



Beliefs and opinions about the existence of life outside the earth: The *UFO Experiences Questionnaire* (UFO-Q)

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ABSTRACT

Unidentified Flying Objects (also called UFO) are usually related to the magical beliefs that accept the existence of extraterrestrial beings and alien abductions. Therefore, UFO experiences describe contacts with UFOs, extraterrestrial beings, covert alien visits and abductions. Although science provides enough advances that bet for the existence of life outside the earth, these experiences have been related and equated with paranormal beliefs under an integrative model given the magical content they manifest. The following paper presents a psychosocial study based on the statistical justification of the *UFO Experiences Questionnaire* (UFO-Q), which examines the underlying dimensions of UFO experiences and beliefs, as well as their social impact on the Spanish-speaking culture. The sample was of non-probabilistic convenience and consisted of 404 subjects selected from the Spanish general population. The Factorial Analyses confirmed that UFO experiences can be represented based on four dimensions: *Extraterrestrial Beliefs* (C1), *Extraterrestrial Experiences* (E1), *Fearful Extraterrestrial Beliefs* (T1) and *Form Beliefs* (C2). The analysis of items suggested that these beliefs could present two cognitive models: On the one hand, there is the magical-divergent model (irrational thinking), and on the other hand, there is also the critical-divergent (rational thinking). However, the Exploratory and Confirmatory Factor Analysis questioned both models because they only allowed the identification of the magical-divergent dimension (factor C2). This result invites us to review the validity of the integrative model that associate paranormal contents with extraterrestrial beliefs. Would it be possible that the relationship between both types of beliefs occurred only in the magical-divergent model?

1. Introduction

UFO experiences (or experiences about *Unidentified Flying Objects*) represent irrational subjective situations, lived and described by subjects who believe in the existence of extraterrestrial beings, alien contacts or visits, UFO sightings and abductions (Gallagher et al., 1994; Tobacyk, 2004). Taking into account the scientific progress in the astrobiology field, the existence of life outside the Earth constitutes a research area with rational foundations included in the contemporary scientific framework (e.g. Brassé et al., 2017; Cabrol, 2016; Gordon & Sephton, 2016; Managadze et al., 2017; Nelson, 2019). Nevertheless, despite its scientific quality as an object of study, some researches also point out that belief in extraterrestrial beings is a social construct related with *divergent* models of thinking (e.g. Irwin, 2009). These types of beliefs are divergent because they tend to challenge the ontological basis of scientific knowledge, although they do not necessarily contradict it (e.g.

Escolà-Gascón, 2020; Spanos et al., 1993). Following this idea, according to Belloch et al. (1995) when the divergence of these systems of meanings show excessively magical, irrational, superstitious, rigid and maladaptive contents, their psychological interpretation can be substantiated on psychopathology (see also Bunge, 2013). The concept “magical” must be understood in this research as an attribute used in clinical psychology to designate the styles of reasoning that express implausible and scientifically impossible contents (see Irwin, 2009). In this way, UFO experiences or UFO contacts can be classified within the framework of *limit-experience* (e.g. Breno et al., 2017), constituting anomalous behaviours that present multiple psychological facets: Some of them are located below the clinical threshold and others represent significant psychopathological symptoms (see Bartholomew et al., 1991).

Extraterrestrial beliefs are not the only ones that challenge the limits of the current scientific paradigm (e.g. Appelle et al., 2000). Traditionally, paranormal experiences or anomalous phenomena (e.g. ‘psi’

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phenomena) have come into conflict with the foundations of science and are considered scientifically impossible phenomena (e.g. Irwin, 1993). This idea asks the question whether extraterrestrial beliefs are related to paranormal beliefs (e.g. Dagnall et al., 2010).

Numerous authors conclude that extraterrestrial beliefs are broadly correlated with paranormal beliefs and their dimensions (e.g. Dagnall et al., 2011; French et al., 2008; French & Stone, 2014; Irwin et al., 2013; Wiseman & Watt, 2004). In fact, Tobacyk (2004) included extraterrestrial beliefs as a sub-dimension of paranormal beliefs. Lindeman and Aarnio (2006) also supported the possibility of joining both constructs. Even Swami et al. (2010) proposed as a common point the presence of underlying conspiracy beliefs both in the paranormal and in extraterrestrial beliefs. However, this last hypothesis is still being discussed (e.g. Murphy-Morgan, Neave, & Cooper, 2019).

One of the personality traits most related to paranormal beliefs is schizotypy (Shapiro et al., 2019). Several studies indicated that both believers in the paranormal and believers in extraterrestrials had high scores on the scales that evaluated schizotypy (e.g. Chequers et al., 1997; Hergovich et al., 2008; Spanos et al., 1993). The problem was that it was not possible to correctly differentiate between those who believed in extraterrestrial beings with paranormal beliefs from believers in extraterrestrial beings without paranormal beliefs. Something similar happened with extraversion and neuroticism, which were correlated with both paranormal and extraterrestrial beliefs (e.g. Irwin, 2009; Thalbourne et al., 1995). When examining the correlations between extraterrestrial beliefs and personality traits, no partial or semi-partial correlations were applied to control the effect of the interaction associated with paranormal beliefs. Therefore, it was not possible to know exactly if these significant correlations could be explained by the covariation between paranormal beliefs and personality traits. Another point in common between the paranormal and extraterrestrial beliefs is observed in the levels of dissociation (see French, 2001). French et al. (2008) obtained high scores on the levels of dissociation of subjects who presented extraterrestrial and paranormal beliefs. The same can be said of imagination or tendency to fantasy (see Swami et al., 2013). In this case, other studies verify positive correlations between this variable and both paranormal and extraterrestrial beliefs (e.g. Patry & Pelletier, 2001; Smith et al., 2009).

It is important to note that it is not the same to accept the existence of extraterrestrial life in other systems, as to assume the existence of ghosts or spirits (e.g. Swami et al., 2009). Although science provides indications that there may be life on other planets (e.g. Brassé et al., 2017; Cabrol, 2016; Nelson, 2019), there is insufficient evidence in scientific literature to support the possible existence of ghosts or spirits (e.g. Reber & Alcock, 2019). Furthermore, although similarities are observed between extraterrestrial beliefs and paranormal beliefs in certain degrees of divergence (e.g. believing that diabolical possessions are real has the same divergence as believing in the existence of alien abductions), it does not mean that at others levels of this similarity divergence should be observed (e.g. Swami et al., 2011).

From a clinical point of view, there is a serious debate about the psychopathological limits of these experiences (e.g. Jinks, 2019). Understanding the present difficulties in analyzing and understanding the psychological basis of the UFO experiences (mainly based on personality), the psychopathological comprehension of this phenomenon it also presents controversies (e.g. French & Stone, 2014).

On the one hand, the UFO experiences may be justified from the semiotic model of perception, elaborated by Ey et al. (1980) and Jaspers (1993). This model postulates that UFO experiences are developed and come about by non-pathological perceptual deformations in the quality of stimulus (perceptions with objects) and not so much by hallucinatory pathological mechanisms (perceptions without object) (see Mishara & Zaytseva, 2019). Based on this model, the UFO anomalies would be due to an error in the ways of identification, representation and interpretation of the perceived stimulus, in comparison with its formal and objective contents (e.g. Leonard & Williams, 2019). This model was also

researched by Irwin (2009) who provided the phenomenological paradigm as a complement to this first non-clinical model. Irwin (2009) noted that the distortions in the interpretation of the stimuli vary depending on the system of meanings used by the perceiving subject. From a traditional perspective, the system of meanings represents complex cognitive schemes which allow each individual to represent and understand his environment (e.g. Fishbein & Ajzen, 1975). If such a system includes the paranormal or UFO beliefs, it is probable that the preceptor himself elaborates interpretations substantiated in those beliefs, understanding that they configure their schemes to represent reality (see Pecher, 2013). Following this line, in a psychosocial and anthropological sense, there seem to be clear inclinations regarding the attributes and evolution of UFO beliefs (e.g. Jinks, 2019). Its course is characterized by the polarized fluctuation between systems of *benevolent meanings* regarding how alien beings are in which he believes –according to the mental categories and schemes of each subject– and *hostile meanings* substantiated in more paranoid models or categories (see Moya-Salazar, 2019; Peters, 2018; Saler et al., 1997). Recent research studies point to the prevalence of a benevolent conception (see Persson et al., 2018), which is probably due to the new spiritual tendencies, new age movements and the social secularization, an aspect that balances the paranoid vision provided by monotheistic religions (e.g. Bainbridge, 2013).

On the other hand, van Os et al. (2009) suggest the *continuum* model of the psychosis in order to explain these experiences. Different from the previous model, this paradigm suggests that UFO and paranormal experiences constitute behaviours similar to certain psychotic symptoms –mostly hallucinatory and delusional– that fluctuate from its most attenuated expression (non-pathological), to its most intense version (pathological). Following this idea, the anomalous experiences would be present not only on the clinical population but also in the general non-clinical population, and they would share the same etymological basis as the conventional psychotic symptoms, although not their intensity (e.g. Shapiro et al., 2019). This fact suggests the hypothesis of the *psychosis phenotype* (see Chau et al., 2019; David, 2010; Stefanis et al., 2002), where any subject could be vulnerable to develop future psychotic crisis. In this case, the vulnerability would vary in relation to the number of symptoms experienced and the discomfort they produce (e.g. Fonseca-Pedrero et al., 2011).

For other researchers, the important thing does not lie so much in the meanings of UFO experiences, but rather in the dialectical coherence of the subject who lives them (see Wilson & French, 2006). The term “dialectical coherence” refers to the degree to which the contents of the experience explained by a subject coincide with the empirical evidence investigated by science. According to Shermer (2011), some witnesses who claim to have perceived some UFO phenomena or even parapsychological, want to participate in TV/radio programs with the objective of finding fame, unconsciously altering what they have lived; either they add hallucinatory erroneous information (false positives) or omit true information (false negatives) (see also MacNeil & Soper, 2019). According to Widows and Smith (2015) this fact hinders and distorts the scientific works that address this matter from the single case study, causing errors in the internal validity of the researches for not controlling sufficient variables, and for not questioning the psychological profile in the experimental subjects. Therefore, it is important to evaluate the biases and the validity of the discourse of the subjects assessed (see Goldstein, 2003). One way to do this may be by exploring the behaviours related to social desirability and manipulating the presentation of the image (e.g. Fernández-Ballesteros, 2011). It should also be noted that these behaviours are not very effective in justifying declarative validity (e.g. Vrij & Turgeon, 2018). However, the fact of contemplating the possibility that and individual UFO experience could be true, does not imply that the said experience has been physically real (e.g. French & Stone, 2014). What is true is the anomalous perception lived, not the ontological validity of the experience (e.g. Álvarez, 2007).

However, some researches involving subjects who reported abduction-related experiences, physical indicators were found that had

no apparent scientific explanation (see Hopkins & Rainey, 2003; Jacobs, 1993). For example, astrophysicist Hill (2014) reproduced flight conditions similar to those of UFO sightings in a wind tunnel and found that the image in the photographs bore a close resemblance to the descriptions made by witnesses in these situations. In fact these nuances are part of an open debate between those who focus on the study of the psychological basis of the UFO experience and those who investigate the empirical evidence in the field of astrophysics (e.g. Nixon, 2020). In this research we will focus on the psychological analysis of UFO perceptions.

Numerous questionnaires have been developed for the evaluation of extraterrestrial beliefs (e.g. Dagnall et al., 2010; Swami et al., 2009). Depending on the conceptual framework, instruments that relate the paranormal to the UFO experiences and instruments that establish a clear separation are identified. An example of the first model is found in the *Paranormal Beliefs Scale* (PBS) of Tobacyk and Milford (1983). Its factorial pattern reveals seven dimensions associated with beliefs in the paranormal that include beliefs in other magic life forms (*Extraordinary Life Forms*). The revised version suggests the inclusion of an eight dimension: *Extraterrestrial life and actual visits (Ets)*, which measures extraterrestrial beliefs with lower levels of magical thinking (see Tobacyk, 2004). In the same line, Gallagher et al. (1994) developed the *Anomalous Experiences Inventory* (AEI), which brings together content associated with both paranormal beliefs and those related to alien beings. Although the manifest content of the reactivities that refer to UFO experiences were acceptably different in relation to the rest of the items (content validity), the convergent validity showed that they correlated with those that alluded to paranormal beliefs. Nevertheless, Swami et al. (2009) created a psychometric instrument to assess the beliefs in the existence of extraterrestrial beings independently of paranormal beliefs (*Extraterrestrial Beliefs Scale*, EBS). The factorial structure revealed the presence of three dimensions: *alien visitation and cover-up* (convictions about covert alien visits); *scientific search* (convictions about the scientific search of alien); and *general beliefs* (general convictions about the existence of extraterrestrial beings). However, subsequent correlational studies (Swami et al., 2011) between the EBS and the ASGS scale of Lange and Thalbourne (2002) revealed the presence of significant correlations between paranormal beliefs and the respective scales of the EBS, suggesting again the prevalence of an integrative dispositional model. The “integrative dispositional model” consists of the grouping of paranormal beliefs and UFO beliefs within one model: “the model of conspiracy beliefs” (see Rizeq et al., 2020).

While it is true that in the Spanish-speaking countries there are not psychometric instruments dedicated to unilaterally assess beliefs in the existence of extraterrestrial beings, some adaptations offer scales that include behaviours associated with such beliefs (e.g. Díaz-Vilela & Álvarez-González, 2004). Despite the published tools, it is also true that these instruments present an Anglo-Saxon conceptual basis (see Irwin, 2009). Likewise, although the adaptations present a rigorous methodology, the composition of the items are conditioned by foreign theoretical bases complicating its prevalence in other cultural contexts, especially in the Spanish-speaking world. At the same time, despite the technical quality they offer, none of the adaptations assess UFO beliefs in an independent way with respect to other types of beliefs. The term “in an independent way” means that UFO beliefs are assessed separately or without regard to other belief systems (e.g., paranormal beliefs). In addition, it should be taken into account that, despite the clinical importance of this kind of belief, no specialized instrument supplies psychometric scales that provide therapeutic contents to the evaluating professional, aimed at exploring alarm signals, psychological distress, etc. (see Lawrence, 2016). These difficulties suggest the possibility to develop a new test adjusted to the cultural, psychological and methodological needs mentioned.

The objective of this study is to examine the validity and reliability of the *UFO Experiences Questionnaire* (UFO-Q) in order to understand the prevalence, incidence and social impact of these kinds of beliefs in the general Spanish population.

2. Method

2.1. Participants

The non-probabilistic sample of this study was composed of 404 Spanish participants, of which 49.3% were men and 50.7% women and all of them between 18 a 58 years old (mean = 26.53; Standard Deviation = 9.3). Regarding the academic level, 64.6% had university studies; 25.2% claimed to have achieved higher professional training; and finally, 10.1% affirmed to have finished high school. In relation to the question ‘regarding the existence of extraterrestrial being, you consider ...’ the 20.5% did not believe in the existence of extraterrestrial beings; 43.3% doubted their possible existence and 36.1% positioned themselves in favour of their existence. No subject had any psychiatric antecedents and all of them signed an informed consent with the purpose of proving their voluntary participation.

2.2. Procedure

The design of this research is based on a multivariate model, being the *Exploratory Factor Analysis* (EFA) and the *Confirmatory Factor Analysis* (CFA) the analysis techniques. At the same time, the study is also defined in a psychometric design of normative groups, using the study sample general criteria.

Taking into account the studies of Swami et al. (2011) and considering the psychometric evidences provided by Swami et al. (2009) in their EBS *Extraterrestrial Beliefs Scale*, a first draft of 34 items was written. After a theoretical revision and considering the suggestions from Frech & Stone (2014) and Behling and Law (2000), the number of items was reduced to a total of 28 definitive questions. Mainly, those items with complex concepts, absolute or ambiguous adverbs (e.g. never, always, normally, etc.) and contents that excessively mixed extraterrestrial beliefs with paranormal beliefs were dismissed. No items were repeated and all of them were written in the affirmative. To facilitate clinical indicators and knowing their psychological impact, some items were also included that described different emotional contents and related them to this kind of anomalous experiences (see item 2: *I would feel restless If I saw a UFO (or if you have already seen a UFO), when I saw the UFO I felt restless*).

Next, the application materials (the informed consents and the UFO-Q questionnaire) were prepared both in pencil-paper and in digital format. The collection of the sample was developed during 2017–2019 with the collaboration of multiple professionals, who gave the questionnaire to university students and the working staff of different companies. As the answers were obtained, the debugging of the raw data was developed and those subjects that presented missed values were eliminated from the final sample.

Once the preparation of the matrix with the answers of the items was completed, the analysis methods were applied to justify the validity and reliability of the UFO-Q questionnaire. The scores for each scale were also calculated and the normative rating of the test was prepared.

2.3. Instruments

The experimental version of the UFO-Q questionnaire (*UFO Experiences Questionnaire*) was used. It was composed by 28 statements and the responses were codified following the *Likert* model: 0 meant *completely disagree*; 1 *disagree*; 2 *agree*; and 3 *completely agree*. The items from UFO-Q gather behavioural data that refer both to the quality of extraterrestrial beliefs and the intensity of UFO experiences. This test has 4 scales defined from the EFA and CFA: *Extraterrestrial Beliefs* (C1), *Form Beliefs* (C2), *Fearful Extraterrestrial Beliefs* (T1) and *Extraterrestrial Experiences* (E1). As the scores are higher, higher incidence will have the content assessed by UFO-Q.

2.4. Data analysis

The results were analyzed with the *Jamovi*® and *MPLUS 5.2* statistical package, using concurrently the *SPSS*®.22 with its *AMOS* extension for the preparation of the path analysis and the structural equations. On the other hand, the validity of the construct was carried out from a first EFA of *Minimum Unweighted Squares* followed by the CFA applied with the *Maximum Likelihood Method* to verify the factor structure found. For the EFA the *polychoric correlations matrix* was calculated previously using *MPLUS 5.2*. Likewise, for the Exploratory Analysis *Jamovi*® was used and the parameters of factor extraction followed the *parallel analysis method* (see *Reise et al., 2000*). In fact, this method is more accurate in comparison with the classical *Gutman-Kaiser's method* (see *Martínez-Arias et al., 2006*). The extracted factors were not rotated. If an item had high saturations by more than one factor (>0.4), it would be assigned to the factor with the highest saturation. Additionally, those items with very low saturations (<0.4), would be dismissed from the final version of the test. On the other hand, the reliability was analyzed by the *Cronbach's Alpha* coefficient for internal consistency analysis and *test-retest* coefficients for examination of longitudinal consistencies. These analyses were applied with the *SPSS*®.22.

3. Results

3.1. Exploratory factor analysis

The Exploratory Factor Analysis enables an items group analysis in a smaller number of factors, taking into account their intercorrelations and their shared variance. To explore the quality of covariance between items, the *Kaiser-Meyer-Olkin* (KMO) sample adequacy test was applied and Bartlett's null sphericity hypothesis was contrasted. Both indices produced significant results (KMO = 0.947; $\chi^2 = 26,480.067$; $p = 0.0001$) indicating that the correlation matrix was not identical, being able to group its element with new variables called factors.

According to *Fig. 1*, the parallel analysis retained up to 4 factors given the cross between the sedimentation curves. They explained 90.767% of the total variance. The first factor explained 36.751% of the variance and was formed by items 1, 6, 8, 12, 15, 18, 19, 20 and 24. According to the content of these items, this factor described extraterrestrial beliefs with different levels of intensity. Therefore, the first factor was called *Extraterrestrial Beliefs* (C1). The second factor explained 27.045% of the variance and was composed of items 4, 5, 10, 11, 14, 17, 23 and 26. These items were related to alien contacts or visits, UFO sightings and

abductions. Then, the second factor was cited as *Extraterrestrial Experiences* (E1). The third factor explained 17.272% of the variance and was formed by items 2, 7, 9, 16, 21 and 27. All these items examined whether the assessed subject felt paranoia or anxiety about his own extraterrestrial beliefs. It was for this reason that the third factor was called *Fearful Extraterrestrial Beliefs* (T1). The last factor explained 9.7% of the variance and grouped items 3, 13, 22, 25 and 28. Again, following the content of items, it seems that this factor tended to analyse extraterrestrial beliefs but in a more sophisticated way. This means that the behaviours assessed are more confused and have more magical attributes (e.g. item 13: *I think aliens might have unknown powers*). Therefore, the fifth factor was called *Form Beliefs* (C2). It was not necessary to remove any item from the matrix, since all of them presented high saturations. The factorial solution is shown in *Table 1*. Taking into account the solution obtained, the results of Exploratory Factor Analysis were reproduced using CFA.

3.2. Confirmatory factor analysis

Fig. 2 shows the regression weights and defines the theoretical structural model associated with UFO-Q. Factor loads were high (all of them greater than 0.7). The lowest values were the C2 factor, which also obtained the lowest saturations in the previous EFA. All latent variables showed significant correlations with each other, except for the relationships between variables C1-E1 and E1-T1, which presented covariances close to 0.

Likewise, it is a recursive model and the adjustment was contrasted by the following indices: $\chi^2 = 450.869$, $df = 336$, $p < 0.0001$; normed $\chi^2 = 1342$; root mean square error of approximation (RMSEA) = 0.02 (<0.05); adjusted goodness of fit index (AGFI) = 0.912; comparative fit index (CFI) = 0.996 (>0.95); normed fit index (NFI) = 0.983 (>0.95); relative fit index (RFI) = 0.981 (>0.95); incremental fit index (IFI) = 0.996 (>0.95); standarized root mean square residual (SRMR) = 0.01. With the exception of the Chi Square statistic, the rest of the indices offered values

Table 1
Exploratory Factor Analysis without rotation (n = 404).

Items	Factors			
	1	2	3	4
C1- 20	0.903			
C1- 8	0.902			
C1- 18	0.902			
C1- 15	0.902			
C1- 19	0.902			
C1- 1	0.901			
C1- 6	0.900			
C1- 24	0.900			
C1- 12	0.899			
E1- 5		0.942		
E1- 23		0.940		
E1- 26		0.931		
E1- 11		0.931		
E1-10		0.912		
E1- 4		0.910		
E1- 14		0.896		
E1- 17		0.894		
T1- 27	0.554		0.783	
T1- 7	0.531		0.783	
T1- 9	0.537		0.777	
T1- 16	0.533		0.764	
T1- 2	0.527		0.761	
T1- 21	0.582		0.698	
C2- 28	0.463			0.738
C2- 25	0.448			0.710
C2- 3				0.681
C2- 13	0.436			0.664
C2- 22	0.413			0.641
% Var.	36.571	27.045	17.272	9.7
Eigenvalues	10.341	7.641	4.896	2.98

Note: C1 = *Extraterrestrial Beliefs*; C2 = *Form Beliefs*; T1 = *Fearful Extraterrestrial Beliefs*; E1 = *Extraterrestrial Experiences*.

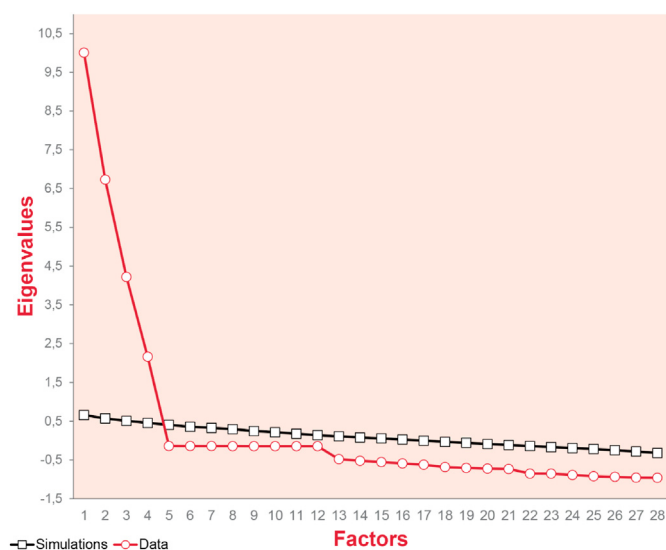


Fig. 1. Scree-plot of parallel analysis.

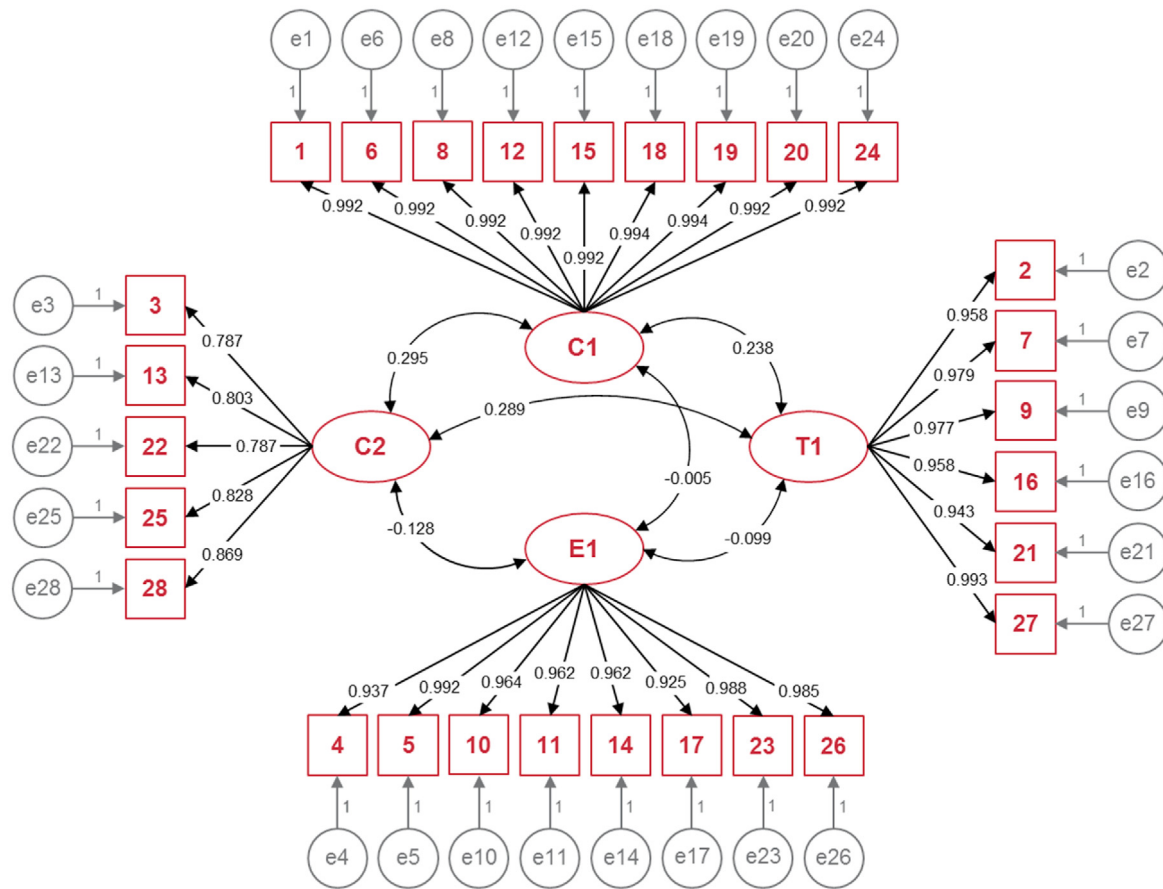


Fig. 2. Path diagram with standardized regression weights and CFA model of UFO-Q.

that supported the goodness of fit of the model (see Bentler, 1990; Bentler & Bonnett, 1980; Bollen, 1986, 1989). However, although Chi Square suggests the rejection of the null hypothesis of equality between the empirical and estimated variance-covariance matrix, it is highly sensitive to the sample size (see Gorsuch, 1983). In fact, when the samples are large, their value can be improved by reducing the sample size (e.g. Bentler & Bonnett, 1980). Therefore, the result of Chi Square alone is not interpretable in this class of structural equation models.

3.3. Reliability

On the one hand, Table 2 shows the descriptive statistics of the UFO-Q factors with their respective reliability indices related to internal consistency. Taking into account the criteria of George and Mallery (2003), all results were excellent as they exceeded the value 0.8. This made it unnecessary to eliminate any item to optimize internal consistency coefficients.

On the other hand, in terms of test-retest reliability, an independent

Table 2
Descriptive statistics for the UFO-Q scales and Cronbach's Alpha coefficients.

	Mean	Standard Deviation	Variance	Asymmetry Error = 0.121	Kurtosis Error = 0.242	Alpha
C1	15.74	6.4364	40.502	-0.643	0.2	0.998
C2	5.83	4.8	23.039	0.824	0.567	0.989
T1	9	6.072	36.868	0.759	0.625	0.919
E1	8.1	3.530	12.464	0.286	-0.877	0.99

Note: C1 = Extraterrestrial Beliefs; C2 = Form Beliefs; T1 = Fearful Extraterrestrial Beliefs; E1 = Extraterrestrial Experiences.

sample of the validation of the UFO-Q was used. The results in Table 3 show the test-retest reliability coefficients.

The sample that formalized this procedure was performed in a non-probabilistic way and was configured by 66 subjects (31 men and 35 women). All of them were between 18 and 41 years old (Mean = 20.53; Standard Deviation = 3.009) and answered the UFO-Q questionnaire in two application sessions; the first was developed on September 19th 2018, and the second on March 11th 2019.

The correlation coefficients were significant for all contrasts, a fact that indicated a good longitudinal consistency for the UFO-Q scales. This result was supported by the student's t-test, the results of which showed no significant differences between the measurements performed.

As a conclusion, it should be noted that Alpha coefficients and the test-retest indicated that UFO-Q presented a satisfactory reliability, both

Table 3
Test-retest coefficients for the UFO-Q scales.

	Mean	Standard Deviation	Mean difference	t(df = 65)	r	
C1 vs. C1	C1 test	10	4.069	0,076	0.325	0.912*
	C1 retest	9.92	4,6			
C2 vs. C2	C2 test	4.59	2.631	-0.106	-0.464	0.796*
	C2 retest	4.7	3.053			
T1 vs. T1	T1 test	5.86	3.234	-0.621	-1.673	0.645*
	T1 retest	6.48	3.816			
E1 vs. E1	E1 test	4.33	4.13	-0.045	-0.37	0.972*
	E1 retest	4.38	4.231			

Note: C1 = Extraterrestrial Beliefs; C2 = Form Beliefs; T1 = Fearful Extraterrestrial Beliefs; E1 = Extraterrestrial Experiences. *p < 0.05; t = t-test; r = Pearson Coefficient.

transverse and longitudinal.

3.4. Complementary prevalence rates

In order to examine the psychosocial impact of these kinds of beliefs and experiences, the UFO-Q was assessed from the scales defined in the CFA. Direct scores were transformed to percentiles using the responses of the general sample itself. Percentiles (*Pc*) facilitated possible hypothetical inferences about which cut-off points could be used to provide statistical value with those excessively high scores with respect to the information provided by each extracted factor. Based on the disposition of the scales (see Table 4), *Pc* 90 was used as a critical value in each scale. The prevalences presented below (Table 5) compile the proportion of subjects with results above those percentiles.

4. Discussion

The main objective of this research was the exploration of the psychosocial comprehension of beliefs in extraterrestrial beings and the anomalous experiences linked to them. In the process, the statistical justification of the UFO-Q was accomplished, which confirms its four-dimensional structure and its satisfactory reliability. Unlike other instruments and following the suggestions of Swami et al. (2009), the UFO-Q was developed attempting to isolate the UFO beliefs and experiences from other systems of magical beliefs (such as the paranormal) which are normally mutually associated (e.g. Dagnall et al., 2011; French et al., 2008). Together with the results discovered, all this allows a structuring of the discussion based on two types of inferences. On the one hand, understanding the psychosocial dimensions that describe and characterize experiences of this nature in the general Spanish population; and on the other hand, to interpret its social impact through the creation of scales and ordinal cut-off points.

The CFA of the UFO-Q suggests a comprehension system of the

Table 4
Direct scores transformed to percentiles.

<i>Pc</i>	C1	C2	T1	E1	<i>Pc</i>
99	24–27	18	24	15	99
98	–	–	–	–	98
97	–	–	–	14	97
96	–	–	–	–	96
95	–	–	–	–	95
90	–	12–17	16–23	–	90
85	–	–	–	13	85
80	–	7–11	–	11–12	80
75	17–23	6	9–15	10	75
70	–	–	8	9	70
65	16	–	–	–	65
60	–	–	–	–	60
55	–	–	–	–	55
50	–	–	–	–	50
45	–	–	–	–	45
40	–	–	–	5–6	40
35	–	–	–	–	35
30	–	1–5	–	–	30
25	–	–	6–7	3–4	25
20	7–8	–	–	–	20
15	–	–	1	–	15
10	–	–	–	–	10
5	–	–	–	–	5
4	–	–	–	–	4
3	–	–	–	–	3
2	–	–	–	–	2
1	0	0	0	0	1
N	404	404	404	404	N
Mean	15.74	5.83	9	8.10	Mean
SD	6.36	4.8	6.07	3.53	SD

Note: C1 = Extraterrestrial Beliefs; C2= Form Beliefs; T1 = Fearful Extraterrestrial Beliefs; E1 = Extraterrestrial Experiences; SD= Standard Deviation; *Pc* = Percentiles.

Table 5
Sample prevalences of the UFO-Q scales.

Grouping	C1	C2	E1	T1
Believer ^a	31.5%	21.2%	24%	19.9%
Agnostics ^b	23.4%	12.9%	24.9%	18.2%
Non-believers ^c	2%	2%	0%	8.2%
General sample	23.8%	14.6%	21.5%	17.6%
Men (N = 146)	25.6%	17.1%	18.6%	18.1%
Women (N = 163)	22%	12.2%	24.4%	17.1%

Note: C1 = Extraterrestrial Beliefs; C2= Form Beliefs; T1 = Fearful Extraterrestrial Beliefs; E1 = Extraterrestrial Experiences.

^a They accept the existence of extraterrestrial beings.

^b They doubt the existence of extraterrestrial beings.

^c They do not accept the existence of extraterrestrial beings. The 90 percentile was taken as the cut-off point for each variable.

phenomenon through 4 defined facets in accordance with the contents of the items respectively grouped. In relation to the first factor (Extraterrestrial Beliefs or also C1) suggests the presence of an integrated system of meanings, which qualitatively organizes the social concern regarding the possible existence of UFOs and extraterrestrial beings in two types of items. In accordance with the elements grouped on this scale, these systems of meanings can present both ‘magic-divergent’ constructs (see item 18: *I believe in extraterrestrial abductions*) and ‘critical-divergent’ constructs (see item 15: *I believe in the existence of other live forms beyond those already known on our planet*). While the social constructs of a magical type conflict with the epistemological bases of scientific knowledge, the divergent social constructs based on the critical thinking show logical-rational contents that seem to be compatible with the contemporary scientific basis (e.g. Brassé et al., 2017; Cabrol, 2016; Nelson, 2019). Thus, it is convenient to note that these kinds of beliefs offer a double interpretative facet or a double dimension the justification of which must not be substantiated only in those magical attributes that characterize paranormal beliefs. Concurrently, these results also question whether the adaptive value of these beliefs lies on those that obey the critical-divergent contents, and to what extent those of the magical-divergent type constitute disruptive thinking at a social level. And consequently, this proposal also questions what levels and connotations scientific discourse is adaptable and beneficial for social progress, and to what extent the magical discourse is really useful in the present culture. This is based on what some authors pointed out that extraterrestrial beliefs should not necessarily be magical (e.g. Chequers et al., 1997; Swami et al., 2011). However, it is curious that in this scale (C1) both types of items correlate positively with each other and therefore are grouped in the same factor. If these two types of items really represent different dimensions, they should be separated and generate a new factor in the EFA that conceptually justifies the difference between the two typologies. Therefore, at least on this UFO-Q scale, the exploratory EFA does not provide statistical evidence that reinforces the differentiation between magical divergence and critical divergence.

As for the second one, (Extraterrestrial Experiences or E1) it should be noted that it compiles information about the possible encounters with alien or extraterrestrial beings, which configure anomalous subjective experiences at a psychological level (see Dagnall et al., 2011; French & Stone, 2014). The items in this dimension illustrate both qualitative and quantitative degradation of how these encounters are developed. On its qualitative basis, three different levels can be distinguished: Firstly, there are items with statements that describe experiences that do not coincide with any of the dimension mentioned before (see item 23: *I saw luminous points in the sky completely inexplicable for me*). In this case, the anomalous experience is not endowed with any magical-divergent or critical-divergent meaning. Secondly, those experiences whose meanings seem to have critical-divergent traits are appreciated (see item 11: *I saw UFOs that could be of an extraterrestrial origin*). The expression “could” of the item denotes a prudent attitude and criticizes, easily associated with critical-divergent meanings (instead of using only the expression “have”,

which at a behavioural level presents higher rigidity). It should also be noted that the term “UFO” (Unidentified Flying Object) must not have magical attributions. The fact that a “flying object” is not identified does not mean that it is “extraterrestrial”; it simply means that it is a presumably flying stimulus whose formal characteristics are not registered in the category systems of the perceiving subject. Finally, in third place are found those experiences with irrational inferences, which obey magical-divergent meanings (see item 14: *I think I have been able to communicate with beings from other worlds*). The numerical value obtained through the addition of responses quantitatively explains the frequency or tendency of the subject to perceive such encounters. Nevertheless, although these three categories are related to the theoretical framework mentioned above, the EFA does not provide saturations that allow empirically, distinguishing these types of items. Again, this report does not have enough evidence to accept the differentiation of the three previous levels in the sample used.

The third factor (Fearful Extraterrestrial Beliefs or T1) deals with the degree of tolerance and comfort facing a possible experience of a UFO contact. Actually, Gallagher et al. (1994) on the scales of AEI questionnaire already noticed a group of items that seemed to examine the grade of recklessness or fear in the case of paranormal experiences. Since the UFO-Q also presents a replica of this dimension extrapolated to extraterrestrial beliefs, it is possible that this fact supports the hypothesis that promotes the integrative model between the paranormal and the UFO experiences (see Dagnall et al., 2010; Dagnall et al., 2011; French et al., 2008; French & Stone, 2014; Swami et al., 2013; Wiseman & Watt, 2004). Even so, the following hints should be taken into account: first, it is probable that the statements of these items were elaborated from an excessively magical conceptual framework, an attribute that coincides with paranormal beliefs and experiences. Then, similar covariation levels could be expected between the responses of both scales, an aspect that would justify this result. Second, the possibility that the dread or fear of UFO experiences provides significant information only when such UFO beliefs/experiences are framed in magical-divergent meanings. If this were so, it would be necessary to confirm whether the exploratory factor patterns would produce a similar grouping when the statements of the items were expressed under less magical terms. And finally, this coincidence can be substantiated on the option that the fear is more related to the personality or to the profiles of the participants who tend to develop magical beliefs, and not so much to the constructs that assess both tests (UFO-Q and AEI). In accordance with the exposition above, the acceptance of the integrative model as a system to explain these experiences may have numerous exceptions that suggests its revision and would generate further researches to include them in a cross-validation process.

Factor 4 (Form Beliefs or C2) groups items that have more magical content than the C1 scale. Given the irrational grades of the items, it is possible that this factor only assesses extraterrestrial beliefs from a magical-divergent perspective. In the same way, the magical contents of the items in some cases are also presented incorporating paranoid or hostile content (see item 3 *I think that extraterrestrial could be as hostile as humans*). This suggests that C2 also assesses the hostile conception of extraterrestrial beings analyzed by some authors (e.g. Moya-Salazar, 2019; Peters, 2018; Saler et al., 1997). Then, high scores on this scale will indicate the presence of dysfunctional extraterrestrial beliefs with hostile characteristics. However, it is also necessary to consider why in the EFA both conceptions (hostile and benevolent) have not been distinguished, since some items did not present hostile attributes and were written in a more neutral way. Likewise, it should be noted that the UFO-Q and specifically in this scale, no attention is paid to the spiritual or religious meanings that the subject may attribute to his experiences. Although some religious beliefs may be irrational and magical, they were not included in the UFO-Q in order to facilitate construct validity and reliability of the C2 scale.

According to the indices of prevalence, they coincide with the tendency described by Irwin (2009) and Dagnall et al. (2010) concerning paranormal beliefs and experiences: as the subjects develop beliefs in

favour of the existence of extraterrestrial beings, higher prevalences are observed for the UFO-Q dimensions. However, the E1 dimension shows a similar prevalence with the believers of those subjects considered agnostic (24.9%), an aspect that invites analysis of how the doubt about the existence of extraterrestrial UFOs predisposes these individuals to be more vulnerable and to develop UFO experiences. Another issue is whether the differences between such rates are significant. Given the small sample for each contrasted group, at this point it is advisable to replicate these rates and examine their grade of independence, as well as the proportion of the information already explained: Can doubting attitudes explain the UFO experiences with greater weight than faith attitudes/believing attitudes?

As expected initially, it seems to be that men tend to believe more in the existence of UFOs than women (see French & Stone, 2014). Nevertheless, although women have less intense extraterrestrial beliefs, they tend to generate more extraterrestrial experiences than men. This second trend also coincides with previous research, which promulgates that it is women who develop more anomalous experiences than men (see Irwin, 1993, 2009; Jinks, 2019). As in the previous paragraph, it would be necessary to contradict the null hypothesis of independence in future researchers to verify if the findings are significant.

Finally, accepting the hypothetical relation between extraterrestrial beliefs and other paranormal belief systems, the issue addressed by the UFO-Q responds to why such experiences and beliefs remain prevalent in today's society, despite the fact that scientific-technological progress provides sufficient resources and evidences to dismiss the use of magical discourses as systems of adaptive meanings. One of the main limitations of this work can be seen in that, despite having drafted items with magic-divergent and critical-divergent attributes, the initial EFA did not distinguish between the magic-divergent and the critical-divergent perspective. The CFA enabled the validation that the UFO-Q has the C2 scale to examine magical-divergent and hostile conceptions. However, it would be advisable to replicate the CFA with another sample and try to specify a new latent variable to include critically divergent extraterrestrial beliefs. With the current CFA, an inter-UFO-Q structure can be accepted that identifies extraterrestrial beliefs (magical and critical) (C1), magical-divergent extraterrestrial beliefs (C2), the fear associated with extraterrestrial beliefs (both magical and critical) (T1) and extraterrestrial experiences (with a degradation of their magical attributes) (E1). The fact that a subject scores low on the C2 scale does not necessarily indicate that his extraterrestrial beliefs are critical (that is, without magical attributes). That is why it would be important to define a new latent factor to introduce the assessment of critical-divergent beliefs. If the correlation between C2 and T1 were higher in the CFA, an alternative would perhaps be to use the T1 scores to try to interpret whether the assessed subject has critical-divergent extraterrestrial beliefs or not. If the CFA were replicated with new theoretical models, the scales could also be optimized (see Table 4), which present the so-called ceiling effect (e.g. Lenhard et al., 2019) and this makes them less useful in interpreting individual scores. Precisely, another limitation is related to the cut points decided from the scales. It would be advisable to use ROC curve designs to examine the sensitivity and specificity of UFO-Q. Along these lines, it would also be necessary to test the psychopathological value of the behaviours assessed by C1, C2 and E1. Although the T1 scale can serve as a previous indicator, it is not a scale that explicitly assesses psychopathological risks. Therefore, caution is recommended with those decisions that seek to determine dysfunctional or maladapted behaviours.

5. Conclusions

The UFO-Q questionnaire with 28 total items enables examination of extraterrestrial beliefs and experiences in the Spanish general population, indicating if the subject's beliefs are magical-divergent and the degree of fear associated with this kind of content. Both the EFA and the CFA provided an acceptable and valid internal structure. The reliability of the UFO-Q scores has also been excellent in the analysis of internal

consistency and *test-retest* designs, which suggest that the dimensions of the questionnaire are psychological traits and not variable states over time. The UFO-Q can be useful in the field of social research and in the clinical understanding of the impact that anomalous experiences have on people's quality of life.

By way of conclusion, the UFO-Q instrument can have useful applications both in the framework of psychological assessment and in the field of sociological study of the UFO phenomenon. UFO-Q should be used as a standardized measure of opinions and perceptions of subjects reporting extraterrestrial beliefs, sightings and UFO experiences. The validity and reliability of UFO will contribute to the understanding of this type of experiences and the psychological basis that characterizes them.

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Human ethics

Participants gave their written consent to use their anonymous data for statistical purposes. All of them were over 18 years of age and voluntarily collaborated without receiving any financial compensation. The procedures were carried out in compliance with the institutional regulations of the university and the Spanish Government Data Protection Law 15/1999. Similarly, all procedures adhere to the Helsinki Declaration of 1975, revised in 2013.

Additional information

No additional information is available for this paper.

CRedit authorship contribution statement

Álex Escolà-Gascón: Methodology, Formal analysis, Investigation, Writing - original draft, Project administration. **Mary O'Neill:** Writing - review & editing, Resources, Data curation. **Josep Gallifa:** Conceptualization, Visualization, Validation, Supervision.

Declaration of competing interest

The authors declare no conflict of interest.

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