Who Has Anomalous Experiences Today? Evidence for the Highly Sensitive Person Paradox

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Abstract

Anomalous experiences are often viewed as red flags for psychosis—yet many individuals who report them show no signs of clinical disorder. This study reveals a paradox: traits associated with the Highly Sensitive Person (HSP) do not increase Anomalous Perceived Phenomena (APP). Instead, when considered within the Psychosis Continuum Model (PCM), sensitivity appears to act as a suppressor. Drawing on data from 1215 adults, we tested the Integrated Temperamental-Sensitivity Theory of Anomalous Experience (ITSTAE), a multifactorial model integrating temperament, HSP traits, and PCM dynamics. As expected, psychotic traits predicted higher APP scores. However, HSP traits only became predictive when moderated by PCM—and notably, the effect was negative. The more sensitive the individual, the fewer anomalous perceptions they reported under psychotic pressure. Structural Equation Modeling (SEM) confirmed the model's fit, with explained variance in APP rising from 47.1% to 61.4% when PCM mediation was included. Multitrait-Multimethod (MTMM) analyses further validated the conceptual independence of HSP and PCM. These findings challenge psychiatric reductionism and suggest a more nuanced, non-pathologizing lens on altered perception. Far from signaling fragility, heightened sensitivity may serve as a buffer—a cognitive shield—against psychosis-linked anomalous experiences. This model reframes sensitivity not as vulnerability, but as a form of psychological complexity.

Keywords Temperament, psychosis continuum model, paranormal beliefs, anomalous experiences, highly sensitive person

Introduction

Temperament is classically defined as a biological and structural basis on which the complex personality that characterizes an individual develops (Ponikiewska et al., 2022; Zawadzki & Cyniak-Cieciura, 2022). Although the concepts of temperament and personality have been used interchangeably (see McCrae & Costa, 2003), temperament is considered a formal component of personality that is manifested from early childhood (e.g., Cloninger, 1993). Similarly, temperament is not unique to humans, as it has also been observed in other animals (Strelau et al., 2015). Furthermore, in other research, temperament is associated with genetic and medical variables (e.g., Alvarenga et al., 2022; Shen et al., 2022), which support the idea of biological structure. In this sense, temperament is a psychobiological construct that determines stable behavioral tendencies and represents the foundation of personality development (Fajkowska et al., 2012; Kozłowska et al., 2022).

The Regulative Theory of Temperament (RTT)

One of the best-established theories describing, classifying, and explaining people's temperament is the **Regulative Theory of Temperament (RTT)** (see Strelau, 1983, 1989). This theory considers temperament as a formal structure of character based on action theory (see Tomaszewski, 1978), the theory of conditioned reflexes (Pavlov, 1928), and the concept of arousal (Gray, 1964). This resulted in temperament acquiring two properties: a **temporal property** (stability over time) and an **energetic property** (informing about activation and inhibition flows of the organism) (see Strelau, 2008; Strus et al., 2022).

RTT conceives temperament as a behavioral marker that allows regulating and defining the individual's responses to the environment (see Clark & Watson, 2021; Strelau, 1989). This means that the different ways in which a person acts in the face of certain stimuli would not only be justified from the classical and instrumental conditioning theories of learning (e.g., Lee et al., 2021)—they would also be regulated by psychobiological markers intrinsic to each person (i.e., temperament) (Dragan et al., 2022; Fagen et al., 1987). As a consequence, temperament could be measured and used as a predictor of behavior (e.g., Irwin et al., 2018).

RTT describes and explains temperament from seven dimensions (see Cyniak-Cieciura et al., 2018; Strelau, 2008): (1) **Briskness** – the agility with which the individual tends to react quickly to environmental stimuli; (2) **Perseveration** – the tendency to repeat the same response when the stimulus that caused it is removed; (3) **Sensory Sensitivity** – the tendency to react to several stimuli at the same time; (4) **Endurance** – the individual's facility to emit highly stimulating and prolonged responses over time in a functional and adaptive manner; (5) **Emotional Reactivity** – the tendency to give very intense responses to affective stimuli; (6) **Activity** – the degree to which a person engages in highly stimulating behaviors; (7) **Rhythmicity** – the degree to which homogeneous responses are emitted by time intervals, in relation to acquired eating and sleeping habits.

Each of these dimensions is validly and reliably measured by the **Formal Characteristics of Behaviour-Temperament Inventory (FCB-TI)** (see Strelau & Zawadzki, 1993, 1995). In fact, the original version of the FCB-TI only included six of these dimensions (the Rhythmicity dimension was excluded) (see Kantor-Martynuska, 2012). However, Cyniak-Cieciura et al. (2018) developed a revision of the FCB-TI in which they maintained the seven dimensions highlighted above and provided evidence supporting its psychometric properties. Although Strelau and Zawadzki (1993) recommend distributing the scores of the FCB-TI in two macrofactors (temporal characteristics and energy), Strelau (1983) admitted that both dimensions are related and could form a single macro-factor of temperament. Along this line, the interpretation of the information of this single factor would be centered on the levels of energy or arousal (see Zawadzki & Strelau, 2010). Indeed, in recent reviews of the FCB-TI(R), statistical evidence supported employing the 1-factor solution as a general basis to subsequently extract alternative bifactor solutions (see Cyniak-Cieciura et al., 2018).

RTT allows application of the analysis of temperament influence to almost any field of psychology: for example, in parental educational styles (Mącik, 2020), self-awareness (see Śniecińska, 2020), types of cognitive reasoning (Dragan & Dragan, 2013; Wytykowska et al., 2022), psychopathology (Fruehstorfer et al., 2012; Watson et al., 2022), concentration (Baran et al., 2021), belief systems related to sense of control (Bylinka & Oniszczenko, 2016), and perceptual distortions (Przedniczek & Bednarek, 2021). This evidences the universality of temperament in the prediction of behavior and its importance as a cross-cutting object of study underlying any type of behavior. In this report, we will focus on an under-researched area: the effects of temperament on the development of the **Sensory Processing Sensitivity (SPS)** construct (see Aron et al., 2012), and on the production of anomalous experiences.

The Sensory Processing Sensitivity (SPS) and Highly Sensitive Person (HSP)

SPS is defined as a type of temperament (see Jagiellowicz et al., 2016) characterized by the degree of reactivity to subtle physical stimuli, or as the ease with which a person is overstimulated (Williams et al., 2021). SPS involves sensitivity in signal detection and cognitive processing that allows mental representation and categorization of perceived stimuli (e.g., Greven et al., 2019). Thus, a very high degree of SPS describes a person who is highly susceptible and reactive to subliminal stimuli in the environment (Lionetti et al., 2019). This type of profile is called **Highly Sensitive Person (HSP)** (see Aron & Aron, 1997), and scientific evidence showed that they are people who easily experience social anxiety (see Hofmann & Bitran, 2007), burnout (Meyerson et al., 2020), and nightmares (Carr et al., 2020), and perceive dreams very lucidly and vividly (Carr et al., 2023). In addition, they may also have a high degree of both empathy for others (see Aron, 2011) and conscientiousness (Acevedo et al., 2014). In general, HSP individuals exhibit high levels of paranoia and psychoticism compared to low scorers (Konrad & Herzberg, 2019).

Based on this trend and other previous evidence (e.g., Fox & Williams, 2000; Irwin, 2009; Irwin et al., 2013), several studies analyzed the relationship between temperament, HSP, and the production of anomalous perceptions (e.g., Gawęda & Kokoszka, 2013; Parra & Argibay, 2016). Specifically, the prevailing evidence holds that people with a tendency toward extraversion and activation tend to develop these types of extraordinary experiences and beliefs (e.g., Andersson et al., 2022; Chauvin & Mullet, 2018). Additionally, evidence also reports that SPS and HSP are not related to anomalous experiences (see Williams et al., 2021). This is not contradictory and is rationally justifiable: people who score high on extraversion biologically possess lower cortical activation than introverted individuals. In order to balance activation levels, extroverted subjects seek stimulation from environmental inputs and, consequently, engage in more socially interactive behaviors (see also Fink & Neubauer, 2004; Stelmack, 1990). In contrast, also following the SPS model, people with an HSP profile would themselves have high levels of cortical activation and would not need environmental stimuli for self-regulation (see Acevedo et al., 2014). Therefore, it is known and proven that the HSP profile is not related to extraversion (Smolewska et al., 2006), and that when this relationship does exist, extraversion scores tend to be low (Grimen & Diseth, 2016). So, it is logical, and to be expected, that people with HSP do not have as many anomalous experiences as extroverted subjects. Despite no relationship between HSP and anomalous perceptions, there would remain the question of how to rationally account for high levels of psychoticism (see Konrad & Herzberg, 2019).

The Anomalous Perceptions

The study of anomalous perceptions is important because research focuses on why some people have these perceptions and others do not (see Escolà-Gascón, 2020a, 2020b, 2022a, 2022b, 2022c; Ross et al., 2017). Typically, anomalous perceptions are explained on the basis of the **Psychosis Continuum Model (PCM)** (e.g., van Os et al., 2009) and justified on the basis of the psychotic phenotype (which includes schizotypal personality) (e.g., Escolà-Gascón, 2022a). The PCM postulates that anomalous perceptions (as positive symptoms of psychosis) fluctuate between two extremes; at one extreme are the more attenuated and non-pathological anomalous perceptions and, at the other, are the more intense, persistent, and dysfunctional perceptual disturbances (e.g., Stefanis et al., 2002). The idea of psychotic phenotypy is to consider the attenuated symptoms of schizotypy as risk factors for future psychotic episodes (Escolà-Gascón & Wright, 2021). Moreover, scientific evidence consistently shows that schizotypy is positively related to anomalous experiences (e.g., Irwin, 2009). The PCM and these robust pieces of evidence represent sufficient epistemic and empirical grounds to analyze psychotic symptoms as variables integrated in the classical personality theories, RTT and SPS. PCM symptoms could have a moderating role that rationally justifies when there might be a significant relationship between SPS and anomalous experiences. Despite these rationales, and the numerous model theories published in the literature that purport to predict which people have anomalous experiences and which do not (see Lindeman & Aarnio, 2007; Stone et al., 2018), no integrative model was found that incorporates RTT, SPS, and PCM as predictor and intervening constructs of anomalous experiences.

Integrated Temperamental-Sensitivity Theory of Anomalous Experience (ITSTAE)

The RTT and the SPS framework, along with the empirical evidence previously cited, supports the hypothesis that the temperament dimensions of Briskness, Endurance, and Activity are negatively correlated with SPS (Sobocko & Zelenski, 2015). This is because, as Ujiie and Takahashi (2022) observed, individuals with high SPS tend to exhibit excessively elevated internal arousal, making them less likely to engage in behaviors that would further increase stimulation levels (see also Iimura, 2021). Our hypothesis is that if anomalous experiences are related to certain positive psychotic symptoms (Dagnall et al., 2024), then such experiences would be more likely to occur in individuals with HSP traits only when a psychotic phenotype is also present—typically reflected in high scores on the aforementioned temperament dimensions.

Based on this, we propose the Integrated Temperamental-Sensitivity Theory of Anomalous Experience (ITSTAE). In this model, both temperament and HSP traits exert direct effects on Anomalous Perceived Phenomena (APP), while the PCM plays a central mediating role. Specifically, PCM is influenced by temperament and, in turn, predicts both HSP traits and anomalous experiences. Moreover, HSP traits themselves also directly predict APP. Thus, the ITSTAE model reflects a complex network of both direct and mediated relationships, structured along three main pathways: (a) temperament → PCM → HSP → APP, (b) temperament → APP, and (c) HSP → APP. These parallel and sequential influences interact simultaneously to determine the likelihood of anomalous experiences in HSP individuals, with

PCM amplifying the effects of both temperament and HSP traits. Figure 1 illustrates the model, with directional arrows depicting the hypothesized relationships among variables.

Figure 1. Flowchart representing the predictive model of anomalous experiences, integrating key theoretical perspectives—Regulative Theory of Temperament (RTT), Sensory Processing Sensitivity (SPS), and the Psychosis Continuum Model (PCM)—into the Integrated Temperamental-Sensitivity Theory of Anomalous Experience (ITSTAE).

As shown in Figure 1, PCM does not serve merely as a mediator between temperament and anomalous experiences, but as a hub variable that connects multiple predictive pathways. It mediates the impact of temperament on both HSP traits and APP, while HSP traits also exert a direct influence on APP. This recursive causal structure, consistent with the type of system described by Lawley and Maxwell (1971), allows for the modeling of simultaneous and interdependent effects across variables. Within this framework, ITSTAE offers a comprehensive and integrative approach to understanding the emergence of anomalous experiences in individuals with heightened sensitivity. This model, inspired by complex mediation designs commonly employed in econometrics, enables the prediction of multifactorial phenomena such as anomalous experiences under overlapping influences. Crucially, the model indicates that without the involvement of PCM, HSP alone would not be sufficient to predict APP. This highlights that HSP traits may only lead to clinically significant or pathological APP when they are shaped or intensified by a psychosis-prone phenotype, as defined by the PCM. Accordingly, ITSTAE provides a preventive and differential framework for identifying when APP represents a benign feature of sensitivity—and when it may instead signal a latent clinical risk. The primary aim of the present research is to test this multi-pathway model and determine under what conditions anomalous experiences become clinically significant—particularly when PCM-related psychotic features are present. In doing so, ITSTAE provides a theoretically grounded and clinically useful model for the psychological assessment and potential treatment of anomalous experiences, especially those associated with psychotic-like symptoms or altered states of consciousness.

Methods

Sample

Responses were recorded from 1215 adult participants (53% female and 47% male). Ages ranged from 21 to 55 years (mean = 39.22; standard deviation = 9.278). Of the participants, 33.6% completed high school, 33.6% also received vocational training, and 32.8% completed university studies. 406 participants (33.4%) lived in Madrid, 403 (33.2%) lived in Barcelona, and 406 (33.4%) lived in Valencia. All respondents agreed to collaborate with this research on a voluntary basis and after having digitally signed an informed consent form explaining what this research consisted of. All data were recorded completely anonymously and treated only for statistical purposes.

Materials

Formal Characteristics of Behavior—Temperament Inventory Revised (FCB-TI [R]). The FCB-TI(R) Inventory was developed by Cyniak-Cieciura et al. (2018) from the original version of this test (see Strelau & Zawadzki, 1993, 1995). It consists of seven subscales with

15 items in each of them with the exception of the Rhythmicity dimension, which contains 10 items only. The seven subscales correspond with the seven dimensions described in the introduction. The responses were coded using the Likert model with 4 graded response alternatives: (1) strongly disagree, (2) disagree, (3) agree, and (4) strongly agree. The validity and reliability of the FCB-TI was satisfactory in both its original and revised versions (see Cyniak-Cieciura et al., 2018; Strelau, 2008; Strelau & Zawadzki, 1993, 1995). In this study, the internal consistency of the responses of each scale was also analyzed by employing McDonald's omega reliability coefficient. The results were acceptable for all scales (omega coefficient >0.8 for all scales).

Highly Sensitive Person Scale (HSPS). The HSPS was developed by Aron and Aron (1997) to assess SPS from 27 items distributed across three dimensions according to the evidence provided by Smolewska et al. (2006): (1) Ease of Excitation (EOE, 12 items); (2) Aesthetic Sensitivity (AES, 7 items); and (3) Low Sensory Threshold (LST, 6 items). In this study, only the 25 most reliable items of the original version were used, as Williams et al. (2021) did. The participant had to indicate the degree to which the content of each question was identified or applied to them. Responses were coded using a graduated scale from 1 = not at all, to 7 = Extremely; high scores indicated the presence of SPS and would describe the HSP profile explained in the introduction. The HSPS had good validity and reliability in multiple studies (see Aron & Aron, 1997; Smolewska et al., 2006; Williams et al., 2021). In this study, Cronbach's alpha coefficient was applied for each dimension to examine the consistency of responses. The results supported the reliability of the scores (where alpha was >0.75 for all scales).

Community Assessment of Psychic Experiences (CAPE). The CAPE scale was originally developed by Stefanis et al. (2002) and contains 40 items assessing PCM from three dimensions: (1) Positive Dimension (PD, 18 items); (2) Negative Dimension (ND, 14 items); (3) Depressive Dimension (DD, 8 items). In a new revision, 2 more items were included in the PD dimension (see Mark & Toulopoulou, 2015). Using a 4-alternative Likert scale (from 1 = never to 4 = almost always), the participant must indicate how often they perceive each of the symptoms expressed by each item. Numerous pieces of evidence support the validity and reliability of the use of the CAPE or CAPE-42 for the measurement of PCM (Mark & Toulopoulou, 2015; Stefanis et al., 2002). In this research, the Spanish adaptation CAPE-42 of Fonseca-Pedrero et al. (2012) was used. The omega coefficient was applied with the data from this sample for each dimension, giving acceptable and satisfactory reliability results (>0.8).

Multivariable Multiaxial Suggestibility Inventory-2 (MMSI-2). The MMSI-2 is a broad-spectrum multidimensional inventory designed to assess experiences of suggestion, subclinical personality traits, and anomalous experiences (see Escolà-Gascón, 2020a, 2020b). In total, it has 174 items with a Likert-type scale from 1 = strongly disagree to 5 = strongly agree that the participant must use to indicate how much they agree with what the statement says. It has a total of 20 subscales, of which only 5 were used: (1) Anomalous Visual/Auditory Phenomena (Pva, 11 items); (2) Anomalous Tactile Phenomena (Pt, 7 items); (3) Anomalous Olfactory Phenomena (Po, 7 items); (4) Anomalous Cenesthetic Phenomena (Pc, 9 items); and (5) Anomalous Perceived Phenomena (APP, is the sum of Pva, Pt, Po, and Pc). According to the scientific literature, the validity and reliability of the MMSI-2 was excellent (Escolà-Gascón, 2020a, 2020b, 2022b), even in the English adaptations of the same (see Escolà-Gascón et al., 2021). In this study, the omega coefficient was used to test the reliability of the scores with the data from this sample and the results were also satisfactory (omega >0.8 for all dimensions).

Procedures

This research has a correlational design based on the statistical control of variables through the application of structural equation models. The collection of responses was done online in collaboration with the logistics company M.G. Integrated Services. It was a private individual computer application designed specifically for survey studies. Participants were contacted through Telegram, Whatsapp, Twitter, and Facebook social network groups. The sampling was non-probabilistic and had a duration of 1 year and 2 months. Before answering the questionnaires, participants had to read and accept the informed consent in which the purposes of the research and the conditions of data collection were detailed; this guaranteed anonymity on all occasions. The data were progressively recorded in an Excel-type file that was subsequently reviewed and configured for data analysis. In this first initial review, no missing values were identified and there were no strange patterns in the responses (e.g., tendency to acquiescence, tendency to denial or neutrality, or both).

Statistical Analysis

The data were processed with the SPSS® statistical package and its AMOS® extension specialized in Structural Equation Modeling (SEM). The R programming language was also used to calculate some reliability coefficients (The R Core Team, 2018). For the SEM models, it was decided to use the Maximum Likelihood Method (MLM) for parameter estimation. This method allowed obtaining a wide catalog of goodness-of-fit indices, which were the following (cut-off points according to Kline, 2013 are specified in parentheses): chi square; Normed χ2 = chi square divided by freedom degrees; RMSEA = Root Mean Square Error of Approximation (threshold= <0.08); AGFI = Adjusted Goodness of Fit Index (threshold= >0.9); CFI = Comparative Fit Index (threshold= >0.950); TLI = Tucker-Lewis index (threshold= >0.950); IFI = Incremental Fit Index (threshold= >0.950); NFI = Normed Fit Index (threshold= >0.950); AIC = Akaike Information Criterion; and BIC = Bayesian Information Criterion. Several theoretical models (with and without variable mediation) were analyzed and the explained variances of the main dependent variables (APP and PCM) were calculated for each of them. Likewise, the Analysis of Variance (ANOVA) technique was used to ensure that there were no significant differences between participants from Madrid, Barcelona, and Valencia. The Kruskal-Wallis nonparametric test was also applied simultaneously. If the results were significant, we would have statistical grounds to use factorial invariance analysis between these groups. Otherwise, we could proceed without this analysis on the understanding that there would be no direct differences and, consequently, no bias attributable to the measurement instruments. A confidence level of 1% and 0.1% was established in all analyses.

Results

Before analyzing the SEM models, we present in Table 1 a summary of the descriptive statistics for all the variables included in this study. We also offer the contrast of means between residents of Madrid, Barcelona, and Valencia to report that there were no significant differences between these groups and that, therefore, there should be no significant cultural influence on the participants' responses.

Table 1. Descriptive statistics and contrast means.

Indices	Groups	Means	Standard deviation	Fisher's test	Kruskal-Wallis test
Briskness	Madrid	35.37	10.378	1.354 p=0.259	1.586 p=0.453
	Barcelona	36.38	10.643		
	Valencia	36.5	11.202		
Perseveration	Madrid	35.18	10.668	1.003 p=0.367	1.338 p=0.512
	Barcelona	35.62	10.474		
	Valencia	36.24	11.034		
Sensory Sensitivity	Madrid	35.15	10.034	0.663 p=0.515	0.986 p=0.611
	Barcelona	35.85	10.027		
	Valencia	35.86	10.399		
Endurance	Madrid	35.40	10.441	0.794 p=0.452	1.050 p=0.592
	Barcelona	36.06	10.505		
	Valencia	36.32	11.237		
Emotional Reactivity	Madrid	36.17	10.890	0.048 p=0.953	0.106 p=0.948
	Barcelona	36.18	10.262		
	Valencia	36.37	11.268		
Activity	Madrid	36.14	10.981	0.284 p=0.753	0.843 p=0.656
	Barcelona	36.54	10.605		
	Valencia	36.69	11.036		
Rhythmicity	Madrid	24.83	6.127	0.195 p=0.823	0.272 p=0.873
	Barcelona	24.62	6.165		
	Valencia	24.87	6.064		
Temperament (total including Rhythmicity)	Madrid	238.22	55.099	0.747 p=0.474	1.897 p=0.387
	Barcelona	241.25	50.851		

Indices	Groups	Means	Standard deviation	Fisher's test	Kruskal-Wallis test
	Valencia	242.85	58.170		
Temperament (total without Rhythmicity)	Madrid	213.39	54.259	0.768 p=0.464	1.964 p=0.375
	Barcelona	216.63	50.453		
	Valencia	217.99	57.814		
Ease of Excitation	Madrid	47.47	16.672	2.002 p=0.136	3.731 p=0.155
	Barcelona	46.05	15.415		
	Valencia	45.16	17.602		
Aesthetic Sensitivity	Madrid	29.70	9.794	0.957 p=0.384	1.680 p=0.432
	Barcelona	29.64	9.394		
	Valencia	28.84	10.316		
Low Sensory Threshold	Madrid	21.74	7.026	0.647 p=0.524	0.791 p=0.673
	Barcelona	21.51	6.899		
	Valencia	21.17	7.719		
Total Highly Sensitive Person Scale	Madrid	98.91	31.653	1.419 p=0.242	2.576 p=0.276
	Barcelona	97.20	29.245		
	Valencia	95.70	33.958		
Depressive Dimension	Madrid	15.92	4.513	1.454 p=0.234	2.842 p=0.241
	Barcelona	15.38	4.613		
	Valencia	15.61	4.584		
Positive Dimension	Madrid	37.82	10.225	0.980 p=0.376	1.958 p=0.376
	Barcelona	37.23	10.595		
	Valencia	36.81	10.173		
Negative Dimension	Madrid	25.72	6.641	0.653 p=0.521	1.382 p=0.501
	Barcelona	25.18	6.633		
	Valencia	25.48	6.849		
Total Community Assessment of Psychic Experiences	Madrid	79.46	19.226	0.931 p=0.394	1.546 p=0.462
	Barcelona	77.78	19.831		
	Valencia	77.90	19.563		
Anomalous Visual/Auditory Phenomena	Madrid	21.18	5.168	0.436 p=0.647	0.808 p=0.668
	Barcelona	20.92	5.193		
	Valencia	21.23	5.035		

Indices	Groups	Means	Standard deviation	Fisher's test	Kruskal-Wallis test
Anomalous Tactile Phenomena	Madrid	16.75	4.585	1.134 p=0.322	1.733 p=0.420
	Barcelona	16.33	4.716		
	Valencia	16.75	4.467		
Anomalous Olfactory Phenomena	Madrid	17.46	4.858	0.013 p=0.987	0.004 p=0.998
	Barcelona	17.41	4.901		
	Valencia	17.45	4.800		
Anomalous Cenesthetic Phenomena	Madrid	14.94	2.918	1.481 p=0.228	3.801 p=0.149
	Barcelona	14.62	3.004		
	Valencia	14.91	2.824		
Anomalous Perceived Phenomena (total MMSI-2 perceptual scales)	Madrid	70.33	15.413	0.651 p=0.521	0.693 p=0.707
	Barcelona	69.28	15.823		
	Valencia	70.35	14.552		

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The contrast of means in Table 1 indicated that the differences between places of residence were not significant. This indicates that there are no effects attributable to the culture of each place of residence and that the application of factorial invariance analysis is not a priority in this study. To assess the validity of the ITSTAE model, two models must be specified, estimated, and evaluated for fit: a first model without the mediating variable PCM, and a second model incorporating the nested dual mediation—which corresponds to the theoretical structure proposed by ITSTAE. It is this second model on which the validity of ITSTAE is analyzed, based on the goodness-of-fit indices used to model and predict APP. However, it would not be appropriate to directly test the nested dual mediation model of ITSTAE without first confirming the existence of a relationship between the measured variables HSP and temperament. Parameter estimation for both models was performed using MLM. More advanced estimation methods, such as Bayesian approaches, were excluded due to specification issues regarding the relationship between HSP and PCM (for further information, see Depaoli, 2021; Muthén & Asparouhov, 2012).

Structural Equation Modeling and Validity of the ITSTAE

Figure 2 presents the model without mediation, including the temperament variables and the HSP profile. If the effects in this model were not statistically significant, it would make little sense to proceed with testing the mediation model proposed by the ITSTAE theory. To help readers better understand: if the effects were significant, we could then test the extent to which the simultaneous mediations proposed by ITSTAE account for part of the observed effects in predicting APPs. It must be clearly stated that we are not comparing different theoretical models, but rather evaluating a single model—the ITSTAE—using a sequential, recursive, and nested approach. The purpose is to ensure that each methodological step in the SEM analyses yields acceptable fit indices, thereby validating the entire process (and not just the most comprehensive version of the model, which includes the mediators).

Figure 2. A SEM analysis was conducted on the previous ITSTAE model without simultaneous statistical mediations. The variable HSP was included as the first mediator; however, the model was not nested. The variable APP corresponds to the MMSI scale that measures anomalous perceptions. All parameter estimates were statistically significant, except for the paths from HSP to APP, which were not significantly different from zero. This finding suggests that, in the absence of additional intervening variables, the HSP profile does not predict APP.

In contrast, Figure 3 incorporates the simultaneous mediations proposed by ITSTAE, as previously outlined and illustrated in Figure 1, which serves as a conceptual diagram supporting the framework presented in Figure 3. Along with the estimates and specifications shown in Figures 2 and 3, we also obtained the fit indices summarized in Table 2. This table includes the minimum theoretical thresholds required to support the validity of the ITSTAE theory.

Figure 3. A SEM analysis was conducted on the ITSTAE model, incorporating the simultaneous mediations of the PCM variable, which represents the psychosis continuum. This variable acts as a dual mediator, influencing both APP and HSP. According to ITSTAE theory, if anomalous experiences occur in individuals with high HSP scores, it is because the psychotic phenotype may mediate effects on both HSP and APP. This accounts for the fact that, even when the psychotic phenotype affects HSP profiles, anomalous experiences do not necessarily increase. It suggests that, if risk factors are involved, they are more likely associated with negative symptoms and social maladaptation, rather than with the positive symptoms of psychosis. All parameter estimates in this more comprehensive specification were statistically significant.

Credit Author Statement

Alex Escolà-Gascón: conceptualization, methodology, data curation, execution of experiments, writing-original draft preparation, writing-reviewing and editing; **Christopher French and Neil Dagnall:** conceptualization, methodology, writing-reviewing and editing; **Andrew Denovan and Alejandro Rujano:** writing-reviewing and editing, supervision.

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This research was not preregistered.

Ethical Statement

Ethical Approval: The Committee of Ethical Guarantees of the University Society for Scientific Research, a Spanish official institution (public I.D. 58210-J/1), reviewed, favorably evaluated, and approved this research.

Data Availability Statement

Data from this research will be available upon request.

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