

Item Response Theory Analysis of the Hospitalized Patients Spiritual Needs Questionnaire

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Abstract

Background: Hospitalized patients Spiritual Needs Questionnaire (HPSNQ) has been developed in Iran. This paper uses the classical test theory (CTT) to test the validity of the HPSNQ. Using Item response theory, a scale can be constructed with items that can be interpreted regarding the spiritual needs of patients revealing evidence that calls for more effective health interventions regarding meeting the spiritual needs of patients. Analysis of the hospitalized patients Spiritual Needs Questionnaire using Item Response Theory with the aim of providing insight into the functioning of the questionnaire to improve the psychometric robustness of the instrument.

Methods: This analytical study was carried out in 2018 on 301 subjects hospitalized in non-acute wards of hospitals in Shiraz, Iran. The analysis was carried out using Item Response Theory: The dimensionality, assessing the items parameters evaluation, and the scale construction were assessed using Cronbach's alpha, item-to-total correlations and confirmatory factor analysis was done for investigation of dimensionality. The Gradual Response Model of Samejima was used to estimate the item parameters, and the MPLUS software was utilized to analyses the data.

Results: Findings revealed that HPSNQ scales are highly unidimensional. In this study, regarding the dimension of "relationship with God", very high discriminations were observed among all items, whereas the items in "peaceful environment" had relatively low discriminations, hence was not as informative as the items of "relationship to god".

Conclusions: Whereas the psychometric properties of the HPSNQ was generally supported from an IRT perspective, there was also evidence of further improvement for this measure. It seems that the nature of the construct under study, has a significant impact on the items' discrimination and information value; however, the wording correction or deletion of certain items or even the response options used in this tool may significantly increase the reliability of the tool.

Background

Spiritual care that is a part of holistic care, depends on studying as well as meeting the spiritual needs of patients. [1]. In general, spiritual needs can be defined as expectations helping human beings, religious or not, to find value, meaning, and purpose in life [2, 3]. To assess and meet such needs is a major responsibility of nursing [4]. There exist several questionnaires assessing spiritual needs; Hermann (2006) designed and then assessed the spiritual needs inventory for patients in their end stage of life in the USA [5]. Yong, Kim, Han, & Puchalski (2008) designed and evaluated a scale to evaluate the spiritual needs of Korean patients suffering from cancer [6]. Bussing et al. (2010) developed a measure to evaluate the spiritual needs of patients suffering from cancer and chronic pain in Germany [7]. Sharma et al. (2012) designed and assessed the psychometric properties of a tool to evaluate the spiritual needs of patients suffering from cancer in the USA [8]. Hatamipour (2018) in Iran [9] developed an assessment scale for spiritual needs of cancer patients.

Although there have been various instruments to study patients' spiritual needs, they are just for the minority of patients with specific disease and often with acute situation for example for patients with cancer [8-11] or end stage patients [12, 13] that aren't applicable for the extensive population of hospitalized patients in general wards . So, recommendations were made to conduct further studies to develop appropriate tools for other patient groups [14]. To this end the Hospitalized patients Spiritual Needs Questionnaire (HPSNQ) has been developed and validated using the classical test theory (CTT) in Iran.

The HPSNQ design and validation process involved: (1) early design of the questionnaire using 16 interviews with hospitalized patients in general hospital settings based on conventional content analysis of Zhang & Wildemuth (2009) [15], as well as the related literature review; (2) assessing the face and content validity of the tool, (3) pilot test to investigate the psychometric properties, accompanied by essential revisions of the scale, (4) administering the modified tool with a more comprehensive sample to analyze psychometric properties more by exploratory and confirmatory factor analysis of HPSNQ, and (5) establishing convergent validity by estimating score correlations with the cancer patients' spiritual needs questionnaire that was validated beforehand. Overall, the HPSNQ demonstrated acceptable psychometric attributes.

It should be noted that CTT was used to examine the psychometric properties of the majority of these instruments as with the HPSNQ, they refer to need for using more robust techniques such as Item Response Theory (IRT). In the CTT, the analyses is done according to the behavior of the whole set of items of the instrument, illustrating the analyses at the test level. When utilizing a tool in clinical settings or in an investigation, we should have enough data about its psychometric properties, limitations, and strengths, so that we can interpret the results obtained with the tool thoroughly [16]. In this regard, IRT provides a rich source of knowledge about the latent structures. IRT makes assumptions at the testing level, but CTT does it at the item level [17]. Since it focuses on each item of the tool, and the importance of the latent traits in explaining a specific test performance, IRT is regarded as a modern theory of psychometrics [17]. The growth of IRT has highly developed the theoretical background in terms of the essentials of measurement in behavioral and social sciences, that need to be explored and practiced to promote the tests made by CTT, and create new ones [17].

The analysis of HPSNQ using IRT provides the opportunity for a better evaluation of features, allowing us to verify the latent traits underlying the tool, and to monitor measured items efficiently. Placing the persons and the items on a scale. Using IRT, a scale can be constructed with points that can be interpreted with regard to the patients' spiritual needs status, revealing the behaviors that must be addressed more effectively. As a result, the purpose of this investigation was to assess the HPSNQ properties through IRT.

Methods

Participants

The provided data in this study are a part of the data of a PhD. Thesis entitled “Designing and Validation of the Questionnaire for the Assessment of Spiritual Needs of Hospitalized Patients.” Participants were selected by random sampling from nine general hospital wards of two public hospitals in Shiraz, Iran. The inclusion criteria were hospitalization in general settings, speaking and understanding the Persian language, age range of 18-60 years, and ability to answer the questionnaire. The exclusion criteria were acute mental or physical disorders, patients at the end stages of life, or patients with AIDS or cancer. Overall, 301 hospitalized patients with a mean age of 42.09 ($SD=11.96$) years participated in this study; 163 (54.2%) of patients were female, 200 (66.4%) were married, 83 (27.6 %) were single, and others were either widows, widowers or divorced. The mean duration of hospitalization was 9.26 ± 6.28 . 15 patients (5%) were illiterate, while the education level of 80 (26.6%) was primary school, 82 (27.2%) was high school, 76 (25.2%) was bachelor’s degree, and 48 (15.9%) was MSc or PhD. 105 (35.9%) of participants were self-employed, 51 (16.9%) had governmental jobs, 88 (29.2%) were housewives, 17 (5.6%) were students, and 14 (14.7%) were unemployed. The hospital ward of 36 (12%) was surgery, 43 (14.3%) was neurology, 27 (9%) was rheumatology, 21 (7%) was nephrology, 46 (15.3%) was internal, 41 (13.6%) was gastrointestinal, 25 (8.3%) was obstetric, 43 (14.3%) was orthopedic and 19 (6.3%) was urology.

The Ethical and Research Committee of Shiraz University of Medical Sciences confirmed this study (No. IR.SUMS.REC.1395.S872). In this study, we followed ethical research principles such as obtaining informed consent, confidentiality, and having the right of withdrawal from research in any step of the study without any impact on the treatment or care procedures.

Instrument

The HPSNQ questionnaire contains 43 items that are divided into 4 subscales and are according to a 5-point Likert scale (1 = No, 2 = Low, 3 = Average, 4 = High, 5= Very high). The questionnaire subscales were “the interconnection with people” (15 items), “relationship with God” (10 items), “transcendence” (10 items), and “peaceful environment” (8 items). According to the pervious study, the HPSNQ questionnaire is of the required validity and reliability for assessing the patients’ spiritual needs in general hospital settings.

In the previous study exploratory sequential design was used. In the qualitative study, data collection was conducted by 16 in-depth and semi-structured interviews with 16 patients. The conventional content analysis introduced by Yan Zhang and Barbara M. Wildemuth (2009) [15] was used for data analysis. According to the data obtained in the qualitative phase and a literature review covering spirituality, spiritual needs and related questionnaires, the questionnaire was designed and could be used for the quantitative phase. So, a pool of 73 items was generated using the inductive and deductive method. Then in the item reduction phase, after face and content validity and item analysis, 43 items remained. Exploratory factor analysis led to extraction of a four-factor structure (interpersonal connectedness, relationship with God, transcendence, and peaceful environment) with 43 items of which 58.35% of the total variance was explained. The confirmatory factor analysis (CFA) was in line with the result of the exploratory factor analysis. A total of 80 patients participated in this study in the stage of convergent

validity of the questionnaire. convergent validity was estimated by identifying the correlation between the HPSNQ and the cancer patients' spiritual needs questionnaire (a valid and reliable tool in Iranian society) scores. The patients completed these questionnaires at the same time. In assessing convergent validity, the correlation coefficient between the scores of the designed questionnaire and the cancer patients' spiritual needs questionnaire was acceptable ($r=0.76$, $p<0.001$). To assess the reliability of the scale using internal consistency (Cronbach's alpha coefficient) and Test re test (interclass correlation coefficient), 301 and 34 hospitalized patients completed the questionnaire, respectively. The Cronbach's alpha of the scale and factors was between 0.83 and 0.95. The interclass correlation coefficient of scale and factors was between 0.89 and 0.96. The data analysis was conducted by the SPSS software (version 19) in the exploratory factor analysis (EFA), convergent validity and reliability stages. The MPLUS software (version 5.1) was used for data analysis in the CFA stage.

Procedures

This study was carried out from June to September 2018, with the patients hospitalized in seven general wards of two public hospitals in Shiraz, Iran. After coordination with the hospitals authorities, a researcher distributed the questionnaires among the hospitalized patients in the general wards who were selected randomly based on the inclusion criteria.

The HPSNQ was originally created as a self-administered tool. Nevertheless, in the present study, patients who had low education, were assisted to use the tool. After reading to the patient each item of the questionnaire as well as its answer, patients could select an answer. This intervention allowed the tool to be used by individuals who had low education.

Patients were given enough time to fill out the HPSNQ. At first, a researcher explained the questionnaire purpose and the instructions for answering. Items meanings were further explained when needed. After completing the questionnaire, if there was any missing data the researcher asked the patients to answer the related items.

Data analysis

Instrument analysis using IRT included: dimensionality assessment, estimation or calibration of the items parameters, and structure of the scale.

Before conducting these analyses, the unidimensionality and concordance of the items in the four subscales were assessed. There is another assumption in IRT that says the answers to items are independent of each other, This is known as local independence [18, 19], meaning that excluding the underlying characteristic, there is no link between the items [19]. The unidimensional latent characteristic is evaluated using a scale (level of patients' spiritual need in the present study). Unidimensionality was evaluated by item-to-total correlations, Cronbach's alpha, and factor analysis [18, 20]. The local items independence can be determined by factor analysis since locally dependent items presented as detached factors in the factor analysis [18].

Samejima's (1969) graded response model (GRM) [21] was used in this study, and all of the analyses were applied using MPLUS. At present, several IRT models are available. Compared to other factors, the response format of items is crucial to selecting which IRT model to use [18]. The two-parameter logistic model [18] is an example of a dichotomous responses model, which offers threshold and discrimination parameters for items. Since the responses format of HPSNQ with the graded response options, is an appropriate IRT model for this response format, which considers an item in terms of a series of $k - 1$, where k shows the response options number [22]. Samejima's (1969) graded responses model (GRM) [21].

The item threshold (difficulty) and discrimination parameters are estimated in GRM. The thresholds number is the response options number minus 1. In this study, there were 5 response options resulting in 4 thresholds. Item difficulty is a concept in the education field that shows the difficulty of achieving a 0.5 probability of a true answer for a particular item considering the respondent's level of latent variable (θ). However the concept of "location parameter" might be more related compared with the "Item difficulty" concept in the health field [17].

The item discrimination parameter specifies how well items determine patients at various levels of each latent trait. The item discrimination parameter or the slope parameter at a special θ level, has steeper slopes demonstrating better discrimination than others with less steep slopes illustrated in the Item Characteristic Curve (ICC).

In this study, In addition to estimating the item threshold (difficulty) and discrimination parameters we also assess ICCs as the graphical functions for showing the probability of endorsing the item in the specific categories as a function of the latent trait of the respondents [23]. Then, according to the ICCs, item information curves (IICs) were presented, IICs in a mathematical way referring to the how much information can be provided by every ICC. Finally, all of the IICs together provided the test information function (TIF), that shows how well a person's locations can be estimated by the questionnaire. The psychometric information at each point in the range of a latent trait can be identified by the information plots [24].

Results

Unidimensionality

The Cronbach's alpha of "relationship with God", "interpersonal connectedness", "peaceful environment", and "transcendence" subscales, respectively, were 0.95, 0.92, 0.83 and, 0.92. The item total correlations for "relationship with God", "interpersonal connectedness", "peaceful environment", and "transcendence" were 0.80, 0.65, 0.58 and 0.70, respectively. The factor analysis led to one factor for HPSNQ scale. When these findings are considered together, they support the unidimensionality of the four subscales and also the items local independence in each subscale.

The adjustment indexes of the CFA which was carried out in the research is presented in table 1.

In this study, because of the presence of a dominant dimension, the one-dimensional model was used for the scale construction. Moreover, all of the items measure only one factor, as the one-dimensional model identified by the CFA indicates (Table 1). Furthermore, by using the CTT, all dimension scores are added together to express the general level of hospitalized patients' spiritual needs, and the data was then processed in a one-dimensional model.

"Table 1"

IRT analyses of the HPSNQ scale

Item Characteristic Curve (ICC) for the four dimensions of the patients' spiritual needs construct, as measured by HPSNQ is showed in figure 1. The curves identified signify the items that are better discriminators and the chance of allocating an item in a specific category as a function of the latent trait. As mentioned previously, in this study, the Samejima model was used, and ICCs were interpreted according to difficulty (β parameter) and discrimination (α parameter).

"Figure 1"

The parameter estimations for per dimension of **HPSNQ** scale with their corresponding standard errors is shown in table 2, the discrimination parameters (the majority of items presented values close to the adopted reference ($\alpha > 0.50$)), and the threshold parameters showed by β_1 to β_4 for all the HPSNQ items. The item position in the scale where it provided more information was revealed by parameter b. As observed in this table, the β parameters significantly increased the level of latent trait at each succeeding response dichotomy. β parameters represent the required amount of measured trait for having a .50 probability of response beyond a specific category (or threshold).

"Table 2"

The discrimination and difficulty parameters of each item were determined considering the item parameter estimations and dimension patterns of behaviors of each item shown by ICCs. Among the 43 items of the scale, α parameters in all items except for 1, 2 and 4 of the peaceful environment dimension were statistically significant, demonstrating discrimination among the categories of responses in the majority of items.

A high item pattern variability (based on standard deviation of more than 1) and a low consistency regarding distribution of the items was demonstrated in the **Relationship with God dimension**. The 10 items in this dimension had good discriminators, but among them, the items 3, 6, and 1 displayed better discriminating characteristics as α parameters of them were 3.287, 2.909 and 2.703, respectively. Also, the discriminating indices of other items in this dimension were high (from 1.627 to 2.681), while a right-biased pattern for items was identified by ICCs, indicating that answering items seemed less difficult. Furthermore, the discriminatory characteristics, item 10 was less than other items in this dimension. However, because of a higher discrimination parameter, the questionnaire items that discriminated the

patients with spiritual needs best, were those in the 'Relationship with God' dimension. According to the test information curve, the items of this dimension are generally more informative.

In terms of **Interpersonal connectedness**, according to α parameters and ICC patterns, the best discriminating items were items 15, 14 and 4. Item 7 showed lower discriminatory characteristics, and items 1, 5, 6, 8, 10, and 13 had α parameters less than 1. ICCs demonstrating a right-biased pattern for the items of this dimension.

Results of the transcendence domain indicated that the range of discriminating items was between 0.639 and 1.412. The best discriminating items were items 8, and 5, while the discriminating parameters of other items in this dimension was below 1; item 1 in this dimension showed a lower discriminatory parameter, and ICCs were right biased.

The discriminatory parameters of all items in the **Peaceful environment** domain was below 0.5, which was less than other item parameters in the questionnaire (Table 2), indicating the slight discrimination in terms of the patients' spiritual needs. The best discriminatory characteristics was related to item 6, 0.426, and item 4 had the least discriminatory characteristics (0.045). In this dimension, ICCs were right biased, demonstrating less difficulty in answering those items. Based on the Test Information Curve, the items of this dimension are much less informative compared with other dimensions.

Discussion

The measuring of spiritual needs of patients has had long history and this has led to significant advancements in our understanding of these needs. [14].

in this study, investigating the psychometric properties of HPSNQ more comprehensively, the graded response IRT model was used [21]. The function of HPSNQ items and identifying possible HPSNQ scale improvement were the main objectives of this study.

According to the review of literature, there is not enough research concerning the psychometrics of the patients Spiritual Needs Questionnaire using IRT. Most studies in this field have merely employed EFA [7, 25, 26], and few have studied CFA [27] and SEM [10] as psychometric methods.

Results revealed unidimensionality using Cronbach Alpha and CFA before utilizing the IRT model.

Primarily, the majority of items tended to have acceptable discrimination parameters, which are in line with those of Gomez and Fisher's (2005) [28] findings regarding the psychometry of spiritual well-being questionnaire using IRT.

In this study, all items of "relationship with God" had had very large discriminations, and so were more informative, whereas the items of "peaceful environment" were relatively low in terms of discrimination. In addition, the other two dimensions, "interpersonal connectedness" and "transcendence", had acceptable but not very high or low discriminations.

Items in “relationship with God” demonstrated high dispersion, presenting present real-life contexts in a religious background. Because this dimension presents different situations and actions to demonstrate the relationship with God, participants might not have been involved in certain actions or they might have answered with regard to social acceptability or their ideal attitudes and views rather than reality, which consequently expands the variability of the answers. Therefore, in spite of high responses variability in this domain, it seems that all these items are relevant in measuring the relationship with God as they demonstrated good discriminatory capacities, which is generally viewed as a good characteristic, since high discrimination of items results in more psychometric information being provided by an item.

With regard to particular scale items, the items with much lower slopes in each scale were the most problematic ones. The low discrimination (slope) items of HPSNQ scale were those of the “peaceful environment” dimension. We should consider that these items assess the main spiritual issues associated with the relationship to the environment and nature, theoretically or empirically identified as important aspects of spiritual needs of patients [29-32]. Therefore, the nature of response to these items might be extreme. Also, social and cultural conditions of patients or facilities in governmental hospitals may impact on how the items with low discriminatory characteristics are answered. Future research should determine if rewording or excluding these items in future versions would be more appropriate.

Overall, ICCs of the items of dimensions were right biased, showing they were relatively easy to answer, this is most likely because HPSNQ items were answered by patients from a wide range of ages (19 to 60), and with varying features, especially regarding the educational level.

Finally, according to the analyses of item thresholds, further item analyses and scale information, the HPSNQ provided very peaked information on one end of the trait continuum in other words, the concept is measured rather well in one end, while measuring is poor in the other end. Probably one of the reasons for this is that the items may have been too easy for the participants. Also, it is common to encounter ceiling and floor effects in other spirituality measurements [28]. Although it could be argued that items should be worded better in this regard, we would argue otherwise. Since the dimensions of HPSNQ do not represent the full spectrum of the continuum, this may explain the peaks in the results. It would appear that the dimensions of HPSNQ are constructs that only have one end or they are quasi-continuous traits. On the other hand, they may be latent types (with or without the trait), which future research would be required to determine. In fact, the nature of spiritual topics is itself a reason for peaking information. The change in the number of response options could be helpful in this regard. A fully dimensional, quasi-dimensional, or latent construct, would provide significant implications regarding modeling change and scaling specific differences. For example, if this construct is really of a latent type, we need to consider the change models of latent transition [33], not latent growth curve analysis, in order to investigate this hypothesis.

Conclusion

The most basic form of IRT methods were applied in this study; they were used as a simple psychometric tool for investigating items of HPSNQ and the function of scale. However, even these basic analyses

showed particularly remarkable psychometric characteristics in this tool and identified some potential challenges in measuring the construct of patients' spiritual needs.

According to an in-depth review of the items functioning in each necessary characteristic and related domains, it is generally concluded that, the patterns of item discrimination are satisfactory, although revising or excluding certain items is further recommended (items of the peaceful environment domain, for instance). It seems that the nature of the construct under study has a significant impact on the items discrimination and information value. Finally, future research might consider providing a smaller version of HPSNQ to improve the use of this tool more practical in certain settings.

Abbreviations

HPSNQ: Hospitalized Patients Spiritual Needs Questionnaire; CTT: Classical Test Theory; IRT: Item Response Theory; CFA: Confirmatory Factor Analysis; EFA: Exploratory Factor Analysis; GRM: Graded Response Model; ICC: Item Characteristic Curve; IICs: Item Information Curves; TIF: Test Information Function;

Declarations

Ethics approval and consent to participate

The study was approved by the Ethics Committee of Shiraz University of Medical Sciences (No. IR.SUMS.REC.1395.S872). we followed ethical research principles (Declaration of Helsinki). Informed consents were obtained from all participants.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available due to patient confidentiality but are available from the corresponding author on reasonable request

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

FA.H, MM, JGO and SY were responsible for the study conception and design; FA.H performed the data collection; FA.H, MM, JGO, BT and AZ performed the data analysis; FA.H, JGO, BT and SY were responsible for the drafting of the manuscript; FA.H, MM, SY, JGO, BT and AZ made critical revisions to the paper for important intellectual content.

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Tables

Table 1: Fit statistics estimates for HPSNQ with robust maximum likelihood estimation

Model	χ^2	df	p	CFI	TLI	RMSEA	SRMR
43 items	1644.77	856	<0.001	0.90	0.90	0.055	0.066

TLI: Lucker-Lewis Index; CFI: Comparative Fit Index; RMSEA: Root Mean Square Error of Approximation; SRMR: Standardized Root Mean Square Residual

Table 2: IRT parameter estimates for the scales of HPSNQ

Items	α (SE)	β_1	β_2	β_3	β_4
Relationship with God					
1. Trust in God to improve my sickness.	2.703 (0.564)	-6.895	-5.701	-3.108	0.606
2. Asking God to forgive my sins	2.248 (0.494)	-5.473	-2.992	-0.440	2.186
3. Praying to God.	3.287 (1.027)	-8.039	-5.183	-2.109	1.044
4. Performing my religious duties.	2.681 (0.788)	-3.515	-2.523	-1.020	1.147
5. Reading the Quran and religious books.	2.380 (0.555)	-2.379	-0.947	1.080	3.228
6. Resorting to the Imams and divine ones.	2.909 (0.810)	-6.058	-4.201	-1.804	1.035
7. Asking others to pray for my recovery.	2.038 (0.317)	-4.745	-3.303	-1.063	1.479
8. Providing facilities for consulting about hospitalized patient's religious challenges.	1.895 (0.432)	-2.398	-1.203	0.261	2.836
9. Having the facilities for performing religious orders	2.493 (0.673)	-3.479	-2.147	-0.531	2.007
10. Being pleased with the divine destiny in the field of my illness and treatment.	1.627 (0.179)	-6.745	-5.410	-2.266	0.218
Interpersonal connectedness					
1. Having the treatment team next to me every time I need them.	0.824 (0.308)	-4.665	-4.438	-3.349	-0.070
2. Being listened by the treatment team carefully	1.061 (0.366)	-5.747	-5.316	-2.799	0.329
3. Being understood by the treatment team	1.017 (0.340)	-5.636	-4.903	-2.375	0.680
4. Being behaved lovely by the treatment team	1.133 (0.284)	-6.472	-5.064	-2.792	0.450
5. Receiving hope through the treatment team	0.986 (0.311)	-6.333	-5.635	-3.248	0.070
6. The treatment team will work to meet my spiritual needs and interests.	0.933 (0.271)	-5.521	-3.948	-1.660	1.412
7. Contributing to my care-based decision-making by the treatment team.	0.715 (0.235)	-5.265	-4.844	-2.507	0.760

Items	α (SE)	β_1	β_2	β_3	β_4
8. Being behaved respectfully with me.	0.879 (0.295)	-6.146	-5.421	-3.592	-0.268
9. Being beside to family and friends.	1.051 (0.261)	-4.944	-4.089	-2.308	0.072
10. Talking to family members and relatives.	0.961 (0.310)	-5.560	-4.395	-2.210	0.636
11. Behaving lovely by my family.	1.042 (0.344)	-5.702	-4.708	-2.912	0.236
12. Receiving empathy from my family and relatives.	1.005 (0.326)	-5.193	-4.484	-2.924	0.463
13. Understanding that my family strives to meet all my needs.	0.918 (0.285)	-5.506	-3.803	-2.001	1.293
14. Helping other patients according to my abilities.	1.377 (0.291)	-5.716	-4.451	-2.010	1.427
15. Covering my body from others.	1.144 (0.276)	-5.253	-4.060	-2.415	0.622
Transcendence					
1. Talking to someone about my fears and worries.	0.639 (0.238)	-5.935	-3.798	-1.786	0.408
2. Thinking about my conditions, beliefs and behaviors in life.	0.813 (0.201)	-5.351	-3.412	-1.354	1.452
3. Accepting my current situation.	0.711 (0.252)	-5.291	-3.989	-1.800	0.777
4. Being patient in the face of difficulties and hardships.	0.850 (0.283)	-6.144	-4.677	-2.938	-0.242
5. Forgiving myself.	1.048 (0.280)	-5.199	-3.099	-1.120	1.648
6. Forgiving others' wrong treatment toward me.	0.745 (0.216)	-5.328	-3.049	-1.055	1.689
7. Hoping to improve my physical condition.	0.892 (0.252)	-6.194	-5.482	-3.294	0.065
8. Finding the illness positive aspects.	1.412 (0.213)	-4.601	-2.503	-0.529	2.236
9. Helping me to know more about the value of my life and circumstances.	0.796 (0.279)	-5.334	-3.053	-1.189	1.140
10. To endure the hardships, considering the important goals of my life.	0.841 (0.243)	-6.115	-4.261	-2.347	0.350

Items	α (SE)	β_1	β_2	β_3	β_4
Peaceful environment					
1. Being able to do activities making me feel useful.	0.150 (0.172)	-5.018	-3.188	-1.432	0.587
2. Being hospitalized in a calm room and ward without any annoyance and noise.	0.230 (0.187)	-4.622	-4.330	-2.177	0.105
3. Being hospitalized in a pleasant environment (in terms of cleanliness, dress and amenities).	0.278 (0.166)	-5.742	-5.044	-2.668	0.411
4. Listening to relaxing music.	0.045 (0.177)	-4.599	-2.817	-1.271	1.033
5. Studying my favorite books.	0.307 (0.155)	-3.416	-1.587	-0.325	1.575
6. Going to the hospital natural area.	0.426 (0.167)	-4.689	-2.377	-0.742	1.555
7. Seeing the surrounding natural area from the window of my room while I am hospitalized.	0.384 (0.164)	-4.667	-3.800	-1.746	0.585
8. Smelling healthy and fresh air.	0.412 (0.192)	-5.097	-4.389	-2.803	0.164

Note: α = discrimination parameter; β_1 , β_2 , β_3 and β_4 = threshold parameters. The scores in the brackets are the standard error values.

Figures

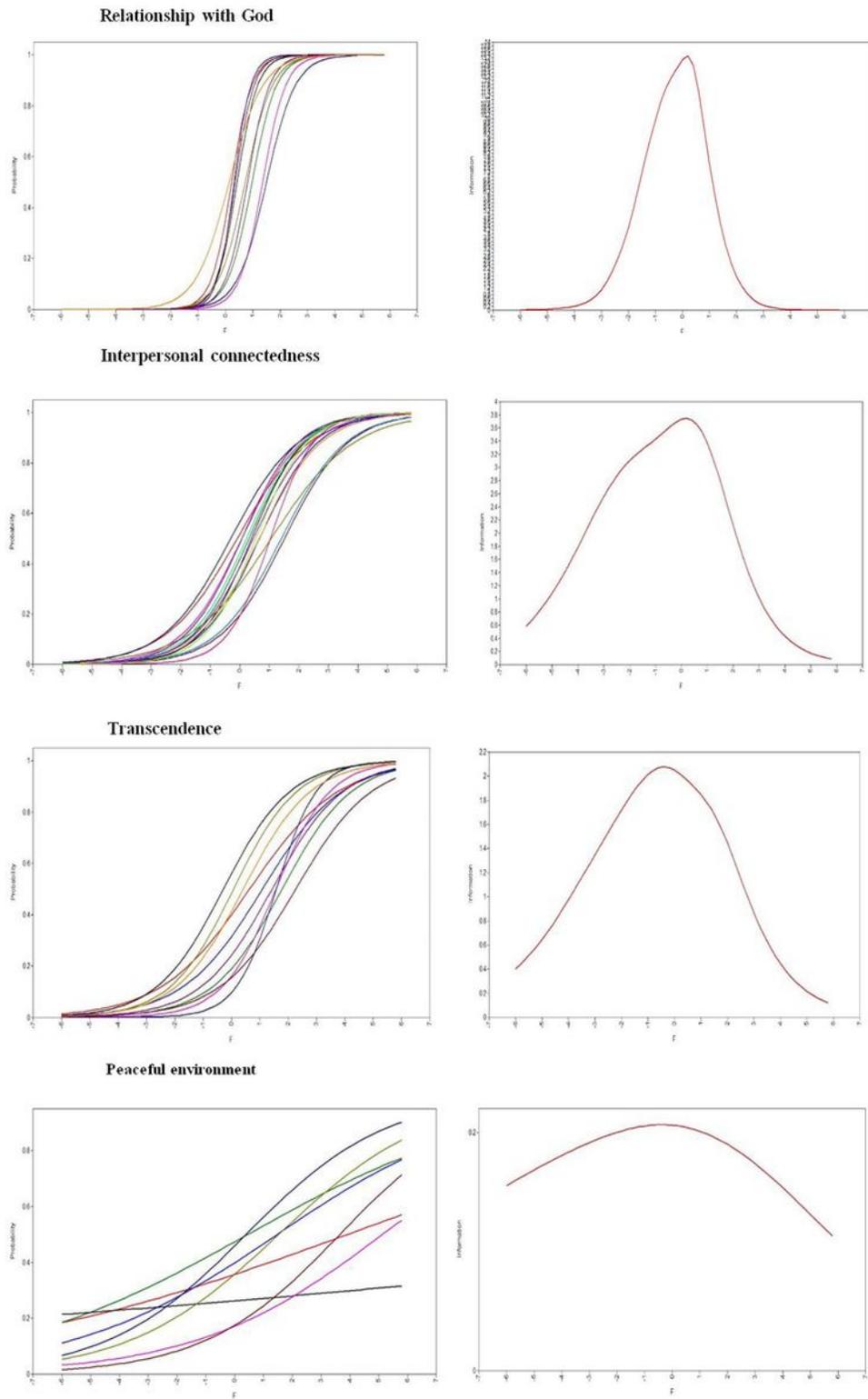


Figure 1

Items characteristic and test information curves regarding each HPSNQ dimension.