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## Factor Structure of the Beck Depression Inventory- Second Edition (BDI-II) with Puerto Rican Elderly

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**The Beck Depression Inventory- Second Edition (BDI-II; 1) is one of the most useful measures for depressive symptomatology in many countries (2). The psychometric properties of this inventory, however, have not been reported with Puerto Rican elderly. This paper reports, exploratory psychometric results with a sample of 410 elderly Puerto Rican (65 years and older; men = 94, women = 316). The assessment of the construct validity of the BDI-II yielded four factors accounting for 52% of total variance and an internal reliability coefficient (alpha Cronbach) of .89. A factor analysis with the 21 items of the BDI-II was performed**

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**using principal component analysis as the extraction method and Varimax rotation. This analysis revealed that the BDI-II was a good measure of the dimensions of depressive symptomatology in the present sample, which resembled prior findings reported with the general Puerto Rican Population (3). This study also reports further data supporting the reliability, validity, and practical utility of the BDI-II for the Puerto Rican population including elders. Implications for potential research with minorities and clinical uses of the BDI-II are also discussed.**

*Key words: Depression, BDI-II, Puerto Rican elderly*

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**T**he Beck Depression Inventory (BDI-II) has become one of the most useful measures for depression in many countries (2). Although the BDI –II may underestimate the prevalence of depression in community samples (4), it has proved to be a strong instrument in terms of its psychometric properties. Few studies, however, exist with limited samples that explore the psychometric properties of the BDI-II with Puerto Rican populations (3,5,6,7).

The BDI was first introduced in 1961 to measure a variety of behavioral manifestations displayed by depressed psychiatric patients, but not in normal populations (8). Recently, the original scale, although not for the first time, was revised and adapted into the Beck Depression Inventory- Second Edition (BDI-II; 1) in order to make it more representative and congruent with the diagnostic criteria for major depressive episode described in the 4<sup>th</sup>

edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (9).

In the BDI-II weight loss, body image change, somatic preoccupation, and work difficulty were replaced with items that particularly measure agitation, worthlessness, concentration difficulty, and loss of energy. Also, the items assessing appetite and sleep changes now allow for measuring both increases and decreases in these behaviors. According to Beck, Steer, and Brown (1) the BDI-II version constitutes a “substantial revision” of the original BDI. Thus, more studies are needed so the psychometric properties, including the factorial structure, can be evaluated.

The prevalence rate of depression in Puerto Rico supports the need to validate instruments in Spanish which measure this mental health disorder. Canino et al. (10) in an epidemiological study in Puerto Rico demonstrated that mood disorders constitute the fourth most prevalent psychiatric disorder in this population. Rodríguez (11), in a pioneer research, found that the Puerto Rican elderly are not only at the highest risk to commit suicide but they also have the highest rate of actual suicide prevalence on the island (11,12,13,14).

The reliability and validity of the BDI-II has been fully documented in a variety of populations. The BDI-II, however, has not been researched with the Puerto Rican elderly. In prior studies, internal consistency (alpha) for both English and Spanish-speaking populations has

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*The project/study described was supported by Grant Number 1 R24 MD00152-01, from the National Center on Minority Health and Health Disparities, National Institutes of Health. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the National Institutes of Health.*

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ranged between .86 and .93, demonstrating the adequacy of the instrument (3,15-18). The construct validity of the BDI-II also has been evaluated using factor analysis. The most consistent factors reported across international studies are cognitive-affective and somatic (15-18). Studies done with Puerto Rican populations are also congruent with the literature related to the psychometric properties of the original BDI, revised BDI-II, and revised Spanish version (BDI-S) (3,5-7). In terms of construct validity of the BDI-II, the following factorial structure has been reported for Puerto Ricans: negative attitudes, cognitive-behavioral, biological, and somatic.

The above review of the literature clearly indicates that the BDI-II is a reliable and valid instrument in the assessment of depression in the general population. But there still exists a necessity to develop, translate and adapt appropriate instruments in order to assess the psychological constructs in the Puerto Rican elderly population. These instruments should be psychometrically valid in order to be used as a screening tool. The BDI-II should receive more attention because of its capacity to be implemented for clinical and research purposes among many cultures. The present study was designed to ascertain two main objectives: (a) to analyze the psychometric properties (internal consistency) of the BDI-II and (b) to evaluate the factorial structure suggested by previous studies in a sample of Puerto Rican elderly individuals living in independent residential housing projects

## Method

### Research Design

An ex-post-facto design was used. The research had a psychometric approach in order to assess the internal consistency and construct validity of the BDI-II with a probabilistic elderly Puerto Rican sample.

### Participants and Sampling Procedures

The sample consisted of 410 elderly individual (316 women and 94 men) living in independent housings. The mean age of the group was 75.6 ( $SD = 7.3$ ). Participant's educational level varied between 3.8 and 12.8 ( $M = 8.3$  years of schooling). Most participants were widowed (47%), followed by divorced (24%), never married (19%), and married (10%). 97% were not working at the time of the study. They were mostly catholic (63%), followed by protestants (32%), and 5% had no religious preference. Their mean reported annual income was \$5,057 ( $SD = 2,769$ ). At the time of the study 16.6% of the sample had been diagnosed with depression and only 8.5% was receiving treatment, and 5.9% of the total sample reported that at least once they had thought about committing suicide

during the past six months.

### Sampling Method

The sampling procedures emphasized sampling by clusters<sup>(19)</sup>, in which the island of Puerto Rico was divided into two regions, according to a geographically divided system used by the Puerto Rican Government's Office for Elderly Individuals Affairs. The formula to determine the number of participants by cluster was  $N_h \times f_h = n_h$ , where  $N_h$  is the number of independent residential housing projects for each region;  $f_h$  is the standard deviation between sample and total population and  $n_h$  is the number of residents of each region<sup>(20)</sup>. This formula resulted in a total of 316 subjects from region I and 94 subjects from region II. These independent samples assured representativeness of all the residents living in independent residential housing projects in Puerto Rico.

### Instruments

**Demographic Data Questionnaire:** A structured questionnaire was developed to collect relevant socio-medical demographic factors such as age, gender, marital status, previous occupation, current income, education, history of previous depression diagnoses, suicide attempt during the last 6 months and other diagnosed mental conditions.

**Beck Depressive Inventory-II:** The BDI-II is a 21-item self-report measure widely used in the assessment of severity or intensity of depressive symptoms<sup>(16)</sup>. It is scored by summing the highest ratings for each of the 21 items and takes approximately 10 to 15 minutes to complete. Each item is rated on a 4-point scale ranging from 0 to 3, and total scores can range from 0 to 63. According to the manual for the BDI-II, scores ranging from 0 to 13 are considered not depressed, scores from 14 to 19 mildly depressed, 20 to 28 moderately depressed, and 29 to 36 severely depressed. Beck, Steer, and Garbin<sup>(2)</sup>, however, recommend that if the purpose of the study is to identify the maximum number of possible cases of depression, cutoff scores should be set between 14 and 19. In the case of the present study, the chosen cutoff point was 16 or greater. Adequate reliability and validity have been documented for the BDI in general<sup>(21)</sup>, as well as for anglo-adults over 60 years old<sup>(22)</sup>.

### Procedures

Permission was received from the administrators of the residents in independent residential housing projects for elderly in Puerto Rico from the two main regions. The researchers made personal contact with the housings' administrators to explain both verbally and in writing the nature and the aims of the project. Clarifications of doubts were also discussed with the administrators before seeking permission from the elderly individuals themselves. Once the elderly individuals were invited to participate in the

study and they agreed to sign an informed consent form, the BDI-II and the demographic data questionnaire were administered by trained doctoral graduate students in psychology. The instruments were administered verbally and individually to the participants. Confidentiality was strictly maintained. The variables related to the items of the BDI-II were selected in order to assess its psychometric properties.

## Results

**Factor analysis procedures:** The preliminary factor analyses identify 4 basic factors that were consistent with the subsequent confirmatory analyses. The confirmatory factor analysis was performed in order to assess the construct validity of the BDI-II and verify the previous factors identified as a common procedure to establish the validity of the instrument (23). The component extraction method was used, which consists of making lineal combinations between the variables (items). The first factor involves the combination of items that explains a greater percent of the total variance of the instrument. A Varimax rotation was used to simplify the interpretation of the factors extracted minimizing the number of items with loadings in one factor. Four factors were extracted according to previous studies (3,5-7). Only the items with loadings of .30 or greater were included in each factor (24).

In general, participants' ( $n = 410$ ) scores in on the BDI-II ranged from 0 to 46, with a mean score of 7.90 ( $SD = 7.63$ ). Cronbach's alpha with the 21 items that make up the BDI-II, resulted in an internal reliability coefficient of .89. The factor analysis yielded 4 factors. Table 1 shows these factors with their Eigenvalues and the total and cumulative percents of variance.

As shown in Table 1, the first factor that emerged was named "somatic," it because included seven items regarding loss of interest, loss of energy, fatigue, and concentration difficulties. This factor explained 35.02% of total variance. The second factor included six items

related to failure, guilt, and feelings of punishment and therefore was identified as "cognitive-behavioral". This factor explained 6.81% of total variance. A third factor was named "biological," that included four items regarding agitation, and problems with sleeping and appetite. This factor explained 6.15% of total variance. The last factor, "Negative Attitudes," included four items related to suicidal ideation and pessimism. This factor explained 4.85% of total variance.

These four factors accounted for 52.83% of the total variance of the instrument. Table 2 shows the final correlation matrix for the four factors rotated by the Varimax method. A comparison between studies done in Puerto Rico using the BDI, BDI-II or BDI-S is shown in Table 3. **Table 2.** BDI-II items and their factorial loadings for the principal component factor analysis (Varimax rotation) ( $n = 410$ )

Loadings for the rotated factor				
BDI-II items	I	II	III	IV
Item 15	.70			
Item 20	.66			
Item 4	.65			
Item 14	.64			
Item 21	.61			
Item 12	.60			
Item 19	.47			
Item 5		.70		
Item 8		.66		
Item 7		.63		
Item 3		.63		
Item 6		.59		
Item 13		.49		
Item 11			.68	
Item 16			.65	
Item 10			.57	
Item 18			.54	
Item 9				.67
Item 2				.65
Item 1				.54
Item 17				.37

**Table 1.** The Four Factors Extracted by Principal Component Analysis ( $n=410$ )

Factor	Eigenvalues	% of variance explained	Cumulative % of variance
1. Negative Symptoms	7.36	35.02	35.02
2. Biological	1.43	6.81	41.83
3. Cognitive-Behavioral	1.29	6.15	47.98
4. Negative Attitudes	1.02	4.85	52.83

## Discussion

Depression is a progressive and debilitating pathology with a high prevalence in the Puerto Rican elderly population (11-12). Previous research done in Puerto Rico has found that 62% of the elderly sample was suffering from depressive symptomatology (11). The need for practical depression-assessment instruments has been recognized by the evidence of high prevalence and under-detection of depression in many settings and populations. This is particularly the case with the Hispanic/Puerto Rican population where the mere translation of instruments into Spanish is not enough. Culturally sensitive research

**Table 3.** Comparison of results between studies realized by Bernal, Bonilla, and Santiago (1995); Rosado, Rodríguez, & Martínez, (1995); Lugo, Rodríguez, & Martínez, (1999); Bonilla, Bernal, Santos, & Santos, (2004), and Rodríguez, Joglar, & Dávila, (2005).

<b>Research Facts</b>	<b>Results Bernal, Bonilla, &amp; Santiago</b>	<b>Results Rosado, Rodríguez, &amp; Martínez</b>	<b>Results Lugo, Rodríguez, &amp; Martínez</b>	<b>Results Bonilla, Bernal, Santos &amp; Santos</b>	<b>Results Rodríguez, Joglar, &amp; Dávila</b>
Sample (N)	300	104, 60 = 164	45	351	410
Mean Age	25	72	33	22	76
Gender	65% women 35% men	50% women 50% men	82% women 18% men	69% women 31% men	77% women 23% men
Main Level of Education	undergraduate	fourth to seventh grade	undergraduate	undergraduate	eighth grade
Main Marital Status	Never Married	Married	Married	Single	Widowed
Residence Area Setting	San Juan, PR Center for Psychological Services and Research (CUSEP), Rio Piedras, PR	Mayaguez, PR Physical Therapy Center	San Juan, PR Mental Health Clinics Metro Area, PR	Puerto Rico Colleges	Puerto Rico Residential Housings for the Elderly across Puerto Rico
Instrument	BDI Bernal	BDI Manuel Ponton Certified Translator for the American Psychological Association	BDI-II Manuel Ponton	BDI-S Not available	BDI-II Manuel Ponton
Internal Consistency ( $\alpha$ )	0.89	0.88	0.92	0.88	0.89
Explained Variance	49.4%	58%	53%	49%	52%
Identified	4	4	4	4	4
Organization Involved (economical support)	Institutional Funding for Research, UPR, Rio Piedras Campus; Biopsychosocial Research Training Program (MARC); Social Sciences Faculty, NIMH, & CUSEP	Principal Investigator	Principal Investigator	Institutional Funding for Research, UPR, Rio Piedras Campus; ATLANTEA; & CUSEP	National Institute of Health (NIH)

transcends the literally translation of instruments because the content, semantic, technical, criterion, and conceptual validity equivalence criteria are not always achieved (10,25-26). To achieve these validity equivalence criteria, research in this area should take into account not only the translation and adaptation of existing instruments but to revise such instruments in terms of their psychometric properties pertinent to the population being assessed (e.g., the use of the BDI-II in the present study).

The main objectives in this study were supported. First, the internal consistency coefficient of the BDI-II was highly significant<sup>(23)</sup>. In addition, the obtained reliability coefficient was favorably comparable with other studies done in Puerto Rico and other socio-cultural contexts (3,5-7,15-18).

The second objective emphasized the construct validity of the BDI-II through factor analysis. It was expected that the factorial structure of the BDI-II should be consistent

with the factors already identified by previous studies done in Puerto Rico (3,5-7). In this study, the items that make up the BDI-II were grouped into four factors: negative attitudes, cognitive-behavioral, biological, and somatic. These factors were comparable with those identified by previous studies done in the island. However, the structure of each factor was similar but not identical. This could be argued in terms of methodological aspects such as different types of samples (e.g., undergraduate students versus elderly), other versions of the BDI as the assessment tool, and sampling methods (e.g., probabilistic versus non-probabilistic).

In conclusion, the present findings support the internal consistency and construct validity for the BDI-II in the assessment of depressive symptomatology among a sample of elderly Puerto Rican. Furthermore, findings with the psychometric properties of the BDI-II with the present sample resembled those identified with other populations and versions of the DBI. Therefore, this research contributes to the growing field of cultural sensitive screening and psychological assessment, bringing evidence of the reliability and validity of an instrument that assesses depressive symptomatology. The present results also suggest that the BDI-II could be used for clinical purposes, as well as for research projects especially with the Puerto Rican elderly. Furthermore, the importance of having a reliable and valid instrument to assess depressive symptomatology in elderly individual emphasizes the true needs of this growing population in Puerto Rico.

Some limitations of this study should be considered in future research. First, only the BDI-II was used in the present study, preventing in some way the investigators from grasping the complexity of symptoms and factors (e.g., internal and external) underlying depression with the present sample. Future investigations should consider the use of additional, culturally sensitive and more comprehensive instruments that consider the specific population studied to achieve a more rigorous assessment. Second, the findings of this study should be replicated with other Puerto Rican samples still living in or outside Puerto Rico in order to address disparity issues that may contribute to depressive symptomatology. In this particular replication of present procedures, the psychometric properties of the BDI-II, particularly its construct and convergent validity, should be explored more thoroughly in future transcultural studies.

## Resumen

El Inventario de Depresión de Beck –Segunda Edición (BDI-II) es uno de los instrumentos psicométricos más

utilizados para medir sintomatología depresiva en diferentes países <sup>(2)</sup>. Las propiedades psicométricas del BDI-II no han sido exploradas para la población de ancianos puertorriqueños. Esta investigación presenta los resultados preliminares del análisis psicométrico realizado con una muestra de 410 ancianos (65 años en adelante, hombres = 94 sujetos y mujeres =316 sujetos). La evaluación de la validez de constructo del BDI-II reflejó 4 factores que explican el 52% de la varianza total con un coeficiente de confiabilidad interna (alfa de Cronbach) de .89. Se realizó un análisis exploratorio de factores con los 21 reactivos del BDI-II utilizando un método de extracción de componente principal y rotación varimax. El análisis reveló que el BDI-II es una medida adecuada para evaluar las dimensiones de sintomatología depresiva en la muestra utilizada., lo cual es consistente con hallazgos previos reportados para la población puertorriqueña general <sup>(3)</sup>. Este estudio provee datos para apoyar la confiabilidad, validez y utilidad práctica del BDI-II para ser utilizado con población puertorriqueña, incluyendo ancianos. Implicaciones para investigaciones futuras con minorías y el uso clínico del BDI-II son presentadas.

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