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The Cultural Health Attributions Questionnaire (CHAQ): Reliability, Validity, and Refinement

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This study describes the reliability and validity of scores on the Cultural Health Attributions Questionnaire (CHAQ), and proposes a refined short form. Murguía, Zea, Reisen, and Peterson (2000) developed the 24-item CHAQ to assess health beliefs among Latinos/Hispanics. The CHAQ incorporates two 12-item subscales: Equity Attributions (EA) and Behavioral-Environmental Attributions (BEA). Although the CHAQ has been published in Spanish and English, psychometric properties have only been evaluated for scores on the Spanish-language version. Participants in the present study were 436 Latinos/Hispanics, half of whom completed the CHAQ in Spanish, and half in English. Multigroup confirmatory factor analysis indicated that the proposed two-factor structure did not fit the data for either language. Subsequent exploratory factor analyses revealed different best-fitting models for the two languages. A common two-factor (EA/BEA) structure was derived from items that loaded univocally in both languages. Additional items were removed to produce a 10-item revised version (CHAQ-R). The two factors were negatively correlated and had good internal consistency reliability. Expected relationships of CHAQ-R scores to acculturation and health locus of control strongly supported convergent validity. The relationship of EA to ethnomedical services usage marginally supported criterion validity. Overall, the results support the reliability and validity of CHAQ-R scores to measure cultural health attributions in Latinos/Hispanics, but further psychometric evaluation is needed.

Keywords: Latino, health beliefs, Cultural Health Attributions Questionnaire, psychometrics

Beliefs about illness can profoundly impact health-related behaviors and outcomes (Champion & Skinner, 2008), and culture strongly influences health beliefs (Caban & Walker, 2006; Landrine & Klonoff, 1992, 1994; Murguía, 2003; Rosal & Bodenlos, 2009; Vaughn, Jacquez, & Baker, 2009). Many ethnocultural groups attribute health outcomes to damaged interpersonal relations, supernatural causes, and spiritual/social influences, rather than behavior or environment (Caban & Walker, 2006; Edman & Kameoka, 1997; Landrine & Klonoff, 1992, 1994; Murdock, 1980; Vaughn et al., 2009; Wallace, Pomery, Latimer, Martinez, & Salovey, 2010). Such beliefs may, in turn, influence the treatment individuals pursue or their efforts to prevent illness (Dunn, Hodges, Sanchez, & Remling, 2005; Landrine & Klonoff, 1992; Latham & Calvillo, 2007).

The health beliefs of Latinos/Hispanics are particularly relevant, given the rapid expansion of this group in the United States. As of 2009, more than half of self-identified foreign-born Americans were of Hispanic origin (United States Census Bureau, 2010), and Latinos/Hispanics are now the nation's largest minority (United States Census Bureau, 2009). Latinos/Hispanics also accounted for more than 50% of U.S. population growth between 2000 and 2010 (Passel, Cohn, & Lopez, 2011). Latinos/Hispanics are at heightened risk for morbidity and mortality related to numerous chronic conditions (Alcalay, Alvarado, Balcazar, Newman, & Huerta, 1999; Murguía, 2003; Vega & Amaro, 1994; Williams & Rucker, 2000). Level and style of acculturation (Wallace et al., 2010), culturally influenced health beliefs (Landrine & Klonoff, 1992, 1994), demographic barriers (Andrulis, 1998), and external health locus of control (HLC; Murguía, 2003) have been identified as contributors to Latinos/Hispanics' health-related behaviors. These behaviors include delay of health care seeking despite illness (Garcés, Scarinci, & Harrison, 2006), fewer health care visits

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(Pleis, Ward, & Lucas, 2010), and less frequent screening (Borrayo et al., 2009). Such behaviors may increase the frequency with which Latinos/Hispanics develop chronic conditions, and of complications upon diagnosis (Murguía, 2003).

Culturally appropriate measurement of health beliefs is imperative to the understanding of how these beliefs relate to outcomes. This understanding can inform interventions that strengthen adaptive, and alter maladaptive, health beliefs among Latinos/Hispanics. To meet this need, Murguía, Zea, Reisen, and Peterson (2000) developed the Cultural Health Attributions Questionnaire (CHAQ), a self-report instrument that quantifiably assesses health attributions that affect behaviors among Latinos/Hispanics. The CHAQ was intended to identify equity attributions (EA) and behavioral-environmental attributions (BEA). Murguía et al. (2000) originally conceptualized a three-factor structure comprised of two forms of EA (i.e., Internal and Powerful Others) as well as BEA (Murguía et al., 2000). However, preliminary examination found the hypothesized Internal and Powerful Others EA factors collapsed into one. This resulted in the reconceptualization of a two-factor structure consisting of EA and BEA (Murguía et al., 2000). Follow-up analysis with a separate sample supported this structure (Murguía, 2003). Murguía et al. (2000) subsequently used only the EA and BEA factors as the two subscales of the CHAQ. The former of these reflects the belief that external forces punish people for behaviors inconsistent with community standards, and reward individuals who follow societal rules (Murguía, 2003). Conversely, BEA reflects behavioral cause and effect regarding health.

Murguía et al. (2000) examined how health attributions affect Latinos/Hispanics' utilization of ethnomedical approaches and/or Western medical techniques. Many Latinos/Hispanics use ethnomedical treatments (Applewhite, 1995; Caban & Walker, 2006; Gordon, 1994; Maduro, 1983; Tafur, Crowe, & Torres, 2009) instead of or in addition to the formal health care system. As ethnomedical healers may share the same religion- and/or culture-bound beliefs as Latino/Hispanic patients (Koss-Chioino, 1995), Murguía et al. (2000) posited that higher levels of culturally relevant health attributions would be related to increased ethnomedicine usage. Prior to the development of the CHAQ, health attributions were assessed indirectly via HLC scales or measures/proxies of acculturation (Murguía, 2003; Murguía et al., 2000). Although such assessments provide insight into Latino/Hispanic beliefs, they do not accurately reflect health attributions as conceptualized by Murguía et al. (2000). Therefore, a new measure was needed.

The CHAQ was developed with input from focus groups held with Latino/Hispanic faculty, students, and community members (Murguía et al., 2000), and consists of six vignettes labeled A through F. Each vignette assesses a health scenario (A: HIV; B: heart attack; C: premature birth, D: anxiety; E: good health; F: diabetes), and is followed by four possible causes/attributions, two representing EA and two representing BEA, to explain the outcome described in the vignette. A total of 24 attributions are assessed. For example, the first vignette describes an individual with HIV. EA response options attribute his diagnosis to poor parenting or punishment by God, whereas BEA response options attribute it to risky sexual practice or contagion from a sexual partner. Each of these attributions is rated on a 5-point scale ranging from *ningún efecto*/*no effect* to *mucho efecto*/*great effect*. Items evaluating EA are averaged, as are items evaluating BEA, resulting in two subscale scores. There is no total score. Higher scores indicate greater conviction in the type of attribution assessed.

The CHAQ scores (Murguía et al., 2000) were originally validated with data from 340 Spanish-speaking mixed-gender Latino/Hispanic community adults, 100 recruited in Washington, D.C., and 240 in Miami, Florida. A cross-validation (Murguía, 2003) study was conducted with 310 Spanish-speaking female Latina caregivers recruited from nonmedical, government-sponsored community settings in Miami. In the validation analysis (Murguía et al., 2000), subscale scores were not significantly correlated, demonstrating assessment of distinct constructs. This is why no total score for the CHAQ is generated. In the cross-validation study (Murguía, 2003), a strong negative correlation ($r = -.77$, $p < .01$) was found between EA and BEA scores; however, subscale scores were nonetheless computed separately (Murguía, 2003). CHAQ scores showed good internal consistency in both samples (validation: $\alpha_{EA} = .92$, $\alpha_{BEA} = .77$; Murguía et al., 2000; cross-validation: $\alpha_{EA} = .95$, $\alpha_{BEA} = .80$; Murguía, 2003). Results of the validation study supported criterion validity of CHAQ scores. Higher EA scores were associated with delay of health care seeking and more use of ethnomedical treatments, after controlling for age, gender, barriers to health care use, acculturation, education, and chance HLC (Murguía et al., 2000). Higher BEA scores were associated with less use of ethnomedical treatments after controlling for these covariates, although not with delay of health care seeking. Findings from the cross-validation further supported criterion validity of CHAQ scores, with higher EA scores predicting increased initial utilization of an ethnomedical provider and higher BEA scores predicting increased initial utilization of a medical provider (Murguía, 2003). Support was also found for convergent validity, with EA and BEA scores showing expected associations with acculturation and HLC in both studies (Murguía, 2003; Murguía et al., 2000).

The CHAQ was originally developed in Spanish and then translated into English via a back-translation process (Murguía et al., 2000). To date, only the psychometric properties of scores from the Spanish-language version have been evaluated, and only in the studies reported here. In order to affirm that scores from the English-language version function equivalently, their psychometric properties must be explored (Geisinger, 1992, 1994).

The present investigation examined the reliability and validity of scores from the Spanish- and English-language versions of the CHAQ. The study goals were to (a) evaluate the replicability of Murguía et al.'s (2000) two-factor structure in a Latino/Hispanic sample with a Spanish-language preference, (b) determine the generalizability of this factor structure to a Latino/Hispanic sample with an English-language preference, and (c) examine the reliability and validity of CHAQ scores derived from both language versions in a novel sample.

Method

Participants

Participants were a community sample of 436 self-identified Latinos/Hispanics (Spanish-language preference, $n = 226$; English-language preference, $n = 210$) recruited from San Diego,

California. Sample characteristics are described in Table 1. Men and women were represented equally, and the majority was of Mexican descent. Individuals were eligible if they self-identified as Latino/Hispanic, were currently residing in the United States, were at least 21 years old, and were capable of completing the survey. Approval for human subjects' research was obtained from all related institutional review boards prior to enrollment.

Measures

Cultural Health Attributions Questionnaire (CHAQ; Murguía et al., 2000). The CHAQ, as previously described, is a 24-item assessment of health attributions. For the current sample, Cronbach's alpha values for subscale scores, aggregated across languages, demonstrated adequate internal consistency (α_{EA} = .85, α_{BEA} = .73), as did scores for the Spanish-language version (α_{EA} = .83, α_{BEA} = .75). The internal consistency of scores for the English-language version was acceptable for the EA subscale (α = .86), but low for the BEA subscale (α = .63).

Validation measures. Validation constructs were selected to be as consistent as possible with those used in the validation (Murguía et al., 2000) and cross-validation (Murguía, 2003) studies. Acculturation, HLC, and ethnomedical services usage were assessed.

Brief Acculturation Scale for Hispanics (BASH; Norris, Ford, & Bova, 1996). Acculturation was assessed using the BASH, a four-item measure adapted from the Short Acculturation Scale for Hispanics (Marin, Sabogal, Marin, Otero-Sabogal, & Perez-Stable, 1987). It evaluates language preference as a proxy for acculturation, and participants rank each item on a scale from 1 (*only Spanish*) to 5 (*only English*). Items are averaged to create a total score, with higher scores indicating a preference for English and lower scores a preference for Spanish. Reliability and validity have been previously demonstrated in Latinos/Hispanics (Norris et al., 1996). Cronbach's alpha in the current sample demonstrated excellent internal consistency (full sample, α = .94; English-language preference subsample, α = .89; Spanish-language preference subsample, α = .90). See Table 2 for full sample and subsample means, standard deviations, and ranges for BASH scores.

Table 1
Participant Characteristics Stratified by Language Preference

Variable	Spanish (n = 226)	English (n = 210)
Age[a]	46.24 (13.37)	38.50 (13.74)
Gender[b]		
Female	112 (49.6%)	107 (51.0%)
Male	114 (50.4%)	103 (49.0%)
Employment status[b]		
Employed	105 (46.5%)	141 (67.1%)
Not employed	111 (49.1%)	59 (28.1%)
Don't know/missing	10 (4.4%)	10 (4.8%)
Marital status[b]		
Married	116 (51.3%)	95 (45.2%)
Not married	109 (48.2%)	115 (54.8%)
Don't know/missing	1 (0.5%)	0 (0.0%)
Country of birth[b]		
United States	31 (13.7%)	131 (62.4%)
Not United States	139 (61.5%)	61 (29.0%)
Don't know/missing	56 (24.8%)	18 (8.6%)
Education[b]		
Less than high school	108 (47.8%)	13 (6.2%)
High school/trade school	48 (21.2%)	39 (18.6%)
Some college/associate's degree	41 (18.2%)	81 (38.5%)
Bachelor's degree	17 (7.5%)	57 (27.1%)
Postgraduate	7 (3.1%)	18 (8.6%)
Don't know/missing	5 (2.2%)	2 (1.0%)
Annual household income[b]		
Less than $15,000	77 (34.1%)	37 (17.6%)
$15,000 to $34,999	75 (33.1%)	44 (20.9%)
$35,000 to $49,999	29 (12.8%)	39 (18.6%)
$50,000 to $75,000	11 (4.9%)	41 (19.5%)
More than $75,000	9 (4.0%)	34 (16.2%)
Don't know/missing	25 (11.1%)	15 (7.2%)

[a] = *M* (*SD*). [b] = *n*, %.

Multidimensional Health Locus of Control Scales (MHLC; Wallston, Wallston, & DeVellis, 1978; Wallston et al., 1999). The 24-item MHLC was used to evaluate Internal, Powerful Others, Chance, and God HLC. The four orthogonal subscales each consist of six items, which are ranked on a scale from 1 (*strongly disagree*) to 6 (*strongly agree*). Items on a subscale are summed to yield a subscale score; higher scores indicate stronger belief in the type of HLC evaluated. No total score is computed. Little is known about the psychometric properties of the MHLC scales in Latinos/Hispanics; however, they have frequently been used in prior research examining this population, such as the CHAQ validation and cross-validation studies (Murguía, 2003; Murguía et al., 2000). In the full sample for the present investigation, three scales showed adequate to good internal consistency (Internal, α = .72; Chance, α = .70; God, α = .86); Powerful Others was marginal (α = .66). This pattern was the same for the Spanish-language preference subsample (Internal, α = .72; Chance, α = .72; God, α = .81; Powerful Others, α = .65). For the English-language preference subsample, Internal (α = .72) and Chance (α = .69) showed adequate internal consistency, God showed very good internal consistency (α = .91), and Powerful Others remained marginal (α = .60). See Table 2 for full sample and subsample means, standard deviations, and ranges for MHLC scores.

Ethnomedical services usage. Participants were asked, "Have you ever been to a traditional healer like a *curandero*?" Response options included "yes," "no," and "don't know," and follow-up questions were asked regarding the time when the healer was seen, the country in which the healer was seen, the type of healer seen, the reason for going to the healer, and why the participant chose to go to a healer rather than a clinic or doctor. Individuals who answered "yes" to the initial question and/or provided a response to a follow-up question implying they had gone to a healer were considered to have used ethnomedical services. More nuanced use was not explored because few participants (n = 58) indicated that they had ever used ethnomedical services.

Procedure

As part of a larger study, participants completed written questionnaires in their preference of Spanish or English. A multifaceted recruitment strategy was employed, including flyer distribution, snowball sampling (Sadler, Lee, Lim, & Fullerton, 2010), and community outreach. Interested individuals contacted the research team to procure additional information and be prescreened for eligibility. A trained bilingual researcher met participants at a

Table 2
Descriptive Statistics for Subscales of the BASH and the MHLC Scales

Scale	Full sample		Spanish-language only		English-language only	
	M (*SD*)	Observed Min – Max	*M* (*SD*)	Observed Min – Max	*M* (*SD*)	Observed Min – Max
BASH	2.74 (1.22)	1 – 5	1.96 (.91)	1 – 5	4.57 (.93)	1 – 5
MHLC scales						
Internal	28.38 (5.67)	6 – 36	25.94 (6.24)	6 – 36	26.84 (4.98)	11 – 36
Chance	15.82 (5.97)	6 – 36	15.46 (6.52)	6 – 36	16.17 (5.37)	6 – 29
PO	21.41 (5.99)	6 – 36	23.51 (6.09)	6 – 36	19.19 (5.02)	6 – 32
God	14.27 (7.65)	6 – 36	14.56 (7.65)	6 – 36	13.98 (7.65)	6 – 36

Note. BASH = Brief Acculturation Scale for Hispanics; MHLC scales = Multidimensional Health Locus of Control scales; PO = Powerful Others.

mutually convenient location and reconfirmed eligibility. After obtaining written informed consent and determining the participants' preferred language, the researcher administered the pencil-and-paper questionnaires to each individual. On average, subjects took 2 hr to complete the packets and were given $75 as an incentive for their participation.

Data Analysis

Multigroup confirmatory factor analysis (CFA) was used to examine the structural equivalence of CHAQ scores (Murguía et al., 2000) for the Spanish- and English-language versions. Multigroup CFA involves the iterative examination of increasingly restrictive models to elucidate comparability of model fit across groups. CFA is commonly used to examine latent structure of observed data when there is a strong theoretical or empirical base indicating the expected structure a priori (Ullman, 2006). Given that Murguía et al. (2000) uncovered a two-factor solution in their first exploratory factor analysis (EFA), and found a similar solution in a subsequent EFA using data from a second sample (Murguía, 2003), a two-factor structure was specified in the present analysis. Overall model fit was determined using the recommendations of Bentler (2007). Multiple indicators of model fit were examined, including (a) the root mean square error of approximation (RMSEA; Steiger, 1990), a parsimony-adjusted index of overall model fit with values less than .08 indicating acceptable fit and values less than .05 indicating good fit; and (b) the standardized root mean residual (SRMR; Hu & Bentler, 1999), an absolute index of overall model fit with values less than .08 indicating acceptable fit and values less than .05 indicating good fit. The comparative fit index (CFI; Bentler, 1990) was not considered because the data analyzed are at the item level (Beauducel & Wittmann, 2005). The likelihood ratio χ^2 was also reported for completeness. It was not utilized as the sole indicator of model fit because it is highly influenced by sample size and does not demonstrate degree of fit (Gerbing & Anderson, 1993). Parameters were estimated using MLR estimation, which provides maximum likelihood parameter estimates with standard errors and a chi-square test statistic that is robust to non-normality and nonindependence of observations.

Subsequent to any finding that the original model was inconsistent across the two language versions of the CHAQ, separate EFAs were planned using data from each language group. Factors were retained if the variance accounted for by the solution rounded to ≥50%, the variance accounted for by each factor rounded to ≥10%, and the produced factors were meaningfully consistent with theory (Streiner, 1994). Parallel analysis, which compares eigenvalues generated by the present data to those that would be expected from random data, was also used to confirm the number of factors to be retained. To maximize practical significance and diminish multivocality, only items that had a primary loading ≥.45 and secondary loadings ≤.25 were retained (Clark & Watson, 1995; Floyd & Widaman, 1995; Tabachnick & Fidell, 2001; Worthington & Whittaker, 2006). Factors were extracted using maximum likelihood estimation, and a direct oblimin rotation was used to permit interfactor correlations, given the significant correlation found in Murguía's (2003) cross-validation study. For this study, confirmatory and exploratory factor analyses were conducted using Mplus version 6.1 (Muthén & Muthén, 2006).

Once factor structure was determined, coefficient alphas were calculated for each factor. Convergent validity was evaluated via bivariate correlations between CHAQ scores and BASH and MHLC scores. Because the BASH utilizes language as a proxy for acculturation, associations with this measure were only evaluated for the full sample. It was expected that higher EA scores would be associated with Spanish-language preference, lower BASH scores, and higher God and Chance HLC scores, and higher BEA scores would be associated with English-language preference, higher BASH scores, and higher Internal and Powerful Others HLC scores. Criterion validity was assessed using logistic regression to examine the relationship between CHAQ scores and ethnomedical services usage. Consistent with the validation study (Murguía et al., 2000), covariates included age, gender, acculturation, education, and chance HLC. Barriers to health care use was not included because this information was not available in the present study. It was expected that higher EA scores would be significantly related to increased ethnomedical services usage, and BEA scores would not. Reliability, convergent validity, and criterion validity of the CHAQ were evaluated using SPSS version 20.0 (IBM Corp., 2011).

Results

Preliminary Analysis

In the present analysis, language preference correlated with a number of other sociodemographic characteristics, as expected,

including education, employment status, country of origin, and age. As language preference is one of the most quickly and easily evaluated of these characteristics, it was used in the present analysis as a proxy for these correlates to characterize the two groups of participants.

Additionally, statistically significant multivariate skewness and kurtosis (all ps $< .01$) were found in the present data; therefore, the Satorra-Bentler Scaled chi-square (S-Bχ^2; Satorra & Bentler, 1988) was evaluated instead of a nonscaled chi-square test statistic.

Multigroup Confirmatory Factor Analysis of the CHAQ

For scores on the Spanish-language version, the baseline two-factor model did not fit well statistically (S-B $\chi^2[251, N = 226] = 613.88, p < .001$) or descriptively (RMSEA = .08, SRMR = .13). For scores on the English-language version, the baseline two-factor model did not fit well statistically (S-B $\chi^2[251, N = 210] = 529.69, p < .01$) or descriptively (RMSEA = .07, SRMR = .09). The originally hypothesized three-factor model was next evaluated, consisting of Internal EA, Powerful Others EA, and BEA. EA items were assigned to Internal or Powerful Others based on face validity. Scores on the Spanish-language version did not fit this model well statistically (S-B $\chi^2[249, N = 226] = 617.95, p < .01$) or descriptively (RMSEA = .08, SRMR = .13). Scores on the English-language version also did not fit this model well statistically (S-B $\chi^2[249, N = 210] = 527.05, p < .01$) or descriptively (RMSEA = .07, SRMR = .09). Therefore, because neither the published two-factor model nor the proposed three-factor model fit for either group (Murguía, 2003; Murguía et al., 2000), it was determined that the original model was inconsistent across languages and an exploratory approach was initiated.

Exploratory Factor Analyses of the CHAQ

Spanish version. For data from the Spanish-language version, EFA using a geomin-rotated matrix suggested a two-factor solution best explained the data. The variance explained by the solution was 57.9%. The two factors individually accounted for 40.2% and 17.7% of the variance, respectively. A parallel analysis also indicated that a two-factor solution best represented the data when eigenvalues from the target data set were compared with eigenvalues from randomly generated data: (a) Factor 1, 5.17 versus 0.60; and (b) Factor 2, 3.47 versus 0.73. Twelve items either did not load at ≥.45 onto either factor or loaded at >.25 onto both factors, and thus were removed. Therefore, 12 items were retained. Examining the items contributing to each factor led to the labeling of Factor 1 as Equity Attributions, and Factor 2 as Behavioral-Environmental Attributions, similar to Murguía et al.'s (2000) conceptualization. The correlation between the two factors was −.41 ($p < .05$). See Table 3 for specific item loadings and a

Table 3
Factor Loadings for the 12-Item Spanish Version and 17-Item English Version from the Exploratory Factor Analyses

Item	Spanish		English		
	Equity factor	Beh-Env factor	Equity factor	Beh-Env factor	Exp factor
Vignette A: HIV					
1. Punishment by others/God	.73	.05	.66	−<.01	−.13
2. Sexual contact	.07	.59	−.01	.61	.02
4. Left children	.73	−.12	.47	−.01	−.04
Vignette B: Heart attack					
1. Changed eating/activities	−.16	.62	−.04	.49	−<.01
2. Became better person	[a]	[a]	.48	.09	.12
3. God testing her	.56	.11	.76	.05	<.01
Vignette C: Premature birth					
1. Greedy and unhelpful	[a]	[a]	.73	.05	−.03
2. Smoked too much	−.01	.78	.03	.53	−.06
3. Justice for community treatment	.74	−.02	.70	−.02	.08
Vignette D: Anxiety/Mental health					
1. Did not want to associate	[a]	[a]	.10	−.01	.51
3. Feelings from past	[a]	[a]	−<.01	.17	.64
4. Dangerous neighborhood	[a]	[a]	−.01	.04	.59
Vignette E: Good health					
1. Deserved it because good	.78	.08	[a]	[a]	[a]
2. God looking out	[a]	[a]	.77	.01	−.02
4. Took good care	.05	.85	−.02	.57	.06
Vignette F: Diabetes					
1. Left family	.51	−.12	.61	−.03	.22
2. Uncontrolled diet	−.08	.77	.02	.51	−.03
3. Punishment	.63	−.10	.73	<.01	.04

Note. Beh-Env = Behavioral-Environmental; Exp = Experiential. All items are paraphrased. The following items were not retained in either final EFA because they did not load univocally in either language and were deleted from further consideration: A3, B4, C4, D2, E3, and F4.
[a] Item removed from the measure in that language.

breakdown of which of the 12 retained items contributed to which factor in Spanish.

English version. For data from the English-language version of the CHAQ, EFA using a geomin-rotated matrix for interpretation suggested a three-factor solution best explained the data. The variance explained by the solution was 49.8%. The three factors individually accounted for 26.8%, 13.2%, and 9.8% of the variance, respectively. A parallel analysis also indicated that a three-factor solution best represented the data when eigenvalues from the target data set were compared with eigenvalues from randomly generated data: (a) Factor 1, 4.95 versus 0.81; (b) Factor 2, 2.35 versus 0.70; (c) Factor 3, 1.12 versus 0.61. Seven items either did not load at ≥.45 onto any factor or loaded at >.25 onto multiple factors, and were removed. Therefore, 17 items were retained. Examining the items contributing to each factor led to the labeling of Factor 1 as Equity Attributions, Factor 2 as Behavioral-Environmental Attributions, and Factor 3 as Experiential Attributions. The correlation between Factors 1 and 2 was −.13 ($p = .36$), between Factors 2 and 3 was .05 ($p = .80$), and between Factors 1 and 3 was .06 ($p = .64$). See Table 3 for specific item loadings and a breakdown of which of the 17 retained items contributed to which factor in English.

Further Item Reduction of the CHAQ

Because the EFAs yielded nonequivalent measures in Spanish and English, further item reduction was conducted. Initially, only items that loaded univocally in both languages were retained. As none of the items loading onto the Experiential Attributions factor in English loaded univocally in Spanish, only two factors remained. They were renamed Equity Attributions (EA) and Behavioral-Environmental Attributions (BEA), to be consistent with the original measure (Murguía et al., 2000). Eleven items reflecting five of the six vignettes loaded onto these two factors in both languages. The sixth vignette (D: anxiety), which had no associated items that loaded univocally in both languages, was eliminated.

Of the five remaining vignettes, four were associated with at least two items, whereas one (E: good health) was only associated with a single remaining BEA item. Therefore, Vignette E and its related item were deleted because only one of the two types of attributions was assessed. This yielded a two-factor, 10-item measure that incorporated four of the original vignettes (A, B, C, and F). Of these 10 items, six loaded onto the EA factor and four onto the BEA factor. Vignettes A (HIV) and F (diabetes) were each followed by three items, two reflecting EA and one BEA, and vignettes B (heart attack) and C (premature birth) were each followed by two items, one reflecting EA and one BEA. The final revised version of the CHAQ (i.e., CHAQ-R) thus consisted of four health problem vignettes (A, B, C, and F) and 10 items.

Internal Consistency Reliability and Descriptive Statistics of the CHAQ-R

Cronbach's alpha values for revised subscale scores for the full sample, aggregated across languages, demonstrated adequate internal consistency ($\alpha_{EA} = .80$, $\alpha_{BEA} = .79$). The internal consistency of the scores on the Spanish-language version was also good for both subscales ($\alpha_{EA} = .78$, $\alpha_{BEA} = .79$). The internal consistency of the scores on the English-language version was good for the EA subscale ($\alpha = .81$) but low for the BEA subscale ($\alpha = .61$).

CHAQ-R item and subscale means, standard deviations, and ranges are presented in Table 4. Bivariate correlations demonstrated that EA and BEA scores were significantly and negatively correlated in the full sample ($r = -.27$, $p < .01$) and Spanish-language subsample ($r = -.32$, $p < .01$), but not in the English-language subsample ($r = -.10$, $p = .16$). An independent samples t test demonstrated that, as expected, mean EA and BEA scores differed significantly by language (EA: $t[399] = -2.00$, $p = .046$; BEA: $t[410] = 5.74$, $p < .01$). Examining subscale means showed that individuals who elected to take the survey in Spanish had significantly higher EA scores and significantly lower BEA scores than those who elected to do so in English (see Table 4).

Convergent Validity of the CHAQ-R

Correlations between the CHAQ-R subscale scores and scores on the convergent validity measures are presented in Table 5. In

Table 4
Descriptive Statistics for Items and Subscales of the CHAQ-R

	Full sample		Spanish-language only		English-language only	
Subscale	*M* (*SD*)	Observed Min – Max	*M* (*SD*)	Observed Min – Max	*M* (*SD*)	Observed Min – Max
EA	1.67 (.82)	1 – 5	1.76 (.87)	1 – 5	1.59 (.77)	1 – 4.83
A1	1.55 (1.16)	1 – 5	1.62 (1.27)	1 – 5	1.48 (1.02)	1 – 5
A4	1.42 (1.04)	1 – 5	1.52 (1.16)	1 – 5	1.32 (.90)	1 – 5
B3	2.39 (1.57)	1 – 5	2.71 (1.70)	1 – 5	2.06 (1.36)	1 – 5
C3	1.65 (1.16)	1 – 5	1.72 (1.25)	1 – 5	1.58 (1.07)	1 – 5
F1	1.70 (1.22)	1 – 5	1.73 (1.28)	1 – 5	1.68 (1.15)	1 – 5
F3	1.49 (0.95)	1 – 5	1.55 (1.03)	1 – 5	1.42 (.85)	1 – 5
BEA	4.75 (.60)	1 – 5	4.58 (.77)	1 – 5	4.91 (.25)	3.25 – 5
A2	4.76 (.77)	1 – 5	4.63 (.98)	1 – 5	4.90 (.42)	2 – 5
B1	4.76 (.78)	1 – 5	4.59 (1.02)	1 – 5	4.94 (.28)	3 – 5
C2	4.72 (.85)	1 – 5	4.53 (1.11)	1 – 5	4.93 (.32)	3 – 5
F2	4.65 (.82)	1 – 5	4.43 (1.02)	1 – 5	4.87 (.43)	1 – 5

Note. CHAQ-R = Cultural Health Attributions Questionnaire – Revised; EA = Equity Attributions; BEA = Behavioral-Environmental Attributions.

Table 5
Correlations Between the CHAQ-R and the Convergent Validity Measures

Measure	Full sample		Spanish-language only		English-language only	
	EA	BEA	EA	BEA	EA	BEA
BASH	−.04	.14**	—	—	—	—
MHLC scales						
Internal	−.06	.27**	.01	.29**	−.15*	.20**
PO5	.18**	−.10*	.18*	−.01	.12	−.03
Chance	.27**	−.15**	.38**	−.22**	.17*	−.10
God	.53**	−.17**	.50**	−.23**	.56**	−.07

Note. CHAQ-R = Cultural Health Attributions Questionnaire – Revised; EA = Equity Attributions; BEA = Behavioral-Environmental Attributions; MHLC scales = Multidimensional Health Locus of Control scales; PO = Powerful Others; BASH = Brief Acculturation Scale for Hispanics.
* $p < .05$. ** $p < .01$.

the full sample, as well as both subsamples, expected relationships were found between the revised EA scores and the Chance and God HLC scores. A nonhypothesized significant association was also found between EA scores and Powerful Others HLC scores in the full sample and the Spanish-language preference subsample, and with the Internal HLC scores in the English-language preference subsample. With regard to the revised BEA subscale, as predicted, scores were significantly correlated with BASH scores in the full sample, as well as Internal HLC scores in the full sample and both subsamples. Nonhypothesized significant correlations were also found between BEA scores and Chance, Powerful Others, and God HLC scores in the full sample and Spanish-language preference subsample.

Criterion Validity of the CHAQ-R

For the full sample, EA scores did not significantly predict ethnomedical services usage, although there was a strong trend in the expected direction ($OR = .63$, Wald $\chi^2 = 3.66$, $p = .056$). As predicted, BEA scores were not a significant predictor of ethnomedical services usage in the full sample. In both subsamples, neither EA nor BEA scores significantly predicted ethnomedical services usage (all ps $> .05$).

Discussion

A primary goal of the present study was to examine the replicability (in Spanish) and generalizability (in English) of the two-factor structure of CHAQ scores as described by Murguía et al. (2000). This structure was originally derived based on data from a Spanish-language sample and later cross-validated with data from a separate Spanish-language sample (Murguía, 2003). Thus, data from the English-language subsample in the current analysis were of particular interest, as the structural validity of the English-language version of the CHAQ had not been examined to date. A final aim of this analysis was to examine the reliability and validity of CHAQ scores in a new sample of Latino/Hispanic adults.

Multigroup CFA demonstrated the original two-factor structure of the CHAQ did not fit well for either language group. Follow-up EFAs demonstrated that 11 of the 24 items loaded univocally onto two comparable factors in both Spanish and English. None of these 11 items were associated with the only vignette that addressed mental health; therefore, this vignette (D: anxiety) was removed from the measure. This suggests that the attributions assessed by the CHAQ may be perceived as more relevant to physical than mental health.

Of the remaining five vignettes, four had at least two related items, whereas one (E: good health) was only associated with one remaining item assessing BEA. Therefore, because there was no associated EA item, this vignette was eliminated. Interestingly, this was the only vignette that did not discuss an ailment or recovery from illness, but rather exclusively addressed good health. This could indicate that the attributions assessed by the CHAQ may be more relevant to the spectrum of illness rather than health maintenance.

The refined CHAQ developed based on the present findings (i.e., CHAQ-R) consists of four illness-related vignettes: A: HIV; B: heart attack; C: premature birth; and F: diabetes. The CHAQ-R scores demonstrated acceptable internal consistency reliability in both the overall sample and the Spanish-language subsample. In the English-language subsample, the internal consistency reliability was good for the EA subscale but low for the BEA subscale. This is likely a function of the limited variability of BEA scores in this subsample ($\sigma^2 = .08$, $p = .24$). Additionally, Cronbach's alpha values are highly influenced by the number of items evaluated (Cortina, 1993), and in the CHAQ-R, the BEA subscale has only four items. Also of note, the original CHAQ's 12-item BEA subscale had similarly low internal consistency in the present sample ($\alpha = .63$), despite being three times longer, and the CHAQ-R EA and BEA scores were significantly correlated in the Spanish-language subsample and in the full sample, but not in the English-language subsample. Additionally, examining the variance of the BEA subscale stratified by education demonstrated diminishing variability as education increased, as well as a ceiling effect for those with the highest levels of education. Taken together, these results indicate that the English translation of the BEA subscale may need to be improved upon, or that this subscale may be problematic or inappropriate for more acculturated Latinos/Hispanics and those with higher levels of education. This concern should be addressed by qualitatively evaluating the translation, and developing additional vignettes and items to add to the CHAQ-R. Furthermore, consistent with prior research, an extreme response style was commonly encountered in the present data, with participants frequently endorsing response options 1 and 5 (Davis, Resnicow, & Couper, 2011). This was particularly encountered on the BEA subscale. Future research may benefit from exploring alternate response scales.

Convergent validity was supported by the relationships of CHAQ-R subscale scores to acculturation and HLC. Across the full sample, greater acculturation was associated with higher BEA scores, consistent with expectations and prior findings (Murguía, 2003; Murguía et al., 2000). Furthermore, significant differences were found between language groups on mean EA and BEA scores, as expected. For the full sample, as hypothesized, as God and Chance HLC increased so did EA scores, whereas the opposite was true for BEA scores. A significant positive association between BEA scores and Internal HLC was found as well, providing further support. Notably, Powerful Others HLC was found to have the opposite relationship with CHAQ-R scores as that found in prior analyses (Murguía, 2003; Murguía et al., 2000). However,

given the common conceptualization of Powerful Others HLC as a form of external HLC (Wallston, 2005), it logically follows that patterns of scores on this subscale were in harmony with the two other forms of external HLC (i.e., God and Chance). For the Spanish-language subsample, the positive associations of EA to God and Chance HLC scores, and the positive association between BEA and Internal HLC scores, provided additional support for convergent validity. Finally, in the English-language subsample the positive relationship between BEA and Internal HLC scores was also in accordance with expectations. Overall, these results were rather consistent with the findings of the validation (Murguía et al., 2000) and cross-validation (Murguía, 2003) studies, and provide support for the CHAQ-R scores' construct validity.

For the full sample, EA scores trended toward significance for predicting ethnomedical services usage, after controlling for relevant covariates. Although the original developers did find a statistically significant relationship (Murguía, 2003; Murguía et al., 2000), the strong trend observed in the present analysis suggests preliminary support for the criterion validity of the CHAQ-R scores. EA scores did not significantly predict ethnomedical services usage when the analysis was stratified by language. These results may be due to the low levels of self-reported ethnomedical services usage in the present sample, with only 13% of participants reporting they had ever gone to a healer. When split by language group, this proportion remained low (Spanish, 10.2%; English, 16.7%). Further studies employing samples with a higher proportion of ethnomedical services usage should be conducted prior to drawing any definitive conclusions regarding the criterion validity of the CHAQ-R scores. Additionally, future studies may benefit from consideration of other criterion variables, such as delay of health care seeking behavior as originally evaluated by Murguía et al. (2000). Such behavior may present more variably in the population and may be more directly relevant to health outcomes.

The primary distinction between the original CHAQ and the CHAQ-R is the number of items and number and type of vignettes retained. The CHAQ-R contains 10 rather than 24 items and four rather than six vignettes, and was developed in accordance with recommendations for short form creation (Smith, McCarthy, & Anderson, 2000). The CHAQ-R was derived from a well-developed and psychometrically sound measure (at least based on initial evidence presented for the Spanish version), the same two-factor structure that was published in the original form was retained in the revision, evidence of the validity of scores for each factor was provided, and because retained items contribute to the same factors as in the original version, it follows that the same content is covered by each factor in both versions of the CHAQ. Therefore, although this investigation did not support the structure of the original CHAQ, it can be argued that the CHAQ-R is a briefer, sharper version of this valuable instrument that preserves the theoretical foundation of the original. Furthermore, the CHAQ-R decreases the burden of the measure on respondents. This is particularly important in the medical setting, as longer surveys may lead to response fatigue, which can contribute to decreased accuracy of responses and more missing data (Choi & Pak, 2005). One notable caveat to the strength of the CHAQ-R is the reduction in internal consistency estimates due to fewer items, a common occurrence during the development of short forms (Smith et al., 2000).

These results must be interpreted within the context of study limitations. Predominantly, the CHAQ-R must be used with extreme caution until it can be cross-validated in additional, separate samples. Additionally, as the participants in this study were predominantly of Mexican descent and from a particular geographic region, the findings may not generalize to members of other Latino/Hispanic groups. Future cross-validation analyses examining samples comprised of members of varying Latino/Hispanic subgroups could help elucidate if the full CHAQ and the CHAQ-R function equivalently for varying subgroups. This would also clarify if the present short-form scale is a best fit for the predominantly Mexican American sample with which it was derived, but does not function well for other groups. Furthermore, the difference between EA scores on the Spanish- versus English-language versions of the CHAQ-R was only .17 on a 5-point scale, and that between BEA scores was .33. Thus, although significant group differences were found for mean EA and BEA scores, the values of those means were similar on a practical level. Additionally, the sample size was too small to permit use of the polychoric correlation matrix in the present analyses. Future investigation may benefit from using such an analytic approach, rather than a product-moment correlation or covariance matrix, given the ordinal nature of the CHAQ's response scale. It must additionally be noted that the BASH evaluates language as a proxy for acculturation, as do a great many of the acculturation scales commonly used with the Latino/Hispanic population (Thomson & Hoffman-Goetz, 2009). However, given that the two groups examined in this study were self-assigned based on language preference, it is possible that the associations found between the CHAQ-R and the BASH were confounded. Future research would greatly benefit from evaluating acculturation multidimensionally when examining it as a construct against which to measure the validity of the CHAQ-R. Lastly, the low rate of ethnomedical services utilization observed in the present sample may be due to limited access to such services, cultural differences among Latino/Hispanic subgroups, and/or acculturation. Future research can help clarify the relative impact of these and other factors on use of ethnomedical services.

Despite these limitations, the results provide a valuable contribution to the assessment of cultural health attributions among Latino/Hispanic adults. Further research is needed to confirm the structural validity of the Spanish- and English-language versions of the CHAQ-R. Future studies should be undertaken with Latino/Hispanic participants whose characteristics are different from those who participated in the current study to enable evaluation of the generalizability of the CHAQ-R findings. It will be especially important to examine these outcomes among Latinos/Hispanics with greater variability in CHAQ-R scores, given the somewhat limited range of responses in the current study.

In conclusion, Murguía et al. (2000) developed a useful measure for assessing cultural health attributions among Latino/Hispanic adults. As the original CHAQ developers argued, such attributions may impact health-related behaviors, and other commonly used assessments of health beliefs insufficiently incorporate many of the beliefs central to the Latino/Hispanic worldview. The present investigation originally set out to examine the replicability (in Spanish) and generalizability (in English) of the reliability and validity evidence provided for the original CHAQ. Ultimately, this analysis resulted in the development of the CHAQ-R, a briefer

derivation of the original measure. This short form retained the essential purpose of measuring EA and BEA as defined by Murguía et al. (2000), while reducing participant burden, thereby increasing the value of this measure when multiple assessment perspectives are necessary.

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