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Scale of Auditory Behaviors: normative reference values for healthy Argentinian children

Agustin Ramiro Miranda[1-3(A,B,C,D,E,F)], Jorge Angel Bruera[4(A,B,C,D,E)], Silvana Valeria Serra[3,5(A,B,C,D,E)]

[1] Instituto de Investigaciones en Ciencias de la Salud, Universidad Nacional de Córdoba, CONICET, FCM (Enrique Barros, Ciudad Universitaria, CP 5014), Córdoba, Argentina.
[2] Secretaría de Ciencia y Tecnología, Universidad Nacional de Córdoba, CONICET, FCM (Juan Filloy, Ciudad Universitaria, CP 5014), Córdoba, Argentina.
[3] Escuela de Fonoaudiología, Facultad de Ciencias Médicas, Universidad Nacional de Córdoba. (Enrique Barros, Ciudad Universitaria, CP 5014), Córdoba, Argentina
[4] Laboratorio de Evaluación Psicológica y Educativa, Facultad de Psicología, Universidad Nacional de Córdoba. (Enfermera Gordillo, Ciudad Universitaria, CP 5014), Córdoba, Argentina.
[5] Instituto de Educación Superior "Dr. Domingo Cabred", Facultad de Educación y Salud, Universidad Provincial de Córdoba (Deodoro Roca, Parque Sarmiento, CP 5014), Córdoba, Argentina.

SUMMARY

Background: A comprehensive assessment of central auditory processing disorders includes parent questionnaires. The Scale of Auditory Behaviors (SAB) was developed to evaluate the limitations and difficulties perceived by guardians of children in everyday activities.The aim of the study was to provide normative data for the SAB for Argentinian healthy children.

Material/ Methods: The parents and guardians of eighty-four children aged 4 and 5 years old, representative of the Argentinian population, completed a sociodemographic questionnaire and the SAB. Normative data were expressed as Mean ± Standard Deviation. Internal consistency was calculated using Cronbach's alphas.

Results: The norms for Argentinian children are: 48.60±7.57. Values <37 points (-1,5 Z-score) indicate the need for an evaluation routing of auditory processing, and values <33 points (-2 Z-score) are indicative of disorder. Internal consistency showed a high SAB reliability (α-Cronbach= 0.84).

Conclusions: With the current norms available, central auditory processing can be evaluated in Argentinian children during pediatric clinical practice.

Key words: central auditory processing, parents, pediatrics, hearing screening tool, scale

INTRODUCTION

In recent years, several pieces of research have been developed to study central auditory processing, with the design and development of multiple clinical evaluation instruments [1]. However, in Argentina the implementation of these techniques has been gradual. There are multiple methods for the evaluating of central auditory processing. In this sense, questionnaires aimed at caregivers and teachers reports are important [2,3]. Moreover, these lie within the methods recommended by the guidelines of several professional associations [4-6]. Generally these questionnaires investigate the behavior in a child's daily life through situations related to the functioning of the auditory abilities:

- Sound localization and lateralization
- Auditory discrimination
- Auditory pattern recognition
- Temporary processing

Specifically, these instruments indicate how caregivers or teachers perceive the child's auditory abilities, and how they perform in the real world. Among the most widely used questionnaires, is the Scale of Auditory Behaviors (SAB) [7]. This questionnaire is an example of a subjective evaluation of central processing [8]. It has the advantage of being easy to apply and also provides important information about the child's reality. Therefore, the combination of subjective methods (screening questionnaire) with another validated behavioral screening test (e.g., dichotic digits) is of great interest for clinical practice since it provides a multidimensional approach to the patient, both at diagnosis and during follow-up [9]. Several authors have considered the importance of developing normative values specific to a given population for the use and interpretation of these questionnaires, including SAB [10,11]. Thus, the main objective of the present work is to develop SAB-specific normative data for healthy Argentinian children.

MATERIAL AND METHODS

Ethical approval

The institution of authors approved the study protocol and the study was conducted in conformity with the ethical principles of international medical research institutions, and informed consent was obtained from the caregivers.

Participants

In this cross-sectional study, eighty-four healthy children from Cordoba (Argentina), ranging in age from 4 to 5 years and 11 months, participated in the study and were individually administered a Spanish translation of the Scale of Auditory Behavior. Inclusion criteria were: agreement to study participation; and being aged between 4 years and 6 years.

Exclusion criteria were: a confirmed history of neurological, psychiatry and metabolic diseases; hearing diseases; and continuous use of medications during

the 6 months preceding the study. The study was approved by the Ethics Committee of the DSRET Raquel Maurette (Faculty of Medical Sciences, National University of Cordoba) and carried out according to the Declaration of Helsinki.

Instruments

The SAB scale was used to investigate the difficulties and limitations of the central auditory processing as perceived by parents or caregivers on children. The SAB scale is formed by 12 items that ask about everyday behaviors associated with audition, listening and academic skills, attention, memory and organization. The SAB scale consists of a Likert 5-point questionnaire where the caregiver must respond how often the mentioned behavior occurs (1, "frequent"; 2, "often"; 3, "sometimes"; 4, "rarely"; 5, "never"), allowing a total score that can vary between 12 and 60, with higher score levels demonstrating better listening abilities (12) (see: Table 1).

Table 1. Spanish version of Scale of Auditory Behaviours

Subtests of the Spanish Version of Scale of Auditory Behaviours	**Frecuente [*Frequent*]**	**A menudo [*Often*]**	**Algunas veces [*Sometimes*]**	**Rara vez [*Seldom*]**	**Nunca [*Never*]**
1. Tiene dificultad para escuchar o entender cuando está en un ambiente ruidoso. [*Difficulty hearing or understanding in background*]	1	2	3	4	5
2. No entiende bien cuando se le habla manera rápida o en voz baja. [*Misunderstands, especially with rapid or muffled speech*]	1	2	3	4	5
3. Tiene dificultad para seguir órdenes o instrucciones orales. [*Difficulty following oral instructions*]	1	2	3	4	5
4. Tiene dificultad para discriminar e identificar los sonidos del habla. [*Difficulty in discriminating and identifying speech sounds*]	1	2	3	4	5
5. Da respuestas incoherentes o sin sentido a la información auditiva. [*Inconsistent responses to auditory information*]	1	2	3	4	5
6. Tiene habilidades pobres de escucha. [*Poor listening skills*]	1	2	3	4	5
7. Pide que se le repitan las cosas. [*Asks for things to be repeated*]	1	2	3	4	5
8. Se distrae con facilidad. [*Easily distracted*]	1	2	3	4	5
9. Presenta problemas de aprendizaje o académicos. [Learning or academic difficulties]	1	2	3	4	5
10. Mantiene su atención por periodos cortos de tiempo. [*Short attention span*]	1	2	3	4	5
11. Parece desatento o con ensueños. [*Daydreams, inattentive*]	1	2	3	4	5
12. Es desorganizado. [*Disorganized*]	1	2	3	4	5

The following instructions are contained on the SAB scale: "*Please rate each item by circling a number that best fits the behavior of the child you are rating. At the top of the column of numbers there is a term indicating the frequency with which the behavior is observed. Please consider these terms carefully when rating each possible behavior. A child may or may not display one or more of these behaviors. A high rating in one or more of the areas does not indicate any particular pattern. If you are undecided about the rating of an item, use your best judgment.*"

Participants completed a socio-demographic questionnaire in which they were asked to report their age, occupational situation, educational level, type of caregiver, child's age and the child's gender.

Statistical analysis

Data were expressed as mean ± standard deviation (SD). Distribution of the data was studied analyzing Asymmetry, Kurtosis. Internal consistency for the SAB was assessed using Cronbach's alpha. Acceptable internal consistency is indicated by alpha values of .70 or higher [13] . The statistical analysis was conducted using SPSS Statistics version 22.0.

RESULTS

In total, there were eighty-four participants (see: Table 2).

Tab. 2. Sociodemographic characteristics of the sample

Sociodemographic characteristics	N	%
Gender		
Female	77	91.66
Male	7	8.33
Age (years)		
20-29	34	40.5
30-39	40	47.6
40-49	9	10.7
50-59	1	1.2
Education of the caregiver		
<12 years of education	44	52.4
>12 years of education	40	47.6
Socioeconomic Status		
Lower	43	51.2
Middle	23	27.4
Upper	18	21.4
Relationship to the child		
Mother	70	83.3
Father	7	8.3
Other	7	8.3
Child gender		
Male	45	53.6
Female	39	46.4
Child age (years)		
4	43	51.2
5	41	48.8

The patients were aged between four years-old (51.2%) and five years-old (48.8 %), being 45 boys (53.6 %) and 39 females (46.4 %). Questionnaires were completed by either mothers, fathers or another type of caregiver: 70 mothers (83.3 %), 7 fathers (8.3 %) and 7 others (8.3 %), aged 21–51 years (M = 32.1, SD = 6.85). Approximately half of the sample had completed more than twelve years of education (47.6 %). With regard to socioeconomic status, 43 of the subjects correspond to lower status (51.2 %) 23 to middle status (27.6 %), and 18 to upper status (21.4 %).

For the total SAB score, the following measures were obtained: M 48.60; DS 7.57; Asymmetry -1.39; Kurtosis 2.16 .; Range, 22-60. An illustration of a histogram is provided in Figure 1.

According to the data obtained in this study, the results should be interpreted as follows:

Approximate values to 48 points indicate auditory behavior appropriate for the age group 4-5 years;

Values below 37 points, which corresponds to a -1.5 Z-score, indicate the need for an evaluation routing of the auditory processing;

Values lower than 33 points, which corresponds to a -2 Z-score, are indicative of auditory processing disorder, showing, thus, the need for intervention and long-term accompaniment.

Finally, there is no significant difference when comparing the scores on the basis of socioeconomic stratum and educational level.

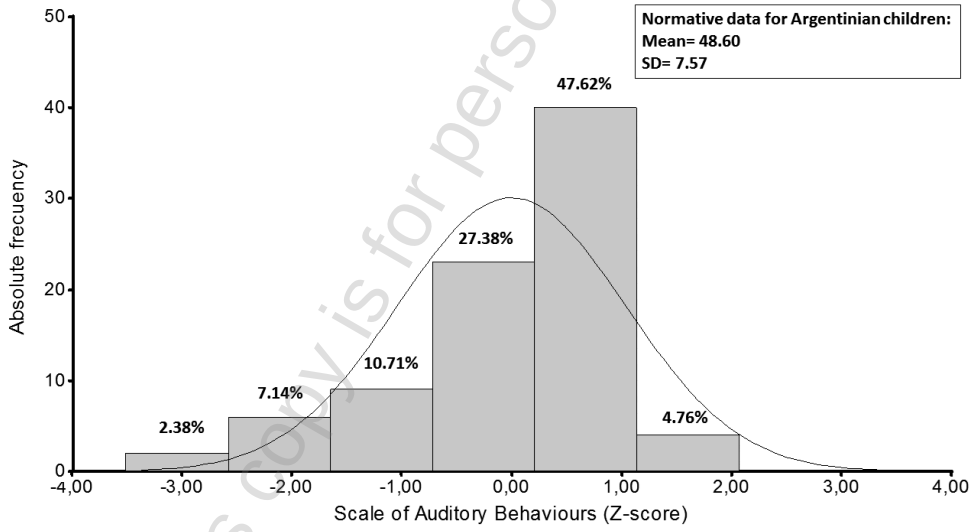

Fig. 1. Histogram of Z-score distributions of 4 and 5-year-old Argentinian children (n= 84). Normative data is presented (Mean ± Standard Deviation)

DISCUSSION AND CONCLUSION

Several authors and international organizations have emphasized the need for studies on the use of scales and questionnaires that measure auditory behavior in young children [5,14,15]. The value of having these screening instruments, and having the respective normative values in different populations, lies in the multidimensional approach that can be offered to the patient. In this sense, the auditory abilities reported by the caregivers of the patients in everyday situations give us valuable information when making decisions in pediatric practice. [16]. Moreover, several investigations have shown that SAB is a useful tool to measure therapeutic efficacy, and even its routine use is recommended in the evaluation of the auditory behavior of children [7,12]. These studies reported positive correlations between SAB scores and the results obtained through other behavioral tests, such as dichotic digits and temporary tests. This also affects the way to complement the SAB findings with diagnostic methods that are not confined to audiometric results and sound detection, since it is not only a minimization of hearing but also a decontextualization of the sensory function.

However, abnormal scores in SAB are not sufficient for the diagnosis of central auditory processing disorders, therefore the association of SAB with other auditory tests of demonstrated sensitivity and specificity is required [9]. Scoring is simple, and there is consensus that scores corresponding to Z-scores below -1.5 are indicative of suspected alteration in processing, while values below -2 would coincide with an underlying disturbance [12,17]. In our study different normative data were obtained than those reported in other populations, such as the American and Portuguese norms. Therefore, the cut-off points for healthy children in Argentina are 37 (Z-score -1.5) and 33 (Z-score -2) respectively.

Originally the SAB scale was normalized in 96 children aged from 4 to 6 years, and researchers detected that its 12 items are congruent with the recommendations of the Bruton group [18]. The scarcity of published studies on the use of the SAB scale should be noted. One of the strengths of the present study is that it studies pre-school children, providing normative data for this specific population [19]. In this sense, early diagnosis is an important resource to minimize the consequences of an altered functioning of central auditory processing, as well as for the assessment of the effectiveness of the treatment implemented [10,11].

The key benefits of using this type of instrument include low cost, ease of administration, non-invasiveness, flexibility over time and mode of administration, and the possibility of obtaining information about the patient's history and development process [20]. Potential disadvantages are the respondent's subjectivity and bias. Despite these drawbacks, implementation of these screening tools is encouraged to address the concerns of parents and caregivers, and to alert pediatricians to suspected behaviors [3].

In conclusion, having SAB norms for Argentine population is very useful for professionals working with children, given the magnitude of central auditory processing problems. These screening instruments allow health professionals to

have a multidimensional view of the patient and their caregivers, as well as providing valuable data about their auditory system functioning. The association of this instrument with other auditory central processing assessment tests is recommended in order to enhance the sensitivity and specificity of the diagnosis of audiological pathologies, besides being useful for monitoring and the evaluation of treatment implemented in children.

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Corresponding autor:
Agustín R. Miranda
INICSA, Enrique Barros, Ciudad Universitaria,
Córdoba 5014, Argentina.
E-mail: armiranda@fcm.unc.edu.ar