# Study of internal consistency and factor structure of three versions of the Zung's rating instrument for anxiety disorders*

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## SUMMARY

***Background:*** The Zung's rating instrument for anxiety disorders has been used in several Colombian researches. Its internal consistency and factor structure have not been reported among university students.

***Objective:*** To calculate the internal consistency and explore the factor structure of three versions of the Zung's rating instrument for anxiety disorders among university students.

***Method:*** Two-hundred and twenty-one medicine and psychology students of a private university in Cartagena, Colombia, completed the 20-item version of the Zung's rating instrument for anxiety disorders. The mean of age of students was 20.5 years (SD=2.6), 64.4% were women, and 54.3% studied medicine. Cronbach alpha was computed and exploratory factor analysis was done for the three versions.

***Results:*** The 20-item version of the Zung's rating instrument for anxiety disorders presents Cronbach alpha coefficient of 0.77 and three principal factors accounted for 40.1% of the total variance. The 10-item version showed Cronbach alpha of 0.83 and two-dimensional structure responsible of 54.0% of the total variance. The 5-item version showed Cronbach alpha of 0.74 and one-dimensional structure accounted for 49.5% of the total variance.

***Conclusions:*** The 10- and 5-item version of the Zung's rating instrument for anxiety disorders present better psychometric properties than the original 20-item version. It is necessary to estimate the properties of these versions compared with a gold standard.

**Keywords**: *Zung's rating instrument for anxiety disorders; Internal consistency; Factor analysis; University; Students; Validation study.*

***Estudio de la consistencia interna y estructura factorial de tres versiones de la escala de Zung para ansiedad***

## RESUMEN

***Antecedentes:*** La escala de Zung para ansiedad se ha usado en varias investigaciones en Colombia. Sin embargo, no se ha informado la consistencia interna y la estructura de factores en estudiantes universitarios.

***Objetivo:*** Estimar la consistencia interna y la estructura factorial de tres versiones de la escala de Zung para ansiedad en estudiantes de una universidad privada de Cartagena, Colombia.

***Método:*** Doscientos veintiún estudiantes de medicina y psicología completaron la versión de 20 puntos de la escala de Zung para ansiedad. La media para la edad fue 20.5 (DE=2.6), 64.4% eran mujeres y 55.3% estudiaban medicina. Se calculó el alfa de Cronbach y se realizó un análisis de factores exploratorio para las tres versiones.

***Resultados:*** La escala de 20 puntos mostró un coeficiente de alfa de Cronbach de 0.77 y tres factores principales responsables de 40.1% de la varianza total. La versión de 10 puntos mostró una consistencia interna de 0.83 y una estructura bidimensional que explicaba 54% de la varianza. La versión de cinco puntos mostró una consistencia interna de 0.74 y una estructura unidimensional que daba cuenta de 49.5% de la varianza.

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***Conclusiones:*** Las versiones de diez y cinco puntos de la escala de Zung para ansiedad presentan mejor comportamiento psicométrico que la versión original de 20 puntos. Se necesita estimar el comportamiento psicométrico de estas versiones frente a un criterio de referencia.

***Palabras clave****: Escala de Zung para ansiedad; Consistencia interna; Estructura factorial; Estudiantes; Universitarios; Estudios de validación.escala de Zung para ansiedad.*

The Diagnostic and Statistical Manual for Mental Disorders (DSM-IV-TR) of the American Psychiatric Association (APA) defines anxiety as the apprehensive anticipation of a further damage or misfortune; it is associated with dysphoria and somatic tension[1].

Anxiety is considered a basic psychobiological emotion, a normal adaptive answer for threats or stressors, conditioning the performance of persons. If the answer is excessive is thought as a desadaptive behavior[2].

The International Classification of Diseases (ICD-10) considers that anxiety disorders as which psychological, behavioral or autonomic nervous system symptoms are explained principally as a typical manifestation of anxiety and are not secondary symptoms of other mental disorders such as psychotic disorders[3]. More common anxiety disorders are panic disorder and generalized anxiety disorder[4].

Anxiety disorders are the main mental health problem among Colombian adults. Researchers' report that near 40% of the population refers meaningful clinically anxiety symptoms[5] and almost 20% meets criteria for any properly anxiety disorder[6].

In Colombia, Amezquita *et al.*[7] found among university students from Manizales that the prevalence of meaningful clinically anxiety symptoms reached 58.1%, with the usage of Beck Anxiety Inventory. Campo-Cabal and Gutiérrez observed in students in Manizales that 66.6% of the participants reported meaningful clinically anxiety symptoms, quantified with the Zung's rating instrument for anxiety disorders[8].

There are several self-reporting scales for quantifying anxiety symptoms that were validated in different groups of age[9]. In Colombia, the Zung's rating instrument for anxiety disorders is the most popular scale because it was used in the first national study of mental health[5]. In addition, it is a free-use scale, it is not necessary to buy questionnaires for using them, as others available scales with similar purpose. The Zung's rating instrument for anxiety disorders was published in 1971[10]. In this year, the concepts of anxiety symptoms and disorders were different than today appears in mental disorder classification, relied on DSM-II that based on questionable psychodynamic principles[1,3].

Around the world, only one research reported the psychometric properties of the Zung's rating instrument for anxiety disorders among freshman college students of psychology. In this study the Zung's rating instrument for anxiety disorders showed an internal consistency of 0.81, and factor structure of four dimensions that accounted for 45.3% of total variance[11]. In Colombia, little information is available about psychometric properties of the scale. One Colombian research reported an internal consistency (0.78) of the scale among outpatients with primary headache[12].

In Colombia, because the high prevalence of anxiety symptoms in all ages it is necessary to count on a free-use and easy application scale for identifying meaningful clinically anxiety symptoms. Among university students everything that deteriorates psychological well-being can present negative outcomes in academic achievement, and contribute with the academic desertion in the superior education[13].

The first step on the process of scale validation is to know some psychometric properties such as internal consistency and factor or dimension structure. These properties have the advantage that they can be estimated with one only application and must be acceptable before starting a validation with the use a gold standard. Moreover, it is necessary to keep in mind that these properties of the scale vary according to demographic characteristics of the population answering the scale. Additionally, today it is considered that these properties are not only intrinsic features of scale but also they just represent the pattern of answers of a particular population[14].

The objective of the research was to estimate the internal consistency and factor structure of three version of The Zung's rating instrument for anxiety disorders among students of a private university in Cartagena, Colombia.

## METHOD

This is a validation study without a gold-standard of a screening scale. Ethical Board of a private university in Cartagena, Colombia, approved this research. All

**Table 1**
**Zung's rating instrument for anxiety disorders**

| | Little or none of the time | Some of the time | A large part of the time | Most ot the time |
|---|---|---|---|---|
| 1. I feel afraid for no reason at all | | | | |
| 2. I feel more nervous and anxious than usual | | | | |
| 3. I get upset easily or feel panicky | | | | |
| 4. I feel like I'm falling apart and going to pieces | | | | |
| 5. I feel that everything is all right and nothing bad will happen | | | | |
| 6. My arms and legs shake and tremble | | | | |
| 7. I am bothered by headaches, neck and back pains | | | | |
| 8. I feel weak and get tired easily | | | | |
| 9. I feel calm and can sit still easily | | | | |
| 10. I can feel my heart beating fast | | | | |
| 11. I am bothered by dizzy spells | | | | |
| 12. I have fainting spells or feel like it | | | | |
| 13. I can breathe in and out easily | | | | |
| 14. I get feelings of numbness and tingling in my fingers, toes | | | | |
| 15. I am bothered by stomach aches or indigestion | | | | |
| 16. I have to empty my bladder often | | | | |
| 17. My hands are usually warm and dry | | | | |
| 18. My face gets hot and blushes | | | | |
| 19. I fall asleep easily and get a good night's rest | | | | |
| 20. I have nightmares | | | | |

students gave an informed consent to participate, after understanding the objective of the study, explaining that will not receive any gift, and assuring data confidentiality.

***Participants.*** A non probabilistic sample was taken. A group of 221 voluntary students of a private university completed the questionnaire during second semester of 2006. To estimate the internal consistency and factor structure of a scale as a general principle is required at least five persons by each item of the instrument. In the classroom, students older than 18 years old were invited to participate. The ages were between 18 and 25 years (Mean=20.5; SD=2.6); 142 (64.3%) were women; 201 (91%) only were students; 210 (95%) were single; and 120 (54.3%) studied medicine and 101 (45.7%), psychology.

***Instrument.*** The Zung's rating instrument for anxiety disorders is a 20-item scale quantifying anxiety symptoms, 15 somatic and 5 cognitive symptoms, during the last month. This scale presents a Likert pattern of answer. It has four options: little or none of the time, some of the time, a large part of the time and most of the time. Each point gives punctuation between one and four, 50% in direct and 50% in reversed score. Then, total punctuation could be found between 20 and 80 points. Almost ten minutes are necessary to completed correctly[10]. The scale appears in the Table 1.

***Statistical analysis.*** Data were processed in the Statistical Package of Social Sciencies (SPSS for Windows 13.0). The internal consistency of the scale was computed by Cronbach alpha coefficient[15]. Item-total correlations were calculated by Pearson correlation.

To start the exploratory factor analysis, Bartlett sphericity test was performed, a high square chi and probability lower than 5% were expected; and Kaiser-Meyer-Olkin measures of sampling adequacy was calculated, it was acceptable a coefficient higher than 0.80 in order to continue the factor analysis. Factor extraction was done with principal component method. Important factors were which showed at least three items with coefficients higher than 0.350, according to size sample (Stevens criterion) with Eigen value higher

**Table 2**
**Item-total puntuaction correlation**

| Item | Item-total puntuaction correlations |
|---|---|
| 1. I feel afraid | 0.525 |
| 2. I feel more nervous | 0.498 |
| 3. I get upset easily | 0.457 |
| 4. Falling apart and going to pieces | 0.495 |
| 5. Everything is all right | 0.243 |
| 6. Shake and tremble | 0.437 |
| 7. Headaches, neck and back pains | 0.459 |
| 8. I feel weak | 0.607 |
| 9. I feel calm | 0.267 |
| 10. Heart beating fast | 0.474 |
| 11. Dizzy spells | 0.477 |
| 12. Fainting spells | 0.229 |
| 13. Breathe in and out easily | 0.208 |
| 14. Numbness | 0.293 |
| 15. Stomach aches or indigestion | 0.474 |
| 16. Empty my bladder often | 0.179 |
| 17. Warm and dry hands | -0.253 |
| 18. Hot and blushes face | 0.227 |
| 19. Asleep easily | 0.344 |
| 20. Nightmares | 0.176 |

than 1.41, and accounted for a minimum of 50% of the variance. It was expected two or more correlated factors, a promax rotation was computed[16].

To design the new version, with ten- and five-items, of the Zung's rating instrument for anxiety disorders were followed same criteria used for 20-item version. Pearson item-total corrected correlations, factor matrix correlation and Cronbach alpha were estimate for each new version.

## RESULTS

Internal consistency, Cronbach alpha, for the 20-item version of the Zung's rating instrument for anxiety disorders was 0.77. The Pearson item-total corrected correlations are presented in the Table 2. The Bartlett sphericity test showed a squared chi ($X^2$) of 1,018.8; df=190 and $p<0.001$. The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.800. The factor analysis showed a three-dimension structure that account for 40.1% of the total variance. Factors were named according to coefficient factor matrix and classification symptom cluster. The first factor (physical symptoms) was responsible for 23.5% of the variance; the second factor (cognitive symptoms), 9.4% of the total variance; and the third factor (apprehension), 7.2%. The coefficient factor matrix is presented in the Table 3.

Because various items showed low Pearson correlation and unacceptable factor structure, psychometric properties of a ten-item version with items 1, 2, 3, 4, 6, 7, 8, 10, 11 and 15 were explored. This version presented an internal consistency of 0.83, Bartlett test with squared chi of 659.1; df=45; and $p<0.001$; the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.839; and two-dimension structure that accounted for 54% of the variance. The first factor (somatic symptoms) was responsible for 39.4% of the variance; and the second one (cognitive symptoms), 13.6% of the total variance. The coefficient factor matrix is presented in the Table 4.

In addition, for a five-item version (1, 2, 7, 8 and 11), the internal consistency was estimated. The version with fewer items showed Cronbach alpha of 0.74; Bartlett test with squared chi of 260.6; df=10; and $p<0.001$; the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.716; and one-dimension structure with Eigen value of 2.47 that accounted for 49.5% of the total variance.

## DISCUSSION

The 20-item version the Zung's rating instrument for anxiety disorders among students of a private university of Cartagena, Colombia, showed an acceptable internal consistency; however, factor analysis was less satisfactory. The 10-item and 5-item version presented more reasonable internal consistency and factor structure.

The present study finds that the original 20-item, 10-item and 5-item version show internal consistency of 0.77, 0.83 and 0.74, respectively. Researches with Colombian university students used the 20-item version

**Table 3**
**Factor matrix of the 20-item version of the Zung's rating instrument for anxiety disorders**

| Item | Factor | | |
|---|---|---|---|
| | I | II | III |
| 1. I feel afraid | | 0.742 | |
| 2. I feel more nervous | | 0.730 | |
| 3. I get upset easily | | 0.739 | |
| 4. Falling apart and going to pieces | | 0.726 | |
| 5. Everything is all right | | | 0.528 |
| 6. Shake and tremble | 0.491 | | |
| 7. Headaches, neck and back pains | 0.657 | | |
| 8. I feel weak | 0.804 | | |
| 9. I feel calm | | | 0.624 |
| 10. Heart beating fast | 0.604 | | |
| 11. Dizzy spells | 0.764 | | |
| 12. Fainting spells | 0.390 | | |
| 13. Breathe in and out easily | | | 0.387 |
| 14. Numbness | 0.516 | | |
| 15. Stomach aches or indigestion | 0.690 | | |
| 16. I have to empty my bladde | 0.350 | | |
| 17. Warm and dry hands | | | 0.492 |
| 18. Hot and blushes face | 0.386 | | |
| 19. Asleep easily | | 0.443 | |
| 20. Nightmares | | 0.251 | |

Coefficients higher than 0.350 are presented

**Table 4**
**Factor matrix of the ten-item version of the Zung's rating instrument for anxiety disorders**

| Item | Factor | |
|---|---|---|
| | I | II |
| 1. I feel afraid | | 0.770 |
| 2. I feel more nervous | | 0.773 |
| 3. I get upset easily | | 0.767 |
| 4. Falling apart and going to pieces | | 0.758 |
| 6. Shake and tremble | 0.525 | 0.428 |
| 7. Headaches, neck and back pains | 0.704 | 0.355 |
| 8. I feel weak | 0.833 | 0.415 |
| 10. Heart beating fast | 0.631 | 0.363 |
| 11. Dizzy spells | 0.763 | |
| 15. Stomach aches or indigestion | 0.707 | |

Coefficients higher than 0.350 are presented

and did not report the information about internal consistency in the samples studied[7,8]. On the other hand, Olatunji *et al.*[11] observed in 552 college students that the 20-item version showed a Cronbach alpha of 0.81. It is expected that Cronbach alpha coefficient reaches between 0.70 and 0.90. These coefficients are acceptable for scales with 20 or less items[16].

In this research found that 20-item version showed a three-dimension structure that accounted for 40% of the total variance approximately; the 10-item version, two dimensions responsible for 54% of the total variance; and the 5-item version, one factor that accounted for near 50% of the total variance. There are not Colombian studies reporting the factor structure the 20-item version the Zung's rating instrument for anxiety disorders. Olantuji *et al.*[11] observed four principal factors responsible for 45.3% of the total variance; they used the principal component method and promax rotation. The difference of the number of factor that retains depends on the criteria used in the analysis. If Olantunji *et al.*[11] had used Gorsuch's criterion, to consider only factor with Eigen values higher than 1.41, the factor structure in that study had retained only two dimensions that would explain 32.4% of the variance.

It is evident that the number of important factors retained in the factor analysis relies on the criteria considered in that moment. There are several criteria or suggerences to choose the principal of a scale. Kaiser criterion is the most popular, it considers important factor only which Eigen value higher 1.0, Cattell screen plot, the percentage of the variance explained for each factor or the number of items with high coefficient in a particular dimension. The best criterion is the combination of various criteria, considering the theory of the scale[17]. The number of factors or dimensions is directly

proportional to number of items of the scale and the variance that explains each item is inversely proportional to the number of items of the scale[10].

A general recommendation, it is to compute factor analysis for scales with maximum 30 items and retain the factors or dimensions more important of the construct in evaluation. A factor is important, if its Eigen value is higher than 1.41 and is compounded for at least three items with high coefficient in the matrix factor, and all principal factor explain more than 50% of the total variance. If researcher only considers the Kaiser criterion, Eigen value higher of 1.0, for retaining factors could overestimate the number of dimensions of a scale[19].

The present study suggests that 10-item and 5-item version could be useful as instruments to identify possible cases of anxiety disorders among university students.

Although, the concept of mental disorders has changed over the last 40 years, typical symptoms of anxiety disorders have not been modified importantly[1,3].

These versions of ten and five items need less time to complete them and punctuate the answers, and better psychometric properties than original 20-item version. The use for one or other version could be defined by the population in a research, purposes or context of the usage. It is necessary to insist that these coefficients showed better the pattern of answer each population than an intrinsic feature of the scale and, in consequences, these coefficients vary according to from a study to other[16].

The diagnosis of any mental disorder is a clinical event; however, scales with acceptable psychometric properties are useful for identifying possible cases quick and cheaply in service rooms with few health personals, and epidemiological researches with big size samples. Possible cases must receive a careful clinical evaluation to precise or confirm a clinical diagnosis and psychotherapeutic or pharmacological treatment.

To know the internal consistency and the factor structure is one of the first step in the validation process of a scale. Delaying items with low correlations, similar this study, has a positive effect in Cronbach alpha coefficient.

The factor analysis is rational and useful strategy in the process of refinement of a scale; this revision corroborates the decision of delaying items with low coefficients. Then, it is important to know other psychometric properties, such as sensitivity, specificity, Cohen's kappa, predictive values, likelihood ratios and best cut-off point to establish the category of a possible disorder. These properties can only calculate with a gold standard to accept or refuse the presence of a clinical condition[20].

It is concluded that the 20-item version the Zung's rating instrument for anxiety disorders presents an acceptable internal consistency; however, factor structure is modestly satisfactory. The new versions, with ten- and five-item, for this group of students show a more favorable performance, with acceptable internal consistency and factor structure. It is necessary to know the psychometric properties of these new versions compared with a gold standard in different contexts and populations.

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