning because

the culture-specific orientation of the scale hinders its effective application within other contexts/cultures for assessing links between paranormal health beliefs and related constructs.

Accordingly, validation using empirically supported techniques alongside item translation to other contexts (an English-speaking context in this project) is vital for furthering quality research on the significance of the construct. Noting this, the present project extended inquiry by validating an assessment tool of paranormal health beliefs for use with English-speaking samples. Critically, this comprised empirically supported best practice techniques involving a combination of qualitative (cognitive) interviewing and quantitative data assessment. Cognitive interviewing techniques evaluated comprehension, retrieval, and response issues from a participant frame of reference. Subsequently, with a larger sample analytic techniques examined a range of significant psychometric criteria (e.g., reliability, validity, factorial structure, item functioning). Techniques included exploratory factor analysis, exploratory structural equation modelling, Rasch analysis, and multidimensional Rasch assessment. Secondly, the project examined how these beliefs impacted health-related outcomes. To ensure that findings were robust and not an artefact of cross-sectional design the project employed multiple time points, considered indirect mediating effects, employed a range of measures allied to health, and employed complex statistical techniques (i.e., examination of sequential mediation).

Cognitive interviewing revealed several flaws when applying the Paranormal Health Beliefs Scale to a UK sample. These included an emphasis on culturally specific and religious material (e.g., viewing Friday 17th as unlucky and the 'evil eye' as a negative influence on health). This was problematic because in countries such as the UK and USA there exists no negative connotations with Friday 17th, and belief in the evil eye tends to be prominent in the Mediterranean and the Balkans. Thus, non-endorsement of these do not indicate an absence of belief. Other examples comprise the inclusion of inappropriate questions that do not link to the supernatural (e.g., interactions with particular groups negatively impacting health). This lacked validity and indexed social prejudice. Accordingly, scale revision included attending to such aspects to produce a more salient measure. The modified (and renamed) Illusory Health Beliefs Scale evidenced sound psychometric properties when applied to a large UK sample. Explicitly, convergent and discriminant validity, invariance (i.e., subgroups attributing a similar meaning to items), and satisfactory item difficulty for the intended sample. Six conceptually coherent, internally consistent factors existed. Subsequent analyses with an independent sample corroborated this structure. Moreover, multidimensional Rasch established that the dimensions were empirically related. However, issues existed with the Skepticism dimension. Overall, though, the refined measure emerged as a psychometrically superior means of capturing paranormal / illusory health beliefs within a UK sample.

Examining relationship outcomes over time revealed that illusory health beliefs aligned with openness to unorthodox treatments (use of complementary and alternative medicine, CAM) and lower confidence in and uptake of traditional treatments. Health-based locus of control (i.e., belief in self and powerful others as responsible for health) and belief in science negatively mediated this relationship, predicting greater confidence in health professionals and health behaviour adherence. The finding regarding powerful others (e.g., doctors, nurses) likely occurs due to indexing positive attitudes towards health professionals. A similar mechanism underpins belief in science. Though illusory beliefs negatively aligned with belief in science, they exhibited a positive relationship with powerful others and internal locus. This likely occurs due to the Illusory Health Beliefs Scale capturing deficits in perceived health control (e.g., 'Health is in the hands of God') and illusory control (e.g., 'Wearing an amulet or a lucky charm

helps to keep one healthy'). Lack of perceived control ascribes causation to external factors, whereas illusory control manifests as internal locus and occurs among individuals with a high desire for control (e.g., desiring to manage illness and avoid feelings of powerlessness) (Irwin, 2000). Therefore, high internal locus potentially indicates illusory control arising from low ability to influence health. Similarly, low control captured with the Illusory Health Beliefs Scale explains associations with belief in CAM and its usage. Explicitly, individuals are more likely to engage with CAM since turning to unorthodox treatments allows them to attempt to influence uncontrollable health issues. Commensurate with this prediction, CAM endorsement is associated with internal (Synovitz et al., 2006) and external locus of control (Ebel et al., 2015).

Conclusions

The original Paranormal Health Beliefs Scale possessed several flaws with its application to a UK sample. This included inappropriate item content, ambiguity, response scale unsuitability, and an emphasis on culturally specific and religious material, Use of sophisticated and empirically supported scale development techniques resulted in a superior measure (the Illusory Health Beliefs Scale) for use with a UK audience. However, cultural specificity restricts its application to other culturally diverse samples. Thus, there is a need to recognise cultural variation when capturing paranormal / illusory health beliefs within research. Different cultures will likely vary in belief content (e.g., variations in religious and supernatural symbols, deities, practices).

This project additionally established that the relationship between illusory health beliefs and health outcomes is complex and multifaceted. Specifically, illusory health beliefs reflect illusory and perceived control, manifesting as low ability to influence health. These likely predict use of CAM as an attempt to initiate control and involvement with health management. Although CAM is useful and can be relieving (e.g., for chronic conditions), many treatments suffer from a lack of scientific evidence. Crucially, recognition of the veracity of science and health-based locus of control predict more engagement with health recommendations. Therefore, this reflects the need to promote critical thinking and feelings of control in relation to health. For instance, developing strategies that promote public and patient education while encouraging evidence-based behaviours. This can include emphasising patient involvement in health decisions, support self-advocacy, self-management, provide comprehensive information about health conditions, and tackle systemic issues including barriers to healthcare access.

Recommendations

This project can inform subsequent research on paranormal / illusory health belief in myriad ways:

• This project provides initial evidence regarding the contribution of illusory health beliefs to health outcomes, and a basis for future research to further investigate this relationship. It is imperative for this to occur to progress the construct, which can have important implications for treatment decision-making.

• Though this project developed a robust psychometric tool for illusory health beliefs, established construct validity and relationships with health, underpinning explanations for the origin of illusory beliefs are underdeveloped. Establishing empirical support at a construct level is critical because these affect people's worldview, and influence life choices/behaviour. Relatedly, due to their illusory nature, they predict negative health consequences.

• A recommended next step for the Illusory Health Beliefs Scale includes development of scale norms to enhance score interpretation and application of the measure to other UK-based

samples. Moreover, scrutiny / development of the measure with culturally similar and diverse samples is necessary for measure refinement and to produce culture-specific versions.

• This project highlights the benefits of using multiple, triangulated analytical approaches. Hence, while traditional cross-sectional investigations afford important theoretical insights it is vital to evaluate their findings rigorously. This includes consideration of indirect effects and the use of multiple time points. Investigations employing complimentary methods / analysis are desirable since they iteratively advance outcomes and produce robust findings.

• It is imperative that subsequent studies use multiple time points to establish the stability of findings and enable the identification of conceptually significant temporal changes.

• Extending the previous point, longitudinal studies over extended time periods (i.e., years) would establish temporal variations in illusory health belief and health outcomes as a function of external factors.

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Expected and achieved output indicators (number of actions)

Output indicators	Expected (according to application)	Achieved
PhD thesis	0	0
Master's thesis	1	0
Organization of seminar or conference	1	1
Book	0	0
Book chapter	1	1
Conference presentation	2	2
Conference paper	2	2

Journal article	5	5
Other (specify)	2	2

Presentations / Press releases

Denovan, A. (TBD). Symposium of the BIAL Foundation. Porto, Portugal.

Denovan, A., Dagnall, N. & Drinkwater, K. (2025, February 14). *Assessing paranormal health beliefs.* Twilight Tales: a Discourse [Audio podcast]. https://open.spotify.com/episode/0zaBrkZgd404g5IPqpuyNg

Denovan, A., Dagnall, N. & Drinkwater, K. (2025, May 7). *Paranormal heath beliefs: an overview*. Presentation to the Anomalous Beliefs and Experiences Research Group (ABERG), Northumbria University, UK.

Denovan, A., Dagnall, N. & Drinkwater, K. (TBC). *Do illusory beliefs drive people away from medicine?* The BIAL Foundation Science Stories.

List of publications

Denovan, A., Dagnall, N., & Drinkwater, K. G. (2024). The paranormal health beliefs scale: an evaluation using cognitive interviewing. *Frontiers in Psychology*, *15*, 1306372. https://doi.org/10.3389/fpsyg.2024.1306372

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Denovan, A., Dagnall, N., & Drinkwater, K. G. (2025). The Relationship Between Illusory Health Beliefs, Recommended Health Behaviours, and Complementary and Alternative Medicine: An Investigation Across Multiple Time Points. *Behavioral Sciences*, *15*(5), 614. https://doi.org/10.3390/bs15050614

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Denovan, A., Drinkwater, K. G., & Dagnall, N. (2025). *Applied Cognitive Psychology: A Case Study Approach*. SAGE. (Book being finalised will contain chapter content on paranormal health beliefs alongside project references).

Publications at time of final report. Further publications will follow and credited by the project team to the BIAL Foundation.