

DIFFERENCES IN PARANORMAL BELIEFS ACROSS FIELDS OF STUDY FROM A SPANISH ADAPTATION OF TOBACYK'S RPBS

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ABSTRACT: The present research had several objectives: (1) to adapt Tobacyk's (1988) Revised Paranormal Beliefs Scale (RPBS) into Spanish in order to make cross-cultural comparisons possible, (2) to test the reliability and dimensionality of the instrument and check if the previously found dimensions are replicated with Spanish-speaking participants, and (3) to test the hypothesis of the non-equivalence in paranormal beliefs across fields of study groups. The study included 355 students from six university departments, both scientific and nonscientific. The results showed the questionnaire is highly reliable although not additive within our sample. We found a set of conceptually valid first-order empiric dimensions that replicated the findings of two earlier studies, and two second-order factors in line with results of a third study. In addition, differences among students from different fields of study were found, suggesting that training in scientific method produces differences in paranormal beliefs. Cross-cultural research based on this questionnaire is possible.

Paranormal beliefs are held by many people nowadays. There are several definitions of paranormal beliefs (e.g., Alcock, 1981; Irwin, 1999; Tobacyk & Milford, 1983), but there is general agreement that they are beliefs which violate the basic principles of science (Tobacyk, 1988). Regardless of whether such beliefs are related to real phenomena, it is clear that they are widely held by many people, and that a current popular interest exists. Evidence for this interest includes the large number of newspaper articles, books, television programs, movies, and groups that focus on such topics (Scheidt, 1973; Tobacyk & Milford, 1983). For this reason, it is obvious that believing in the paranormal is a psychologically and behaviorally relevant field of research.

The long-standing interest in this issue is shown by the large number of studies trying to find different correlates of paranormal beliefs with several psychologically relevant variables. For instance, paranormal experiences and beliefs appear to be associated with several psychopathologies such as manic-depression and schizophrenia (Thalbourne 1994; 1998; Thalbourne & French, 1995), complex partial epileptic-like symptoms (Persinger, 1993) and dissociative and schizotypal tendencies (Houran, Irwin, & Lange, 2001). In addition, it has been shown that there are some correlates with factors associated with individual differences or biographical variables like

childhood trauma (Irwin, 1994), gender (Tobacyk & Milford, 1983; Vitulli, Tipton, & Rowe, 1999), age (Vitulli et al., 1999), as well as personality factors like neuroticism (Vyse, 1997), locus of control (Dag, 1999), sensation seeking (Groth-Marnat & Pegden 1998), extraversion, and intuition (Rattet & Bursik, 2001). Previous results of studies about relationships of paranormal beliefs with intelligence, cognitive processes, and educational factors are particularly interesting for the present research. For instance, Killeen, Wildman, and Wildman (1974) found that high school students with an above-average IQ endorsed fewer paranormal beliefs than did students with an average IQ. Musch and Ehrenberg (2002) found that low cognitive ability correlates with paranormal beliefs, suggesting that differences in general cognitive performance rather than specific probabilistic reasoning provide the basis for paranormal beliefs.

Some studies have focused on the influence of the academic background of participants on their acceptance of belief in paranormal phenomena. Vitulli and Luper (1998) observed that some concrete paranormal beliefs decrease after a course in General Psychology. Morier and Keeports (1994), using a nonequivalent control group design, tested the effectiveness of an interdisciplinary course on the scientific method in increasing students' skepticism toward the paranormal. This study concluded that, while there were no initial differences between the control and treatment groups in their belief in the paranormal, students in the Science and Pseudoscience class demonstrated substantially reduced belief in the paranormal relative to the control class. Otis and Alcock (1982) showed that university professors believe less in the paranormal than do students, and that social and natural scientists also believe less than do their colleagues in the humanities, arts, and education (see also Pasachoff, Cohen, & Pasachoff, 1970). However, Sonntag (2000) recently found that a low performance in verbal and mathematical tasks, a low grade point ratio, and a low rank in high school academic performance were related to a high number of beliefs in paranormal phenomena. But more importantly, the kind of study chosen did not appear to be related to those beliefs. Sonntag concluded that increasing university education or studying specific areas is not related to a lower level of paranormal belief, and that most paranormal beliefs are relatively immune to the critical thinking skills taught in the academia. These conclusions are in agreement with Jahoda (1968), who failed to find any effect of years of education on paranormal beliefs, and with Salter and Routledge (1971), who failed to find different patterns of those kinds of beliefs in different fields of study.

One of the instruments most frequently used to measure the degree of belief in paranormal phenomena is the Belief in Paranormal Scale by Tobacyk & Milford (1983) and the new version the Revised Paranormal Belief Scale (RPBS) (Tobacyk, 1988). The RPBS consists of 26 questions related to various paranormal beliefs that subjects rate on a seven-point scale from "strongly agree" to "strongly disagree." In addition to a full scale

score, seven orthogonal factors have been found that lead to seven subscale scores: Traditional Religious Beliefs, Psi, Witchcraft, Superstition, Spiritualism, Extraordinary Life Forms and Precognition. A considerable amount of literature has been published in relation to the metric properties of the questionnaire. These studies have mainly focused on the number of dimensions in the scale: seven (e.g., Tobacyk, 1988; Tobacyk & Thomas, 1997), five (Lawrence, Roe, & Williams, 1997, 1998), four (Hartman, 1999), two (Lange, Irvin, & Houran, 2000), or just one factor (Thalbourne, Dunbar, & Delin, 1995). Another issue that has produced some debate is the interrelatedness of these dimensions: while some authors claim that they are orthogonal (e.g., Tobacyk & Milford, 1983), others conclude that the factors are oblique (e.g., Lawrence & De Cicco, 1997; Lawrence, Roe, & Williams, 1997, 1998; Lange et al., 2000).

Special consideration may be given to Lange et al. (2000). These authors found that several items in the RPBS scale should be removed for their differential functioning depending on sex, age, or both. They also found that despite the scale's having a fair Cronbach's alpha, items are not additive. From a step-by-step analysis using three consecutive methods (Principal Components, Poly-SIBTEST and Bigsteps, and Poly-DIMTEST), their results show that the remaining items can be grouped in only two clusters, which they call *New Age Beliefs*, containing most of Psi, Spiritualism, and Precognition items; and *Traditional Paranormal Beliefs*, containing items related to Traditional Religious Beliefs and Witchcraft.

There is possibly an additional problem with this scale that has to do with cross-cultural validity of some of the items included, such as those related to extraordinary life forms or superstitious beliefs. This problem is likely produced by the fact that most of the research has been carried out in samples from English-speaking countries, with similar cultural backgrounds. For example, folk tales like "Bigfoot" or "Yeti" are not necessarily known in every social setting or country, and the number 13 or breaking a mirror is not necessarily thought to bring bad luck by all populations. Finally, we observed a lack of items measuring extraterrestrial-related beliefs, which are also widely accepted worldwide. The belief in aliens has recently moved from beliefs in biological beings to beliefs in spiritual entities. Furthermore, UFO believers obviate the lack of physical evidence of their visitations. So we think they could be included as typical paranormal beliefs.

The aim of this research was threefold. First, we wanted to adapt Tobacyk's (1988) Revised Paranormal Beliefs Scale (RPBS) into Spanish. We consider that the adaptation of existing instruments like the RPBS to other languages besides English will allow the direct comparison of samples from a cross-cultural perspective, permitting the carrying out of cross-cultural studies of paranormal beliefs and their correlates. In this sense, the objective

is to find general assertions to include items that can be applied to any cultural setting.

Second, we wanted to test five hypotheses about the metric properties and dimensionality of the instrument:

- a) We hypothesized that if the RPBS is measuring a general construct of paranormal beliefs that can be used from a cross-cultural perspective, the scale will be reliable enough. Cronbach's alpha should be over 0.90.
- b) Also we hypothesized that our Spanish adaptation would have the same metric properties and additivity problems found by Lange et al. (2000) with the original English scale.
- c) Further if this scale could be dimensionalized, we hypothesized that eight factors would arise, each clustering the items in a conceptually interpretable basis: seven factors similar to Tobacyk's original solution, plus one additional factor extracted from the addition of new items. New added items a priori related to existing subscales would be grouped in existing dimensions, and nonrelated items would create new dimensions.
- d) We also hypothesized that given the shared (paranormal) nature of the objects of these beliefs, oblique rotation of these factors would result in moderately correlated factor scores: every pair of dimensions would correlate moderately and significantly.
- e) Following the results of Lange et al. (2000), we hypothesized that if there were two underlying dimensions, a second order factor analysis would result in these two dimensions grouping as the Traditional Paranormal Beliefs and the New Age Beliefs.

Third, we examined the existence of differences between the participants' field of study (such as physics, biology, and psychology) in their acceptance of beliefs in paranormal phenomena, given the contradiction among different studies mentioned earlier. If Sonntag (2000) is right, the average acceptance of these beliefs should be the same between groups of students from scientific versus humanistic studies. To test this hypothesis properly, we included a larger range of studies than in Sonntag's work.

METHOD

Participants

A total of 355 students from seven courses of six departments of the University of La Laguna participated in this research: 137 students from education; 30 from physics; 42 from biology; 56 from a degree in Tourist Organizations Management; 35 from sociology; 38 from the third

course of General Psychology, and 17 from the specialty in Industrial Psychology (following a Human Resources Management course). Ages ranged from 17 to 45, with a mean of 20.84 years old and a standard deviation of 3.15 years; 25.1% were male and 69% female, while 5.9% did not declare their gender.

Instrument

We adapted the Revised Paranormal Belief Scale by Tobacyk (1988), which originally included 26 items. We added four new items regarding the existence of ghosts (a priori related to the Spiritualism dimension), the existence of real UFO sightings and the ET visits (a priori a new dimension), and the reality of a locally accepted kind of incantation called *mal de ojo* (a priori related to the Witchcraft dimension). Subjects were asked to express their agreement level with each belief on a Likert-type scale ranging from 1 ("totally disagree") to 7 ("totally agree"). Following the original questionnaire, all the beliefs were presented in an affirmative form, except Item 23, which was formulated in a negative way ("Mind reading is not possible"). We called this version of the scale the RPBS-Sp.

Procedure

Subjects filled out the questionnaire in classroom settings and were asked to answer during their class time, on a voluntary basis, as collaboration with a research team from our department.

RESULTS

Analysis of the Metric Properties of the Questionnaire

First, we performed a reliability analysis on the scale data. As a result of this analysis we excluded Item 23, the only one in negative form, given its very low correlation with the total scale, $r_{xy}(293) = -.09$; ns . The resulting scale of 29 items, applied to 295 valid cases (list-wise), reached a reliability Cronbach's alpha (α) = .91, which we may consider large (Norusis & SPSS, Inc., 1988).

Nevertheless, Hotelling's T^2 index of equality of means was not so promising: $T^2 = 2388.12$, following a distribution $F(28, 272) = 77.59$, $p \leq .001$, and ANOVA test of nonadditivity was also significant, $F(1, 8699) = 161.94$, $p \leq .001$. Thus, we can say that the item scores, although interrelated, are not additive. These results support our first two hypotheses: (a) The questionnaire seems to measure interrelated paranormal beliefs; and (b) the questionnaire shows similar metric properties and additivity problems to those found by Lange et al. (2000).

Before rejecting the additivity property of the questionnaire items, we performed two additional analyses. First we analyzed the individual item distributions. We used kurtosis and skewness, and Kolmogorov-Smirnov (K-S) tests as criteria to consider normality, but as the significance of the K-S test depends too much on the number of cases, we considered the magnitude of the K-S statistic as the criterion. Second, we transformed item scores into standard scores and then performed a reliability analysis on them.

Six items had kurtosis and skewness over 1, and a K-S of about 0.4: the 3 Superstition items (4, 11, and 18), which also had the 95% confidence interval in the score of 1, with 16.9%, 21.6%, and 16.9% outliers, respectively; and the Yeti, Nessie, and "the Horoscope may predict the future" items (6, 13, and 14), with 95% confidence interval below the score of 3, and 12.4%, 16.9%, and 13.2% outliers, respectively. These items' distributions clearly influenced our ANOVA results, so we dropped them for a second reliability analysis. This resulted in Cronbach's $\alpha = .92$, and the ANOVA of nonadditivity was nonsignificant, $F(1, 7060) = 1.01, p > .05$, although Hotelling's T^2 was still high and significant, $T^2 = 1366.42; F(22, 285) = 57.85, p \leq .001$. It seems that the nonadditivity of the items in the scale is caused by their non-normal distribution, due, in these cases, to a very high skewness value, which indicates a clear tendency to score low (disbelieve) on several items, probably because of the university origin of the sample.

When standard item scores were analyzed, the questionnaire reached additivity. The reliability of the standardized scale was Cronbach's $\alpha = .91$; the ANOVA of nonadditivity can be considered small, $F(1, 8699) = 8.28, p > 0.001$, and Hotelling's T^2 was not significant at all, $T^2 = 5.88; F(28, 272) = .19, p > .05$. These results support the possibility of additivity of the scale items when a normal distribution is reached, suggesting that the questionnaire is reliable in relation to the category Traditional paranormal beliefs, and nonadditivity problems are due to metric properties in this sample (subject profiles are not parallel when raw data are considered).

Exploration of the Empirical Structure of the Questionnaire

The first condition in our third hypothesis (c) was the dimensionality of the scale. To test this we analyzed the adequacy of the correlation matrix (**R**) of 29 items (leaving out item 23) for the Principal Components Analysis. We found an **R** determinant different from 0 (5.54E-07); the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.89, which is moderately high, given Tabachnick and Fidell's (1989) recommended minimum value of 0.60. Bartlett's test of sphericity shows that the **R** correlations differ from 0, approx. $\chi^2 (406) = 4703.78, p < .001$. Also, the anti-image correlation matrix included only

24 out of 406 (5.91%) negatives of partial correlations greater than 0.20 in absolute value, indicating **R** is factorable and variables are relatively free of unexplained correlations. Furthermore, individual variable measures of sampling adequacy were all over 0.76, with an average value of 0.87, indicating that all the items seem to fit with the other items' structure.

Given these positive results, we proceeded to the Principal Components analysis. This resulted in an 8-factor solution with eigenvalues over 1, which explained 68.46% of the total variance. Most values in the residual correlation matrix were near 0; only 19 out of 406 (4.68%) surpassed this threshold, while none of them reached .2. This result indicates the adequacy of the extraction and number of factors; there are no more underlying factors (Tabachnik & Fidell, 2001).

These 8 factors were orthogonally and obliquely rotated. For the orthogonal rotation we applied the standard SPSS Varimax procedure, while for the oblique rotation an Oblimin method with $\delta = 0.2$ was used. The standard SPSS Oblimin rotation starts with a delta value of 0 (Quartimin rotation), which reproduced exactly the varimax structure with fairly correlated dimensions. Following Díaz-Vilela (1997), we increased this value in decimals to maximize the intercorrelations between dimensions until the resulting factors were different from the orthogonal ones. We reached this point at a δ value of 0.3, so a $\delta = 0.2$ solution was chosen. Table 1 shows the factor loadings from the Varimax orthogonal rotation and from the structure matrix in the Oblimin oblique rotation. In this table, items are sorted by their factor loadings in the orthogonal rotation. Items with factor loadings below .40 in the orthogonal rotation and below .50 in the oblique rotation have been left out to simplify reading.

It can be observed that the 1st factor is mainly characterized by witchcraft and magical beliefs, including our culturally local Item 28. The 2nd factor mainly loads items related to telekinesis and the power of mind to move physical objects, Tobacyk's (1988) *Psi* factor. The 3rd factor has to do with traditional religious beliefs related to the existence of Heaven, God, the Devil, and the immortality of the soul. The 4th dimension relates to the capability of the soul to have a "body-free" life, Tobacyk's (1988) Spiritualism dimension plus two other shared items related to this characteristic of soul (soul continues existing after death and ghosts do exist). The 5th dimension mainly loads items related to extraterrestrial life and its presence on Earth, which are new in the scale. The 6th dimension relates to the possibility of predicting the future, the Precognition factor. The 7th mainly loads the 3 Superstition items. Finally, the 8th factor refers to extraordinary life forms, the Yeti and Nessie, which we can call Monsters. Note that the belief in extraterrestrial life forms, originally belonging to this factor in Tobacyk's (1988) analyses, is grouped with its 2 related new items in the 5th dimension.

TABLE 1
STRUCTURE OF THE RPBS-SP SCALE WITH VARIMAX AND OBLIMIN LOADINGS

Item#	Item description	VMax	OMin
		$\delta=0.2$	
Witchcraft			
24	There are actual cases of witchcraft	.835	.868
17	Through the use of incantations it is possible to cast spells on persons	.745	.831
3	Black magic really exists	.727	.798
28	The "Mal de Ojo" is a real phenomenon	.660	.747
10	Witches do exist	.656	.702
25	It is possible to communicate with the dead	.501	.682
29	Ghosts do exist	.492	.630
26	Some people have an unexplained ability to predict the future	.422	.614
21	Some people can predict the future	.389	.589
Psi			
2	Some individuals are able to levitate objects through mental forces	.857	.907
9	Psychokinesis, the movement of objects through psychic powers, exists	.855	.896
16	A person's thoughts can influence the movement of a physical object	.789	.847
25	It is possible to communicate with the dead	.279	.527
21	Some people can predict the future	.252	.539
Traditional Religious Beliefs			
22	There is a heaven and a hell	.809	-.855
15	I believe in God	.769	-.799
1	The soul continues to exist although the body may die	.658	-.759
8	There is a Devil	.694	-.754
Spiritualism			
5	Your mind or soul can leave your body and travel (astral projection)	.799	-.853
12	During altered states (sleep or trances), the spirit can leave the body	.692	-.796
19	Reincarnation does occur	.630	-.711
1	The soul continues to exist although the body may die	.478	-.610
25	It is possible to communicate with the dead	.407	-.613
29	Ghosts do exist	.335	-.536
Extraterrestrial life and actual visits (ETs)			
27	ET's visit us	.846	.869
30	There are real viewings of UFOs	.811	.849
20	There is life on other planets	.707	.714
29	Ghosts do exist	.352	.535
Precognition			
14	The horoscope accurately tells a person's future	.805	-.864
7	Astrology is a way to accurately predict the future	.785	-.844
21	Some people can predict the future	.504	-.558
26	Some people have an unexplained ability to predict the future	.361	-.655
Superstition			
4	Black cats can bring bad luck	.800	-.809
18	The number "13" is unlucky	.749	-.768
11	If you break a mirror, you will have bad luck	.692	-.752
Extraordinary life forms (monsters)			
6	The abominable snowman of Tibet exists	.854	.856
13	The Loch Ness monster of Scotland exists	.815	.856

Factor scores obtained from the oblique rotated factor matrix are all significantly correlated except for the pairs including Superstition with Extraterrestrial life and with Monsters (see Table 2).

TABLE 2
INTERCORRELATIONS OF OBLIQUE FACTOR SCORES

	Witchcraft	ETs	Precog.	Religion	Monsters	Psi	Spiritual.
E.T.'s	.37***						
Precognition	.53***	.28***					
Religion	.51***	.21***	.40***				
Monsters	.33***	.31***	.28***	.19***			
Psi	.50***	.43***	.27***	.25***	.18***		
Spiritualism	.49***	.41***	.30***	.37***	.20***	.51***	
Superstition	.30***	-.00n.s.	.41***	.30***	.06n.s.	.17***	.14**

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$ (two-tailed).

Note. Scores in the negative loaded factors were inverted for these calculations.

N = 355

These results give clear support to our Hypothesis C: the scale can be dimensionalized and the factor structure consistently replicates Tobacyk's (1988) results, including new related items, plus a new dimension drawn from the inclusion of extraterrestrial visitations beliefs. In relation to our Hypothesis D, results are also supportive: Inter-dimensional correlations are moderate and significant for almost every pair.

To test our Hypothesis D we performed a second order factor analysis on these 8 factor scores. The determinant of the correlation matrix of these dimensions was different from 0 (Det. = .12). The overall Kaiser-Meyer-Olkin measure of sampling adequacy was KMO = .81, and 16 (57.14%) out of 28 values in the anti-image correlation matrix were below .1, and 6 (21.43%) values were over .2, while the highest value was .31 (Precognition x Superstition). Individual item MSA's were all over 0.71, with an average value of .80. These data indicate that our dimensions are relatively free of unexplained correlations, and each dimension fits with the structure of the other dimensions.

We rotated 2 second-order factors with eigenvalues over 1 that explained 56.23% of the total variance, using a varimax procedure. Eight values (28.57%) in the residual correlation matrix were over .1, while none of them were over .2, indicating this 2-factor rotation is optimal. Table 3 summarizes the factor loadings of the 2 second-order factors on each dimension. The 1st factor includes the Extraterrestrial life, Psi, Spiritualism, Witchcraft, and Monsters dimensions. This could be a "New Age" related factor. The 2nd factor includes the Superstition, Precognition, Religious, and Witchcraft dimensions, what could be the "Traditional" factor. These results partially support our Hypothesis D: First order dimensions regroup in 2 second-order factors, but not exactly as expected from Lange et al. (2000).

TABLE 3
SECOND-ORDER FACTOR LOADINGS FOR BELIEF DIMENSIONS

	New Age philosophy	Traditional beliefs
Extraterrestrial life	.793	
Psi	.721	
Spiritualism	.712	
Witchcraft and magic	.601	.570
Monsters	.488	
Superstition		.824
Precognition		.715
Religious beliefs		.644

Differences Between Subsamples

Given our negative results about the additivity of the RPBS-Sp items, we did not test differences between fields of study on the overall measure of paranormal beliefs. We applied a profile analysis based on MANOVA procedure to test differences between group profiles and contrasts between group means within each dimension.

For these analyses we used 5 of the 8 factor scores obtained in the oblique rotated solution. As can be seen in Table 4, these factor scores are almost normally distributed with Kolmogorov-Smirnov statistics, although significant, below .1 except for Monsters, Precognition and Superstition. In these 3 dimensions we also found high and positive skewness, as well as a number of outliers. In Monsters and Superstition we also found high kurtosis. As the MANOVA procedure is extremely sensitive to outliers, we decided to drop these dimensions from the analysis.

TABLE 4
DESCRIPTIVE STATISTICS FOR THE EIGHT FACTOR SCORES

	Min	Max	Mean	Std. Dev.	Skew. ¹	Kurt. ²	K-S test	
							Value	D.F.
Witchcraft	-1.63	2.40	0	1	.213	-.960	.070***	355
E.T.'s	-2.03	2.41	0	1	.198	-.606	.051*	355
Precognition	-1.82	3.55	0	1	1.060	.598	.129***	355
Religion	-1.62	2.22	0	1	.156	-.925	.061**	355
Monsters	-1.13	3.96	0	1	1.568	2.070	.212***	355
Psi	-1.59	2.18	0	1	.167	-1.037	.064**	355
Spiritualism	-1.98	2.84	0	1	.242	-.747	.061**	355
Superstition	-1.14	4.57	0	1	2.233	4.981	.261***	355

¹ Standard error = 0.13 in every case

² Standard error = 0.26 in every case

* p ≤ .01 ** p ≤ .001

Given the differences in number of cases between study groups, we performed univariate and multivariate homogeneity of variance analyses. These analyses resulted in nonsignificant univariate Cochran and Bartlett-Box statistics. Finally, following Tabachnick & Fidell (2001), multivariate tests of homogeneity of variances were not significant enough to threaten robustness, Box's-M = 139.55; $F(90, 37842) = 1.45$; $\chi^2(90, N = 354) = 131.26$, $p > .001$.

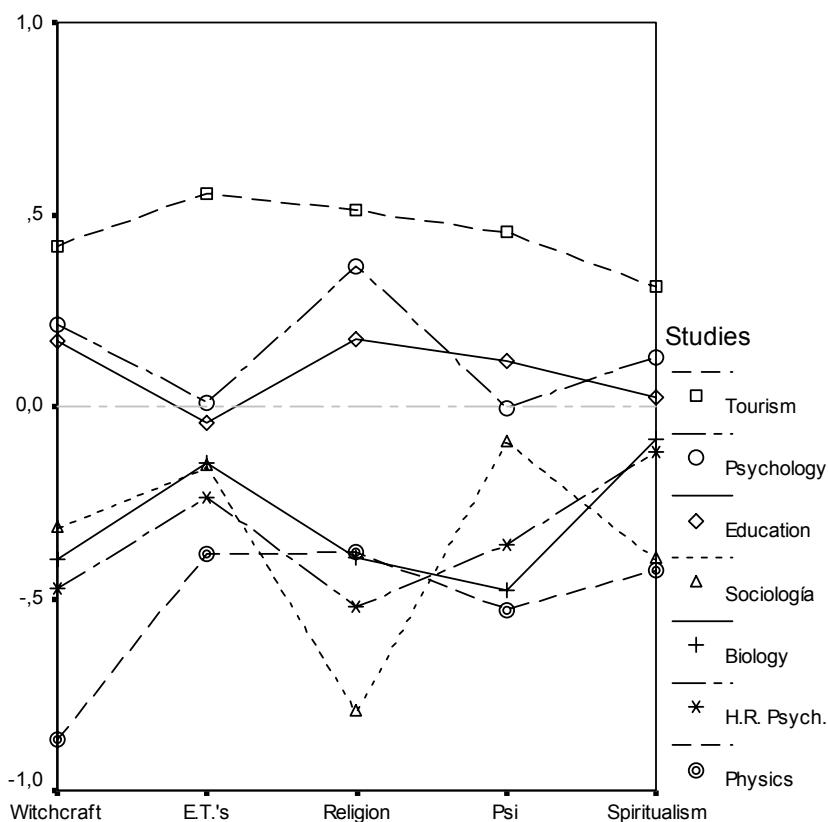


Figure 1: Factor scores for beliefs dimensions and studies

Applying a MANOVA procedure, we found that the group profiles shown in Figure 1 deviated significantly from parallelism, $F(24, 1392) = 2.22$, $p \leq .001$, so groups do not share a common profile shape. This same analysis

gave a significant effect of the variable *studies*, $F(6, 348) = 10.89, p \leq .001$. Finally, as factor scores are standard ones (0 mean), all dimensions have the same mean regardless of the field-of-study groups (overall profile is flat), $F(4, 1392) = 0.86, n.s.$

TABLE 5
CONTRAST TESTS BETWEEN STUDY GROUPS WITHIN EACH DIMENSION

Studies	Group Means	<i>t</i> tests				
		Educat.	Physics	Biology	3rd Psych.	H.R. Psych.
• Witchcraft						
Education	.21					
Physics	-.88	5.72***				
Biology	-.42	3.76***	-2.06*			
3rd Psychology	.09	n.s.	-4.21***	-2.40*		
H.R. Psychology	-.34	2.26*	n.s.	n.s.	n.s.	
Tourism	.39	n.s.	-5.98***	-4.22***	n.s.	-2.82**
Sociology	-.11	n.s.	-3.29**	n.s.	n.s.	n.s.
						2.48*
• Extraterrestrials						
Education	-.01					
Physics	-.39	1.97*				
Biology	-.21	n.s.	n.s.			
3rd Psychology	-.06	n.s.	n.s.	n.s.		
H.R. Psychology	-.14	n.s.	n.s.	n.s.	n.s.	
Tourism	.54	-3.52***	-4.22***	-3.74***	-2.91**	-2.50**
Sociology	-.10	n.s.	n.s.	n.s.	n.s.	n.s.
						3.03**
• Religion						
Education	.18					
Physics	-.39	3.06**				
Biology	-.47	3.96***	n.s.			
3rd Psychology	.33	n.s.	-3.22***	-3.87***		
H.R. Psychology	-.48	2.75**	n.s.	n.s.	3.00**	
Tourism	.47	n.s.	-4.10***	-4.94***	n.s.	-3.68***
Sociology	-.68	4.88***	n.s.	n.s.	4.66***	n.s.
						5.73***
• Psi or Telekinesis						
Education	.17					
Physics	-.48	3.38***				
Biology	-.54	4.19***	n.s.			
3rd Psychology	-.10	n.s.	n.s.	-2.05*		
H.R. Psychology	-.28	n.s.	n.s.	n.s.	n.s.	
Tourism	.45	n.s.	-4.31***	-5.06***	-2.73**	-2.75**
Sociology	-.06	n.s.	n.s.	-2.16*	n.s.	n.s.
						2.49**
• Spiritualism						
Education	.06					
Physics	-.46	2.64**				
Biology	-.13	n.s.	n.s.			
3rd Psychology	.08	n.s.	-2.26*	n.s.		
H.R. Psychology	-.13	n.s.	n.s.	n.s.	n.s.	
Tourism	.32	n.s.	-3.52***	-2.24*	n.s.	n.s.
Sociology	-.25	n.s.	n.s.	n.s.	n.s.	n.s.
						2.69**
• Precognition, Monsters, and Superstition were dropped.						

*** $p \leq .001$; ** $p \leq .01$; * $p \leq .05$

Note. Minus signs in *t* scores indicate higher mean in row group.

Within the same MANOVA procedure, we tested the contrasts between every pair of study groups within each belief dimension. Table 5 shows these five sets of contrasts. We can see physics students show the lowest mean on the Witchcraft, E.T.'s and Spiritualism dimensions; sociology students have the lowest mean score on Religious beliefs; biology students stand out for their low mean score in Psi beliefs. These 3 groups could be considered relative unbelievers.

On the other hand, students from tourism studies have clearly the highest mean score on all the 5 dimensions. These means are significantly different from most of the other group means, but especially from physics, biology and sociology, with which these differences are always significant. Education, psychology and human resources students tend to have similar scores closer to the overall mean of 0.

Finally, Figure 1 shows a general tendency to cluster 3 study groups as most believing (tourism, psychology and education), and the other 4 as most unbelieving (biology, human resources, sociology, and physics). We performed a contrast test comparing the 2 clusters within the same MANOVA procedure. This contrast resulted significant only for the Religion dimension, $F(1, 348) = 17.94, p \leq .001; t(348) = -4.23, p \leq .001$, indicating that only on this dimension do the scientific (less religious) versus nonscientific (more religious) studies differ.

As we can see from these analyses, our results give support to our last hypothesis, predicting differences between studies groups. Nevertheless, in some cases our data behaved as expected from Sonnstag's (2000) study, showing equal means between several pairs of groups, especially when studies are grouped in general clusters.

GENERAL DISCUSSION

The aim of this paper was threefold. First, we wanted to adapt Tobacyk's (1988) Revised Paranormal Beliefs Scale (RPBS) into Spanish to make cross-cultural comparisons possible. Second, we wanted to test four hypotheses about the reliability and dimensionality of the instrument. And third, we wanted to test the hypothesis of the equality of means across study groups.

Our data give us optimistic expectations about the use of this scale in different cultural and linguistic settings. We found minimal problems in understanding the items based on an almost literal translation. Besides, we believe some items could be skewed because they belong to a very different cultural background. For instance, our population knows too little about monsters like Yeti or Bigfoot in order to have a clear opinion about their existence. Nevertheless, these items showed a clear, distinct behavior in the factor analyses, which gives us an idea of the cross-cultural conceptual strength of the dimensions within the scale. This finding clearly expands

the possibilities of the questionnaire in order to carry out cross-cultural research that can shed some light on the similarities and differences in paranormal beliefs across different human groups and their correlates.

We also found a high level of reliability in the scale (Cronbach's $\alpha = .91$), which permits us to assert the items are measuring a set of very highly related beliefs. We found one of the items did not correlate with the total scale score. This item was the only reversed one (negatively worded). It is strongly recommended to put this belief in an affirmative item when new versions of the questionnaire are developed. Besides, we found, as Lange et al. (2000) pointed out, that the items are not additive into a total scale score. There is a clear significant interaction between subjects and items. We also found clear problems with the distribution of some items, especially with Monsters and Superstition related items, and to some extent, also with Precognition items. Besides, after normalizing item scores we found these additivity problems may disappear.

These results suggest that there is some general tendency to believe or disbelieve in paranormal phenomena, but it does not apply with the same strength to any paranormal object of belief. Item distributions are not equal. Furthermore, our sample may be skewed to disbelieve especially in some items. Our subjects are university students, not "normal" population. Data from standard population should bring some light on this topic.

Statistics about dimensionality of RPBS-Sp can be considered excellent and a Principal Components analysis with orthogonal and oblique rotations performed on the items correlation matrix resulted in eight conceptually valid empiric dimensions. These coincided with Tobacyk's (1988) and Tobacyk and Thomas's (1997) studies, grouping items in the same seven factors plus a new one formed from the inclusion of new a priori nonrelated items, in a quite consistent way. These results show an unexpected strength in the dimensionality of the scale.

Once we analyzed these eight dimensions in a second order factor analysis, we found a two-factors solution similar to that found by Lange et al. (2000), including a New Age Philosophy related factor and a Traditional Paranormal Beliefs factor. We have to note that these authors applied a top-down purification of items after they found additivity problems in the subscales' mean scores and differential item functioning due to gender and age levels. We did not follow this approach for two reasons: We used factor scores, which are a composite of all the variables with different weights within different factors, not simple additions of highly loaded items; and second, it would take too much space for a beginning approach in the development of a Spanish version of the questionnaire.

Finally we found some differentiation among study groups in assuming some of these beliefs. Specifically, students from physics are especially prone to disbelieve, while tourism students tend to believe in every dimension. Nevertheless, belief profiles are not parallel between study groups, so apart from the comparison between tourism and physics, the

rest of the groups tend to score the same in some dimensions (i.e., E.T.'s or Spiritualism), and differently in other dimensions (i.e., Witchcraft or Religion). Furthermore, study groups that score together in a given dimension (i.e., sociology and psychology in psi beliefs) are significantly different in another (i.e., Religion). But when study groups are clustered in scientific versus nonscientific categories, differences disappear except in the Religion dimension. These results partially support Sonntag's (2000) results, but it seems that paranormal beliefs are more probable in nonscientific areas than in some scientific ones, suggesting that training in scientific methods, as well as in critical thinking, can produce a decrease in paranormal beliefs in line with some previous findings (e.g., Morier & Keeports, 1994; Otis & Alcock, 1982; Vitulli & Luper, 1998). Another possibility is that the choice of a field of study is influenced by the previous beliefs. Clearly, this is a subject for future research.

In summary, the successful adaptation of the RPBS into Spanish opens new possibilities in the research of the psychological correlates of paranormal beliefs from a cross-cultural perspective. Our findings about the reliability and dimensionality of the questionnaire are also promising, and, we hope, clarifying. Nevertheless, differential item functioning analyses are still needed. In addition, the present finding suggesting that some differences in paranormal beliefs depend on the participants' field of study is a matter for further research, especially given the controversy in the field. For instance, whether the contradiction between Sonntag's results and the present outcomes is caused by cultural differences or by other factors is a question that clearly merits further empirical evidence.

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