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Abstract

The present study evaluated the psychometric properties of the Patient Health Questionnaire–4 (PHQ-4), a screener of psychological distress, in English- and Spanish-speaking Hispanic Americans. Hispanic American adults ($N = 436$) completed the PHQ-4, which yields two subscales (Anxiety and Depression) that can be summed to create a total score. Multiple-group confirmatory factor analysis was used to evaluate structural validity. The two-factor structure was the best fit to the data for both English- and Spanish-speaking Hispanic Americans, and items loaded equivalently across groups, demonstrating measurement invariance. Internal consistency reliability was good as measured by coefficient alpha. Construct validity was evidenced by significant expected relationships with perceived stress. These findings provide support for the reliability and validity of the PHQ-4 as a brief measure of psychological distress for English- or Spanish-speaking Hispanic Americans.

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Keywords

Patient Health Questionnaire-4, Hispanic Americans, psychometrics, anxiety, depression

The Patient Health Questionnaire-4 (PHQ-4) is a four-item screener of psychological distress (Kroenke, Spitzer, Williams, & Lowe, 2009). The PHQ-4 is a composite of the Patient Health Questionnaire-2 (PHQ-2; Kroenke, Spitzer, & Williams, 2003) and Generalized Anxiety Disorder-2 (GAD-2; Kroenke, Spitzer, Williams, Monahan, & Lowe, 2007) scales, two-item scales designed to screen for depression and anxiety over the prior two weeks, respectively. Kroenke et al. (2009) noted that depression and anxiety are the two most common mental health disorders and are often comorbid with each other. Furthermore, disability has been found to be most severe when depression and anxiety co-occur. Thus, the PHQ-4 was developed, combining the PHQ-2 and GAD-2 into a four-item scale to permit efficient screening of both depression and anxiety using the same, very brief measure.

The PHQ-4 was developed and validated in a United States (U.S.) sample of 2,149 patients from 15 primary care sites. Patients had a mean age of 47.2 years ($SD = 15.4$ years) and were predominantly female and non-Hispanic White. A principal components analysis (PCA) of the four PHQ-4 items indicated that 84% of the total variance was explained by two factors. As expected, the two anxiety items had the highest factor loadings on one factor, and the two depression items had the highest factor loadings on the other. Kroenke et al. (2009) noted that two subscale scores can be calculated, one each for Anxiety and Depression, along with a total score reflecting psychological distress. The mean PHQ-4 score for the total sample was 2.5 ($SD = 2.8$), described by Kroenke et al. (2009) as indicating normal to mild levels of psychological distress, although determination of cutoff scores was not described. Internal consistency reliability was good ($\alpha > .80$) for the total score and subscales. The measure also demonstrated strong construct validity. Higher scores on the PHQ-4 were associated with increasing scores in all six domains of the Medical Outcomes Study Short-Form General Health Survey (SF-20; Wells et al., 1987).

The PHQ-4 has also been cross-validated in a large sample ($N = 5,036$) from the general population in Germany (Lowe et al., 2010). Participants had a mean age of 48.4 years ($SD = 18$ years) and were predominantly female. Information on the race/ethnicity of participants was not provided. Mean PHQ-4 scores were 1.76 ($SD = 2.06$), and internal consistency reliability for

the total score and subscales was good. A two-factor model fit the data well. Scores on the PHQ-4 correlated at expected magnitudes and directions with the Rosenberg Self-Esteem Scale (Rosenberg, 1965), the Questionnaire on Life Satisfaction (Henrich & Herschbach, 2000), and the Resilience Scale (Schumacher, Leppert, Gunzelmann, Stauß, & Brahler, 2005), demonstrating convergent validity.

The psychometric properties of the PHQ-4 were recently examined in a sample of surgical patients attending preoperative anesthesiological assessment clinics ($N = 2,852$) in Germany (Kerper et al., 2014). Approximately half of the sample was female (Age: $M = 47$ years). Race/ethnicity data were not provided. Clinically significant psychological distress (t score $\geq .63$) on the Brief Symptom Inventory (BSI; Derogatis, 1993) was reported by 14.6% of the sample. A two-factor model was examined using PCA, and the factors explained 83% of the total variance. The four items, however, did not load onto the two factors as expected. The two GAD-2 items had the highest loadings on Factor 1, as expected, and Item 1 from the PHQ-2 had the highest loading on Factor 2 (assessing Depression). However, Item 2 from the PHQ-2 loaded highest on Factor 1, with the two GAD-2 items. Convergent validity was demonstrated by correlations with the total score and selected subscales of the BSI, a measure of perceived distress.

The purpose of the present study was to evaluate the psychometric properties (reliability, structural validity, construct validity) of the PHQ-4 among a sample of English- and Spanish-speaking Hispanic Americans. The PHQ-4 has yet to be psychometrically evaluated in the Hispanic American population, despite being extensively used in research on diverse samples including Hispanic Americans. Furthermore, the structural invariance of the English and Spanish versions of the measure across different Hispanic American language groups has yet to be examined. Evidence of structural invariance across these language groups is a critical prerequisite for cross-group comparisons (Floyd & Widaman, 1995).

Method

Participants and Procedures

Hispanic American adults ($N = 436$) were recruited as part of a larger community study validating health-related measures. To be eligible for inclusion, individuals must have self-identified as Hispanic American, been at least 21 years old, resided in the U.S., and be literate in either English or Spanish. The sponsoring universities' Institutional Review Boards approved all study procedures and materials, and participants provided informed consent prior to participation.

Measures

Demographics. Participant demographic information was provided by self-report.

PHQ-4. As described above, the PHQ-4 (Kroenke et al., 2009) is a four-item measure of psychological distress. Total scores range from 0 to 12, with higher scores indicating greater psychological distress. GAD-2 and PHQ-2 scores can also be calculated by summing the first two items and last two items of the measure, respectively, with subscales' scores ranging from 0 to 6. The Spanish versions of the GAD-2 items were previously translated by García-Campayo et al. (2010). The Spanish versions of the PHQ-2 items were translated by the Stanford Patient Education Research Center (*Spanish Personal Health Questionnaire (PHQ-8) Depression*, n.d.). See Table 1 for individual items of the PHQ-4 in English and Spanish.

Perceived Stress Scale (PSS). The PSS is a self-report measure of perceived stress developed by Cohen, Kamarck, and Mermelstein (1983); the Spanish version of the measure was drawn from Cohen's website (*PSS Translations*, n.d.). Total scores range from 0 to 40, and higher scores reflect greater perceived stress. In the present study, internal consistency reliability was good ($\alpha = .82$) for the total sample and acceptable to good when language preference groups were examined separately (English: $\alpha = .87$; Spanish: $\alpha = .78$).

Table 1. Items From the Patient Health Questionnaire–4 in English and Spanish.

Generalized Anxiety Disorder–2 (English / Spanish)

Over the last 2 weeks, how often have you been bothered by the following problems? / Señale con qué frecuencia ha sufrido los siguientes problemas en los últimos 15 días

1. Feeling nervous, anxious, or on edge / Se ha sentido nervioso, ansioso o muy alterado
2. Not being able to stop or control worrying / No ha podido dejar de preocuparse

Patient Health Questionnaire–2 (English / Spanish)

Over the last 2 weeks, how often have you been bothered by the following problems? / Durante las últimas 2 semanas, ¿con qué frecuencia le han molestado los siguientes problemas?

1. Little interest or pleasure in doing things / Tener poco interés o placer en hacer las cosas
 2. Feeling down, depressed, or hopeless / Sentirse desanimada, deprimida, o sin esperanza
-

Data Analysis

PHQ-4 total scores were computed for the English and Spanish language groups separately, and group means were compared with an independent-samples *t* test. Internal consistency reliability was evaluated using Cronbach's alpha.

Multiple-group confirmatory factor analysis (MCFA) was used to evaluate the comparability of the factor structure of the PHQ-4 across language groups. Prior investigations have found evidence for a two-factor structure; thus, a two-factor solution was expected for both language groups in the present analysis. The MCFA was conducted in accordance with the approach recommended by Vandenberg and Lance (2000). Three increasingly restrictive models were iteratively examined. To establish *configural invariance*, a model is examined in which the number of factors and the items contributing to each factor are constrained across groups, but all other parameters are freely estimated. Once configural invariance is established, the *metric invariance* of the structure between groups is examined to determine if each item loads equivalently onto the same factor in both groups. To establish metric invariance, a model is examined in which the loading of each item onto its respective factor is constrained across groups, but factor variances, factor covariances, and error variances, are freely estimated. Finally, once metric invariance is established and deemed to be a superior fit to the data than the configural invariance model, the *factor variance/covariance invariance* of the structure is examined across groups. In this most restrictive iteration, the loading of each item onto its respective factor is again constrained across groups, as are the variances and covariances of each factor; error variances are freely estimated. To determine which model is the optimal fit to the observed data, each model that is deemed to adequately fit the data is statistically compared with the prior, next less restrictive iteration using a chi-square difference test.

Multiple indicators of overall model fit were examined, including (a) the comparative fit index (CFI; Bentler, 1990), an absolute index of model fit; (b) the root mean square error of approximation (RMSEA; Steiger, 1990), a parsimony-adjusted index of model fit; and (c) the standardized root mean residual (SRMR; Hu & Bentler, 1999), an absolute index of model fit. For the CFI, values > 0.95 indicated good model fit, and values > 0.90 indicated acceptable model fit. For the RMSEA and SRMR, values < 0.08 indicated acceptable model fit, and values < 0.05 indicated good model fit. A model was determined to adequately fit the observed data if at least two of the three descriptive fit indices met acceptable model fit criteria. The likelihood ratio chi-square was also reported, however, it did not serve as the only indicator

of model fit because it is highly influenced by sample size and does not demonstrate degree of fit (Gerbing & Anderson, 1992).

The construct validity of PHQ-4 total and subscale scores was evaluated by examining Pearson product-moment correlations with scores on the PSS. The MCFA was conducted using MPlus version 7.11 (Muthén & Muthén, 1998-2010). All other analyses were completed in SPSS version 20 (IBM, 2011).

Results

Descriptive Statistics

Descriptive statistics can be found in Table 2. Spanish language group PHQ-4 scores ($M = 2.94$, $SD = 2.94$) were significantly higher than English language group scores ($M = 2.07$, $SD = 2.59$), $t(432) = -3.26$, $p = .001$. The majority of the sample (61.5%) had PHQ-4 scores indicative of normal levels of psychological distress (≤ 2), while 8.6% of the sample had scores indicative of severe levels (≥ 9). Overall, the Spanish language group had lower income, were less educated, and less likely to be employed in comparison with the English language group.

Table 2. Sample Characteristics.

	English ($n = 210$)	Spanish ($n = 226$)
Age ^{*a}	38.50 (13.74)	46.24 (13.37)
Gender ^b		
Female	107 (51.0%)	112 (49.6%)
Male	103 (49.0%)	114 (50.4%)
Education ^{*b}		
Less than bachelor's degree		
Less than high school	13 (6.2%)	108 (47.7%)
High school/trade school	39 (18.6%)	48 (21.2%)
Some college/associates degree	81 (38.5%)	41 (18.2%)
Bachelor's degree or higher		
Bachelor's degree	57 (27.1%)	17 (7.5%)
Postgraduate	18 (8.6%)	7 (3.1%)
Missing/do not know	2 (1.0%)	5 (5.3%)
Employment status ^{*b}		
Employed	141 (68.1%)	106 (46.5%)
Not employed for wages		

(continued)

Table 2. (continued)

	English (n = 210)	Spanish (n = 226)
Unemployed	30 (14.2%)	42 (18.6%)
Homemaker	6 (2.9%)	30 (13.3%)
Student/retired/ disabled	19 (9.0%)	29 (12.7%)
Social security/SSI	4 (1.9%)	9 (4.0%)
Missing/do not know	10 (3.9%)	10 (4.9%)
Marital status ^b		
Married	95 (45.2%)	116 (51.3%)
Not married		
Single	65 (31.0%)	59 (26.1%)
Living with partner	15 (7.1%)	14 (6.2%)
Divorced/separated	32 (15.2%)	27 (11.9%)
Widowed	3 (1.4%)	9 (4.0%)
Missing	0 (0.0%)	1 (0.5%)
Income ^{a,b}		
US\$0-US\$24,999	61 (29%)	121 (53.5%)
US\$25,000-US\$49,999	59 (28.1%)	60 (26.5%)
US\$50,000-US\$74,999	41 (19.5%)	11 (4.9%)
>US\$75,000	34 (16.2%)	9 (4%)
Missing/do not know	15 (7.2%)	25 (11.1%)

^aM (SD).

^bn (%).

^{*}Independent-sample t tests resulted in a significant difference at $p < .01$ (two-tailed) between language preference groups.

SSI = supplemental security income.

Reliability

For the total sample, internal consistency reliability was good for the PHQ-4 ($\alpha = .86$) and its subscale scores (PHQ-2: $\alpha = .80$; GAD-2: $\alpha = .81$). For the English language group, internal consistency reliability was good for the PHQ-4 ($\alpha = .85$) and acceptable to good for its subscale scores (PHQ-2: $\alpha = .81$; GAD-2: $\alpha = .77$). For the Spanish language group, internal consistency reliability was good for the PHQ-4 ($\alpha = .86$) and its subscale scores (PHQ-2: $\alpha = .80$; GAD-2: $\alpha = .82$).

MCFA Models

Preliminary analyses demonstrated that the data were significantly multivariately non-normal. Therefore, the Satorra-Bentler chi-square test statistic (S-B χ^2 ; Satorra & Bentler, 2001) was evaluated.

Configural invariance. The baseline configural invariance model demonstrated that the two-factor structure fit the observed data well for both language groups (Table 3). For the English language sample, all estimated unstandardized factor loadings for both the PHQ-2 (Item 1: 0.89; Item 2: 1.13, $p < .05$) and the GAD-2 (Item 1: 0.74; Item 2: 1.35, $p < .05$) subscales were statistically significant, as were the variances for both factors ($\sigma^2_{\text{PHQ-2}} = 0.35$, $\sigma^2_{\text{GAD-2}} = 0.29$, all $ps < .01$). The covariance between the two factors was also statistically significant ($r = .27$, $p < .01$), indicating that the two dimensions of psychological distress were positively related to one another.

For the Spanish language sample, all estimated unstandardized factor loadings for both the PHQ-2 (Item 1: 0.93; Item 2: 1.08, $p < .05$) and the GAD-2 (Item 1: 0.93; Item 2: 1.08, $p < .05$) subscales were statistically significant, and the factor variances for both factors were also significant ($\sigma^2_{\text{PHQ-2}} = 0.43$, $\sigma^2_{\text{GAD-2}} = 0.55$, all $ps < .01$). Furthermore, the covariance between the two factors was again statistically significant ($r = .41$, $p < .01$).

Metric invariance. The metric invariance model fit the data well (Table 3). When this model was statistically compared with the configural invariance model, the metric invariance model was a superior fit to the data ($\Delta S\text{-}B\chi^2 = 2.777$, $\Delta df = 2$, $p = .250$).

Factor variance/covariance invariance. This most restrictive model fit the data well. When this model was compared with the metric invariance model, the factor variance/covariance invariance model was the best fit to the data ($\Delta S\text{-}B\chi^2 = 2.785$, $\Delta df = 3$, $p = .426$).

Table 3. Fit Statistics for Configural Invariance, Metric Invariance, and Factor Variance/Covariance Invariance Models of the PHQ-4.

Model	S-B χ^2	df	p	CFI ^a	SRMR ^b	RMSEA ^b	Reference model number	$\Delta S\text{-}B\chi^2$	Δdf	Δp
1. Configural	20.590	4	<.01	0.966	0.035	0.138				
2. Metric	21.821	6	<.01	0.968	0.044	0.110	1	2.7774	2	.250
3. Factor	22.286	9	<.01	0.973	0.071	0.082	2	2.7851	3	.426

Note. PHQ-4 = Patient Health Questionnaire-4; S-B χ^2 = Satorra-Bentler chi-square test; CFI = comparative fit index; SRMR = standardized root mean square residual; RMSEA = root mean square error of approximation.

^aPlausible fit > .90, good fit > .95.

^bPlausible fit < .08, good fit < .05.

Construct Validity

As expected, there was a strong positive correlation between PHQ-4 total and subscale scores and scores on the PSS (PHQ-4: $r = .63, p < .01$; PHQ-2: $r = .57, p < .01$; GAD-2: $r = .60, p < .01$).

Discussion

These findings suggest that the PHQ-4 is a reliable and valid measure of psychological distress for use with English- and Spanish-speaking Hispanic Americans. Internal consistency reliability was strong. Results from the MCFA indicate that the PHQ-4 consists of two factors, one reflecting symptoms of anxiety and the other symptoms of depression. The MCFA indicated that the factor variance/covariance invariance model was the best fit to the data. Thus, these results suggest that the PHQ-4 can be used to measure the construct of psychological distress equivalently across English- and Spanish-speaking Hispanic Americans and that scores on the PHQ-4 can be compared across these language groups. In addition, higher PHQ-4 total and subscale scores were strongly associated with higher perceived stress, demonstrating construct validity.

These results should be interpreted while recognizing study limitations. The present sample did not include a large sample of participants with moderate or severe levels of distress. In addition, the sample was predominantly Mexican American and lived in a metropolitan border city, further limiting the generalizability of study findings. Despite these limitations, the results support the PHQ-4 as a good choice for researchers and health care professionals who wish to quickly screen for psychological distress in Hispanic Americans.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Tonya M. Pan is a doctoral student at the SDSU/UCSD Joint Doctoral Program in Clinical Psychology, specializing in behavioral medicine. Her research interests include exploring the psychosocial aspects of cancer survivorship among medically underserved communities; child, adolescent, and young adult cancer survivors; and family members/caregivers of people with cancer.

Vanessa L. Malcarne is a professor of psychology at San Diego State University, and core faculty in the SDSU/UCSD Joint Doctoral Program in Clinical Psychology. Her research focuses on chronic illness, including prevention, quality of life, and disparities. She is also interested in measure development and validation, especially across diverse groups. She received her PhD in clinical psychology from the University of Vermont.

Scott C. Roesch is a professor of psychology at San Diego State University, and core faculty in the SDSU/UCSD Joint Doctoral Program in Clinical Psychology. His research focuses on trait-state models of stress and coping, coping with physical illness, and cultural, ethnic, and acculturation differences in stress and coping. He is also interested in cross-ethnic measurement equivalence, structural equation modeling, and meta-analysis. He received his PhD in psychology from the University of Nebraska–Lincoln.

Georgia Robins Sadler is a professor of surgery at the UCSD School of Medicine and the associate director for Community Outreach at the UCSD Moores Cancer Center. Her research focuses on developing ways to reduce health disparities. Working through community-campus partnerships, her research is focused on creating and evaluating cost-effective strategies for addressing health disparities within the African American, Asian American and Pacific Islander, Hispanic American, and Deaf communities. She received her BSN from the University of Pennsylvania, her MBA from Wharton Graduate School, and her PhD from the Union Institute and University. She did her postgraduate work at the University of London while a Thouron British American Scholar.