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The Hierarchic Structure of Fears: A Cross-Cultural Replication with the Fear Survey Schedule in a Portuguese Sample

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Abstract

A confirmatory attempt is made to assess the validity of a hierarchic structural model of fears. Using a sample comprising 1,980 adult volunteers in Portugal, the present study set out to delineate the multidimensional structure and hierarchic organization of a large set of feared stimuli by contrasting a higher-order model comprising general fear at the highest level against a first-order model and a unitary fear model. Following a refinement of the original model, support was found for a five-factor model on a first-order level, namely (1) Social fears, (2) Agoraphobic fears, (3) Fears of bodily injury, death and illness, (4) Fears of display to aggressive scenes, and (5) Harmless animals fears. These factors in turn loaded on a General fear factor at the second-order level. However, the first-order model was as parsimonious as a hierarchic higher-order model. The hierarchic model supports a quantitative hierarchic approach which decomposes fear disorders into agoraphobic, social, and specific (animal and blood-injury) fears.

Keywords: Fears; Self-assessment; Hierarchic fear structure; Confirmatory analysis

Introduction

Taylor proposed a conceptual framework involving a multidimensional structure and hierarchic organization of fears [1]. This model proposes that there are at least three levels in the hierarchic structure of fears. General fear factors form the highest level, and the major factors of fear (social fears, agoraphobic fears, animal fears, and blood-injury-illness fears) form the next level of abstraction, and fears of specific stimuli form the lowest level. Taylor [1] viewed this model as a call for research and pointed out that confirmatory analyses were needed to address this issue [1]. Studies on the classification and organization of fears and phobias are important as they provide us with insight and hypotheses about the common (that is, shared or non-specific predisposition towards the development of all sorts of fear) and specific or non-shared antecedents of fears which uniquely contribute to the development of a well-circumscribed type of fear (for example, blood-injury fears or social fears).

Unfortunately, with one notable exception described below, Taylor's call for research has not been followed up and there are no studies available that have used confirmatory analysis to test the factorial validity of available models. Thus, a survey of a large number of previous studies has shown that most of the identified fear factors are included in one of the following four categories: (1) social fears (fears of interpersonal events or situations), (2) fears of death, injury, illness, blood or surgical procedures, (3) fears of harmless animals, and (4) agoraphobic (situational) fears. These categories not only represent the major factors of fear, but they are constant, i.e. they have also been shown to be invariant across gender, nationality, and sample type, that is, student, community, and clinical samples [2-6]. Rather than taking this dimensional model as point of departure used data from the U.S. National Co-morbidity Survey (N = 8098) to delineate the multidimensional structure and hierarchic organization of 19 feared situations assessed by structured interview, by carrying out an exploratory factor analysis on the first half of the sample (N = 4071), followed by an attempt to cross-validate the so-obtained findings using the second half of the sample (N = 4027). Not surprisingly then, their exploratory analysis of a small number of fear stimuli did not yield an exact replication of the previous model referred to above. Instead, a five-factor model emerged which was interpreted as: (1) agoraphobic fears, (2) speaking fears, (3) fears of being observed, (4) fears of heights or water, and (5) threat fears (a mixture of claustrophobic, agoraphobic, and animal fears, and fears of blood/needles, and storm/thunder fears). Cox et al. [7] reported that the latter four fear dimensions in turn loaded on to two second-order fear factors, namely social fears and specific fears. Moreover, a single, general fear factor at a third-order level showed evidence of a hierarchic structuring of fears. Thus, rather than building on the available evidence, Cox et al. [7] took as their point of departure an exploratory analysis of fear items in addressing the issue at hand. Moreover, Cox et al. [7] did not contrast their higher-order model with any competing model so as to ascertain that the former model would provide the best fit to the data.

It is noteworthy that most of the available evidence suggestive of a hierarchical structuring of fears is based on exploratory higher-order factor analyses of multi-battery tests [1]. We are not aware of any attempts in the literature aiming at testing the validity of a hierarchical structure of fears employing a confirmatory approach in which items (rather than scales) were taken as input, followed by the measurement of fit of a proposed and (an) alternative model(s). The main aim of the present study was to do just that using a pool of feared stimuli larger than the one employed by Cox et al. [7] and taking as point of departure the proposed first-order structure advanced by Arrindell [8]. This five-dimensional structure encompasses (1) social fears, (2) agoraphobic fears, (3) fears of bodily injury, death, and illness, (4) fears of sexual and aggressive scenes, and (5) fears of harmless animals. In testing the validity of this model, a Portuguese sample was employed.

Although the dimensional composition advanced by Arrindell [8] has been replicated in at least 10 different national samples [2], there are as yet no studies available that have addressed this matter with Portuguese subjects. The dimensional composition advanced by Arrindell [8] was originally based on several different Dutch samples [3]. However, large-scale cross-national studies in the area of personality testing [9,10] have shown that it cannot be assumed that a dimensional composition yielded in one culture can be simply transported to another culture. Whether this is possible (for both theoretical and practical purposes) is a matter that should be empirically verified rather than assumed. The Diagnostic and Statistical Manual of Mental Disorders [11] states emphasizes the need to "consider whether an individual's experiences, symptoms, and behaviours differ from sociocultural norms and lead to difficulties in adaptation in the cultures of origin and in specific social or familial context" (p. 14).

Those cross-national personality studies have also shown that items that are relevant in a dominant culture may prove to be meaningless in a new culture. In addition, it is possible that an item loses its meaning and loading (in factor analysis) totally or goes over into an originally theoretically-unrelated factor. This phenomenon may not necessarily be ascribed to lack of semantic equivalence of items across national samples - a form of equivalence that can be achieved with the utilization of adequate translation and back-translation procedures in cross-cultural research [12]. Moreover, cultural differences may affect the magnitude of descriptive statistics for individual items and multi-item scales and, hence, affect results based on correlations. For example, Hofstede [13] described a number of dimensions on which cultures could differ. Two of these cultural dimensions are relevant in the present context, namely masculinity-femininity (MAS) and uncertainty avoidance (UAI). Arrindell et al. [14,15] have demonstrated that cross-national differences in MAS and UAI can predict mean-level differences in self-assessed fears across national samples. Both MAS and UAI are positively associated with certain dimensional measures of fears. Both MAS and UAI are precisely the two cultural dimensions on which Portugal and the Netherlands differ, with Portugal scoring higher on both cultural measures - especially markedly higher on UAI [13]. Thus, the present study was conducted with a sample that differed meaningfully in terms of dimensions of national culture from the original sample in which the first-order factors were established. These cultural differences may or may not have theoretical (in terms of model building) and/or practical implications (qualitative and quantitative differences in relation to items, scales, scoring key, and norms) that may emerge in the process of statistical analyses of data based on correlations.

Accordingly, following the proper translation and back-translation procedures in cross-cultural research [12] in relation to the instructions and reduced pool of 52 items from the Fear Survey Schedule III [16], the specific aims of the present study were to (1) study the distributions of the individual fear items, (2) test the validity of a hierarchic structure of fears, taking as point of departure the first-order dimensional system proposed by Arrindell [8], and (3) examine sex differences in self-reported fears at the scale level to determine whether the usual finding of higher scores for females could be replicated in a Portuguese sample. In testing objective (2), Taylor's model was contrasted against two alternative models, a one-factor or general fear model and a first-order fear model. If Taylor's model provides the best description of reality, it should emerge as the best fitting model when compared with models that rule out a hierarchic order as proposed. At this juncture, cross-cultural comparisons in terms of mean fear scale scores were not intended.

Methods

Subjects

After obtaining ethical approval by a supervising institution and funding agency (FCT), a total of 3,550 adults, aged over 18 years, from the general population of Terceira Island – Azores/Portugal, were invited to participate. Four schools from the island cooperated with the data collection process. Students were asked to deliver an invitation letter (mail survey) and a questionnaire to potential candidates among their acquaintances. They had to be over 18 years old and to live in the island (inclusion criteria). To ensure anonymity and honest responses, a stamped envelope was delivered with the forms. Two thousand and twenty adults completed and returned the questionnaires (Response Rate: 57%); of these, 40 were excluded because they did not complete the questionnaire adequately. There were 1,172 female and 808 male participants. The total sample had a mean age of 40 years (SD = 8.5 yrs; range: 18 – 80 years; under 25 yrs: 4.8% of the sample; 25-44 yrs: 69.4%; 45-64 yrs: 24.6%; over 65yrs: 1.2%). Most subjects were married (78.3%) and had completed at least the 4th grade in the elementary school (58.1%).

Measure

In addition to a background demographic sheet, a shortened version of the Wolpe and Lang [16], the Fear Survey Schedule III (FSS III) was employed. Originally, the FSS III comprised 76 fear items. Based on the factor-analytic work of Arrindell [8], 52 fear items were shown to be distributed across five dimensions: Social Anxiety (13 items), Agoraphobia (13 items), Fear of bodily injury, death, and illness (12 items), Fear of Display to Sexual And Aggressive Scenes (8 items), and Fear of harmless animals (6 items).

The 52 items from Arrindell's model were used as the basis model for the present study while maintaining the original instructions for filling in the scale. Two bilingual native psychologists conducted independent translations of the U.S. version of the FSS III (the instructions and the 52 items of interest) from English to Portuguese. To ensure translation equivalence [12], in a further stage their back-translations to English were reviewed by the first author to discuss disagreements and reach consensus on the final Portuguese version of the scale.

The items and the scoring key of the short FSS III are provided in Arrindell [8] and Arrindell et al. [2,3]. Subjects are required to indicate their degree of felt anxiety on five-point Likert-type scales ranging from 0 (not at all disturbed) to 4 (very much disturbed).

Statistical analyses

Prior to testing model fit, descriptive statistics for each item were analyzed. As items with extreme endorsement rates (P-values) may bias the results of confirmatory analyses because of not conforming to multivariate normality and could likely produce unstable or un-interpretable results [17], item distributions were examined through skewness (SK) and kurtosis (KU). Skewness estimates greater than 3 and kurtos higher than 8 were considered deviations from normality

[18]. Such items were eliminated from further analyses. Missing data were treated using the Linear Interpolation method.

In testing the validity of initial models, items were constrained to load on one factor only, errors were uncorrelated, and the latent factors were allowed to co-vary. In reporting fit indices, Hu et al. [17] suggested a two-index presentation format. This always includes the standardized root mean square residual (SRMR). In addition, as recommended, the root mean square error of approximation (RMSEA) and the comparative fit index (CFI), for comparing different models, were also included. Even though there is not much consensus on cut-off values for adequate fit [19], conventional guidelines [20] were followed. Fit was considered adequate/acceptable if SRMR < 0.08, RMSEA < 0.06, and CFI < 0.90 which indicates that at least 90% of the co-variation in the data can be reproduced by the given model. In spite of interpretative problems associated with its use, the model chi-square statistic, along with its degrees of freedom and associated p value, were also reported. The Akaike information criterion (AIC), Consistent AIC (CAIC), the Expected Cross-Validation Index (ECVI, with 90%-CI) and the Population Discrepancy Function (PDF or F0, with 90%-CI) were also reported in order to compare the fit of the competing models. The AIC and CAIC are comparative measures of fit and so the model with the lowest AIC/CAIC is the best fitting model. ECVI assesses the discrepancy between the fitted covariance matrix in the analyzed sample and the expected covariance matrix that would be obtained in another sample of equivalent size. The model with the smallest ECVI value has the greatest potential for replication. Similarly, the PDF is a measure of the degree of discrepancy between a specified and a true population model. The model having the lowest F0-value shows the smallest discrepancy and has the greatest potential of having the highest degree of stability in repeated samples.

CFA was performed using AMOS ® 18.0 (SPSS, IBM Company, Chicago, IL).

Three indicators of reliability were also determined for each subscale corresponding to each first-order factor, namely internal consistency (Cronbach's alpha coefficient), homogeneity (mean inter-item correlation), and corrected item-total (item-remainder) correlations. Common standards of acceptability include 0.70 for Cronbach's alpha [21], +0.15 for the minimum value of the item-remainder correlation [22], and a 0.2 – 0.4 range for the mean inter-item correlation value [23].

Sex differences on fear scales were determined using T-test for independent samples (one-tailed).

Results

Foregoing analyses

The models were tested in two non-overlapping split samples of subjects. Comparisons between the two subject groups showed that there were no between-group differences in terms of gender ($\chi^2 = 0.53$, df = 1, p = 0.469), age (t [1978] = -1.196, p = 0.232), or educational level ($\chi^2 = 9.805$, df = 5, p = 0.08).

Items 17 (Journeys by train), 18 (Journeys by bus), 19 (Journeys by car), 24 (Large open spaces), 31 (Ugly people), 48 (Nude men) and 49 (Nude women) were removed from further analyses as they represented severe deviations from normality. These items had very low positive endorsement rates, that is, they were items on which at least 75% of subjects scored "not at all disturbed" and less than 10% had a score of '1', '2' or '3' or greater than "a little disturbed".

Model fit

There was a reduction in the number of items comprising the Agoraphobia subscale (from 13 to 9) and in the factor of Fears of sexual and aggressive scenes (from 8 to 5). As a consequence, the first-order reduced model proposed by Arrindell (1980) has not an acceptable fit in the test sample: $\chi^2 = 6140.632$, df = 1264, p < 0.001, SRMR = 0.071, RMSEA = 0.062, CFI = 0.755. To improve the model's fit, items 2 (Being alone) , 7 (Falling), 10 (Entering a room where other people are already seated), 15 (Strangers), 20 (People in authority), 32 (Sick people), 35 (Being in an elevator), 39 (Animal blood), 43 (Medical odours), 46 (cemeteries), 50 (Doctors) and 51 (Making mistakes) were removed as they had strong cross-factor loadings with theoretically-unrelated factors. Therefore, these items were considered non-specific to any fear dimension. In doing so, the Agoraphobia dimension was further reduced to 6 items, the Social fears dimension from 13 to 9 items, and the Bodily injury-death-illness dimension from 12 to 7 items. Fit indices for the final reduced five-factor model are presented in Table 1.

The simplified model had a significantly better fit in the test sample than the original reduced model [$\Delta\chi^2(779) = 4564.941$, p < 0.001)]. In the replication sample the model fit was equally good (factorial weights: $\Delta\chi^2(33) = 29.171$; p = .658; co-variances: $\Delta\chi^2$ (10) = 20.408; p = 0.026). It should be pointed out, however, that the removal of the Nude men (no. 48) and Nude women (no. 49) items from the analyses, the Sex component in the original Fears of display to sexual and aggressive scenes disappeared. Thereby, this dimension was re-interpreted and defined as Fear of display to interpersonal aggression. Table 1 also shows the results obtained for the test and replication samples for the higher-order model and the one-factor (unitary) model (33 fear items).

According to the SRMR, RMSEA and CFI scores (Table 1), the unitary model showed the poorest fit to the data, whereas both first-order and second-order models showed acceptable fits to the data, especially in the test sample, while there was a slight drop in CFI values in the replication sample.

AIC and CAIC index values favoured the first-order model. However, ECVI and PDF indicated that even though the first-order model had the smallest index values, overlapping confidence intervals suggested that both first-order and second-order models had an equivalent potential of replication (ECVI) and an equally great potential of having a high extent of stability in repeated samples (PDF). Thus, support was found for the validity of both first- and higher-order models, that is, both models performed equally well. Figure 1 gives the results of the final structural higher-order model. Correlations between the factors were substantial, mostly in the 0.70 s (range: 0.54 - 0.81).

The scales that derived from their corresponding fear factors showed to be internally consistent, even if the items that did not load adequately on each factor, that did not involve a cultural meaning of fear or that did not produce a perception of fear due to the sample characteristics (e.g., age) were removed.

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Model	χ2		df		SRMR		RMSEA and 90% CI		CFI	
	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
Unitary Model (One-Factor)	3058.408	3294.888	464	464	0.099	0.1	0.075 (0.072;0.077)	0.079 (0.076;0.081)	0.756	0.744
First-Order Model (Five-Factor)	1575.691	1855.965	485	485	0.061	0.067	0.047 (0.045;0.050	0.054 (0.051;0.056)	0.904	0.883
Higher-Order Model (2ndOrder)	1666.369	1912.412	490	490	0.067	0.071	0.049 (0.046;0.052)	0.054 (0.052;0.057)	0.896	0.878

Table 1: Fit indices for the unitary, 5-factor and 2nd order FSS models.

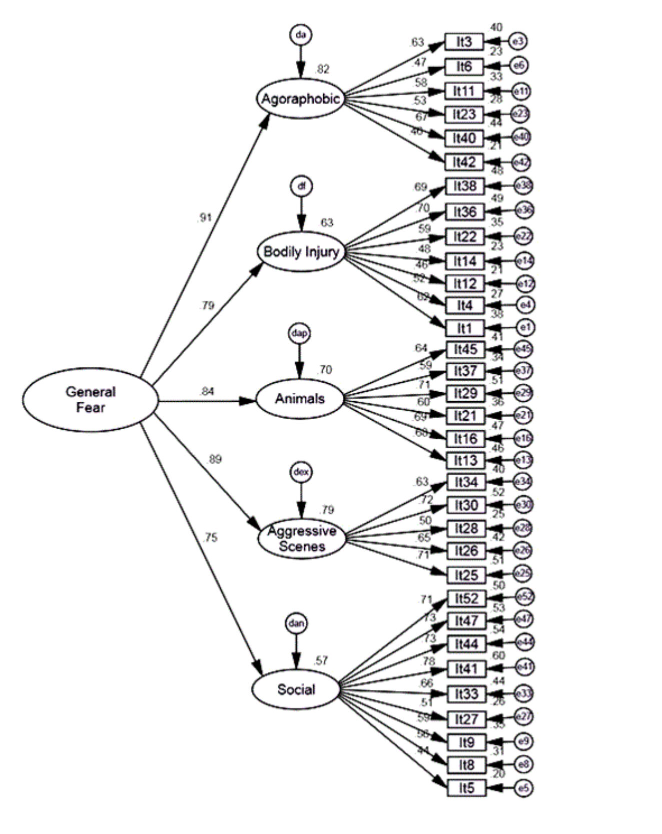

Figure 1: General fear.

Sex differences

Based on results of T-tests, females were found to score consistently higher on all fear scales: social fears (M = 1.2887; M = 0.8833) t [1882] = -11.960, p < .001; agoraphobic fears (M = 1.2920; M = 0.6961) t [1932] = -18.777, p < .001; fears of bodily injury, death, and illness (M = 1.2768; M = 0.8830) t [1822] = -11.003, p < .001; fears of aggressive scenes (M = 1.1412; M = 0.6378) t [1918] = -14.647, p < .001; fears of harmless animals (M = 1.9038; M = 0.8938) t [1907] = -26.640, p < 0.001; and General fear (M = 1.3763; M = 0.8139), t [1886] = -20.706, p < 0.001. Thus, the largest sex difference was observed on the fears of harmless animals subscale.

It is recognized that culture shapes the individuals' interpretive frameworks within their settings and experiences in life [11]. For this reason, cultural aspects and sample characteristics should be taken into account when assessing fear symptoms or other disorders [11]. This may have led to the finding that only 33 of the original 52 items that compose the FSS III proposed by Arrindell [8] and Arrindell et al. [3] were distributed across the original five factors. In spite of this, 4 out of 5 factors could be interpreted in line with the original naming of the Dutch factors. However, the travel subcomponent (items 17, 18 and 19) disappeared from the larger Agoraphobia factor because they had low endorsements rates on the relevant items, but the subcomponents 'fear of being in a strange, public place that is also crowded' and 'claustrophobic' were maintained. In addition, the fear of display to sexual scenes element in the originally wider factor of Fears of sexual and aggressive scenes was removed due to the same reason (items 48 and 49). Besides the statistical criteria, those two items were removed because they produced sensations that were not fear (e.g., discomfort, embarrassment). The same happened for item 31 (Ugly people) and 32 (Sick people). Item 39 (Animal blood) also produced a different response from fear (e.g., disgust). Other items that influenced the individuals' answers are related to their settings or concern situations that were part of their routines and that do not produce reactions of fear (e.g., item 24 - large spaces; item 18 – journeys by bus; item 19 - journeys by car). Other stimuli do not exist or are rare in the people's environments (e.g., item 17 – journeys by train; item 35 - elevator). Item 46 (cemeteries) refers to a place that has a strong religious connotation and people go there as a ritual or a tradition; in these occasions they do not feel fear.

Reliability analyses

Table 2 gives the results of reliability analyses for the most reduced scales. Indicators of internal consistency, item-homogeneity, and item-remainder correlations for the subscales were all in line with good reliability criteria. One item comprising the total scale had an item-remainder correlation just below the acceptable lower bound of +0.15, namely item no. 9 (Failure). However, Cronbach's alpha did not increase considerably after the removal of this item (0.926). Therefore, this item was kept in the overall scale.

	FSS

	Social Anxiety	Agoraphobia	Fears of Bodily Injury, Death and Illness	Fear of Display to Aggressive Scenes	Fear of Harmless Animals	Overall (total) scale
Cronbach's α	0.858	0.725	0.779	0.762	0.809	0.927
Range of Item-remainder correlations						
Lower Bound	0.242	0.208	0.187	0.28	0.285	0.112
Upper Bound	0.613	0.414	0.537	0.554	0.496	0.613
Mean inter-item Correlation	0.401	0.308	0.334	0.407	0.42	0.283

Table 2: Reliability Analysis for the FSS Dimensions (N = 1980).

Note: Social fears –items 5, 8, 9, 27, 33, 41, 44, 47, 52; Agoraphobic fears –items 3, 6, 11, 23, 40, 42; Fears of bodily injury, death, and illness –items1, 4, 12, 14, 22, 36, 38; Fears of harmless animals –items13, 16, 21, 29, 37, 45; Fears of display to aggressive scenes –items 25, 26, 28, 30, 34; General or total scale comprises all 33 items.

Discussion

On the other hand, the mean age of this sample was higher than the mean age of Arrindell's samples [2]. It is hypothesized that older individuals, who have considerably more individual experiences in life, evaluate differently the stimuli's danger or menace levels. This may have happened when answering, for example, to items 7 (Falling), 10 (Entering a room where other people are already seated), 15 (Strangers), 43 (Medical odour[s]) and 50 (Doctors).

Thus, despite these modifications to the item-pool, the original dimensional system advanced by Arrindell [8] and Arrindell et al. [3] was largely replicated. These results are in line with the findings of Staley and O'Donnell [24], who performed a factor analysis on the ratings of 868 mothers about their children's fears on 104 items. They also meet the proposition advanced by Taylor [1] as the five first-order dimensions loaded on a single higher-order fear factor. This indicates the existence of a hierarchical structure, even though the results of confirmatory analyses showed that both first-order and higher-order models performed well. This means that the higher-order model did not outperform the first-order model in terms of potential for replication or extent of invariance across repeated samples. Thus, the present findings support the viewpoint that fears (and phobias) arise from a hierarchy of causal factors, ranging from specific to general. Taylor [1] cites studies showing how the different fear dimensions of the first-order and higher-order models tested in the present study are differentially related to environmental and genetic factors.

Taylor [1] also proposed that the first-order factors may themselves represent complex dimensions that can be broken down into more specific subcomponents, for example, agoraphobia may actually represent a higher-order factor that can be decomposed into 'fear of public places', 'fear of open spaces', and 'claustrophobia', thereby pointing to the potential existence of a multi-layered hierarchic structure of agoraphobic fears. When the number of levels (layers) of the hierarchy and the number of factors at each level are identified in further studies, the environmental, psychobiological, and genetic factors at each level of the causal hierarchy may be identified.

The present findings are also interesting in the context of the discussion of the poor value of a rationally-based classification system (DSM-IV), which was mainly based on the subjective criterion of shared phenomenological features [25]. Watson [26] has argued that this system should be replaced by an empirically-based structure that reflects the actual - not the assumed - similarities among different disorders. In proposing a quantitative hierarchical model, Watson [26] proposed that the mood and anxiety disorders proposed in the DSM-IV [25] should be subsumed together in an overarching class of emotional disorders, which can be decomposed into three subclasses, one of which is of interest to the present study, the one concerning fear disorders. In Watson's view [26], the fear disorders can be further decomposed into panic disorder, agoraphobia, social phobia, and specific phobia, which later includes animal and blood-injury phobias. The hierarchical structure of fears of the present study provides further support for this viewpoint.

Despite this, the scales comprise homogeneous sets of items and relate well with all items that compose the relevant scale, including the general fear scale. Therefore, both subscales and the overall scale may be used for practical-clinical and research purposes with subjects in Portugal. In addition, the common finding that females have higher scores on the scale [2] was also replicated in the present sample of Portuguese subjects.

Further studies with community and clinical subjects, to whom mood and symptom state scales and personality trait measures are administered, are needed to determine the convergent and divergent validity and discriminatory power of the Portuguese version of the FSS III. It is also suggested that future works based on FSS III [8] investigate a hierarchical structure with a third-order fears factor. This factor would be related to General Fears. The three second-order fear factors would be composed of the following aspects: (1) Social Fears factor (which contains the Social Fears and Fears of Sexual and Aggressive Scenes dimensions); (2) Agoraphobic Fears factor (with the Agoraphobic Fears dimension), and (3) Specific Fears factor (which includes the Fears of Bodily Injury, Death, and Illness, and Fears of harmless animals dimensions).

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