

Identifying Robust Autism Indicators for Latino Children

Nicolás Linares-Orama, PhD; Katherine Miranda, PhD; Annette Romero, BS

Objective: This study was aimed at identifying those items in the “Childhood Autism Rating Scale” (CARS) that are more robust indicators of the probable existence of an Autism Spectrum Disorder (ASD) in Latino children.

Methods: CARS data from 53 randomly selected children, who were evaluated at the FILIUS Institute in San Juan, Puerto Rico, were analyzed. Individual scores of CARS items were compared against the final diagnosis for the presence or absence of an ASD in these children to determine the items with the highest positive correlation with the diagnosis.

Results: This analysis yielded 4 CARS items with the highest positive correlations (listed in descending order from a highest to the lowest correlation): Item 2- Imitation; Item 1- Relating to People; Item 5- Object Use; and Item 4- Body Use.

Conclusion: These data are used to recommend a simplified Latino ASD screening procedure that can be managed by pediatricians and other primary care givers (with a limited time and skills to screen children from Latino families) during routine care visits; this will assist them in making referrals for an ASD diagnostic evaluation, based on this screening. [*P R Health Sci J* 2019;38:71-74]

Key words: Autism, Children, Diagnosis

According to the 2010 U.S. Census the population of Latinos in the United States makes up 16% of its total population, and as of 2010, Latino children represented 24.4% of all the children aged 0 – 17 in the United States (1). Despite this growth in the Latino population, which makes it the largest minority group in the U.S. there is a disparity in their Autism Spectrum Disorder (ASD) diagnosis increase. Compared to non-Latino white children, Latino children in the United States are diagnosed with ASD less often and over a year later (2). Statistics from the U.S. Centers for Disease Control’s (CDC) Developmental Disabilities Branch show that Latino children are diagnosed with ASD at a 32% lower rate compared to non-Latino whites (3). There is also a disparity in the services that Latino children diagnosed with ASD receive (4). Language barriers, economical status, maternal level of education, access to information regarding ASD, access to developmental specialists, among others, have been listed as possible reasons for the disparity in the ASD diagnosis and services received by the Latino children (2,3,4).

Streamlined ASD screening methods aim to assist health personnel in their efforts of identifying early signs of ASD in children. These methods are based on the premise that, by observing the child or asking the child’s caretaker questions related to key behaviors common on children with autism, they could quickly identify possible signs of ASD in the child and refer the child to a diagnostic evaluation. There have been efforts to promote that pediatricians proactively look for and identify possible ASD in Latino children in the United States, and previous studies have researched the role that they could

play in early identification of ASD in Latinos (5). However, this service is more difficult for non-Latino pediatricians in the United States as, most of the times, they do not understand the Spanish language and differences among different Latino cultures, nor the Latino non-verbal communication peculiarities, thus making it very challenging for them to accurately identify ASD social communication symptoms in these children.

In Puerto Rico, although the identification and diagnosis of children with ASD is not usually affected by language barriers, it is impacted by multiple factors such as poor family socioeconomic status and limited knowledge about ASD in parents, teachers and caretakers; and the scarce time that pediatricians can spend with the children during health care visits. This last factor has worsened due to the current public health care system that limits the time used by the primary care provider with pediatric patients. Pediatricians have insufficient time to screen the child for ASD risk signs and refer them to a health team for diagnosis.

The research reported here was based on studies that emphasize the role of pediatricians in early ASD identification.

University of Puerto Rico, Medical Sciences Campus, San Juan, Puerto Rico

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Address correspondence to: Nicolás Linares-Orama, PhD, Escuela de Profesiones de la Salud, Recinto de Ciencias Médicas Universidad de Puerto Rico Programa de Patología del Habla-Lenguaje, PO Box 365067 San Juan PR 00936-5067. Email: nicolas.linares@upr.edu

We wanted to determine what components a simplified Latino-ASD screening method could have to allow pediatricians and general practitioners to quickly screen Spanish-speaking children for possible ASD during a routine care visit. The investigators aimed to answer the question of what “Childhood Autism Rating Scale” (CARS) (6) items are more efficient and powerful indicators of the existence of ASD in Latino children. The answer to this question would allow us to provide recommendations to develop a simplified ASD screening method to identify Latino children with possible ASD. By having such a screening method available for use by primary care providers, early ASD identification will increase, thus allowing these Latino children to have earlier access to treatment.

Approximately 400 yearly diagnostic evaluations were completed at the FILIUS Institute-Autism Project (Medical Sciences Campus-University of Puerto Rico) in San Juan, Puerto Rico from 2000-2014. FILIUS clinicians utilize the CARS, the DSM (DSM-IV at the time of this research) (7), and other project criterion-referenced instruments to perform their evaluations. The CARS is a 15-item instrument that helps identify children with autism, as well as determine the severity of the disorder. CARS works by rating the child’s behavior, characteristics, and abilities against the expected developmental growth of a typical child. It is done by a primary healthcare provider by rating the child’s behaviors from 1 to 4 as follows: 1 being normal for the child’s age, 2 for mildly abnormal, 3 for moderately abnormal, 4 as severely abnormal. Scores range from 15 to 60 with 30 being the cutoff rate for a diagnosis of mild autism. Scores 30-37 indicate mild to moderate autism, while scores between 38 and 60 are characterized as severe autism. The 15 items are: Item 1- Relating to people; Item 2- Imitation; Item 3- Emotional response; Item - 4 Body use; Item 5- Object use; Item 6- Adaptation to change; Item 7- Visual response; Item 8- Listening response; Item 9- Taste, smell, and touch response and use; Item 10- Fear or nervousness; Item 11- Verbal communication; Item 12- Nonverbal communication; Item 13- Activity level; Item 14- Level and consistency of intellectual response; and Item 15- General impressions of the observer. Each item can receive a score from 1 to 4, including mid-scores (i.e. 2.5), for a maximum possible score of 60 points. The current scale establishes the following: 15 – 29.5 No Autism, 30 – 36.5 Mid-to-Moderate Autism, and 37 – 60 Severe Autism. All the items in this scale have the same scoring weight; thus, if a child receives a score between 30 to 36.5 points (Mid-to-Moderate autism) it does not necessarily mean that the child has autism. The child might have sensory, speech or mental disabilities, but due to the equal weight of the items, the child receives an autism diagnosis.

The CARS can be used to determine if the child meets the DSM-V criteria for an ASD. The following CARS items are used to determine the existence of criteria A (social relationship and social communication disorders): Item 1-Relate to people;

Item 2- Imitation; Item 3- Emotional response; Item 11- Verbal Communication; Item 12- Nonverbal communication. The following items for criteria B (restrictive and repetitive patterns): Item- 4 Body Use; Item 5: Object use; Item 6- Adaptation to change; Item 7- Visual response; Item 8- Listening response, Item 9- Taste; Item 10- Fear or nervousness; Item 13- Activity Level and Item 14- Level and consistency of intellectual response.

Methods

This was a pilot project of CARS in a convenience sample of 53 randomly selected clinical records of children evaluated at the FILIUS Autism Project-Diagnostic Clinic. Our goal was to determine the intra-rater reliability between the diagnostic impression per child and the ratings provided for each of the CARS when arriving at a valid ASD diagnosis for the children served. This was a random convenience sample. We utilized a kappa coefficient analysis to arrive at a definite selection of the most discriminating CARS items. The alpha value was set at 0.05. No generalization of results to the general population was intended. Predetermined criteria for record selection were not utilized to avoid researcher bias. The final results would assist us in recommending a general screening assessment based on the most distinguishing CARS items. The child at-risk who does not approve the items can then be referred to a complete CARS assessment. The children were assessed by joint teams of interdisciplinary Puerto Rico board-certified health personnel in speech-language pathology, occupational therapy and psychology, with an average of 12 years of autism diagnostic experience. The children received an assessment protocol consisting of a standard parental interview, clinical observations of the children behaviors using a social profile, a communication outline, and a sensory integration measure. CARS and DSM-IV team analyses were conducted after the assessments. These children were classified as: 33 No Autism, 9 Mid-to-Moderate Autism and 11 Severe Autism. These numbers were based on the total CARS scores.

The inter-professional staff at FILIUS created a 4-point scale to evaluate each item: 1 – 2.5 points=No Autism; 3 – 3.5 points=Mid-to-Moderate Autism; and 4 points=Severe Autism. Based on the team’s assessment using this 4-point scale, the number of children classified ended up as: 44 children with No Autism; 4 children with Mid-to-Moderate Autism; and 5 children with Severe Autism. The scores for each item were analyzed against the final team diagnosis using parametric statistical methods to establish the frequency and correlation of the variables. Analyzing these data, the individual CARS’ items with a higher positive correlation with the Autism diagnosis were recognized. This study was approved by the Institutional Review Board of the Ponce School of Medicine (Protocol NO. 090427NL) that was authorized for FILIUS when it was located at the University of Puerto Rico-President’s Office.

Results

The individual CARS items' scores for each child were analyzed against the final diagnostic impression of the FILIUS evaluation team for correlations, residues and inter-rater reliability measures (kappa). The CARS item 15 of "General Impressions" of the observers, was not included in the analysis as this item represents their final diagnosis.

The analysis yielded four CARS items that have a high positive correlation with the final diagnosis and significant inter-rater reliability: Item 1-Relating to people; Item 2- Imitation; Item 4-Body use; and Item 5- Object use (see Table 1). The data in Graph 1 show the correlation between the four significant items' score and the team diagnosis.

Based on this analysis, CARS Item 2, "Imitation", is the best indicator of autism, with a correlation of 0.91 and a $k = 0.940$ (see Table 1). These findings suggest that the equal weight of all CARS items might add to an incorrect diagnosis of Autism in these Latino and other children.

Table 1. Correlation and kappa values of the four significant CARS items

Items	Correlation	Kappa (k)
Item 2: Imitation	0.91	0.94
Item 1: Relating to people	0.86	0.78
Item 5: Object use	0.82	0.77
Item 4: Body use	0.72	0.61

Data from 25 additional children, evaluated at the FILIUS Institute, were analyzed to look for correlations between selected CARS items and DSM-IV results. The children in this group ranged from 2; 1 to 12; 3 years of age. The CARS items chosen, based on the clinical expertise of FILIUS clinicians were: (1) Relating to people, (2) Imitation, (5) Object use, and (12) Non-verbal communication. Pearson's correlation analyses were run between the scores obtained in these items and the total DSM-V score obtained. The CARS item of Relating to

Table 2. Screening activities for use by pediatricians

Age group	Imitation	Relating to people
18-24 months	<ul style="list-style-type: none"> Shakes a rattle after you Rolls a toy car after you Makes a spoon hit the table after you 	<ul style="list-style-type: none"> Enjoys peek-a-boo with you Laughs when you count 1, 2, 3, and tickle the child Looks at an object you point to
25-36 months	<ul style="list-style-type: none"> Builds a tower with three colored blocks after you Flies with arms after you Hits the table with the hand after you 	<ul style="list-style-type: none"> Gives you an object you request Puts an object you request on the table Simulates to feed you with a toy spoon
37-48 months	<ul style="list-style-type: none"> Touches shoulder and sticks out tongue after you Feeds a baby doll after you Stands up and jumps after you 	<ul style="list-style-type: none"> Plays with you when using a toy house Uses gestures to communicate with you Uses phrases of at least 3 words when telling a story
49-60 months	<ul style="list-style-type: none"> Combs the hair after you Assembles a toy house and later puts toys away after you Closes a door or window after you 	<ul style="list-style-type: none"> Converses with you Asks you questions Narrates what he did today combining gestures and speech

Materials: Rattle, toy car, toy spoon, three colored blocks, baby doll and feeding bottle, comb, toy house, children's book with pictures.

people had the highest positive significant correlation value of $r=0.84$ with a $p = 0.0041$ (see Figure 1). This research found that the CARS items of (1) Relating to people and (2) Imitation, have the highest correlation to final diagnosis of Latinos with ASD.

Discussion

The new DSM-V ASD (8) diagnostic criteria put a substantial emphasis on social communication and pattern use when diagnosing this disorder in children. Our investigation demonstrates that, out of the 15 items in the CARS, "Imitation" and "Relating to People" are the strongest indicators of autism. These two behaviors are social communication behaviors, a reason why we are recommending that pediatricians dedicate their limited time to observe children and interview parents on these interpersonal dimensions. The limited communication skills of English-speaking pediatricians and limited screening time when serving poor Spanish-speaking Latino families of children in the USA have been suggested as factors for the very late diagnosis of ASD in this population. In Puerto Rico the situation is more intense due to its health care fiscal constraints; these limitations affect efforts to obtain earlier ASD identification and proper referrals for a diagnosis. The limited amount of 5-7 minutes per pediatric visit in Puerto Rico must be used sensibly to ascertain if a child should be referred for a complete ASD diagnosis. Following is Table 2 with activities that pediatricians can utilize in that limited period of time to screen 18 to 60-month-old Latino children for ASD signs. For each age-group the pediatrician should refer a child for an ASD diagnosis if he/she does not demonstrate at least 4 of the 6 behaviors, and whose parents' express developmental concerns for the child.

Resumen

Objetivo: Esta investigación fue dirigida a identificar los ítems en la "Childhood Autism Rating Scale" (CARS) que

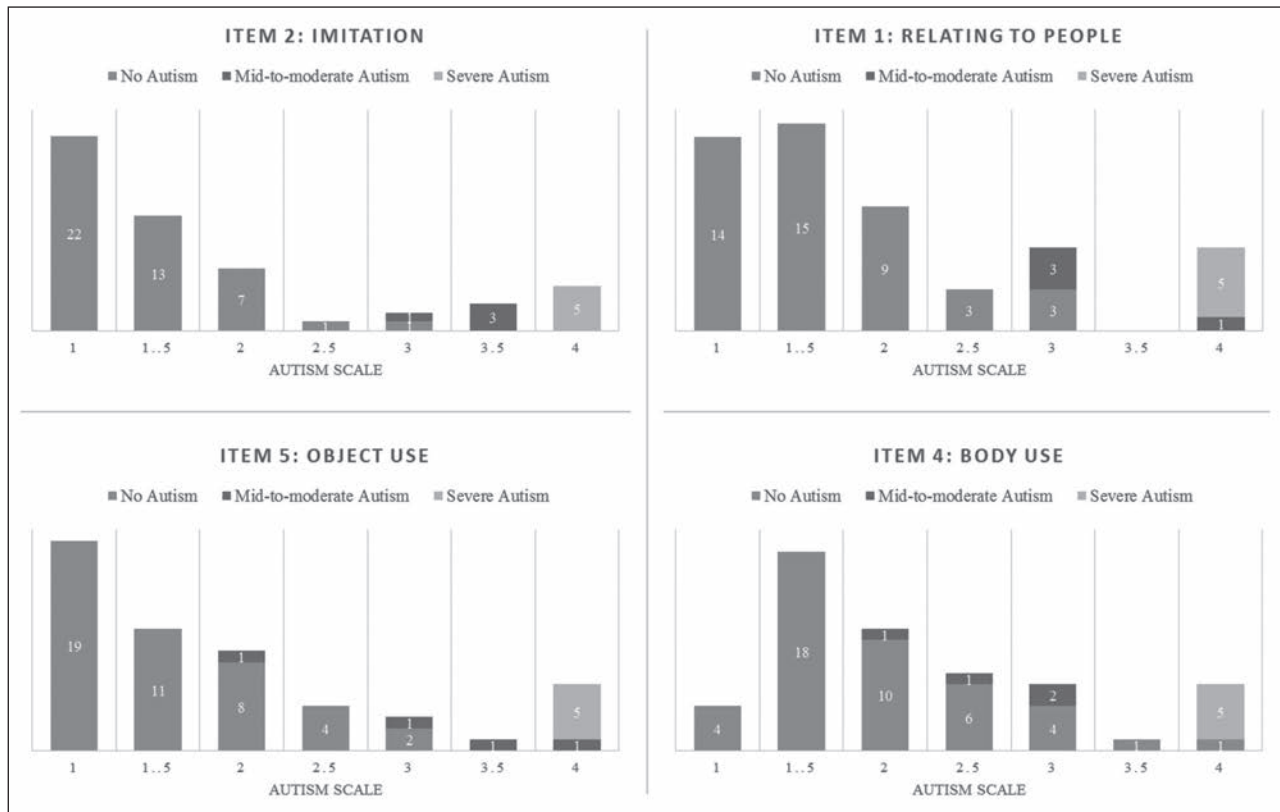


Figure 1. Graphical representation of the distribution of children diagnosis for the four significant CARS items

son los indicadores más robustos de la existencia probable de un Trastorno en el Espectro de Autismo (TEA) en niños latinos. Método: Se analizaron los datos de la CARS de 53 niños seleccionados al azar que fueron evaluados en el Instituto FILIUS en San Juan, Puerto Rico. Las puntuaciones individuales de los ítems de la CARS fueron comparados con el diagnóstico final en cuanto a la presencia o ausencia de un TEA en estos niños, para así determinar los ítems con las más altas correlaciones positivas con el diagnóstico. Resultados: Este análisis reflejó 4 ítems de la CARS con las más altas correlaciones positivas (presentadas en orden descendente de las más alta a las más baja correlación): ítem 2-Imitación; ítem 1- Relacionándose con Personas; ítem 5- Uso de Objetos; e ítem 4-Uso del Cuerpo. Conclusión: Estos datos son usados para recomendar un procedimiento simplificado de identificación que puede ser utilizado por pediatras y otros profesionales de la salud (con tiempo y destrezas limitadas para identificar a niños de familias Latinas) durante las visitas de rutina; esto les asistirá en el proceso de referidos de niños para evaluaciones diagnósticas de TEA, basados en este cernimiento.

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