Psychological effects and risks after playing the paranormal *Ouija* board game: A *quasi-experimental* study

Appendices are provided at the end of the manuscript.

Run title:

Psychological effects of *Ouija*

Paranormal games are activities some people use as oracles for entertainment, with the *Ouija* board being the most classic example. There is scant information in scientific literature regarding the psychological effects and risks associated with these types of activities. Although the *Ouija* is legally sold as a children's game, its potential health impacts need to be scientifically assessed and evidence-based. In this study, we examine the psychological effects and risks linked to using the *Ouija* board. A quasi-experimental design was carried out. Twenty-one *Ouija* sessions were performed with 4 participants in each trial. In total, 84 subjects took part. Pre-test and post-test measures of anxiety levels, Altered States of Consciousness and perceptual disturbances were evaluated. The variable "beliefs in the paranormal" was added as an interaction factor. Believers demonstrated higher average scores than non-believers on all post-test measurements. Analysis of the interaction between simple effects revealed that believers' anxiety levels increased by 25.5% for paranormal believers (vs. non-believers). Believers also experienced heightened altered states of consciousness and anomalous experiences. It is important to highlight the possible influence of the environment on believing participants. Certain environmental characteristics could have generated increases in the levels of anxiety and suggestibility. These influences should be controlled in future research. Overall, this study found that participants who believe in the paranormal (vs. non-believers) are more likely to perceive symptoms of anxiety, altered states of consciousness and anomalous experiences as a result of playing *Ouija.*

Key words: Anxiety; Paranormal Beliefs; *Ouija*; Anomalous Perceptions; Hallucinations.

1. Introduction

A significant proportion of people believe in the existence of the paranormal (e.g., Musella, 2003). This belief often expresses as interest in rituals or games that supposedly facilitate communicate with supernatural beings (e.g., Irwin, 1999; Rock, 2013). Although recently activities have emerged such as 'Charlie Charlie' and 'Spirit of the Coin' the traditional and most popular method is via a *Ouija* (also known as a spirit or talking board) (e.g., Palmer, 1999). Accordingly, the board comprises a range of messaging tools (i.e., letters of the alphabet, numerical values from 0 to 9, and statements such as "hello" or "goodbye"), which vary according to the edition or participants' judgment (e.g., Wegner, 2002). To produce communications, players place their index finger on a planchette or *Ouija master* (typically a small heart-shaped piece of wood or plastic). Planchette movements then interact with the boards to produce messages purportedly produced by supernatural forces.

Very little is known about the psychological and perceptual effects of paranormal games such as the *Ouija* board. Although discussions and speculations regarding potential health and wellness risks to players exist, direct empirical evidence delineating these effects is lacking. Notably, the *Ouija* board continues to be marketed as a children's board game (e.g., Hasbro Shop, 2020). In this study, we undertake a statistical analysis of these effects and present to the international scientific community the mental health risks associated with *Ouija* board use. We conducted a straightforward pre-post longitudinal study, employing statistical analysis to examine the observed symptoms and explore the implications of such practices within the field of anomalistic psychology.

1.1. Characteristics of the *Ouija* board and ideomotor movements

The *Ouija* has formal rules that vary according to edition, but in all its modalities, three beliefs or assumptions are assumed: (a) no participant exerts any physical force that can manipulate the movement and trajectory of the planchette; (b) the planchette moves through mechanisms - considered exclusively from paranormal beliefs - as supernatural; and (c) the words and messages derived from the movement of the cursor originate from supernatural beings. The second and third assumptions represent unlikely phenomena since they conflict with the logical foundations of science (e.g., Tobacyk & Milford, 1984; Tobacyk, 2004). The *Ouija* session usually begins with the following question: "is there anyone there?" It is assumed that the planchette will move to produce a response. Next, one or more participants generate sequential questions that are answered by movements of the planchette. The activity ends when the participants bid farewell to the hypothetical supernatural energy (see Hunt, 1985).

It is true that some areas of study are currently categorized as "unexplained" or "anomalous" by scientific research (e.g., *precognition* or *anomalous reception of information*), and that debate continues regarding the scientific value of these phenomena (e.g., Bem, 2011; Bem et al., 2016; Bobrow, 2003; Kelly & Arcangel, 2011; Mossbridge et al., 2012; Utts, 2018). However, in the case of *Ouija*, although certain authors still speculate over the causes of planchette movements (e.g., Gauld, 1971; McClenon, 2001), there are no occurrences that challenge the foundations of current scientific ontology (e.g., French & Stone, 2014). In fact, other investigations have established that participant psychomotor automatisms cause planchette movements (e.g., Gordon & Rosenbaum, 1984). Specifically, unconsciously initiated ideomotor actions (e.g., Burgess, 1998; Spitz, 1997; Stock & Stock, 2004). Gauchou et al. (2012) found that ideomotor movements contributed to the formation of meaningful responses and words. They observed both ideomotor

and volitional movements. Participants were more easily successful in their choice of response when they used ideomotor movements. This study demonstrated that ideomotor actions can facilitate the elaboration of conscious semantic content and confirmed that there was no reason to attribute planchette movement to supernatural forces (see also Shin et al., 2023).

1.2. Psychology of paranormal beliefs

The psychological foundations that validate paranormal beliefs are multicentric since they comprise multiple theories and variables (e.g., French & Stone, 2014; Houran et al., 2019). One prominent model is *Scientific Unexplained Beliefs* (SUB), which explains the origin of paranormal beliefs via the need to seek *control* (e.g., Irwin, 1999/2009). The need to seek control is not exclusive to paranormal beliefs; it is also found in various systems of meaning. However, in this context, we will focus on how the pursuit of control functions within these particular beliefs.

SUB postulates that during periods of high of uncertainty, the search for meaning produces attributions or illusions of control (see Matute et al., 2015). In this context, paranormal belief can provide a framework for comprehending the world (e.g., Irwin et al., 2013). Attributions based on the supposition of supernatural powers, forces, and entities represents an external locus of control, one where the ability to influence the world is outside of the individual's influence (Griffiths et al., 2018). Likewise, causal illusions based on an external locus of control frequently give rise to pseudoscientific and paranormal beliefs (Groth-Marnat & Pegden, 1998; Matute et al., 2011; Drinkwater et al., 2021). The perception of control, however, can also derive from an internal locus of control. This occurs when the subject perceives that they are responsible for causing the observed results (Moore & Fletcher, 2012). Internal control based on personal awareness is referred to as *Sense of Agency* (SoA) (Dewey & Carr, 2013; Haggard & Tsakiris, 2009; Moore & Obhi, 2012). SoA is negatively related to ideomotor actions, causal illusions, and *Ouija*

participation (Blakemore et al., 2002; Haggard & Chambon, 2012; Wegner et al., 2003). The less aware the subject is of their movements, the less control they perceive, the greater experience of illusory effects, where the individual is convinced that they did not move the planchette. This interaction is most likely to result in an attribution of paranormal cause (Andersen et al., 2018). While causal attributions are important, it is crucial to recognize that such illusions aren't the sole cognitive biases or variables influencing the formation of paranormal attributions. The phenomenological complexity of these beliefs presents a challenge in pinpointing specific causes, yet pursuing this line of inquiry remains a scientifically accepted approach.

An important aspect of paranormal beliefs and experiences is that their consequences do not always serve a positive psychological function, as we have previously explained. Literature highlights how belief in the paranormal can trigger negative experiences (e.g., Houran et al., 2022). Prominently, explanations in the literature about these negative consequences focus on the implicit emotion of fear towards the paranormal and the unknown (Laythe et al., 2021, 2022). Similarly, while positive attributions about paranormal beliefs likely lead to satisfying experiences, when a believer adopts negative attributions and becomes fearful, the likelihood of experiencing negative paranormal phenomena increases (Escolà-Gascón & Houran, 2021; Houran & Williams, 1998). This explanation aligns with the mechanisms that regulate states of consciousness, making them more suggestive and increasing their susceptibility in direct proportion to the level of fear of the paranormal (Escolà-Gascón, 2020a, 2020b).

Considering the evidence surrounding the *Ouija* board, we have reasons to associate negative paranormal attributions with this game: films, novels, and the Judeo-Christian "demonization" that the *Ouija* has undergone since the 1970s in Western countries have contributed to a thoroughly dark and perilous view of the *Ouija* (see Hunt, 1985; Jackson & Belau, 2017). Interestingly, before

this period, the *Ouija* was socially considered, at worst, as a simple oracle. We will not engage in theological judgments about the value of the *Ouija,* but it is crucial to highlight this cultural influence to understand why beliefs in the paranormal associated with the *Ouija* might carry more negative than positive connotations. If this observation holds true, playing with the *Ouija* should only be problematic for individuals within this Judeo-Christian tradition who believe in the paranormal. For those who do not hold such beliefs, their skepticism could serve as a distancing mechanism from the suggestibility associated with fear of the paranormal.

1.3. The present research

Scientific-experimental research on the psychological effects of *Ouija* is scarce (Kruse, 2019). Other information such as popular literature lacks rigor and does not provide a valid source of scientific information (see Álvarez, 2007; Hunt, 1985). In addition to a paucity of academic research, the fact that *Ouija* is marketed in many Western countries as a "board game" (e.g., Hasbro Shop, 2020) further obfuscates awareness of the potential negative psychological effect participation has on believers. Perceptions of *Ouija* as a mundane, trivial pursuit are correct in some contexts; however, in others *Ouija* is viewed with apprehension and fear. Consideration of media sources such as blogs, podcasts, and social media evidence numerous instances where *Ouija* sessions have caused discomfort and distress (Hunt, 1985).

Acknowledging the different social, pseudoscientific, and paranormal attributions attached to *Ouija* (French & Stone, 2014; Palmer, 1999), this study examined whether playing *Ouija* initiated changes in levels of subclinical anxiety. Anxiety was selected as a dependent variable because it is a commonly assessed index of apprehension/fear (Bateson et al., 2011; de Girolamo et al., 2006; Roca et al., 2009). In addition to this, measures of paranormal belief, *Altered States of Consciousness and Anomalous Perceptions* or perceptual disturbances related to paranormal

attributions (see Escolà-Gascón, 2020a, 2020b, 2022a; Escolà-Gascón & Gallifa, 2020) were included.

Therefore, the objectives and hypotheses of this study were: (a) to analyze variations in the levels of anxiety (across its various dimensions) before and after using the *Ouija* board, distinguishing between participants who believe in the paranormal and those who do not; (b) to examine whether there was an increase in the quantity and types of anomalous perceptions among both believers and non-believers following their use of the *Ouija* board; (c) to explore whether altered states of consciousness (measured via suggestibility scales) were associated with the use of the *Ouija* board and how these states varied after its use.

2. Materials and methods

2.1. Sample

Eighty-four volunteers participated, 54.8% were women and 45.2% were men. All were of 18-42 years of age (mean = 25.85; standard deviation = 6.405) and voluntarily collaborated in the research. Of the sample, 42 declared to be believers in the existence of the paranormal, and the other 42 said they did not believe in the existence of the supernatural. All participants signed an informed consent. We sourced our participants from two primary channels. First, we tapped into the Escolà-Gascón (2020a, 2020b) database, which consists of individuals with a belief in the paranormal, previously involved in the MMSI-2's statistical validation studies. Additionally, we approached non-believers in the paranormal through various Facebook groups. While our sampling approach wasn't probabilistic, it enabled the formation of a diverse participant pool. This pool was then strategically segmented into matched groups, each comprising two paranormal believers and two skeptics. Details of this balanced pairing approach are elaborated in the Procedures subsection.

Before commencement of the study, the following exclusion criteria were applied: (1) having suffered or currently suffering from a formally diagnosed mental disorder; (2) being agnostic in the face of the existence of the paranormal (that is, doubting the paranormal without denying or accepting it); (3) explicitly declaring being afraid of the *Ouija* board game; (4) not knowing the *Ouija* board game; and (5) having or suffering any medical condition that could endanger the health of the participant. The medical conditions that were formally consulted were as follows: (a) presence of chronic diseases; (b) presence of seasonal or environmental allergies; (c) presence of any physical injury that prevents the participant from walking or maintaining body stability; and (d) taking or being in possession of illegal substances (including cannabis). All participants responded negatively to the above exclusion criteria. In the informed consent form, the following was made explicit: - I *declare that I have not lied in my answers. Any deception or concealment of the information that incurs any of the above criteria is my responsibility. I know that I can withdraw from the investigation at any time, even during the Ouija session that will be held*. *I am also aware and accept that the responsible researcher can stop and end my participation in the Ouija game when he sees fit.* This measure guaranteed that all participants in the study were without any previous experience with the *Ouija* board game. No participant abandoned the research of their own free will nor on the recommendation of the research team.

2.2. Instruments

2.2.1. Multivariable Multiaxial Suggestibility Inventory-2 (MMSI-2)

The *Multivariable Multiaxial Suggestibility Inventory-2* (hereafter MMSI-2) is a subclinical self-report questionnaire that assesses the psychological origin of the Anomalous Perceptions experienced (including parapsychological or paranormal experiences) (see Escolà-Gascón, 2020b). It consists of 174 items whose responses are coded using a Likert scale between 1 (which

means “completely disagree”) and 5 (which means “completely agree”). In this study, only the dimensions belonging to the factors *Anomalous Perceived Phenomena* (hereafter APP, formed by 34 items) and *Altered States of Consciousness* (hereafter ASC, composed of 22 items) were used. The other items and scales were not used in this study. The MMSI-2 offers statistical guarantees that prove its validity and reliability, with internal consistency indices greater than 0.8 in most scales (e.g., Escolà-Gascón, 2020a), also including the dimensions of its reduced version (see Escolà-Gascón & Gallifa, 2020). Concretely, the internal consistency indices utilized for this study's sample, employing alpha and omega coefficients specifically, yielded satisfactory outcomes. These results surpassed the 0.7 threshold on the MMSI-2 scales, reinforcing the reliability of the test scores within our sample.

2.2.2. Beck Anxiety Inventory (BAI)

The *Beck Anxiety Inventory* (hereafter BAI) is a self-report scale originally developed by Beck et al. (1988). It comprises 21 items distributed in two dimensions (somatic anxiety and affective anxiety); although an overall score can also be obtained. In this study, the Spanish adaptation offered by Sanz & Navarro (2003) was used. The responses are scored using a Likert scale that ranges from 0 (“not at all”) to 3 (“severely; I could barely stand it”). The BAI is a widely used test for the evaluation of anxiety, and the Spanish adaptation offers statistical evidence that supports its factor validity and reliability (see Magán et al., 2008). The reliability of the scores in this study's sample was analyzed using the alpha and omega coefficients for internal consistency, both of which showed values exceeding 0.7. These results indicated that the scores obtained on the BAI scales were sufficiently stable to be used and interpreted in the current study.

2.2.3. Spanish Kuwait University Anxiety Scale (S-KUAS)

The *Kuwait University Anxiety Scale* (KUAS) was developed by Abdel-Khalek (2000) with the objective of measuring anxiety in the general nonclinical population. It has 20 items that are statements related to the symptoms of anxiety, and the subject evaluated must determine the frequency with which they feel each of the items. To do this, a Likert scale is utilized with values ranging from 1 ("rarely") to 4 ("always"). The 20 items are distributed in 3 factors or scales that measure S*ubjective Anxiety* (7 items), *Cognitive Anxiety* (9 items) and *Somatic Anxiety* (4 items). In this study, the Spanish adaptation (by Abdel-Khalek et al. 2004) was used, which is called the *Spanish Kuwait University Anxiety Scale* (hereafter S-KUAS). It has reliability indices higher than 0.8 in the three dimensions and satisfactory factorial validity (see Abdel-Khalek, 2000). In our study, the reliability was assessed using the same indicators employed in other questionnaires. This approach yielded results surpassing the 0.7 threshold, thereby affirming an acceptable level of reliability for the scores obtained from these scales.

2.2.4. Professional Ouija Board of 7 Circles

There are multiple editions and versions of *Ouija*. In this research, the edition published by the company *PLANA & DIEGUEZ, Inc.* was applied. This edition was acquired through the *distributor KARMA* (see KARMA, 2020). It consists of (1) a booklet with general instructions for guidance on how to conduct a *Ouija* session; (2) a trapezoidal wooden slider with a large circular hole in the center; and (3), a paper-cardboard board with prints on both sides. On the one hand, the conventional *Ouija* board is printed, which includes the letters of the alphabet, the numbers from 0 to 9, the answers "yes-no", some questions (?), The plus (+) and minus (-) signs and an expression that says "I do not understand, asks better". On the other hand, the same contents are printed, but in addition, it also adds esoteric information that is not relevant in this research. Only the classic

version of *Ouija* was used. The photograph in Figure 1 shows a copy of the board used in this study.

Figure 1. *Example of the Ouija board used in this study.*

2.2.5. Considerations regarding post-test measurements in this study

The purpose of this discussion is to clarify that the MMSI-2, BAI, and S-KUAS instruments were administered both before and after participants played the *Ouija* board. While the instructions for the pre-test applications remained unchanged and followed the existing guidelines for each instrument, we did make some adjustments for the post-tests. Specifically, the only change we implemented was to adjust the timeframe participants were to consider when assessing the frequency of their experiences and psychological symptoms. This adjustment was particularly critical for the BAI and S-KUAS tests, which typically ask participants to evaluate their anxiety symptoms over the previous weeks. Our interest was solely in the symptomatic

frequency during the days following the *Ouija* board session. Therefore, the post-test measurements were situational, assessing state rather than trait stress levels.

2.3. Procedure

This research used *quasi-experimental* methodology (since subjects were not randomly assigned to the working groups) (see León & Montero, 2002). Two independent variables were defined: (1) the belief in the existence of the paranormal (establishing the group of faithful subjects and the group of non-believers) and (2), the possible effects of *Ouija,* requiring the measurement *a priori* (*hereafter* pre-test) and *a posteriori* (hereafter post-test) of the dependent variables. The dependent variables were the following: (1) Anomalous Perceptions (evaluated by the MMSI-2 APP scale); (2) Altered States of Consciousness (evaluated by the MMSI-2 ASC scale); (3) general levels of anxiety (state-type) (measured with the BAI); (3) subjective or "trait" type anxiety (examined by the *Subjective Anxiety* scale of the S-KUAS); (4) paranoid-type anxiety (evaluated by the Cognitive Anxiety scale of the S-KUAS); and (5) anxiety attributed to the body (analyzed by the Somatic Anxiety scale of the S-KUAS). Therefore, it is a methodological design of 2 factors (one independent and the other for related samples). It should be noted that the *Ouija* sessions were the treatments that were applied.

During two years (2018 and 2019), a total of 21 *Ouija* sessions were held. In each experimental session, 4 subjects participated (2 of them were believers in the paranormal and 2 were non-believers). The sessions were held in the Montserrat Mountain (belonging to the province of Barcelona, Spain). This place was chosen because it is attributed to numerous legends whose contents are supposedly magical and supernatural. The specific place was on a public access embankment, just in front of an old abandoned hotel, which is known as the "Hotel Colonia Puig" (see Thomas & Schoonmaker, 2007). It is a historic building that was used as a military hospital

during the Spanish Civil War before being a hotel. At no time was the hotel compound accessed. The sessions were held during the months of July to September and took place at night (between 10:30 pm and 11:30 pm). The summer months were chosen to avoid cold and bad weather.

Each *Ouija* session had the same structure and/or development. Participants were contacted by phone (between 2 and 4 weeks prior to the session) to explain the research and check compliance with the inclusion-exclusion criteria. Once they agreed with them the day and time of the session, a joint meeting was held with the 4 participants 5 hours before the *Ouija* sessions began. The contents of the meeting were as follows: (1) review and fulfillment of the exclusion criteria (in case there were any unforeseen events in the lives of the respective subjects); (2) explanation of the investigation and the signing of the informed consent; (3) explanation of the norms or rules of how the *Ouija* session would be developed; and (4), application of the psychometric scales that examine the dependent variables of the research (pre-test).

All *Ouija* sessions had a minimum duration of 40 minutes and a maximum of 90 minutes. On the one hand, the phases that characterized the *Ouija* sessions were the following: (Phase 1) physical accommodation of the participants in the camping chairs and preparation of the materials. (Phase 2) Psychological accommodation of the subjects through the application of breathing and relaxation exercises that had a maximum duration of 10 minutes. In these exercises, the participants had to hold their hands and close their eyes. In each inhale, the subjects had to simultaneously squeeze or tension both hands, and on each exhale, they had to release the tension exerted. Subjects were not asked to take deep breaths to avoid hyperventilation. In the same way, a licensed psychologist and member of the research team specialized in hypnosis techniques was the one who set the rhythm of the breaths based on the positive hypnotic instructions recommended by Hambleton (2008). (Phase 3) The *Ouija* session begins in such a way that one of the participants

should ask the following question: *“is there something or someone there?”* If the cursor did not move, this question could be repeated as many times as necessary until reaching 7 minutes. After these minutes, the participants could choose whether to perform the relaxation exercise again (and start the experiment again from Phase 2) or continue insisting. After a total of 40 minutes, the participants could close the session. (Phase 4) The *Ouija* session closes with the following farewell: *"We must conclude this session and therefore we ask you to move the cursor to the center of the board"*. Once the cursor goes to the center of the board, participants must count to 3 and remove their finger simultaneously. If, after verbalizing the farewell phrase, the cursor does not move towards the center, participants can choose two options: (a) if they have not exceeded 90 minutes, they can insist again by verbalizing the same statement (and another participant can do it); or (b), in the case of exceeding 90 minutes, they should also apply the following phrase: *"if the cursor does not move towards the center of the board, we will count to 5 five and remove the fingers simultaneously"*. After this sentence, the participants could all count to five together and remove their fingers. This alternative was optional but would be mandatory in the case of reaching the time limit per session (90 minutes).

On the other hand, the formal rules or conditions of each *Ouija* session were as follows: (1) the participants had to keep the index finger of their dominant hand resting on the wooden cursor throughout the session; (2) each question could be formulated by one of the 4 participants (the order of the subjects in each question was something that the participants decided subjectively during the session); (3) all participants had to verbalize at least one question; (4) questions with offensive content were not allowed (in the event that it occurred, the respective subject would be scolded); (5) questions about the intimate or private lives of the participants that did not ask the question itself could not be raised (in the event that it occurred, the respective subject would be

scolded); (6) participants could verbalize and share aloud the sensations and emotions they felt during the session; (7) the participants had to remain seated in the camping chairs during the session, but they could change the position of the legs; (8) Participants could speak and interact with each other. They could only contact the research team to report the desire to leave the session or report a critical incident that could spoil the smooth course of the session. (9) After exceeding 40 minutes, the research team had to notify the participants that they could close the game whenever they wanted. (10) In the event that 80 minutes elapsed, the research team should advise the participants that they only had 10 minutes to close the session; the same should be done when 88 minutes were reached. (11), the participants had to formulate the farewell phrase (see Phase 4) in the case of exceeding 90 minutes. (12) If the cursor did not move, after the first 7 minutes of Phase 3, the session could be started again starting with the breathing exercises. This repetition could be performed up to 6 times (minimum duration of the *Ouija* game = 40 minutes; a maximum of 6 repetitions are performed, since $6 \cdot 7 = 42$). Figure 2 summarizes the phases and these conditions.

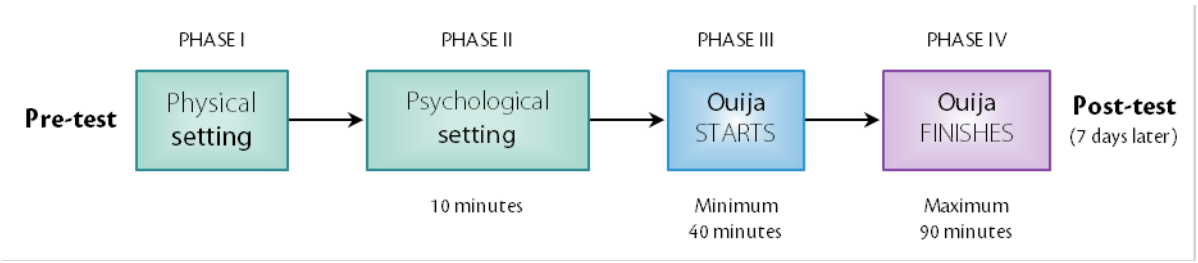

Figure 2. *Phases developed in each experimental session.*

Once each session was completed, 7 days had to elapse for the application of the post-test. Participants were contacted by phone and digitally answered the questionnaires. All participants responded the assessment tests without difficulty.

2.4. Statistical analysis

Data were computed and processed with the JASP and JAMOVI programs, both produced by the same working group (see The Jamovi Project, 2020). Two-factor *analysis of variance* (ANOVA) was applied. The use of *Student's t* tests was discarded because it is a statistical model that includes main effects, simple effects and the effects of interactions between the single effects (see Escolà-Gascón, 2022b). However, it is useful to use the *t test* in the comparison of the interactions between simple effects. Since this study works with variables that only have two groups, it was not necessary to check the previous assumption of statistical sphericity. Likewise, the preconditions of normality (for both variables) and homogeneity of the variances (for the "belief in the paranormal" factor) were met. The coefficient of determination (R^2) was estimated as a measure of the *explained variance*, which can also be extrapolated to the analysis of the *effect size* and vice versa (see equation 3 below).

As a complement, a *Bayesian* estimation of the contrasts relative to the main effects (including the interaction between the two independent variables) was also performed. The Bayesian approach was developed from *Bayes factors* (*hereinafter BFs*) adapted to the analysis of variance. The *BFs* represent a very useful alternative to the *critical levels* obtained through frequentist probability models. The critical level of a classical hypothesis test can be defined as the probability (*P*) that the data (*D*) fit the distribution attributed to the null hypothesis of the model (H_0). However, in Bayesian statistics, BF_{10} can be defined as the number of times that the data are reproduced by the alternative hypothesis (H_1) for each estimate made by the null hypothesis. For this reason, BF_{10} can be mathematically estimated as follows:

$$BF_{10} = \frac{P(D|H_1)}{P(D|H_0)} \qquad [1]$$

The mathematical *ratio* of the previous formula suggests that the *BF* yields interpretable values from the *odds* metric. This means that the results of BF_{10} can be transformed to the probability metric. Then, when H_0 and H_1 are equiprobable (with 0.5), BF_{10} can represent the probability (*P*) that H_1fits the observed data (*D*) by the following equation:

$$P(H_1|D) = \frac{BF_{10}}{BF_{10} + 1} \qquad [2]$$

The expression $P(H_1|D)$ represents the probability that the research hypothesis fits the empirical data obtained. This expression can also be calculated from the *Bayes rule* adapted to the hypothesis contrast, but the *BFs* have a more widespread use. In reality, *BFs* offer the same information as $P(H_1|D)$ but in a different metric. This expression should not be confused with the critical level or $P(D|H_0)$. Discarding the null hypothesis in a frequentist contrast does not imply that H_1 is true. $P(H_1|D)$ or does it represent the certainty that H_1 is true, but it does allow us to approach this possibility.

Therefore, in the present investigation, the *BFs* were used using the critical levels obtained in the frequentist contrasts and formulas 1 and 2. The *a priori* probabilities for H_0 and H_1 were 0.5, respectively. Likewise, the *a priori* probability of the variance explained for the factors with fixed effects was adjusted to 0.5.

3. Results

The means and standard deviations for each group and variable are presented in Tables 1 and 2. It should be noted that Table 1 offers the marginal means that will be analyzed from the *main effects* of the independent variables and the *interaction*. In contrast, Table 2 shows the specific means and standard deviations for each variable but differentiating the groups from each other. These will be the means that will be analyzed using the *simple main effects* and the *simple interaction effects*. To avoid confusion, on the one hand, the simple effects refer to the comparisons

of the means between the 2 groups of a factor, but maintaining the same level-group in the other variable; on the other hand, the simple interaction effects refer to the comparisons of the means of the 2 groups of a factor, but each of them is compared with the group of the other independent variable of the opposite level-group.

Table 1. *Descriptive marginal statistics for each variable and groups.*

DV	**Believers** (including pre-post test scores)		**Non-believers** (including pre-post test scores)		**Pre-tests** (including believers and non-believers)		**Post-tests** (including believers and non-believers)	
	Means	SD*	Means	SD*	Means	SD*	Means	SD*
APP	74.131	1.992	44.667	1.992	53.857	0.926	64.94	0.926
ASC	44.417	0.755	30.679	0.755	31.131	0.63	43.964	0.63
BAI	17.405	0.727	8.929	0.727	9.381	0.541	16.952	0.541
SA	12.464	0.346	9.905	0.346	10.631	0.258	11.738	0.258
AA	17.155	0.446	12.036	0.446	12.714	0.355	16.476	0.355
SoA	8.179	0.235	5.917	0.235	6.095	0.192	8	0.192

Note: *DV= dependent variables; APP= Anomalous Perceived Phenomena; ASC= Altered States of Consciousness; BAI= Beck Anxiety Inventory; SA= Subjective Anxiety; AA= Affective Anxiety; SoA= Somatic Anxiety; and SD= standard deviation.*
**SDs were calculated for each variable because means are marginal (see also Table 4).*

Table 2. *Descriptive statistics per variables and groups.*

Dependent variables	Pre-tests				Post-tests			
	Believers		Non-believers		Believers		Non-believers	
	Means	SD	Means	SD	Means	SD	Means	SD
APP	62.667	8.706	45.048	6.332	85.595	11.166	44.286	6.905
ASC	31.405	4.214	30.857	3.606	57.429	9.35	30.5	3.909
BAI	9.857	4.141	8.90	4.482	24.952	6.401	8.952	4.483
Subjective Anxiety	11.429	2.558	9.833	2.047	13.5	2.856	9.976	1.854
Affective Anxiety	13.381	2.537	12.048	2.163	20.929	5.128	12.024	2.158
Somatic Anxiety	6.167	1.286	6.024	1.473	10.19	2.559	5.81	1.435

Note: *APP= Anomalous Perceived Phenomena; ASC= Altered States of Consciousness; BAI= Beck Anxiety Inventory; and SD= standard deviation.*

To facilitate the understanding of the main effects, the simple main effects and the simple interaction effects, Table 3 is presented, which is a 2x2 contingency table. Each of the means relative to each dependent variable of Tables 1 and 2 can be located within the boxes of Table 3.

Table 3. *Example of a 2x2 contingency table with the location of each cell. In each cell there will be the mean corresponding to each dependent variable.*

	A- Pre-test	B- Post-test	*Main effects*
A- Believers	*Means* AA	*Means* AB	A+
B- Non-believers	*Means* BA	*Means* BB	B+
Main effects	+A	+B	++

Note: The annotations in this table come from the proposals for Pardo & Ruiz (2015). *Use the codes in each cell to understand the comparisons of the means in Tables 5, 6 and 7.*

Each scale or dependent variable will have a contingency table, as shown in Table 3. The marginal means of Table 1 will be placed in boxes A+, B+, +A and +B, and the means of Table 2 will correspond to boxes AA, AB, BA and BB. This explanation is important because the main effects analyzed in Table 4 correspond to the comparison of the marginal means of each variable and group.

Table 4. *Analysis of variance, main effects of variables and Bayesian approach.*

DV	IV	*F*	*p*	BF_{10} (% estimated error)	$P(H_1|D)$	R^2
APP	Pre-post	208.9	<0.001	5.397e+7≈ 21.67 (0.834%)	0.95588	0.718
	Beliefs	305.32	<0.001	1.293e+24≈ 27.51 (1.703%)	0.96492	0.645
	Interaction	238.61	<0.001	2.826e+22≈ 29.681 (4.335%)	0.96740	0.923
ASC	Pre-post	367.05	<0.001	8.193e+10≈ 32.27 (1.403%)	0.96994	0.401
	Beliefs	165.53	<0.001	1.274e+9≈ 12.463 (1.536%)	0.92572	0.316
	Interaction	387.8	<0.001	2.236e+34≈ 40.078 (1.996%)	0.97565	0.880
BAI	Pre-post	511.8	<0.001	2.320e+10≈ 16.306 (1.726%)	0.94221	0.521
	Beliefs	67.8	<0.001	3.426e+7≈ 16.312 (0.94%)	0.94223	0.330
	Interaction	505.4	<0.001	3.667e+32≈ 41.967 (2.872%)	0.97672	0.923
SA	Pre-post	46.41	<0.001	69,440.368 (0.735%)	∼1	0.784
	Beliefs	27.4	<0.001	10,684.727 (2.478%)	∼1	0.7
	Interaction	35.21	<0.001	119,063 (5.004%)	∼1	0.836
AA	Pre-post	133.64	<0.001	3.579e+7≈ 16.728 (1.988%)	0.94359	0.507
	Beliefs	65.74	<0.001	1.065e+8≈ 10.894 (1.121%)	0.91592	0.364
	Interaction	135.43	<0.001	4.978e+15≈ 28.531 (3.996%)	0.96613	0.802
SoA	Pre-post	97.6	<0.001	2.004e+6≈ 11.447 (1.718%)	0.91966	0.405
	Beliefs	46.16	<0.001	333,756.775 (0.983%)	∼1	0.297
	Interaction	120.8	<0.001	7.513e+14≈ 34.422 (4.176%)	0.97176	0.782

Note: *DV= dependent variables; IV= Independent variables; F= Fisher's tests;* BF_{10}*= Bayes Factors in favor to alternative hypothesis;* R^2*= explained variance corrected according BFs; APP= Anomalous Perceived Phenomena; ASC= Altered States of Consciousness; BAI= Beck Anxiety Inventory; SA= Subjective Anxiety; AA= Affective Anxiety; SoA= Somatic Anxiety.*

The results reveal that the marginal means of the variable beliefs in the existence of the paranormal (believers and non-believers) differ significantly from each other for all dependent variables. Therefore, the null hypotheses belonging to this variable and for each of the scales are rejected. Taking into account the recommendations of Jarosz & Wiley (2014), this rejection is also

supported by the results offered by the *BFs*, which exceed the value 10 in all cases (see also that the probability values $P(H_1|D)$ approximate 1). In relation to the different time points (pre-test and post-test), the means also differ from each other in all measurements. This trend is supported by the *BFs*. Thus, the null hypotheses belonging to this factor and for each dependent variable can be rejected. The interaction also has significant effects on all measurements. In fact, according to the *explained variance* (R2), the interaction between both factors statistically explains most of the observed effects and not each factor on its own. Then, in the interaction, the null hypotheses for each dependent variable are also rejected.

Since each independent variable had two groups, *post hoc* comparisons were not performed. However, this does not mean that there are no main simple and interaction effects between the boxes in Table 3. The analysis of the simple and interaction effects will allow us to know if the differences between the means are observed for both groups equally or if they give different trends for each of them. Tables 5 and 6 offer these comparisons. Table 5 focuses on the differences in the means between the pre-test and post-test levels for each of the groups of the variable beliefs in the paranormal, and Table 6 focuses on the differences between the groups of believers and non-believers for each of the levels in the pre-post test variable.

Table 5. ***Simple main effects*** *analysis for the* ***paranormal beliefs*** *variable between pre and post-tests.*

Dependent variables	Paranormal Beliefs variable	*Means comparison*	*t test**	*p* values (Tuckey)	*p* values (Bonferroni)	*d*
APP	Believers	AA - AB	21.143	<0.001	<0.001	2.307
	Non-believers	BA - BB	-0.703	0.896	∼1	-0.077
ASC	Believers	AA - AB	27.471	<0.001	<0.001	2.997
	Non-believers	BA - BB	-0.337	0.982	∼1	-0.041
BAI	Believers	AA - AB	31.893	<0.001	<0.001	3.48
	Non-believers	BA - BB	0.101	∼1	∼1	0.011
Subjective Anxiety	Believers	AA - AB	9.013	<0.001	<0.001	0.983
	Non-believers	BA - BB	0.622	0.925	∼1	0.068
Affective Anxiety	Believers	AA - AB	16.401	<0.001	<0.001	1.789
	Non-believers	BA - BB	-0.052	∼1	∼1	-0.006
Somatic Anxiety	Believers	AA - AB	14.757	<0.001	<0.001	1.61
	Non-believers	BA - BB	-0.786	0.861	∼1	-0.086

Note: *APP= Anomalous Perceived Phenomena; ASC= Altered States of Consciousness; BAI= Beck Anxiety Inventory; d= Cohen's d corrected using Hedges' g; AA= believers + pre-test; AB= believers + post-test; BA= non-believers + pretest; and BB= non-believers + post-test.*
**t test was corrected for multiple comparisons.*

Table 6. ***Simple main effects*** *analysis for the* ***pre and post-tests*** *variable between believers and non-believers.*

Dependent variables	Pre & post-tests	*Means comparison*	*t test**	*p* values (Tuckey)	*p* values (Bonferroni)	*d*
APP	Pre-test	AA - BA	-9.511	<0.001	<0.001	-1.038
	Post-test	AB - BB	-22.3	<0.001	<0.001	-2.433
ASC	Pre-test	AA - BA	-0.434	0.972	∼1	-0.047
	Post-test	AB - BB	-21.363	<0.001	<0.001	-2.331
BAI	Pre-test	AA - BA	-0.88	0.815	∼1	-0.096
	Post-test	AB - BB	-14.79	<0.001	<0.001	-1.614
Subjective Anxiety	Pre-test	AA - BA	-3.094	0.013	0.015	-0.338
	Post-test	AB - BB	-6.834	<0.001	<0.001	-0.746
Affective Anxiety	Pre-test	AA - BA	-1.877	0.243	0.377	-0.205
	Post-test	AB - BB	-12.537	<0.001	<0.001	-1.368
Somatic Anxiety	Pre-test	AA - BA	-0.371	0.982	∼1	-0.041
	Post-test	AB - BB	-11.387	<0.001	<0.001	-1.242

Note: *APP= Anomalous Perceived Phenomena; ASC= Altered States of Consciousness; BAI= Beck Anxiety Inventory; d= Cohen's d corrected using Hedges' g; AA= believers + pre-test; AB= believers + post-test; BA= non-believers + pretest; and BB= non-believers + post-test.*
**t test was corrected for multiple comparisons.*

Taking into account the objectives of this study, the most useful information is probably observed in Table 5, since it analyzes the changes observed in the dependent variables before and after the *Ouija* session. The results indicate that the changes are only significant for the group of believing subjects. Therefore, the rejection of the null hypotheses in the main effects (see Table 4) should only be performed for the group of believing subjects, who show higher post-test means compared to the pre-test means. In Table 6, the differences were significant at the post-test level for all scales and were only significant in APP for the pre-test level. In this case, the rejection of the null hypotheses should be applied at the post-test level in all scales and for the pre-test level

only for the APP variable. In the post-test, it is the believing subjects who give a mean higher than the mean of the non-believing subjects. In the pre-test related to APP, it is also the believing subjects who systematically score above the non-believers. These results suggest analyzing whether the means of the believing subjects in the post-test differ significantly from the means of the nonbelieving subjects in the pre-test. Likewise, the means of the believing subjects in the pre-test and the means of the nonbelieving subjects in the post-test could also be compared. These last comparisons are precisely the simple interaction effects, which are analyzed in Table 7.

Table 7. ***Interaction of simple main effects.***

Dependent variables	*Means comparison*	*t test**	*p* values (Tuckey)	*p* values (Bonferroni)	*d*
APP	AA - BB	-9.923	<0.001	<0.001	-1.083
	BA - AB	21.889	<0.001	<0.001	2.388
ASC	AA - BB	-0.718	0.89	~1	-0.078
	BA - AB	21.080	<0.001	<0.001	2.3
BAI	AA - BB	-0.836	0.837	~1	-0.091
	BA - AB	14.834	<0.001	<0.001	1.619
Subjective Anxiety	AA - BB	-2.817	0.029	0.035	-0.307
	BA - AB	7.111	<0.001	<0.001	0.776
Affective Anxiety	AA - BB	-1.911	0.229	0.35	-0.208
	BA - AB	12.503	<0.001	<0.001	1.364
Somatic Anxiety	AA - BB	-0.928	0.79	~1	-0.101
	BA - AB	10.83	<0.001	<0.001	1.182

Note: *APP= Anomalous Perceived Phenomena; ASC= Altered States of Consciousness; BAI= Beck Anxiety Inventory; d= Cohen's d corrected using Hedges' g; AA= believers + pre-test; AB= believers + post-test; BA= non-believers + pretest; and BB= non-believers + post-test.*

**t test was corrected for multiple comparisons*

These results indicate for APP that the means between the believing subjects at the pre-test level and the nonbelieving subjects at the post-test level differ significantly from each other. In this case, the pre-test mean of believers is higher than the post-test mean of non-believers. This means that believing subjects already scored higher than non-believers in APP before performing the *Ouija* game. On the other hand, when comparing the pre-test means of the nonbelieving subjects with the post-test means of the believing subjects, the results were significant for all the dependent variables. If Table 7 is followed, the means indicate that the post-test group of believers scores higher than the pre-test group of non-believers. Therefore, the null hypotheses of no differences between means of the pre-posttest variables and beliefs in the paranormal can also be rejected for all scales when the effects are analyzed for post-test believers and non-believers at the pre-test level. Regarding the effects observed in APP, the null hypothesis can also be rejected for the differences between pre-test believers and non-believers at the post-test level. Figure 3 shows the graphs of the differences between the means. In them, a clear tendency of the group of believing subjects to score higher with respect to the group of non-believers in all dependent variables can be observed.

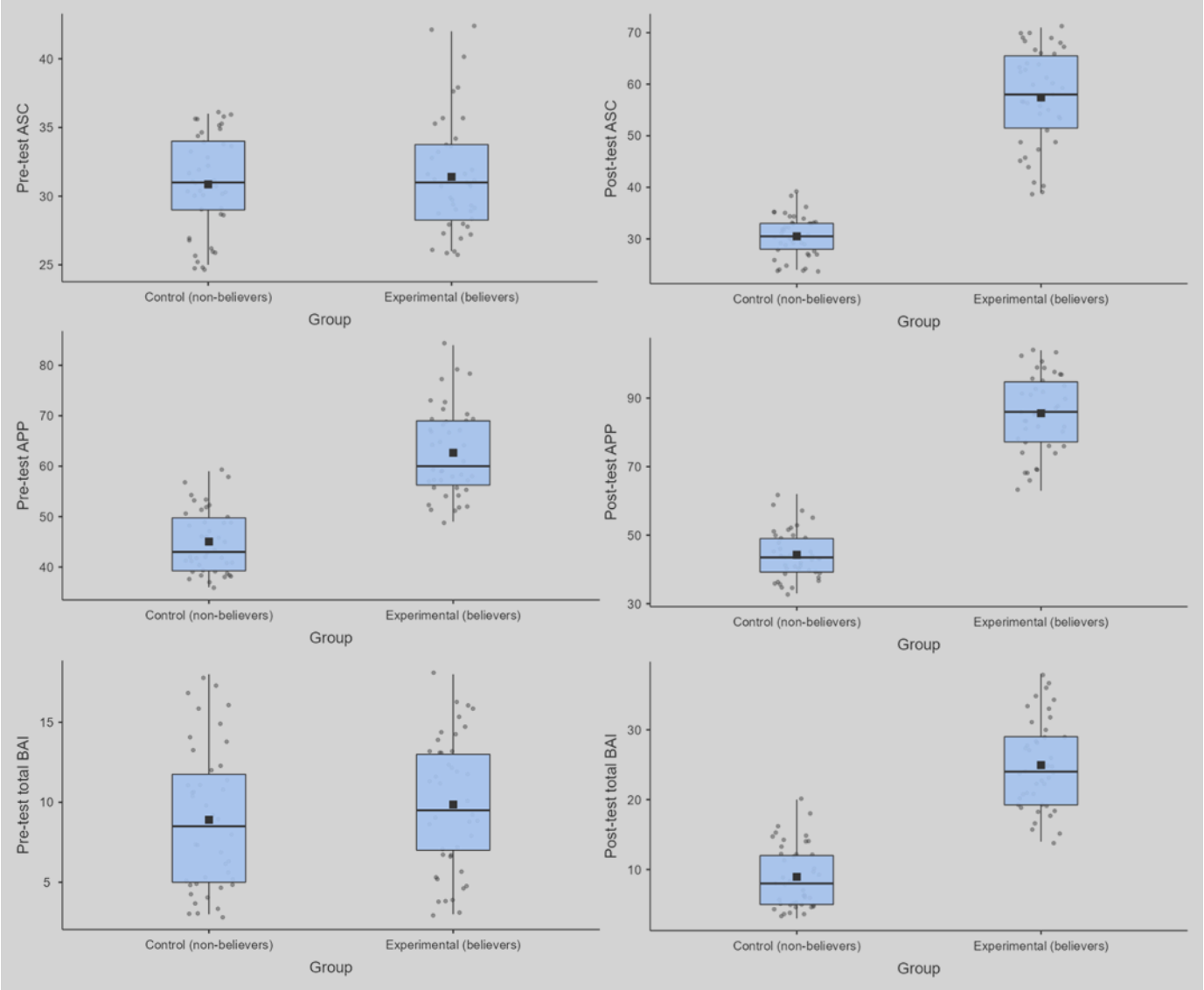

Figure 3 (part A). *Box and whisker plots showing the median pre- and post-test measurements for each variable.*

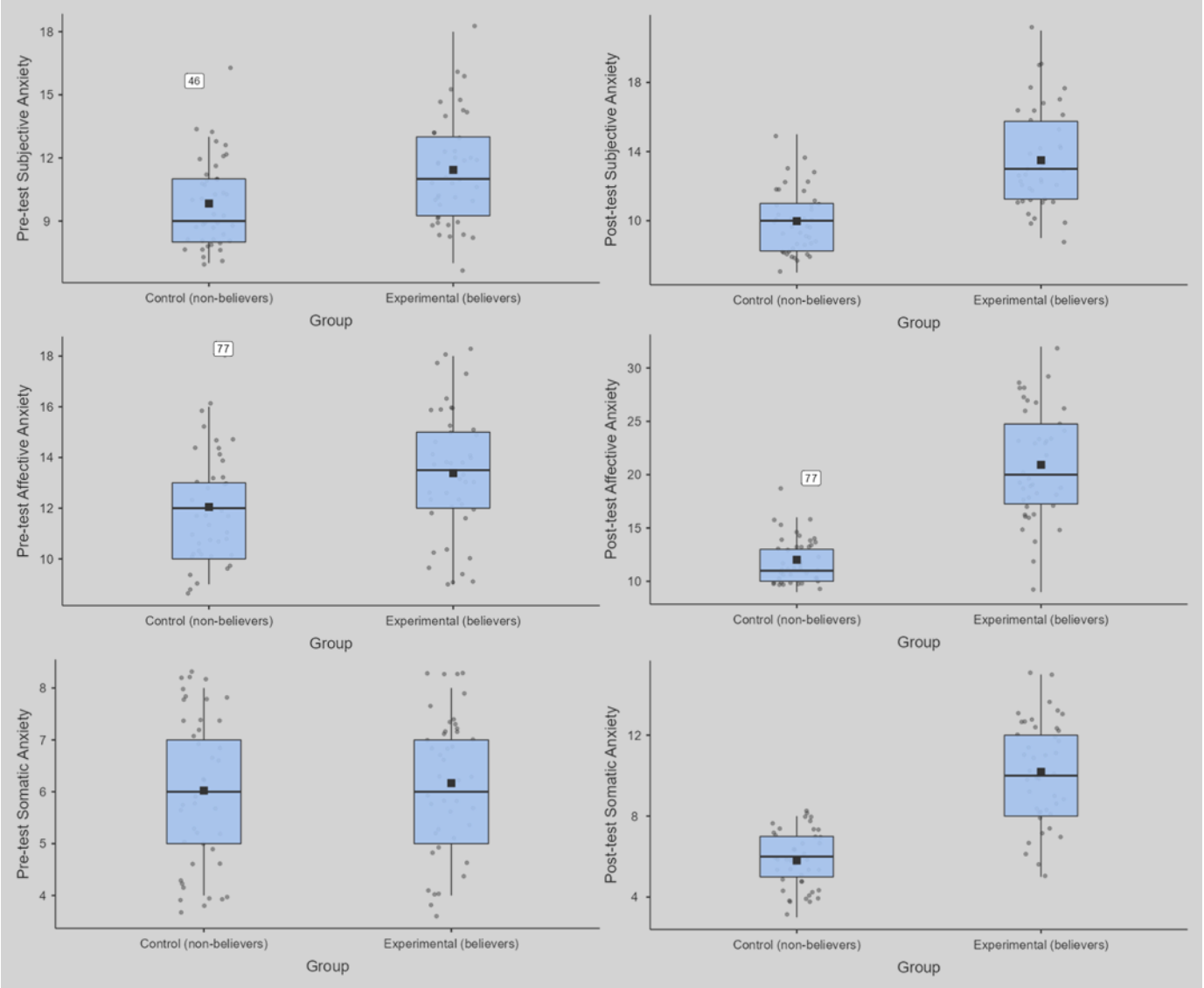

Figure 3 (part B, continuation). *Box and whisker plots showing the median pre- and post-test measurements for each variable.*

4. Discussion

The main objective of this research was to examine the psychological effects (especially those related to the symptoms of anxiety) produced by the practice of the *Ouija* game, which is very common among young people and among believers in the paranormal (e.g., Palmer, 1999). It is not intended to discuss the motives underlying the movement of the cursor or the quality of the formation of the messages. The publications that dealt with this issue - although there are few references in the scientific literature - came to the conclusion that these are ideomotor movements related to the *Sense of Agency* (e.g., Andersen et al., 2018; Gauchou et al., 2012; Gordon & Rosenbaum, 1984; Burgess, 1998; Spitz, 1997; Stock & Stock, 2004). The topic of this discussion is based on the psychological consequences derived from the use of *Ouija*.

4.1. Interpretation of the results

Taking into account the scientific explanations offered - previously cited and contrasted in the literature - on the movements of the Cursor of *Ouija*, *a priori* there would be no rational reasons to suspect or deduce possible negative effects of this activity on its users (e.g., Andersen et al., 2018; Randi, 1982). In fact, there were no previous studies that have explicitly tested the hypothesis of this research or that have experimentally studied the effects of *Ouija* on people (see Kruse, 2019). Therefore, using a psychosocial framework it is imperative to examine why *Ouija* in Western culture has so many religious and supernatural attributions that they are paranoid and poorly adjusted with what science says about this "game" (see French & Stone, 2014). The fact that the *Ouija* has supernatural attributions raises the question of what psychological effects this game may have on players who believe in the existence of the paranormal.

The probabilities that Anomalous Perceptions, Altered States of Consciousness and anxiety levels increase are greater when the subject believes in the existence of the paranormal. In fact, if

the pre-post contrasts isolate the subjects that believe in the paranormal and compare the means of the only nonbelieving subjects, the Anomalous Perceptions, the Altered States of Consciousness and the levels of anxiety do not increase significantly (see Tables 5 and 6 for simple main effects). In fact, the effect sizes in Table 5 indicate that the scores belonging to the BAI are the anxiety levels that increase the most, in comparison with the other scales that also measure anxiety (*Cohen's d* = 3.48). In reality, when anxiety is evaluated with the BAI only for subjects believing in the existence of the paranormal, the *Ouija* practice explains 74.6% of the increase in anxiety symptoms (see Appendix A to know how this explained variance was calculated.). In addition, the increase in anxiety levels for the believers group was estimated with a weight of 25.5% (see Appendix B to know how this weight was calculated). That *Ouija* explains more than 70% of the increase in anxiety in participants who believe in the paranormal requires reflecting on what psychological mechanisms are activated and interfere in the subjects to generate this increase in anxiety levels.

These results appear to align with previous evidence that positively links anomalous experiences and magical beliefs to increases in anxiety levels (see Bell et al., 2011). This alignment supports the possibility of a positive feedback loop between paranormal beliefs, the fear of the paranormal we previously mentioned in the introduction (see Houran et al., 2022), and the anxiety that could be partly triggered by the levels of suggestibility associated with this fear. Therefore, the contributions of Laythe et al. (2021, 2022) were not off the mark, and their line of research could also be integrated into the psychological understanding of the effects of the *Ouija*. Furthermore, we should note that Rabeyron (2022) highlighted that up to 80% of the individuals seeking help at the IGPP (Institute for Frontier Areas of Psychology and Mental Health, Freiburg, Germany) for paranormal experiences also display various levels of anxiety. This percentage

further supports the necessity of employing a specialized clinical approach to manage these cases. Thus, the hypothesis that anxiety plays a role in anomalous experiences is not far-fetched at all.

4.2. Clinical implications and psychological mechanisms

Understanding which psychological mechanisms were involved in generating increases in anxiety levels requires consideration of the following factors: (1) belief systems, (2) Altered States of Consciousness, and (3) continuum model of psychosis. Firstly, paranormal belief systems are positively correlated with Anomalous Perceptions (APP) (e.g. Irwin et al., 2013; Escolà-Gascón, 2022). APPs can be interpreted as illusions or perceptual delusions that occur when the formal characteristics of a stimulus are perceived in a confused manner. In order to resolve the confusion, the individual automatically makes an attribution of meanings according to his/her mental schemas. This attribution is intended to identify and represent the perceived stimulus. If the individual has mental schemas and meaning systems based on paranormal contents, he/she will have APPs represented as "paranormal experiences". This explanation refers to the theory of causal illusions (see Matute et al., 2015; Drinkwater et al., 2021). In the same way that a perceptual disturbance can be a source of anxiety, following this logic, "paranormal experiences" could also produce anxiety. Therefore, playing *Ouija* should stimulate paranormal belief systems, making it easier for the believing individual to have perceptual disturbances or APPs. Paranormal beliefs and APPs could foster increases in anxiety levels (e.g., Bell et al., 2011).

As previously discussed, anxiety levels may rise due to the fear of the paranormal experienced by believers (see Houran et al., 2022). This fear also depends on the qualitative meanings attributed to an individual's paranormal beliefs. When these meanings or cognitions reinforce fear, an increase in anxiety levels is likely and to be expected. Our findings align with this perspective, highlighting the need—following Rabeyron (2022)—for specialized

psychological intervention strategies to manage this potential fear and the resulting perceived anxiety from anomalous experiences. Additionally, we note that the culturally negative connotations associated with the *Ouija,* which emerged in the 1970s (see Hunt, 1985; Jackson & Belau, 2017), should also be analyzed as a cultural variable to assess how intercultural information might influence these increases in anxiety levels.

Secondly, Altered States of Consciousness (also called ASCs) may have played an important role. ASCs occur when there are high levels of suggestibility. The MMSI-2 theoretical model (see Escolà-Gascón, 2020a, 2020b) views ASCs as arising from suggestibility—briefly defined as a tendency towards emotional susceptibility—levels of activation or energy (ranging from peak physical-cognitive activation to fatigue), and the potential use of psychotropic substances. Although the instances of psychoactive substance use are generally low and often nonexistent, activation and suggestibility significantly influence and define an individual's conscious perceptual experiences. Given that anxiety induces high activation states and suggestibility makes an individual emotionally unstable, ASCs also align with the research of Laythe et al. (2021, 2022). If a believer harbors a fear of the paranormal, the dimensions of the MMSI-2 that comprise ASCs are likely to intensify, increasing the probability of developing ASCs after playing with the *Ouija* board. It's important to note that our focus in this research is not on the theoretical explanation of ASCs, which could fill volumes on consciousness theories (and as it's well known, consciousness theories are akin to toothbrushes—every neuroscientist has their own and there's a complete absence of scientific consensus, see Fink, 2016). We are particularly interested in the functionalist framework of the MMSI-2 and how its dimensions or latent variables connect the development of ASCs to the effects of playing a paranormal game like the *Ouija*. This

focus is deliberate and avoids delving into the broader philosophical discussions of consciousness, which are beyond the scope of this study.

Finally, the fact that APPs and ASCs have increased only in believing participants is also related to the psychotic phenotype and the continuum model of psychosis (see Schutte et al., 2021). This model postulates that perceptual disturbances can also manifest in an attenuated form in healthy individuals (e.g., Tarbox-Berry et al., 2023). The act of perceiving these alterations incurs the risk of suffering future psychotic pictures (even if the subject is healthy, see Wright et al., 2020). Substantial statistical and psychiatric evidence underpins this possibility, indicating that it should not be overlooked. Hence, we have included this as a key recommendation in our discussion (see Begemann et al., 2020; Coid et al., 2021; Jonas et al., 2024). We wish to clarify here that our intention is not to stigmatize anomalous experiences or categorize them purely as pathological perceptions. Indeed, evidence also points out that the psychosis continuum model falls short in comprehensively explaining anomalous experiences (see Meyer et al., 2022), and it is not a quantitative model capable of predicting clinically significant psychotic symptoms with precision (see Niles et al., 2019). Our research team's analysis of various instruments for measuring anomalous experiences revealed that not all are predictors of hallucinatory psychotic symptoms (see Escolà-Gascón & Rusiñol, 2022). It is, therefore, crucial to acknowledge the limitations of this psychiatric approach. However, despite these limitations, this clinical approach must be mentioned in this report due to its scientific objectivity based on prior evidence. Just as attenuated anomalous perceptions in healthy individuals increase the risk of future psychotic episodes (see Clemmensen et al., 2024; Wright et al., 2018, 2020), anomalous experiences associated with using the *Ouija* board may also carry a similar risk. While this hypothesis needs further investigation,

our findings seem to support this possibility, which should not be overlooked by the community of psychologists and psychiatrists.

4.3. Criticisms and limitations

One of the handicaps presented by this research is that the *Sense of Agency levels* of the participants have not been examined. If they had been examined, they could be included as a modulating variable together with suggestibility to explain why the *Ouija* generates the respective increases in anxiety in believing subjects. However, this has a very evident justification: modulating variables cannot be included between the practice of *Ouija* and the increase in anxiety levels in believing subjects without first contrasting that, in fact, such increases in anxiety levels occur in believing subjects. The possibility of including modulating variables should be contrasted in future research that wishes to continue with this line of research. Given that the statistical evidence in our study supports this aspect, we propose that future research incorporating the sense of agency as a modulating variable should employ brief self-report questionnaires administered after *Ouija* session tasks. An example of a validated test suitable for this purpose is the Sense of Agency Scale (refer to Tapal et al., 2017). This method is likely to be highly feasible due to the straightforward nature of test administration, compared to other more complex, but potentially less realistic, evaluation methods. Another viable choice is the Sense of Agency Scale developed by Polito et al. (2023a), which is listed in the database of psychological assessment instruments. Although it's an older scale, it's known for its predictive validity, particularly in relation to specific empirical markers in attention and memory (refer also to Polito et al., 2013b).

Another limitation or possible criticism can be observed in the pre-test and post-test records. On the one hand, the pre-tests were applied 5 hours before the *Ouija* sessions. Although it was not something wrong, it would have been interesting to start the pre-test a week before and do it again

5 hours before the *Ouija* sessions. This would have facilitated the analysis of whether there are latent increases in anxiety prior to the *Ouija* sessions. These possible increases would be related to the *anticipation of responses*, a very common symptom in anxiety disorders (see the *DSM-5*, American Psychiatric Association, 2013). As mentioned, this limitation does not invalidate the results of the research, but it does warn that future pre-test applications should be included days and hours before the *Ouija* sessions. In any case, it must be remembered that the criterion of exclusion was specified as "feeling or being afraid of the *Ouija*". This criterion was used precisely to avoid including those subjects in the study who had anticipatory anxiety symptoms prior to the *Ouija board* sessions. Nevertheless, this exclusion criterion was effective in mitigating the anticipation of anxiety on an emotional level, but it did not necessarily address it cognitively. Given this, we recommend that future studies incorporate an assessment of potential anticipatory anxious thoughts related to the *Ouija*.

A related hypothetical scenario to the previous point is that our use of mixed groups (comprising both paranormal believers and non-believers) might have hindered completely isolating the effects attributable to belief systems. The potential for interaction among participants could create synergies or learning experiences, possibly reducing the levels of perceived suggestibility and anxiety. While this may appear as a limitation, it was not really so; the decision to work with mixed groups was strategically aimed at minimizing interactions among believers that could inflate suggestive anxiety and lead to an artificial increase in effect sizes, causing Type I errors or false positives. Complete control or elimination of participant interactions in *Ouija* sessions is not feasible, as these interactions are inherent to the context. Faced with the choice between risking false positives and striving for robust, consistent statistical effects, we opted for the mixed-group approach. This approach, a methodological form of case matching (as detailed in

Escolà-Gascón, 2022b), allowed for moderated social feedback. In this setup, skeptics could act as a functional inhibitory filter against believers' suggestibility, while the believers' faith could challenge non-believers on metaphysical aspects of reality. Working with homogeneous, matched groups of believers and non-believers, therefore, was a methodological strength rather than a drawback. However, since this approach did not allow for complete isolation, the interpretation of effects attributed to beliefs should be viewed as associative and exploratory, rather than confirmatory. Further investigation in future studies is needed to fully understand these dynamics.

As a last limitation, it is important to highlight the possible influence of the environment on believing participants. In this study, the *Ouija* sessions were held in a place with numerous legends and supernatural myths (the mountain of Montserrat). Is it possible that these attributions could affect the levels of suggestion and anxiety of subjects that believe in the paranormal? This experimental condition was introduced because for subjects who believe in the paranormal, the practice of the *Ouija* acquires its magical meaning when it is used to contact deceased beings (see Palmer, 1999). Being in the mountain of Montserrat and in front of an old abandoned sanatorium hotel facilitates and guarantees this condition for believers. However, it is also true that it is not known how this environmental variable could affect nonbelieving subjects. At least in this study, it seems that the levels of anxiety, Altered States of Consciousness and abnormal perceptions did not vary significantly. In future research, it would be advisable to include as a moderating (nonmodulating) variable the differentiation of at least two types of environments: on the one hand, a natural environment such as this research (whose "magical-supernatural" beliefs are implicit in the place) and another artificially controlled environment (which would be a scenario typical of experimental laboratory conditions).

4.3. Conclusions

The results of this research allow us to reach 4 conclusions: (1) The psychological effects of *Ouija* on people depend on the degree to which each subject believes in the existence of the paranormal. (2) *Ouija* is associated with systematic increases in anxiety symptoms, quantified at 25.5% among subjects who believe in the paranormal. (3) The "game" of *Ouija* explains 74.6% of the anxiety perceived by the subjects that believe in the paranormal. (4) *Suggestibility*—stemming from *fear of the paranormal* (see Houran et al., 2022)—are proposed as possible modulating variables between the practice of the *Ouija board* and anxiety levels. Finally, (5) it is recommended to develop different pre-test and post-test applications of the means on anxiety levels to analyze the anticipation and clinical course of the symptoms. The practice of *Ouija* may not have effects on some participants (mainly non-believers in the paranormal), but caution is recommended when the subjects are believers in the existence of the paranormal.

5. Appendices

Appendix A: Estimation of the highest explained variance

The proportion of variance explained does not need to be recalculated using a contrast of repeated samples for believing subjects and the BAI anxiety scale. This way of proceeding would be incorrect because it does not take into account the multiple comparisons of the other simple effects and would thus bias the result. Instead, it is easier to transform Cohen's *d* to the correlation scale. The following equation is shown as an example of how the previously explained variance was obtained:

$$r = \frac{d}{\sqrt{d^2 + \frac{\left(n_{pre} + n_{post}\right)^2}{n_{pre} n_{post}}}} \qquad [3]$$

$$= \frac{d}{\sqrt{d^2 + \frac{\left(n_{pre} + n_{post}\right)^2}{n_{pre} n_{post}}}} = \frac{3.48}{\sqrt{3.48^2 + \frac{(42+42)^2}{42 \cdot 42}}} = \frac{3.48}{\sqrt{12.11 + \frac{7056}{1722}}}$$

$$= \frac{3.48}{\sqrt{16.208}} = \frac{3.48}{4.026} = 0.864,$$

Remember that n_{pre} and n_{post} include only the number of subjects that believe in the paranormal. If the previous result is squared, then the variance proportion is obtained: $r = 0.864 \Rightarrow R^2 = 0.864^2 = 0.746 \cdot 100 = 74.6\%$. If desired, the same formula can be applied for the other effect sizes of each type of anxiety - although it is not necessary, since 3.86 represents the highest effect size.

Appendix B: Estimation of the proportional increase in anxiety levels

A critical point lies in how to interpret the respective increase in anxiety. One possibility would be to resort to the interaction of simple effects. Taking as reference the previous results of the BAI, the interaction of the simple effects informs us that the levels of anxiety of the group of believers in the pre-test do not differ with respect to the levels of anxiety in the post-test of the nonbelieving subjects. Therefore, this allows us to conclude that the baseline for anxiety levels of all subjects is the same. Likewise, this means that the significant results of the BA-AB comparison can be used to know with what weight anxiety has increased in believing subjects compared to non-believers. Since the difference in means is equal to 16.052 (the following calculation is made: 24.952-8.9 = 16.052), the following percentage can be extracted:

$$\Delta An_{BAI} = \frac{\mu_{postB} - \mu_{preNB}}{X_{max_{BAI}}} \qquad [4]$$

where:

ΔAn_{BAI} is the increase in anxiety evaluated by the BAI,

μ_{postB} is the mean of the post-test believers,

μ_{preNB} is the mean of the pre-test nonbelieving subjects and

$X_{max_{BAI}}$ is the maximum direct BAI score. With which, [4] can be calculated as follows:

$$\Delta An_{BAI} = \frac{\mu_{postB} - \mu_{preNB}}{X_{max_{BAI}}} = \frac{24.952 - 8.9}{63} = \frac{16.052}{63} = 0.255 \cdot 100 = 25.5\%$$

Therefore, the practice of *Ouija* generates an increase in anxiety levels evaluated by the BAI in believing subjects of 25.5%, with respect to the baseline of anxiety of nonbelieving subjects. This calculation would not have been possible without the analysis of the interaction of the simple effects, which represent effects that have been little analyzed in most studies that include 2x2 ANOVAs (see Pardo & San Martín, 2015).

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