

# Final Scientific Report: Perceptual-Personality Variables Associated with Anomalous Experience vs. Paranormal Attributions

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## Background

Independent research (e.g., David, 2010; Houran & Lange, 2004; van Elk, 2015) increasingly suggests that subjective parapsychological experiences involve two, potentially separate components or processes: (a) the onset of anomalous experiences, and (b) their subsequent interpretation. Instruments to measure anomalous experiences (and hallucinations and delusions) typically do not distinguish between these two components (David, 2010; Irwin et al., 2013; van Leeuwen & van Elk, 2018) but instead conflate them. To remedy this, Irwin et al. (2013) introduced the Survey of Anomalous Experiences (SAE) with subscales distinguishing “Proneness to Anomalous Experiences (PAE)” from “Proneness to Paranormal Attributions (PPA).” These subscales are only moderately associated ( $\rho$ 's = .29 to .40,  $p < .001$ ; Irwin, 2015, 2017, 2018; Irwin & Wilson, 2013), which suggests two distinct factors from a Classical Test Theory (CTT) standpoint.

Studies show mixed results regarding perceptual and attentional processes that facilitate PAE vs. PPA. Both subscales correlate with schizotypy, emotion-based reasoning, and suspension of reality testing, but Irwin et al. (2013) found that only PAE correlated significantly with executive dysfunction. PAE and PPA also correlated with an intuitive thinking style (Irwin & Wilson, 2013), whereas stress sensitivity and minimal-self dysfunction only correlated with PAE (Irwin, 2018). Ross et al. (2017) used the SAE to explore reasoning biases in the formation of paranormal explanations of anomalous experiences, paralleling research highlighting cognitive deficits associated with paranormal beliefs (Irwin, 2009), i.e., the adoption of implausible explanations for anomalous experiences due to improper or biased consideration of evidence. As expected, Ross et al. (2017) found that people low in “analytic cognitive style” (the willingness or disposition to critically evaluate outputs from intuitive processing and engage in effortful analytic processing) were more likely to invoke paranormal labels for their anomalous experiences.

However, the SAE's conceptual and psychometric foundation are debatable, since there are potentially serious measurement problems with instruments developed using CTT (Bond & Fox, 2001; Lange, 2017) such as the SAE. To avoid CTT's limitations, Lange et

al. (2000) introduced a “top-down purification” process that is grounded in Modern Test Theory (MTT). It combines Rasch (1960/1980) scaling with the removal of age- or gender-related response biases to avoid spurious factor structures of constructs, significant distortions in scores, and consequently erroneous reliability and validity findings (Lange, 2017; Lange, Irwin, & Houran, 2000). This approach can help to evaluate the utility of the SAE and more robustly test the idea of two distinct cognitive-perceptual processes inherent to the perception and report of subjective parapsychological experiences.

## Aims

Based on the above, we conducted a three-part study. Study 1 used “top-down purification” analyses to produce Rasch versions of PAE and PPA with (a) interval-level, bias-free scores, and (b) more accurate reliabilities to combat suppressed effect sizes due to measurement error (Evans et al., 2019). Studies 2 and 3 applied learnings from Study 1 to further test: (a) the hypothesis that subjective parapsychological experiences can be consistently described in terms of anomalous experiences vs. paranormal attributions, and (b) whether specific perceptual-personality variables predict the concepts of PAE vs. PPA. Concerning PAE, considerable evidence indicates that transliminality facilitates anomalous experience (Thalbourne & Houran, 2003; Thalbourne & Storm, 2012; Ventola et al., 2019) via Thalbourne and Houran’s hypothesis of neuroplasticity, or enhanced interconnectedness between brain hemispheres, as well as among frontal cortical loops, temporal-limbic structures and primary or secondary sensory areas or sensory association cortices (Thalbourne et al., 2001, 2003; Thalbourne & Maltby, 2008). This model predicts that PAE reflects capacity for syncretic cognitions, or the fusion of perceptual qualities in subjective experience, e.g., eidetic imagery (fusion of imagery and perception) or physiognomic perception (fusion of perception and feeling). Thus, PAE should correlate with (a) Hallucinations, (b) Synesthesia, (c) Delusional Ideations, and (d) scores on Transliminality and Childhood Trauma, which is a risk factor for transliminality (Thalbourne et al., 2003).

With respect to PPA, we predicted positive correlations with the variables defining our Anxiolytic Model of anomalous experience. Specifically, Lange and Houran (1998, 1999) published a series of path analyses that empirically modelled paranormal belief and experience as adaptive, non-pathological delusion-like beliefs (cf. Houran & Lange, 2004). These beliefs, in the absence of clear or convincing orthodox explanations, give people a sense of relief or control when assessing stressful or ambiguous stimuli. Our findings suggest that people face a basic choice between fear of an unknown and an uncritical explanation for an unknown, and this hypothesis is also supported by nonlinear analyses (Lange & Houran, 2000). Independent studies also support the idea that paranormal beliefs serve anxiolytic functions (e.g., Callaghan & Irwin, 2003; Greenaway et al., 2013; Houran & Williams, 1998; Kossowska et al., 2016). Therefore, we expected PPA to positively correlate with the psychometric variables from Lange and Houran’s model that define a low “analytic cognitive style” when individuals interpret anomalous or ambiguous information, namely (a) Intolerance of Ambiguity, (b) Fear of the Anomalous/Paranormal, and (c) Belief in the Paranormal.

## Method

*Study 1:* We collated data [ $n = 1,377$ , 351 men and 1026 women ( $M_{age} = 32.3$  yrs,  $SD = 19.5$ , range 18 -75 yrs)] from seven published studies (i.e., Irwin, 2015, 2017, 2018; Irwin, Dagnall & Drinkwater, 2013; Irwin, Schofield & Baker, 2014; Irwin & Wilson, 2013; Ross et al., 2017) to examine the SAE's internal validity via new Rasch scaling and differential item functioning analyses. Data were predominantly convenience samples of students from Australian and British universities. This integrated dataset was then subjected to top-down purification analyses per Lange (2017).

*Study 2:* We surveyed a convenience sample of 79 men and 101 women ( $M_{age} = 38.6$  yrs,  $SD = 14.2$ , range = 18-70 yrs.) using the SurveyMonkey® Audience paid research panel. These respondents were pre-screened for having had reported a “particularly memorable ‘ghostly’ experience during a paranormal tour or excursion within the past 12 months.” Respondents then provided a global “enchantment” rating of their anomalous experiences, as well as selected specific descriptors from a set of 30 items on an Enchantment-Adjective checklist (ACL) that reflected “emotional, sensorial, timeless, rational, and transformative” themes. This dataset was then subjected to top-down purification analyses per Lange (2017).

*Study 3:* We surveyed a convenience sample 507 men and 507 women ( $M_{age} = 34.9$  yrs,  $SD = 17.8$ , range = 18-70 yrs.) recruited from the SurveyMonkey® Audience paid research panel. Participants completed eight measures in counterbalanced order: the (a) SAE [measuring Proneness to Anomalous Experiences (PAE) and Proneness to Paranormal Attributions (PPA)]; (b) Peters et al. Delusions Inventory (PDI: Peters et al., 1999, 2004); (c) Launay-Slade (1981) Hallucination Scale (LSHS); (d) Synesthesia subscale from from Tellegen and Atkinson's (1974) Absorption Scale; (e) Revised Transliminality Scale (Lange, Thalbourne et al., 2000); (f) Survey of Traumatic Childhood Events (STCE: Council & Edwards, 1987); (g) 20-item Rasch version (Lange & Houran, 1999) of MacDonald's (1970) AT-20 scale; (h) Fear of the Paranormal subscale from the the Anomalous Experiences Inventory (AEI; Gallagher et al., 1994); and (i) Lange, Irwin, and Houran's (2000) Rasch-version of Tobacyk's (2004) Revised Paranormal Belief Scale.

## Results

*For Study 1*, the PPA showed good fit to the Rasch model and no item-bias, but it lacked adequate reliability. Several PAE items showed misfit to the Rasch model or gender-bias, though deleting five items produced a scale with acceptable reliability. Finally, we failed to validate a 3-category rating scale version with the goal of improving the SAE's psychometric properties. All three formulations revealed a secondary factor related to the items' extremity rather than contents, suggesting that future research must consider the *intensity* of respondents' anomalous experiences and paranormal attributions. Accordingly, the measurement of anomalous experiences and associated attributions is not a straightforward task and instead confounded by inherent responses biases and statistical irregularities.

*For Study 2*, analyses revealed that 21 items on the Enchantment-ACL formed a Rasch hierarchy of generally “pleasant” themes that was free of response biases related to Age, Sex, and Latency (time since the “enchanted” experience). This hierarchy contains all five experiential themes (i.e., emotional, sensorial, timeless, rational, and transformative), and the resulting Enchantment-ACL measure of this phenomenon showed good internal reliability (Rasch reliability = 0.82) and a positive correlation with global enchantment ratings ( $r = 0.51$ ,  $p < .001$ ). The pattern loadings suggest that, in addition to varying along the probabilistic Rasch scale, the 21 Enchantment-ACL items also vary along bi-polar distinction of “Attention” (positive loadings that seemingly reference “detection” of stimuli) vs. “Connection” (negative loadings that seemingly reference the “interpretation” of stimuli). This effect thus parallels PAE and PPA. The other nine items formed a separate factor containing overtly “unpleasant” ideations. We discuss the results within a cognitive dissonance framework for situational-enchantment, although future research must explore potential nuances related to the construct’s dimensionality and the specific role of pleasant versus unpleasant ideations.

*For Study 3*, all variables conformed to Rasch models and were significantly associated with one another as evidenced by dis-attenuated correlations, which corrected for measurement error due to limitations in reliabilities. Linear regression accounted for 71% of the variance and confirmed the hypothesis that Hallucinations, Synesthesia, Delusional Ideations, and Childhood Trauma (but not age or sex) significantly predict PAE. Similarly, regression analysis ( $R^2 = 0.66$   $p < .01$ ) supported the hypothesis that Intolerance of Ambiguity, Fear of the Paranormal, and Paranormal Belief (but not age or sex) predict PPA. Machine learning approaches corroborated both findings, although all independent variables proved useful in the prediction of PAE and PPA, respectively.

## Discussion

The measurements of “anomalous experiences” and “paranormal attributions” are neither simple nor straightforward psychometric tasks. Analyses also revealed a secondary factor related to “item extremity” rather than contents. The intensity of experiences and attributions therefore are critical issues. Nevertheless, our series of studies provided consistent support for the hypothesis that subjective parapsychological experiences involve two, distinct components or processes, i.e., one that mediates or moderates the onset of anomalous experiences and another that mediates or moderates paranormal attributions for these experiences.

Consistent with Thalbourne and Houran’s Neuroplasticity Hypothesis, anomalous experiences seemed to be rooted in loose mental boundary functioning. However, consistent with Lange and Houran’s Anxiolytic Model, paranormal interpretations of anomalous experiences seemed to be rooted in variables that suggest a low analytic cognitive style. Still, these basic patterns certainly do not tell the entire story, as machine learning predictions of PAE and PPA were most powerful when all independent variables were considered [i.e., Hallucinations, Synesthesia, Delusional Ideations, Childhood Trauma, Intolerance of Ambiguity, Fear of the Paranormal, and Paranormal Belief (New Age Philosophy and Traditional Paranormal Belief)]. This might suggest that “experience”

and “attribution” might neither be as distinct in their respective *natures* nor *mechanisms* as assumed. Instead, loose boundary functioning and anxietytic functioning seem structurally or functionally intertwined to some extent – although a parsimonious explanation for this interrelationship is presently unclear. Consequently, future studies are needed to better understand the structural relationships among variables underlying boundary functioning and anxietytic processes, and especially as these relate to the perception, report, and impact of anomalous experiences. Given the inherent psychometric pitfalls involved, future research should adopt MTT methods in tandem with the most robust predictive models afforded by machine learning if the goals are valid model-building and theory-formation.

## Conclusions

The cumulative evidence from our project suggests that (a) CTT measurements of anomalous experiences and paranormal attributions are riddled with psychometric confounds that can readily distort model-building and theory-formation, and (b) MTT methods to overcome these limitations revealed empirical patterns that suggest the onset of subjective parapsychological experiences are related to permeable mental boundary functioning, whereas paranormal attributions are linked to a low analytic cognitive style.

## Recommendations

Future research on subjective parapsychological experiences relative to attitudes, beliefs, or other individual differences should incorporate two methodological standards, as well as adopt a specific conceptual approaches:

- *First*, investigators must make clear distinctions between the anomalous/ altered experiences and the interpretations or attributions of these experiences.
- *Second*, self-report measures that were developed with CTT should be omitted (or re-analyzed and “purified”) in favor of MTT-based instruments and machine learning methods to avoid psychometric confounds that can distort model-building and theory-formation. In this way, comprehensive and replicable causal models can be identified.
- *Lastly*, new research is needed to explore whether PAE and PPA overlap more so than is currently understood with respect to their underlying mechanisms or structural relationship.

## References

- Bond, T. G., & Fox, C. M. (2001). *Applying the Rasch model: Fundamental measurement in the human sciences*. Mahwah, NJ: Lawrence Erlbaum.  
<https://doi.org/10.4324/9781410600127>
- Callaghan, A., & Irwin, H. J. (2003). Paranormal belief as a psychological coping mechanism. *Journal of the Society for Psychical Research*, 67, 200-207.
- Council, J. R., & Edwards, P. W. (1987). *Survey of Traumatic Childhood Events*. Unpublished psychological test. Fargo, ND: North Dakota State University.
- David, A. S. (2010). Why we need more debate on whether psychotic symptoms lie on a continuum with normality. *Psychological Medicine*, 40, 1935-1942.  
<https://doi.org/10.1017/S0033291710000188>
- Drinkwater, K., Denovan, A., Dagnall, N., & Parker, A. (2017). An assessment of the dimensionality and factorial structure of the Revised Paranormal Belief Scale. *Frontiers in Psychology*, 8:1693. <http://doi.org/10.3389/fpsyg.2017.01693>
- Evans, J., Lange, R., Houran, J., & Lynn, S. J. (2019). Further psychometric exploration of the transliminality construct. *Psychology of Consciousness: Theory, Research and Practice*, 6, 417–438. <https://doi.org/10.1037/cns0000163>
- Gallagher, C., Kumar, V. K., & Pekala, R. J. (1994). The Anomalous Experiences Inventory: Reliability and validity. *Journal of Parapsychology*, 58, 402-428.  
<https://doi.org/10.1037/t14244-000>
- Greenaway, K. H., Louis, W. R., & Hornsey, M. J. (2013). Loss of control increases belief in precognition and belief in precognition increases control. *PLoS ONE*, 8(8): e71327.  
<https://doi.org/10.1371/journal.pone.0071327>
- Houran, J., & Lange, R. (2004). Redefining delusion based on studies of subjective paranormal ideation. *Psychological Reports*, 94, 501-513. <https://doi.org/10.2466/pr0.94.2.501-513>
- Houran, J. & Williams, C. (1998). Relation of tolerance of ambiguity to global and specific paranormal experience. *Psychological Reports*, 83, 807-818.  
<https://doi.org/10.2466/pr0.1998.83.3.807>
- Irwin, H. J. (2009). *The psychology of paranormal belief: A researcher's handbook*. UK: University of Hertfordshire Press.
- Irwin, H. J. (2015). Paranormal attributions for anomalous pictures: A validation of the *Survey of Anomalous Experiences*. *Journal of the Society for Psychical Research*, 79, 11–17.
- Irwin, H. J. (2017). Empathy and parapsychological experiences: A constructive replication. *Journal of the Society for Psychical Research*, 81, 1-16.
- Irwin, H. J. (2018). Stress sensitivity and minimal-self dysfunction as predictors of anomalous experiences and paranormal attributions. *Journal of the Society for Psychical Research*, 82, 1-14.

- Irwin, H. J., Dagnall, N., & Drinkwater, K. (2013). Parapsychological experience as anomalous experience plus paranormal attribution: A questionnaire based on a new approach to measurement. *Journal of Parapsychology*, 77, 39-53. <https://doi.org/10.1037/t31377-000>
- Irwin, H. J., & Marks, A.D.J. (2013). The 'survey of scientifically unaccepted beliefs': A new measure of paranormal and related beliefs. *Australian Journal of Parapsychology*, 13, 133-167.
- Irwin, H. J., & Wilson, K. (2013). Anomalous experiences and the intuitive-experiential style of thinking. *Journal of the Society for Psychological Research*, 77, 65-71.
- Kossowska, M., Szwed, P., Wronka, E., Czarnek, G., & Wyczesany, M. (2016). Anxiolytic function of fundamentalist beliefs: neurocognitive evidence. *Personality and Individual Differences*, 101, 390-395. <https://doi.org/10.1016/j.paid.2016.06.039>
- Lange, R. (2017). Rasch scaling and cumulative theory-building in consciousness research. *Psychology of Consciousness: Theory, Research and Practice*, 4, 135-160. <https://doi.org/10.1037/cns0000118>
- Lange, R., & Houran, J. (1999). Scaling MacDonald's AT-20 using item-response theory. *Personality and Individual Differences*, 26, 467-475. [https://doi.org/10.1016/S0191-8869\(98\)00152-4](https://doi.org/10.1016/S0191-8869(98)00152-4)
- Lange, R., Irwin, H. J., & Houran, J. (2000). Top-down purification of Tobacyk's Revised Paranormal Belief Scale. *Personality and Individual Differences*, 29, 131-156. [https://doi.org/10.1016/S0191-8869\(99\)00183-X](https://doi.org/10.1016/S0191-8869(99)00183-X)
- Launay, G., & Slade, P. D. (1981). The measurement of hallucinatory predisposition in male and female prisoners. *Personality and Individual Differences*, 2, 221-234. [https://doi.org/10.1016/0191-8869\(81\)90027-1](https://doi.org/10.1016/0191-8869(81)90027-1)
- MacDonald, Jr., A. P. (1970). Revised scale for ambiguity tolerance: Reliability and validity. *Psychological Reports*, 26, 791-798. <https://doi.org/10.2466/pr0.1970.26.3.791>
- Peters, E. R., Joseph, S. A., Day, D. S., & Garety, P. A. (2004). Measuring delusional ideation: The 21-Item Peters et al. Delusions Inventory (PDI). *Schizophrenia Bulletin*, 30, 1005-1022. <https://doi.org/10.1093/oxfordjournals.schbul.a007116>
- Peters, E. R., Joseph, S. A., & Garety, P. A. (1999). Measurement of delusional ideation in the normal population: Introducing the PDI (Peters et al. Delusions Inventory). *Schizophrenia Bulletin*, 25, 553-576. <https://doi.org/10.1093/oxfordjournals.schbul.a033401>
- Preti, A., Vellante, M., & Petretto, D. R. (2017) The psychometric properties of the "Reading the Mind in the Eyes" test: An item response theory (IRT) analysis. *Cognitive Neuropsychiatry*, 22, 233-253. <https://doi.org/10.1080/13546805.2017.1300091>
- Rasch, G. (1960/1980). *Probabilistic models for some intelligence and attainment tests*. (Copenhagen, Danish Institute for Educational Research), expanded edition (1980) with foreword and afterword by B. D. Wright. Chicago: University of Chicago Press.
- Ross, R. M., Hartig, B., & McKay, R. (2017). Analytic cognitive style predicts paranormal

- explanations of anomalous experiences but not the experiences themselves: Implications for cognitive theories of delusions. *Journal of Behavior Therapy and Experimental Psychiatry*, 56, 90-96. <https://doi.org/10.1016/j.jbtep.2016.08.018>
- Schofield, M. B., Baker, I. S., Staples, P., & Sheffield, D. (2018). Creation and validation of the Belief in the Supernatural Scale. *Journal of Parapsychology*, 82, 41-64. <https://doi.org/10.30891/jopar.2018.01.04>
- Stout, W. F. (1987). A nonparametric approach for assessing latent trait dimensionality. *Psychometrika*, 55, 293-326.
- Tellegen, A., & Atkinson, G. (1974). Openness to absorbing and self-altering experiences ("absorption"), a trait related to hypnotic susceptibility. *Journal of Abnormal Psychology*, 83, 268-277. <https://doi.org/10.1037/h0036681>
- Thalbourne, M. A., & Houran, J. (2003). Transliminality as an index of the sheep-goat variable. *European Journal of Parapsychology*, 18, 3-14.
- Thalbourne, M. A., Houran, J., Alias, A. G., & Brugger, P. (2001). Transliminality, brain function, and synesthesia. *Journal of Nervous and Mental Disease*, 189, 190-192. <https://doi.org/10.1097/00005053-200103000-00009>
- Thalbourne, M. A., Houran, J., & Crawley, S. E. (2003). Childhood trauma as a possible antecedent of transliminality. *Psychological Reports*, 93, 687-694. <https://doi.org/10.2466/pr0.2003.93.3.687>
- Thalbourne, M. A., & Maltby, J. (2008). Transliminality, thin boundaries, unusual experiences, and temporal lobe lability. *Personality and Individual Differences*, 44, 1617-1623. <https://doi.org/10.1016/j.paid.2008.01.022>
- Thalbourne, M. A., & Storm, L. (2012). Has the sheep-goat variable had its day? Testing transliminality as a psi predictor. *Australian Journal of Parapsychology*, 12, 69-80.
- Tobacyk, J. (2004). The Revised Paranormal Belief Scale. *International Journal of Transpersonal Studies*, 23, 94-98. <https://doi.org/10.24972/ijts.2004.23.1.94>
- van Elk, M (2015). Perceptual biases in relation to paranormal and conspiracy beliefs. *PLoS ONE* 10(6): e0130422. <https://doi.org/10.1371/journal.pone.0130422>
- van Leeuwen, N. & van Elk, M. (2018). Seeking the supernatural: The interactive religious experience model. *Religion, Brain, Behavior*, DOI: [10.1080/2153599X.2018.1453529](https://doi.org/10.1080/2153599X.2018.1453529)
- Ventola, A., Houran, J., Laythe, B., Storm, L., Parra, A., Dixon, J., & Kruth, J. G. (2019). A transliminal 'dis-ease' model of poltergeist 'agents.' *Journal of the Society for Psychical Research*, 83, 144-171.