Psychometric Properties of Two Developmental Screening Instruments for Hispanic Children in the Philadelphia Region

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ABSTRACT

OBJECTIVE: To assess the validity of Spanish versions of the Survey of Well-being of Young Children (SWYC) Milestones and the Ages & Stages Questionnaire, Third Edition (ASQ-3), and to document the rates of developmental delays in an urban cohort of children with Hispanic parents.

METHODS: Spanish-speaking families with a child 9 to 60 months of age (N = 991) were initially screened using Spanish translations of the SWYC Milestones and the ASQ-3. A stratified random sample of 494 of these children subsequently received standardized clinical assessment to confirm the presence of developmental delays. Reverse weighting corrected for the selection bias inherent in the stratification scheme.

RESULTS: Fifty-five percent of toddlers (9 to 41 months of age) and 34.8% of preschoolers (42 to 60 months of age) scored in the moderately to severely delayed range, most frequently in language. Sensitivity and specificity for toddlers with severe delays associated with the SWYC were 0.69 and 0.64, respectively, and 0.55 and 0.75 for the ASQ-3. Sensitivity and specificity for preschoolers with severe delays associated with the SWYC were 0.87 and 0.58, respectively, and 0.71 and 0.86 for the ASQ-3.

CONCLUSIONS: Although psychometric properties of the Spanish translated versions are not as strong as the English versions, the findings suggest that both the SWYC Milestones and ASQ-3 represent promising tools for identifying Hispanic children with developmental delays. The rate of delays were consistent with other studies showing a high percentage of Hispanic children with developmental delays, most frequently in language skills.

KEYWORDS: Ages & Stages Questionnaire; developmental screening; Hispanic; language; Survey of Well-being of Young Children

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WHAT'S NEW

This study provides additional evidence of the occurrence of language delays in children of Hispanic families and is the first study to document and compare the sensitivity and specificity of Spanish translations of the Survey of Well-being of Young Children and Ages & Stages Questionnaire, Third Edition, using clinical assessments.

THE HISPANIC POPULATION is expected to reach 30% of the total US population within the next decade.[1] Currently, approximately 17% of Hispanic children, most of them born in the United States, are under 5 years of age.[1] It has been shown that children of Spanish-speaking families are at higher risk for early developmental delays compared to the general population,[2] which may account for poorer academic performance in school.[3,4] The reasons for developmental delays and school failure in this population are not fully understood but are attributable, in part, to the risk factors associated with family poverty, social isolation, segregation, limited exposure to both their home language of Spanish and to English and English-speaking proficiency, and limited participation in high-quality preschool education in the formative years.[3−5]

Early identification of developmental delays through screening is an important first step toward providing children with appropriate interventions and services, which have been shown to prevent failure in school environments.[5] Unfortunately, developmentally delayed children of Spanish-speaking families are more likely to be underidentified, and opportunities to link these children to early

intervention services are often missed.[6–9] Few Hispanic children under the age of 3 years receive child care in formal, out-of-home settings.[10] Consequently, health care providers are the primary professionals to have continuous contact with these young children. The American Academy of Pediatrics mandates that pediatric care providers screen for developmental delays at 9, 18, 24, and/or 30 months of age for all children,[11] but they face challenges when screening children of Spanish-speaking families.[5,6,8,12]

Among those challenges is limited access to Spanish-translated screening instruments that are validated and easy to administer. Although care has been taken to provide Spanish-translated versions of several common screening instruments, the normative data needed to update scoring algorithms have not yet been collected in Spanish; thus, adequate evidence for their validity is lacking.[13] Two instruments—the Ages & Stages Questionnaire, Third Edition (ASQ-3),[14] and the Survey of Well-being of Young Children (SWYC) Milestones[15]—are the focus of this study and were selected from other parent report developmental screeners because they are both commonly used in the Philadelphia region by child care centers, the Early Intervention Program, and a large health care provider. In this study, data from clinical evaluations conducted in a large cohort of children who had been screened at multiple community settings in the Philadelphia region were used to 1) assess the key psychometric properties of the Spanish versions of the SWYC Milestones and the ASQ-3, and 2) document the rates of developmental delays in Hispanic children ages 9 to 60 months.

METHODS

STUDY DESIGN AND SAMPLE

The current study was part of the larger KiDSS Project conducted by Children's Hospital of Philadelphia involving comprehensive screening and follow-up clinical evaluations of Hispanic children ages 9 to 60 months of age. Behavioral problems, autism, and developmental delays were evaluated. Findings presented here are limited to those pertaining to developmental screening.

KiDSS participants were recruited between October 2013 and August 2016 from 8 Hispanic community center sites, 4 health care centers, 1 Women, Infants, and Children food and nutrition service office, and several early childhood learning centers located in greater Philadelphia.

A total of 1297 families were approached; of these, 1205 were screened for eligibility, and 1070 were eligible to participate. A family was eligible if the child was 9 months to 60 months of age and had no known significant hearing or visual impairment and if Spanish was the primary language spoken at home. Of those eligible, 991 were consented and enrolled in the study (Figure). One parent/guardian in each enrolled family completed the ASQ-3 and the SWYC Milestones. A face-to-face interview, with one parent/guardian in each enrolled family, was conducted to complete the ASQ-3, the SWYC Milestones, and a sociodemographic questionnaire. All items for both screeners and the questionnaire were read to parents in Spanish by a research assistant who had been trained to present the questions in an unbiased manner. The order in which the screeners were presented was randomly assigned.

A stratified random sampling procedure was employed to select a subset of children for follow-up clinical evaluations. Sampling was used to manage costs and time associated with the clinical evaluations. The initial goal for the project was to complete 500 clinical evaluations, accounting for attrition. In the end, a total of 577 of the 991 children whose parents completed the developmental screeners were selected for clinical evaluation; of those, 83 (14%) were lost to follow-up, resulting in 494 completed clinical evaluations (Figure). The study design was planned to randomly select 75% of children who failed 2 or more of the screener instruments, 50% of those who failed only 1 screener, and 25% who failed none to complete a clinical standardized assessment. Random selection for clinical evaluation was determined prior to screening and unknown to staff until screening was completed. The final sample size of infants and children who completed clinical assessment was 494. Of the 494, 263 (77.5%) had failed 2 or more screeners, 119 (49.2%) failed 1 screener, and 112 (26.8%) failed none.

QUALITY CONTROL AND MEASUREMENT

Recruitment, determination of eligibility, consenting, and screening of all participants were performed by bilingual staff. The items of the SWYC and ASQ-3 were read to all participants in order to accommodate for the possibility of low literacy. Children were clinically assessed in their primary language. A child's primary language for conducting assessments was initially determined by parental report and confirmed by the child's preferred language for responding to test items. Code switching was allowed during test administration, consistent with a conceptual scoring approach where correct responses are accepted regardless of the language.

Consistent with the fact that Spanish was the primary language spoken at home for all families, most of the assessments for the younger children (less than 43 months of age) were administered either entirely (86%) or mostly (12%) in Spanish. The majority of the assessments for the older children (43 to 60 months) were also administered either entirely (62%) or mostly (26%) in Spanish. All clinical assessments were scheduled to occur no later than 60 days following completion of the screeners and were conducted on site by trained bilingual clinicians under the supervision of a non-bilingual psychologist at Children's Hospital of Philadelphia. In many cases, the assessment took place on the same day. Inter-rater reliability was established prior to any study visit and checked periodically. To avoid bias toward any desired outcomes, those conducting assessments were masked to the results of the initial screening process, both in the aggregate and for each individual child.

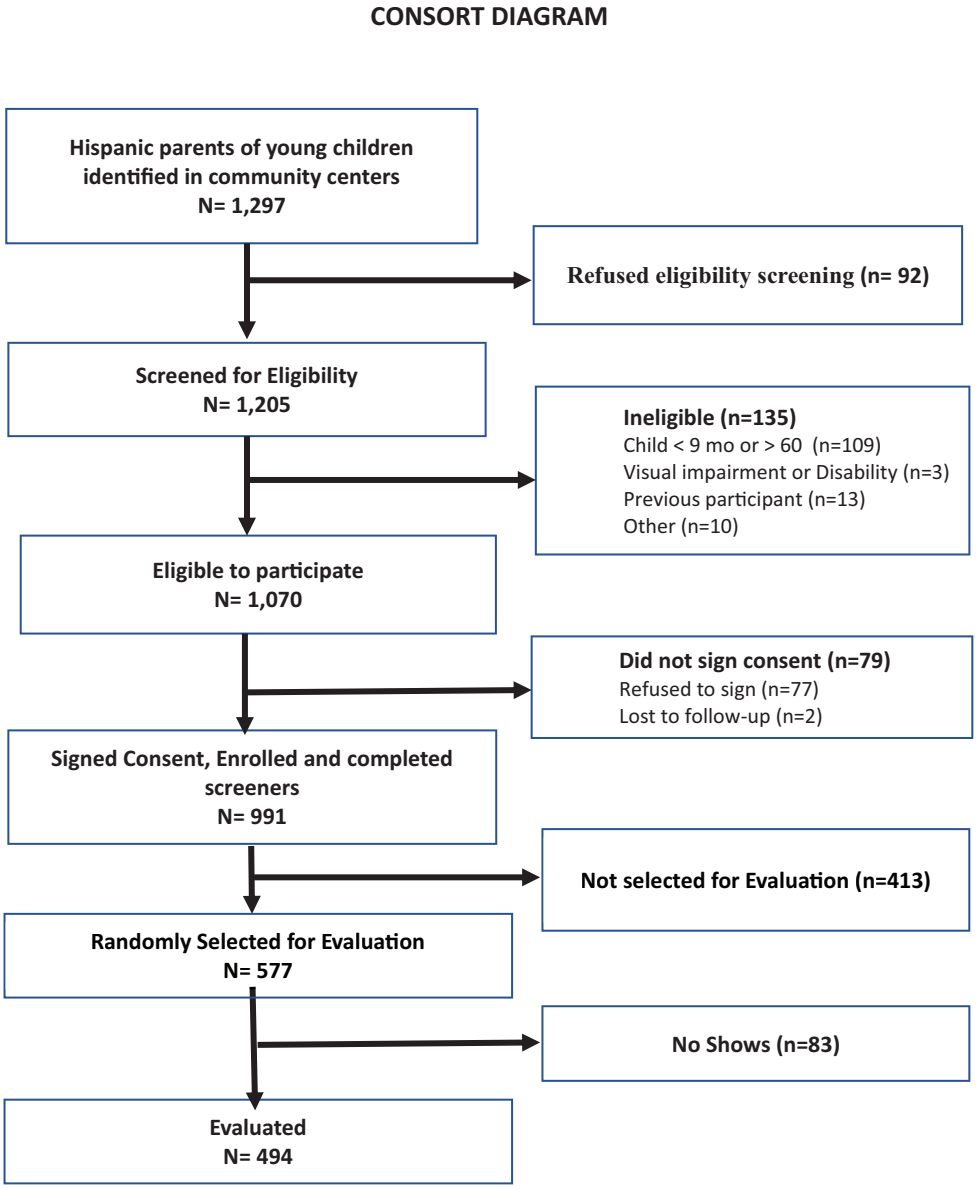

Figure. *Consort diagram.*

Developmental Delays

ASQ-3[14] and the SWYC Milestones[15] were selected as developmental screening tools for this study because each is in use in the Philadelphia region, has a Spanish translated version, was developed independently, and includes items of the same constructs of problem solving, communication, motor, and adaptive domains. The Spanish version of the ASQ-3 was obtained from the publisher and is a 30-item parent report measure that yields scores in 5 domains: communication, gross motor, fine motor, problem solving, and personal-social. The ASQ-3 is in the private domain and offers both paper versions and electronic versions at a cost per use. The SWYC is comprised of developmental, autism, and behavioral screeners. The SWYC Milestones, a 10-item parent report measure of development, has items covering the same constructs as the ASQ-3 and yields a single score. The SWYC Milestones are in the public domain and offer both a paper and electronic version at no cost. Both tools asked parents to indicate for each item whether their child showed the developmental skill—yes, sometimes, not yet (ASQ-3); not yet, sometimes, does it a lot (SWYC Milestones). Because the existing Spanish version of the SWYC Milestones was only recently created, it was reviewed and updated by the study team in strict conformance with the guidelines for translation established by the World Health Organization[16] and with approval from the original SWYC developers.

For the clinical evaluations, the Bayley Scales of Infant and Toddler Development, Third Edition (BSID-III),[17] was administered to identify developmental delays in children ages 9 months to 41 months, including the language, cognitive, and motor subscales. A translated version of the BSID-III used in previous research studies was used. The Spanish edition of the Differential Ability Scales, Second Edition (DAS-II),[18] provided by publisher,

Table 1. Sociodemographic Characteristics of Study Sample (N = 494)

	n	Percent
Children		
Toddlers, 9–42 mo	360	72.9%
Toddler subgroups		
9–18 mo	136	37.8%
19–30 mo	113	31.4%
31–41 mo	111	30.8%
Preschoolers, 42–60 mo	134	27.1%
Sex: Male	251	50.8%
Mothers*	494	
Maternal education	494	
Less than high school	...	47.9%
High school	...	25.8%
Beyond high school	494	26.3%
Married/living as married	482	75.7%
Household income		
< $15,000	...	35.5%
$15,000–$25,000	...	25.1%
$25,000–$35,000	...	11.4%
> $35,000	...	8.7%
Not stated	...	19.3%
Speaks English	489	
Very well	...	11.4%
Well	...	11.5%
Little or not at all	...	77.1%
Born in United States	494	4.0%
Country of birth, if foreign born		
Mexico	...	51.1%
Central America	...	14.1%
Cuba/Caribbean	...	11.8%
Puerto Rico	...	11.5%
South America	...	7.8%
Other/unknown	...	3.7%

*Maternal age, mean (SD) = 30.3 y (8.7).

was administered to identify developmental delays in children 42 months to 60 months of age. The verbal ability, nonverbal ability, spatial ability, general conceptual ability (GCA), and special nonverbal composite standard scores were used. At the time that the study was conducted, both of these measures were regarded to be the best of what was available to identify or confirm developmental and behavioral disorders in young children, including those from Spanish-speaking families. This larger study and its components were supported by Pennsylvania Department of Health and approved by the institutional review board at Children's Hospital of Philadelphia.

Statistical Analysis

The statistical analysis plan was to describe the study sample, document the frequency of developmental delays as a result of the clinical evaluations, and calculate the key psychometric properties (sensitivity, specificity, and negative and positive predictive values) associated with both screening instruments. Data obtained from the maternal survey were used to describe the study sample, as well as to determine if those lost to follow-up for clinical evaluation (n = 83) differed from those who were evaluated (n = 494), by using *t*-tests or Wilcoxon tests for continuous variables and chi-square or Fisher's exact tests for categorical variables.

The SWYC Milestones and ASQ-3 screening instruments were scored and categorized as positive or negative based on published guidelines. Scores for children in the cohort were used to create 3 mutually exclusive categories indicating the presence of a delay. Children were classified as having a "severe" delay if the score was ≥ 2 standard deviations (SD) below the mean, a "moderate" delay if the score was ≥ 1.5 SD below the mean (but not in the "severe" range), and a "mild" delay if the score was > 1 SD below the mean (but in neither the "severe" or "moderate" range). Both the BSID-III and DAS-II yield scores that are standardized based on national norms with a mean of 100 and standard deviation of 15; hence, results from the study cohort can be contrasted with those for US children, for whom 2.3%, 4.4%, and 9.2% have severe, moderate, or mild delays, respectively.

All percentages documenting the frequency of confirmed delays (Table 2), as well as the psychometric measures pertaining to each of the screening instruments (Table 3), were calculated using the standard weighting procedure which adjusts for any biases inherent in stratified random sample designs as described above. Specifically, weights equal to the inverse of the sampling fractions employed to randomly select the 494 children receiving clinical evaluation (from the larger pool of those who were screened; N = 991) were applied when calculating all rates of delay, as well as the sensitivity, specificity, and positive and negative predictive values presented here.

Results

Description of the Study Sample

Sociodemographic characteristics of the study sample are presented in Table 1. Preliminary analyses revealed no significant differences in these characteristics between the 494 families who were selected for and received clinical assessments and those who were selected but could not be reached for the follow-up clinical assessment (n = 83) (data not shown).

Of the 494 children who were clinically evaluated, 71.6% were between 9 and 41 months of age (toddler group: 136 within 9 to 18 months, 113 within 19 to 30 months, 111 within 31 to 42 months), and 28.4% (n = 134) were between 43 and 60 months of age (preschool group). The mean maternal age was 30.3 years. The mean (SD) of days between visit 1 and visit 2 was 11.1 days (range, 0 to 61 days). Most mothers were married or living as married (75.7%), and almost half never completed high school (47.9%). The families were poor, with annual incomes less than $15,000 (34.3%) or between $15,000 and $25,000 (24.3%). Seventy-five percent reported that they either spoke little or no English. Only 4% of the mothers were born in the continental United States, with the majority reporting having migrated from either Mexico (51.1%) or Central America (14.1%).

Table 2. Developmental Concerns by Clinical Severity and Domain

		Delay Severity			
Age Group	**Domain**	**Mild (77.5 to 85)**	**Moderate (70 to 77.4)**	**Severe (< 70)**	**Mean (SD)**
Toddler, 9–41 mo (N = 360)	Any domain	20.6%	21.0%	17.0%	88.1 (8.7)
	Communication	16.7%	20.3%	16.0%	80.7 (12.6)
	Cognitive	11.8%	5.3%	2.2%	90.4 (11.3)
	Motor skills	10.2%	3.5%	0.9%	92.9 (10.5)
Toddler subgroups					
9–18 mo (n = 136)	Communication	20.1%	22.7%	13.3%	81.3 (11.7)
	Cognitive	7.6%	1.4%	2.9%	95.8 (13.0)
	Motor skills	11.4%	7.0%	1.4%	91.0 (11.7)
19–30 mo (n = 113)	Communication	12.4%	20.0%	26.3%	76.4 (13.3)
	Cognitive	13.7%	9.6%	2.6%	88.2 (10.3)
	Motor skills	8.4%	1.1%	1.2%	93.8 (10.5)
31–41 mo (n = 111)	Communication	15.9%	17.5%	8.3%	84.4 (11.6)
	Cognitive	15.3%	6.0%	0.6%	86.0 (6.3)
	Motor skills	10.6%	1.2%	0.1%	94.2 (8.6)
Preschoolers, 42–60 mo (N = 134)	Any domain	14.3%	5.2%	9.8%	94.7 (15.2)
	Verbal ability	15.0%	6.5%	7.6%	88.3 (16.4)
	Nonverbal reasoning	7.7%	6.7%	3.0%	95.1 (15.8)
	Spatial ability	5.2%	6.5%	2.2%	99.6 (17.5)

SD indicates standard deviation.

Clinical Assessment

Both toddlers and preschoolers in the study receiving clinical evaluation were classified as having a mild, moderate, or severe delay, based on the standardized scores from the respective instruments developed to assess each of those age groups. Results of the clinical evaluations for toddlers, toddler subgroups, and preschoolers are presented in Table 2. Among all toddlers, 20.6%, 21.0%, and 17% were assessed as scoring in the mild, moderate, or severe delay range, respectively, in one or more of the communication, cognitive, or motor skills domains of the BSID-III. Delay in the communication domain, especially moderate and severe, was disproportionately present and most frequent in toddler ages 19 to 30 months. Among preschool children, 13.3%, 15.2%, and 9.8% were assessed as scoring in the mild, moderate, or severe delay range, respectively, in one or more of the verbal ability, non-verbal reasoning, or spatial ability domains of the DAS-II. Consistent with the findings for toddlers in the study, low scores were associated with language-related skills (verbal reasoning domain) and accounted for a disproportionate share of the identified delays.

Mean values presented in the last column of Table 2 reveal below-average scores for both toddlers and preschoolers, aggregated across all domains and within subdomains, and comparatively lower values for toddlers

Table 3. Psychometric Properties of SWYC Milestones and ASQ-3 for Developmental Delays by Age of Child and Clinical Severity

	Clinical Severity							
	Moderate or Severe (1.5 or more SD below mean ≤ 77.5)				Severe (2 SD or more below mean ≤ 70)			
Age Group	**Sensitivity**	**Specificity**	**PPV**	**NPV**	**Sensitivity**	**Specificity**	**PPV**	**NPV**
Toddlers, 9–41 mo								
SWYC milestones	0.59	0.69	0.54	0.73	0.69	0.64	0.28	0.91
ASQ	0.43	0.78	0.54	0.69	0.55	0.75	0.31	0.89
Toddler subgroups								
9–18 mo								
SWYC milestones	0.43	0.73	0.50	0.67	0.49	0.69	0.22	0.89
ASQ	0.32	0.73	0.43	0.63	0.40	0.73	0.21	0.88
19–30 mo								
SWYC milestones	0.67	0.75	0.771	0.72	0.80	0.69	0.49	0.90
ASQ	0.53	0.91	0.83	0.68	0.68	0.84	0.62	0.87
31–41 mo								
SWYC milestones	0.76	0.61	0.41	0.87	0.79	0.54	0.14	0.96
ASQ	0.44	0.74	0.38	0.78	0.43	0.71	0.12	0.93
Preschoolers, 42–60 mo								
SWYC milestones	0.67	0.62	0.38	0.85	0.87	0.59	0.19	0.98
ASQ	0.54	0.91	0.67	0.85	0.71	0.85	0.35	0.96

SWYC indicates Survey of Well-being of Young Children; ASQ, Ages & Stages Questionnaire; PPV, positive predicted value; NPV, negative predicted value; SD, standard deviation.

(80.7) in the communication domain and preschoolers in the verbal ability domain (88.3).

Among Hispanic toddlers, at all levels of severity, the percentage with delays in the communication domain was well above national norms. A similar pattern emerged for preschoolers with regard to verbal ability scales. For toddlers, the percentage with severe delays on the communication domain (16.0%) is 7 times the national norm of 2.3%. The peak age group for delays in the communication domain was 19 to 30 months. Similarly, among preschoolers, the percentage with severe delays on the verbal ability subscale (7.6%) was more than 3 times greater than the norm.

PSYCHOMETRICS OF DEVELOPMENTAL SCREENERS

The sensitivity, specificity, positive predictive value, and negative predictive value of the SWYC Milestones and ASQ-3 for toddlers, toddler subgroups, and preschool groups are presented in Table 3. Sensitivity values for both screeners were higher for the preschool group than for the total toddler group, especially those associated with severe as opposed to moderate to severe delays. Among children identified with severe delays, the sensitivity of the SWYC Milestones was 0.69 for toddlers and 0.87 for preschoolers. Comparable figures for the ASQ-3 were 0.55 among toddlers and 0.71 among preschoolers. Among toddlers, sensitivity for severe delays was best for those 19 to 30 months of age for the SWYC Milestones (0.80). Psychometric properties were lowest in the 9 to 18 months group for both instruments. For both instruments, positive predictive values were low and negative predictive values were high, indicating a very high percentage of false positives.

DISCUSSION

Demographic shifts in the US population are reflected in the increasing number of Hispanic children entering childcare centers and Head Start programs. Hispanic children now represent the most rapidly growing subgroup of the US school population.[19] Researchers and educators have become increasingly aware of the unique challenges that English language learners face.

Most of what is known about the scope and nature of the developmental status, progress, and prognosis of Hispanic children in the United States[20–22] is based on studies conducted on children already in school. In our study of the psychometric properties of 2 developmental screening instruments, we documented the rate of developmental delays in a cohort of Hispanic toddlers (age 9 to 41 months) and preschool children (age 42 to 60 months) through evaluations conducted in a major urban children's hospital. The findings indicated that developmental delays appeared quite frequently, far exceeding national norms. Although a lack of availability of strongly validated clinical assessment tools may lessen the true accuracy or degree of delays, these findings are consistent with previous studies.[23–25] We found that delays associated with communication and language were the most pronounced for both toddlers and preschool children. Moreover, the percentage of children identified with severe delays was about 7 times higher and more than 3 times higher for toddlers and preschoolers, respectively, than all children in the United States.

These findings serve to underscore the need for early and routine screening for developmental delays among Hispanic children. There is convincing evidence that early interventions mitigate risks and improve outcomes, not only for children in general but also for Hispanic children in particular.[2] Moreover, identifying language delays early in a child's life and in the child's primary language is key, as competence in the primary language also plays an important role in the acquisition of the second language.[26–28]

Improved screening practices by pediatric providers represent an important step toward identifying children at the right time and reducing missed opportunities for referral to appropriate services and interventions. Unfortunately, providers who care for Hispanic children often face challenges inherent in any attempt to screen all or even most of the children they see. One challenge is imperfect knowledge about the accuracy associated with the available translated screening instruments.

This study took an initial step to systematically validate two translated developmental screeners for use with Spanish-speaking populations in the United States. Specifically, the results of clinical evaluations conducted as part of the KiDSS Project to calculate the sensitivity, specificity, positive predictive value, and negative predictive value of two such instruments—SWYC Milestones and ASQ-3. The findings revealed that among children identified with severe delays, sensitivity of the SWYC Milestones approached acceptability for toddlers (0.69) and reached acceptability for preschoolers (0.87) using the threshold of 0.7.[11] The greater sensitivity and specificity for children 19 to 30 months of age were possibility related to this period of emerging language skills. Neither instrument reached an adequate level of sensitivity for moderate to severe delays, although the SWYC Milestones approached that level among preschoolers. In all cases, sensitivity was somewhat higher and specificity was lower for the SWYC Milestones compared to the ASQ-3. This is consistent with other studies on the Spanish-translated version of the ASQ-3 that have shown lower sensitivity and specificity than its English language counterpart.[29–31] The generally poor positive predictive values for both instruments imply that a large number of false positives will be associated with both tests, and the generally good negative predictive values suggest that both instruments functioned quite well in ruling out the presence of any developmental delays. Positive predictive value is a common characteristic of screening tools, especially for lower incidence concerns.[32,33] These findings support that screening should be a part of a broader process of developmental surveillance which includes consideration of parental concerns, medical history, and the family and neighborhood environment. Hence, a negative result should be considered reassuring, but a positive screening result could raise the possibility of referral for

further evaluation or for early intervention or other educational services.

Although the higher rate of false-positive results is concerning, the inconvenience and expense involved in referring too many children for diagnostic evaluations should be weighed against the consequences of failing to identify an otherwise remedial developmental problem before a child enters school.[34] Moreover, compared to children confirmed negative for developmental delays, children who turn out to be false positives may still benefit from other services such as high-quality child care, preschool, or Head Start programs.[35] Further research is needed to better understand the process of language development in this population.

Study Limitations

The sample was derived from one major east coast region and included a primarily Mexican population; thus, the generalizability of the findings awaits replication on other subpopulations of children raised in Spanish-speaking families. The use of a translated version of the BSID-III that has not been fully validated may have created ceiling effects on estimates of sensitivity and specificity, which are limited by the error variance of the reference standard. Fully validated instruments are not yet available. Additionally, the English language norms and cut-offs were applied to the Spanish translations of both the SWYC and the ASQ-3. It may be the case that norms established for the English versions of (or the specific items comprising) these instruments need to be modified in order to match or improve the psychometric properties when translated into Spanish. The sample size was not large enough to study the effectiveness for each separate form, and a larger, more representative US sample is needed to verify these outcomes.

Conclusions

The young Hispanic children in our study were at high risk for delays in development, especially in language skills. Although key psychometric properties of Spanish-translated versions of the SWYC Milestones and the ASQ-3 were weaker than the English language counterparts, both screening instruments offer considerable promise as effective tools to promote early identification in the Hispanic population. Screeners were more accurate for those children 18 months or older and with more significant delays. Until screening instruments with normative cut-offs based on Spanish-speaking populations are available, a negative screening result on these translated instruments should be reassuring and a positive result should generate a referral. These findings serve to underscore that screening represents an important step in identifying Hispanic children with developmental delays and linking families to early childhood services.

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References

1. Flores A. How the US Hispanic population is changing. Available at: http://www.pewresearch.org/fact-tank/2017/09/18/how-the-u-s-hispanic-population-is-changing/. Accessed October 22, 2018.
2. Collins BA. Dual language development of Latino children: effect of instructional program type and the home and school language environment. *Early Child Res Q*. 2014;29:389–397.
3. Reardon SF, Galindo C. The Hispanic-white achievement gap in math and reading in the elementary grades. *Am Educ Res J*. 2009;46:853–891.
4. Waldfogel J. The role of out-of-school factors in the literacy problem. *Future Child*. 2012;22:39–54.
5. Avila RM, Bramlett MD. Language and immigrant status effects on disparities in Hispanic children's health status and access to health care. *Matern Child Health J*. 2013;17:415–423.
6. Pedersen A, Pettygrove S, Meaney FJ, et al. Prevalence of autism spectrum disorders in Hispanic and non-Hispanic white children. *Pediatrics*. 2012;129:e629–e635.
7. Magnuson K, Duncan G, Lee KT, et al. Early school adjustment and educational attainment. *Am Educ Res J*. 2016;53:1198–1228.
8. Bethell C, Reuland C, Schor E, et al. Rates of parent-centered developmental screening: disparities and links to services access. *Pediatrics*. 2011;128:146–155.
9. Feinberg E, Silverstein M, Donahue S, et al. The impact of race on participation in part C early intervention services. *J Dev Behav Pediatr*. 2011;32:284–291.
10. The Annie E. Casey Foundation. *The 2013 KIDS COUNT Data Book:* State Trends in Child Well-Being. Baltimore, Md: The Annie E. Casey Foundation; 2013.
11. Duby JC, Lipkin PH, Macias MM, et al. Identifying infants and young children with developmental disorders in the medical home: an algorithm for developmental surveillance and screening. *Pediatrics*. 2006;118:405–420.
12. Zuckerman KE, Mattox K, Donelan K, et al. Pediatrician identification of Latino children at risk for autism spectrum disorder. *Pediatrics*. 2013;132:445–453.
13. El-Behadli AF, Neger EN, Perrin EC, et al. Translations of developmental screening instruments: an evidence map of available research. *J Dev Behav Pediatr*. 2015;36:471–483.
14. Squires J, Bricker D. *Ages & Stages Questionnaires®, Third Edition (ASQ®-3): A Parent-Completed Child Monitoring System*. Baltimore, Md: Brookes; 2009.
15. Sheldrick RC, Perrin EC. Evidence-based milestones for surveillance of cognitive, language, and motor development. *Acad Pediatr*. 2013;13:577–586.
16. World Health Organization. Process of translation and adaptation of instruments. Available at: http://www.who.int/substance_abuse/research_tools/translation/en/. Accessed February 20, 2017.
17. Bayley N. Bayley Scales of Infant and Toddler Development®, Third Edition (Bayley-III®). London: Pearson Education; 2005.
18. Elliott CD. Differential Ability Scales®-II (DAS-II®). London: Pearson Education; 2007.
19. Gonzalez J, Reid R, Synhorst L, et al. Pathways to disparity: language, literacy, and reading skills among migrant and non-migrant Hispanic preschool students. *Special Issue of Multiple Voices*. 2006;9:149–167.
20. Hemphill FC, Vanneman A. Achievement Gaps: How Hispanic and White Students in Public Schools Perform in Mathematics and Reading on the National Assessment of Educational Progress. Washington, DC: National Center for Education Statistics; 2011.
21. Alva SA, Reyes RdL. Psychosocial stress, internalized symptoms, and the academic achievement of Hispanic adolescents. *J Adolesc Res*. 1999;14:343–358.
22. Eamon MK. Social-demographic, school, neighborhood, and parenting influences on the academic achievement of Latino young adolescents. *J Youth Adolesc*. 2005;34:163–174.
23. Fuller J, Hosemann A. Latino education. *Lang Linguist Compass*. 2015;9:168–180.

24. Hammer CS, Hoff E, Uchikoshi Y, et al. The language and literacy development of young dual language learners: a critical review. *Early Child Res Q*. 2014;29:715–733.
25. Hoff E, Core C, Place S, et al. Dual language exposure and early bilingual development. *J Child Lang*. 2011;39:1–27.
26. Mancilla-Martinez J, Lesaux NK. The gap between Spanish speakers' word reading and word knowledge: a longitudinal study. *Child Dev*. 2011;82:1544–1560.
27. Lindholm-Leary K. Bilingual and biliteracy skills in young Spanish-speaking low-SES children: impact of instructional language and primary language proficiency. *Int J Biling Educ Biling*. 2014;17:144–159.
28. Fuller B, Bein E, Kim Y, et al. Differing cognitive trajectories of Mexican American toddlers: the role of class, nativity, and maternal practices. *Hisp J Behav Sci*. 2015;37:139–169.
29. Guiberson M, Rodríguez BL. Measurement properties and classification accuracy of two Spanish parent surveys of language development for preschool-age children. *Am J Speech Lang Pathol*. 2010;19:225–237.
30. Yu LM, Hey E, Doyle LW, et al. Evaluation of the Ages and Stages Questionnaires in identifying children with neurosensory disability in the Magpie Trial follow-up study. *Acta Paediatr*. 2007;96:1803–1808.
31. Pomés M, Squires J, Yovanoff P. Psychometric examination of a Spanish translation of a developmental screening instrument. *J Early Child Res*. 2016;14:132–145.
32. Sheldrick RC, Benneyan JC, Kiss IG, et al. Thresholds and accuracy in screening tools for early detection of psychopathology. *J Child Psychol Psychiatry*. 2015;56:936–948.
33. Sheldrick RC, Garfinkel D. Is a positive developmental-behavioral screening score sufficient to justify referral? A review of evidence and theory. *Acad Pediatr*. 2017;17:464–470.
34. Barnett WS, Escobar CM. Economic costs and benefits of early intervention In: Meisels SJ and Shonkoff, JP, eds.. Handbook of Early Childhood Intervention. New York: Cambridge University Press; 1990. p. 560–582.
35. Glascoe FP. Screening for developmental and behavioral problems. *Ment Retard Dev Disabil Res Rev*. 2005;11:173–179.