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Validation of the Asthma Illness Representation Scale–Spanish (AIRS-S®)

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Abstract

Background—To expand knowledge surrounding parental illness representations (IRs) of their children’s asthma, it is imperative that culturally appropriate survey instruments are developed and validated for use in clinical and research settings. The Asthma Illness Representation Scale (AIRS®) provides a structured assessment of the key components of asthma IRs, allowing the health care provider (HCP) to quickly identify areas of discordance with the professional model of asthma management. The English AIRS was developed and validated among a geographically and ethnically diverse sample. The authors present the validation results of the AIRS-S® (Spanish) from a sample of Mexican and Puerto Rican parents.

Methods—The AIRS was translated and back translated per approved methodologies. Factor analysis, internal reliability, external validity, and 2-week test-retest reliability (on a subsample) were carried out and results compared with the validated English version. Data were obtained from 80 Spanish-speaking Mexican and Puerto Rican parents of children with asthma. The sample was recruited from two school-based health centers and a free medical clinic in Phoenix, Arizona, and a hospital-based asthma clinic in Bronx, New York.

Results—The original Nature of Asthma Symptoms, Facts About Asthma, and Attitudes Towards Medication Use subscales emerged. Remaining factors were a mixture of items with no coherent or theoretical distinction between them. Interpretation of results is limited due to not meeting the minimum requirement of 5 observations/item. Cronbach’s alpha coefficients for the total score ($\alpha = .77$) and majority of subscales (α range = .53–.77) were acceptable and consistent with the English version. Parental reports of a positive relationship with the HCP significantly predicted AIRS scores congruent with the professional model; longer asthma duration was associated with beliefs aligned with the lay model; and AIRS scores congruent with the professional model were related to lower asthma severity. Stability in AIRS-S scores over 2 weeks was demonstrated.

Conclusions—The AIRS-S is a culturally appropriate instrument that can be used by HCPs to ascertain Spanish-speaking parents’ asthma illness beliefs and assess discordance with the professional model of asthma management. This information can be used by the HCP when discussing parent’s asthma management strategies for their children during clinical encounters.

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Declaration of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

Keywords

asthma; illness representation; Spanish; validation

Introduction

As management of asthma has incorporated more self-management strategies, it is important to understand how parents perceive their children's asthma so that effective communication regarding treatment expectations and symptom or disease resolution can occur. There is the potential to improve adherence to the prescribed medication regimens while remaining sensitive to the parents' ethno-medical beliefs. In order to elicit this information from parents of diverse ethnic backgrounds, valid, reliable, and culturally and linguistically appropriate survey instruments are needed that can be utilized in clinical and research settings. It is important that these instruments be disease-specific in order to capture illness and medication beliefs that may be unique to a particular disease.

The goal of this study was to develop and validate a linguistically equivalent and culturally appropriate Spanish version of the Asthma Illness Representation Scale (AIRS-S[®]). The analyses in the present study assess the psychometric properties of the AIRS-S and compare the results to those of the validated English version (1,2). Data for this study were obtained from a sample of Spanish-speaking Mexican and Puerto Rican families living in Phoenix, Arizona, and Bronx, New York, respectively.

Methods

Study Design

The data for these analyses ($N = 80$) were derived from two studies: (1) a pilot study that was designed to test the preliminary validity of the AIRS-S in Phoenix, Arizona, and (2) as part of a larger cross-sectional study on children's patterns of asthma symptom perception and parental health beliefs carried out in Bronx, New York.

Sample and Procedures

Phoenix Sample—The study sample consisted of 63 Spanish-speaking Mexican parents of 5- to 17-year-old children with asthma recruited from two school-based health centers and one free medical clinic in Phoenix, Arizona. Spirometry assessments were carried out on a subsample of 22 children from the school-based health centers at baseline and 2 weeks postbaseline. Parents of these children completed interviews at the same time periods to assess test-retest reliability. Parents and children were invited to participate in the study if they met the following criteria: (a) the child was 5 to 17 years of age; (b) the parent preferred to complete the AIRS in Spanish; and (c) the child carried a diagnosis of asthma (confirmed by chart review). The Arizona State University and Scottsdale Healthcare Institutional Review Boards approved the study protocol. All parents and children provided informed consent/assent prior to the interview and assessments.

Bronx Sample—Participants for this study were recruited from pediatric asthma/allergy and general pediatric clinics, and the emergency room at a public, city hospital. Parents and children were invited to participate in the study if they met the following inclusion criteria: (1) 7 to 15 years of age; (b) the parent preferred to complete the AIRS in Spanish; (c) the child had received a diagnosis of asthma, which was confirmed by medical chart review; and d) the child had experienced breathing problems in the past year. The adult informant was required to be a parent or caregiver of the child and must have lived with the child for at least 9 months out of

the past year. Children were excluded from the study for severe cognitive learning disabilities. The analysis sample from this site is comprised of 17 parents who completed the AIRS-S (Spanish) and their children who completed spirometry measures. The Institutional Review Board of Albert Einstein College of Medicine reviewed and approved this study and all parents provided informed consent for their and their child's participation and children provided verbal assent.

Measures

Asthma Illness Representation Scale—The 37-item Asthma Illness Representation Scale (AIRS) is comprised of five subscales (Nature of Asthma Symptoms, Facts About Asthma, Attitudes Towards Medication Use, Treatment Expectations, and Emotional Aspects of Medication Use) and a total score. This instrument is designed to identify barriers and risk factors for underutilization of controller medications that can be used in research and health care settings. The validation of the English version of the AIRS has been reported previously but will be briefly summarized here (1–3). The Cronbach's alpha for the total score is .82. AIRS scores were found to differ based on ethnicity, poverty, and education, and AIRS scores congruent with the professional model were found to be associated with a perception of less severe asthma, fewer reports of asthma and somatization symptoms, and a positive relationship with the health care provider. When necessary, items within each subscale are reverse scored so that higher values indicate closer alignment with the professional model for asthma management. The subscales and total score are calculated based on the mean of the nonmissing items.

Asthma Illness Representation Scale—Spanish (AIRS-S) Development

The Spanish translation and cultural adaptation of the AIRS-S was carried out in several phases. Phase I involved translation to Spanish by a certified bilingual translator. A second certified bilingual translator, blinded to the original English instrument, carried out the back-translation to English. Both of these translators were of Mexican origin. The Principal Investigator (PI; who is bilingual) compared the back-translated instrument to the original English version and identified only two questions where the quality of the translation was questionable. Revisions were made to the Spanish version to resolve these discrepancies. During Phase II, the original English version was provided to a bilingual translator of Puerto Rican origin for translation and to examine the translation for cultural equivalency between Mexican and Puerto Rican respondents. Based on these translations and comparisons, several additional revisions were made to the Spanish version. Phase III involved giving the AIRS-S to the clinic staff at each site and asking them to review the instrument for readability and comprehension based on the clients they serve. One final round of minor revisions was made. Phase IV was the validation of the final AIRS-S instrument in the Phoenix and Bronx study sites.

Sociodemographic Variables

Ethnicity—Parents self-identified their ethnic group as either Mexican or Puerto Rican.

Education—Parental education was reported as the years of completed education.

Variables for Examining External Validity

Parent–Health Care Provider Relationship—To assess the parent–health care provider (HCP) relationship, parents were asked 10 questions covering topics such as continuity of care provider, shared communication with the provider regarding worries about asthma and medications, understanding the impact of asthma on the child's and family's lives, and instructions about medication use. These items comprise section II of the AIRS-S and are not part of the total score. Questions are scored on a 5-point Likert-type scale, with responses

ranging from 1 (*strongly agree*) to 5 (*strongly disagree*). Several questions were reverse scored prior to aggregation so that higher scores represented a more favorable relationship with the HCP. The overall score was calculated as the mean of the nonmissing items. The English version of this subscale was developed and validated among an ethnically diverse sample (white, African American, and Puerto Rican) and has shown good internal reliability ($\alpha = .82$). This scale also significantly predicted illness representations congruent with the professional model (1,3,4).

Asthma Duration—We obtained information on how old the child was when his/her asthma was first diagnosed. Using the child's age at the time of the interview, illness duration was calculated by subtracting the age at diagnosis from the age at interview. This yielded the number of years, which was converted to months. There was one parent who reported age at diagnosis as "since birth." Asthma duration for this case was coded as 1 month.

Perception of Child's Asthma Symptom Severity—Parents were asked to classify, on a 5-point Likert-type scale, their interpretation of the severity of their child's asthma symptoms. Response ranged from 1 (*very mild*) to 5 (*very severe*).

Assessment of Asthma Severity—Per the National Asthma Education and Prevention Program (NAEPP) guidelines (5), a structured assessment of asthma severity was conducted for those children who were not currently on a daily controller medication. Components of severity assessed were nighttime awakenings, use of short-acting β_2 -agonist, activity limitations, and pulmonary lung function measures (forced expiratory volume in one second [FEV₁] and FEV₁/forced vital capacity [FVC] ratio). Children were classified as 1 (*intermittent*), 2 (*mild persistent*), 3 (*moderate persistent*), or 4 (*severe persistent*).

Assessment of Asthma Control—Per the NAEPP guidelines (5), a structured assessment of asthma control was conducted for those children who were currently on a daily controller medication. Components of asthma control assessed were nighttime awakenings, use of short-acting β_2 -agonist, activity limitations, and pulmonary lung function measures (FEV₁ or peak flow, and FEV₁/FVC). Level of control was classified as 1 (*well-controlled*), 2 (*not well-controlled*), and 3 (*very poorly controlled*).

Number of Acute Care Visits—The total number of acute clinic visits, emergency room visits, and hospitalizations in the past year were obtained from parent report for a subsample of 38 children

Spirometry Assessment—We completed spirometry assessments on 38 children (the free medical clinic in Phoenix does not have spirometry equipment). The NAEPP guidelines (5) suggest that the FEV₁/FVC percent predicted ratio is a more sensitive measure of severity in children and thus, we used this value in our examination of external validity.

Data Analysis

The psychometric properties of the AIRS-S instrument were analyzed using standard psychometric techniques (factor analysis, internal reliability, and external validity). For the factor analysis, a minimum eigenvalue of 1 was set and varimax rotation specified. Items were allowed to load only on one factor and factor loadings had to be $\geq .40$ to be included. Internal reliability was determined by examining the Cronbach's alpha coefficients and external validity through regression analyses with the measures of parental perception of asthma symptom severity, asthma duration, quality of the parent-HCP relationship, assessment of asthma severity and control, spirometry values, and acute care visits. Descriptive statistics (means and standard deviations) were computed for each subscale and the total score and compared (using

independent samples *t* tests) to those obtained from the original validation study. SAS v9.1 was used for all analyses.

Results

Participants

Table 1 below presents the demographic characteristics of the sample. Eighty-three percent of the parents were of Mexican origin and had completed an average of 9 years of education. The mean AIRS-S score of 2.9 indicates that their asthma illness representations are not strongly aligned with either the professional or lay model. The mean age of the children was 10 years, the average asthma duration was 64 months, and children averaged slightly more than $2\frac{1}{2}$ acute asthma visits in the past year. The mean FEV₁/FVC ratio was 0.82, indicating normal lung function, but 53% of parents classified their children's asthma as moderate or severe persistent and 75% reported not well-controlled or very poorly controlled asthma.

Psychometric Analyses

The original factor structure was not replicated. When forced to five factors, three of the original five factors did emerge: nature of asthma symptoms, facts about asthma, and attitudes towards medication use. The remaining two factors were a mixture of items which did not yield theoretically or conceptually relevant scales. Table 2 presents a comparison of the Cronbach's alpha coefficients between the original English and Spanish validation samples. With the exception of the nature of asthma symptoms and emotional aspects of medication use scales, the internal reliability results for the Spanish sample are acceptable and consistent with those from the English sample.

External Validity

In this study, reports of a more positive relationship with the HCP were associated with AIRS-S scores congruent with the professional model ($\beta = .22$, $SE = .06$, 95% CI = .10, .33, $p = .0002$). This is consistent with the results from the English validation study. Interestingly, asthma duration emerged as a significant predictor of AIRS-S scores in this sample, a finding that was not observed previously. Longer asthma duration was associated with AIRS-S scores congruent with the lay model ($\beta = 0.002$, $SE = .001$, 95% CI = $-.003$, $-.0002$, $p = .03$). AIRS-S scores aligned with the professional model were significantly associated with lower asthma severity ($\beta = -2.34$, $SE = .92$, 95% CI = -4.14 , $-.53$, $p = .008$ (Table 3)).

2-Week Test-Retest Reliability

A subsample of 22 parents completed a 2-week test-retest interview (Table 4). With the exception of attitudes towards medication use, there were no significant differences in the scores between assessment periods, indicating stability of the instrument.

t Test Differences in AIRS Scores Between English and Spanish Validation Samples

Table 5 highlights the differences between the original English and Spanish validation samples on the AIRS subscales and total scores based on independent sample *t* tests. With the exception of the Nature of Asthma Symptoms subscale, there were statistically significant differences between the English and Spanish parents' AIRS scores. The Spanish-speaking parents held asthma illness representations less congruent with the professional model than English-speaking parents. These findings are consistent with our previous results, which demonstrated that AIRS scores differed by ethnicity, with Latino parents' AIRS scores being more closely aligned with the lay model (1,2).

Limitations

There are several limitations to these analyses that need to be considered when interpreting these results. As stated earlier, the original factor structure was not replicated. This may have been the result of the small sample size and violation of the minimum criteria of five observations per item (6). When the factor solution was forced to five factors, three of the original factors did emerge.

We only had spirometry assessments and medical record visit data on 38 of the children. This may have led to the lack of a statistically significant relationship between the AIRS-S and FEV₁/FVC or number of acute asthma visits.

There were only 14 parents of Puerto Rican origin in this study, which precluded testing any differences between Mexican and Puerto Rican parents regarding their asthma illness representations (IRs). Examination of these differences is planned in a recently funded study of asthma IRs that will enroll 150 Mexican and 150 Puerto Rican parents.

Discussion

As the U.S. population continues to become more diverse, it is critical that research and clinical assessment instruments are developed and validated that not only measure the construct of interest but also are appropriate for the sample in which they are going to be used. To assume that an existing instrument can be used across multiple, diverse samples, even if in the same language, ignores the influence of ethnicity, gender, age, education, and other factors in how the respondent interprets the items of the instrument. It is important to understand the language used by the respondent to portray the construct and the meanings ascribed to the construct.

The results of this study demonstrated that the AIRS-S is a culturally appropriate instrument that can be used by HCPs and researchers to ascertain Spanish-speaking parents' asthma illness beliefs and assess discordance with the professional model of asthma management. The psychometric properties of the AIRS-S were similar to the English version and stability in scores was demonstrated over a 2-week period. The AIRS-S instrument discriminated children with differing levels of asthma symptom severity; parents holding beliefs congruent with the professional model had children less likely to have persistent symptoms.

In this study, longer asthma duration was associated with IRs congruent with the lay model, a finding not observed in our previous studies. It may be that parents start out with illness beliefs aligned with the professional model but, over time, as their child's symptoms have worsened or failed to resolve despite controller medication use, that they turn away from the traditional medical system and seek other alternatives. Beliefs aligned with the lay model were observed to lead to increased symptom severity, lending some support to this notion. Additional validation analyses and examination of changes in illness representations over time are planned as part of a larger, longitudinal study currently underway involving 600 Mexican and Puerto Rican parents, and their children with asthma.

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Table 1

Sociodemographic characteristics of the sample.

Characteristic	<i>N</i> (%)
Ethnic group	
Mexican	66 (82.5)
Puerto Rican	14 (17.5)
Child's asthma severity	
Mild intermittent	21 (37.5)
Mild persistent	21 (37.5)
Moderate persistent	12 (21.4)
Severe persistent	2 (3.6)
Child's asthma control	
Well-controlled	9 (25.0)
Not well-controlled	15 (41.7)
Very poorly controlled	12 (33.3)
	<i>M</i> (<i>SD</i>)
Parental education	8.99 (2.67)
Child's age	9.93 (3.05)
No. of acute asthma visits—past year	2.79 (2.71)
Asthma duration (months)	64.48 (44.35)
FEV ₁ /FVC	0.82 (0.13)
Total AIRS-S score	2.91 (0.30)

Table 2

Comparison of Cronbach's alpha coefficients between original English and Spanish validation samples.

	English α	Spanish α
Section I		
Attitudes Towards Medication Use	.83	.77
Treatment Expectations	.71	.66
Facts About Asthma	.54	.52
Nature of Asthma Symptoms	.62	.53
Emotional Aspects of Medication Use	.67	.30
Total AIRS score	.82	.77
Section II		
Parent–health care provider relationship	.82	.75

Table 3

External validity.

	β (SE)	95% CI	<i>p</i> value
Predictors of AIRS-S (<i>N</i> = 80)			
Parent-health care provider relationship	0.22 (.06)	0.10, 0.33	.0002
Parental perception of control	0.01 (.05)	−0.10, 0.11	.91
Asthma duration	−.002 (.001)	−0.003, −0.0002	.03
Maternal education	0.02 (.01)	−0.01, 0.04	.20
Outcomes predicted by AIRS-S			
Assessment of severity (<i>N</i> = 55) *	−2.34 (.92)	−4.14, −0.53	.01
Assessment of control (<i>N</i> = 35) *	−0.06 (1.02)	−2.06, 1.94	.95
No. acute asthma visits (<i>N</i> = 38)	1.33 (1.49)	−1.69, 4.36	.38
FEV ₁ /FVC (<i>N</i> = 38)	0.10 (.07)	−0.04, 0.23	.16

* Even though the NAEPP guidelines state that for children on daily controller medication only an assessment of control is done, there were children who had assessments of severity and control, thus leading to a sum greater than 80.

Table 4

2-Week test-retest reliability.

Scale	Mean difference (SD)	<i>t</i> value	95% CI	<i>p</i> value
Nature of Asthma	.10 (.73)	0.59	-.24, .44	.56
Facts About Asthma	.11 (.34)	1.47	-.05, .26	.16
Attitudes Towards Medication Use	-.27 (.56)	-2.21	-.52, -.01	.04
Treatment Expectations	-.03 (.46)	-0.24	-.25, .20	.81
Emotional Aspects of Medication Use	.39 (.85)	1.97	-.03, .80	.06
Total AIRS-S score	.03 (.26)	0.59	-.08, .15	.56
Parent-health care provider relationship	.06 (.55)	0.49	-.19, .31	.63

Table 5

Test for AIRS scores: English versus Spanish.

Scale	English (N = 334) Mean (SD)	Spanish (N = 80) Mean (SD)	Mean difference (SD)	t value	95% CI of mean difference	p value
Nature of Asthma Symptoms	2.96 (.68)	3.02 (.76)	.06 (.69)	.64	-.12, .23	.53
Facts About Asthma	3.89 (.39)	3.19 (.33)	-.70 (.38)	-14.86	-.80, -.61	<.0001
Attitudes Towards Medication Use	3.06 (.70)	2.68 (.60)	-.38 (.68)	-4.46	-.55, -.21	<.0001
Treatment Expectations	3.11 (.68)	2.82 (.42)	-.29 (.64)	-4.77	-.41, -.17	<.0001
Emotional Aspects of Medication Use	3.22 (.70)	2.63 (.76)	-.59 (.71)	-6.73	-.77, -.42	<.0001
Total AIRS-S score	3.33 (.41)	2.91 (.30)	-.42 (.39)	10.50	-.50, -.34	<.0001
Parent-health care provider relationship	4.05 (.53)	3.71 (.55)	-.34 (.54)	-5.14	.50, .58	<.0001