Adolescents' Self-Perception about Auditory Behavior: Agreement with Parents and Central Auditory Processing Evaluation

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Abstract

Introduction Central auditory processing disorder (CAPD) has been diagnosed through behavioral tests. Moreover, screening tools as validated questionnaires may contribute to identify individuals at risk for this disorder, including adolescents.

Objective (1) to characterize and compare adolescents' self-perception regarding their auditory behavior with their parents' perception; (2) to verify their agreement with behavioral evaluation of central auditory processing (CAP).

Methods Cross-sectional, prospective, and descriptive study, in which 40 adolescents and 40 parents of both genders participated. All participants answered the scale of auditory behaviors questionnaire, and the behavioral evaluation of CAP was conducted with the adolescents. Findings were analyzed descriptively and inferentially, with a significance level of 5% ($p \leq 0.05$) and application of the following tests: Test for equality of two proportions, Chi-squared, and Kappa concordance index.

Results Most adolescents rated their auditory behavior as "low risk" for CAPD while their parents rated it as "typical." When comparing adolescents' self-perception and parents' perception about the auditory behavior with the behavioral evaluation outcome, a statistically significant difference was observed only in adolescents' self-perception. The results of the behavioral evaluation indicated that 42.5% of the adolescents showed alterations. The concordance index between adolescents' self-perception and parents' perception of auditory behavior showed a significant (minimal) difference.

Conclusion Most adolescents were able to perceive difficulties regarding their auditory behavior and characterized it as "low risk" for CAPD, but the same did not occur regarding their parents. There was agreement only between the adolescents' self-perception and their performance in the behavioral evaluation of CAP.

Keywords
- hearing
- auditory tests
- auditory perception
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Introduction

Central auditory processing (CAP) can be defined as "the way in which the brain recognizes and understands the sound information people listen".[1] This processing encompasses auditory abilities of detection, discrimination, sound localization, speech recognition, figure-ground for verbal and nonverbal sounds, auditory closure, synthesis, simple and complex temporal ordering and temporal pattern recognition.[2,3]

The maturation process of the central auditory nervous system begins in the early years of life and ends in adolescence.[4] Thus, adolescents are expected to be able to process auditory information properly.

Adolescence is a stage of life marked by a complex process of biopsychosocial growth and development.[5] It is the moment when an individual develops his/her autonomy, leaves the family universe and decides for himself/herself, building his/her own identity. Moreover, it is at this stage that the maturation process of the central auditory nervous system is completed.[4]

In general, the CAP is clinically evaluated through a battery of behavioral tests to investigate some auditory abilities, such as sound localization and lateralization, auditory discrimination of verbal and nonverbal sounds, temporal auditory processing, and auditory performance with competing or degraded acoustic information, among others.[6]

Individuals diagnosed with central auditory processing disorder (CAPD) have the following behaviors: great difficulty hearing in noise, difficulty understanding speech, frequent repetition requests, and lack of attention and/or memory for verbal instructions. These individuals may also have reports of speech, language, literacy, attention, and academic performance disorders. Inattention and memory are often present, either as a secondary characteristic (such as fatigue associated with auditory demands) or as a primary characteristic of the impaired auditory perception.[7]

Studies describe that in this disorder individuals may have the following manifestations: poor school performance, reading and writing problems, social behavior disorder, difficulty discriminating sounds, difficulty in sound localization, recognizing, recording and/or understanding stimuli presented.[8–10]

Moreover, to identify populations at risk for CAPD, the literature has recommended the use of screening instruments to identify auditory behavior and/or performance in auditory tests.[6,11]

The British Society of Audiology (2018)[7] recommends that the initial screening of CAP should include a well-structured clinical history and application of validated questionnaires to both parents and teachers to identify individuals at risk for CAPD.

Questionnaires and checklists are instruments that can be used in this screening because they produce relevant information about daily life situations related to the functioning of the individual's auditory system provided by family members, teachers, and the individual himself/herself. One of these instruments is the scale of auditory behaviors (SAB) questionnaire, which was translated into European Portuguese.[12] It is brief, easy to apply, and contains questions often related to the CAP.

A systematic review study demonstrated that the SAB questionnaire was translated and adapted into Portuguese to be used as a screening tool for CAPD. The authors reported that among the questionnaires analyzed, the SAB and the children's auditory performance scale (CHAPS) were the most used in the national literature; they also determined that the population screened through these instruments was children and adolescents, emphasizing a predominance of the child population both in preschool and school age.[13]

In this same study, the authors highlighted that the auditory processing domains questionnaire (APDQ) was translated and validated into Brazilian Portuguese with 100% sensitivity and specificity, being the most suitable instrument for application in clinical practice and research setting.[13]

The auditory processing domains questionnaire (APDQ) was designed to screen auditory processing disorder. This instrument has 52 questions designed to enable parents/teachers to classify students' auditory abilities regarding auditory processing, attention, and language factors. The authors concluded the APQD seems to be an effective screening questionnaire for individuals with CAPD because its standards on the scoring scale are useful for making appropriate clinical referrals.[14]

Studies developed by Kemp (2016),[15] Menezes (2017)[16] and Cerqueira (2018)[17] used the SAB questionnaire as a screening tool to support the diagnosis of CAPD.

The study by Kemp[15] investigated the auditory ability of 36 schoolchildren in initial grades subdivided into 2 groups: group 1 consisted of 13 children aged from 6 years to 6 years and 9 months; group 2 (G2) consisted of 23 children aged from 6 years and 11months to 7 years and 10 months. In one of the evaluation stages, the SAB questionnaire was sent to the parents, and the analysis of items that composed the questionnaire revealed that the most frequent behaviors reported by the parents of students in G1 were: "asking to repeat things" and "disorganization," and among the parents of students in G2, they were: "not understanding well when someone speaks fast or muffled," "asking to repeat things" and "easily distracted." The author observed that the majority of the students' parents reported some behaviors that indicated difficulty in processing auditory information; however, this frequency was relatively low.

Another study[16] described scores of the SAB questionnaire and verified the degree of agreement between the questionnaire and the CAP evaluation of 60 female and male children, aged 9 and 12 years old, divided into two groups: group I (GI): 30 children with learning disorder and; group II (GII): 30 children with dyslexia. The analysis of SAB questionnaire showed that the average scores were similar for both groups, and the investigation of the degree of agreement between the SAB results and the CAP evaluation showed an accuracy of 95%. It was possible to conclude that the SAB questionnaire was an important predictor in the identification of CAPD.

In this study, Cerqueira[17] compared and related the auditory behavior of 31 female and male individuals with stuttering, aged 7 to 26 years old, and their performance in the behavioral evaluation of CAP. The comparison of the results showed a significant difference between the final SAB score and their performance, and these findings suggest that the

questionnaire was a good instrument in cases in which individuals had scores ≤ 45 points, that is, they were considered at risk for CAPD, since it was confirmed in the evaluation. However, the correlation between these variables was weak.

Information provided by parents/guardians and/or teachers about an individual's auditory perception difficulties in different environments is relevant for the early identification of CAPD, especially data reported by teachers, since these individuals remain a long period of their time at school.[18]

Despite the existence of studies that previously investigated the parents' perception about their children's auditory behaviors during childhood,[16,19] the parents' perception of adolescent populations about auditory behavior is still little investigated. In addition, considering that adolescents are able to provide feedback on their own auditory performance, it would also be relevant to investigate the self-perception of this population about the auditory behavior, thus enabling a comparison with their parents' perception.

As a hypothesis of this study, it is believed that adolescents can perceive their own difficulties related to auditory behavior and have a better perception than their parents.

Therefore, regarding the scarcity of studies on CAP with the adolescent population and the need for applicability of screening instruments, the present study aimed to: (1) characterize and compare adolescents' self-perception regarding their auditory behavior with their parents' perception; (2) verify their agreement with findings of the behavioral evaluation of CAP.

Method

This was a cross-sectional, prospective, and descriptive study, approved by the Research Ethics Committee under number 2.179.621. The data collection of this study was conducted in a private hospital, located in the city of Cuiabá, Mato Grosso, in partnership with the Faculty of Philosophy and Sciences of the São Paulo State University "Júlio de Mesquita Filho", UNESP, Marília.

Adolescents who were invited to participate in the basic audiological assessment at this location had hearing thresholds within the normal range bilaterally, based on the classification of the degree of hearing loss from the World Health Organization.[20] Thus, the convenience sample consisted of 40 adolescents, being 20 female and 20 male, all regularly enrolled in elementary or high school aged 12 to 18 years old (mean age 14.82 years) and 40 parents and/or guardians.

The inclusion criteria for selection of the adolescents were: a) hearing thresholds within normal range in both ears; b) bilateral type "A" tympanometric curve, c) presence of contralateral acoustic reflex in the 500, 1,000 and 2,000 Hz frequencies in both ears; d) signature of the informed consent form or assent form.

The exclusion criteria were: a) to have neurological disorders; b) psychiatric disorders; c) communication and genetic syndromes reported by parents during anamnesis, which could interfere with behavioral evaluation of CAP; d) not understanding instructions needed for performing tests from the behavioral evaluation battery of CAP; e) to give up during the application of the evaluations.

Initially, the adolescents and their parents answered the anamnesis; soon after, they individually answered the scale of auditory behaviors (SAB) questionnaire, and, then, only the adolescents performed the behavioral evaluation of the CAP, composed by the following tests: speech-in-noise (SIN), synthetic sentence identification (SSI), dichotic digits test (DDT), pitch pattern test (PPT), random gap detection test (RGDT). This evaluation was performed in one session in most adolescents, but, in some cases, it took two sessions to confirm the results, especially those that presented alteration in a single test of the behavioral evaluation of CAP.

The SAB is an easy-to-apply questionnaire consisting of 12 items and scored using a 5-point Likert scale to screen auditory behavior.[19] The SAB was applied to the adolescents to verify their self-perception regarding their auditory behavior and, later, to the parents to evaluate the perception about their children's auditory behavior. According to the authors of the questionnaire, the final score classifies auditory behavior as typical with a final score ≥ 46 points, low-risk behavior for auditory processing disorder values between 31 and 45 points, and high-risk behavior for auditory processing disorder is defined by a score ≤ 30 points (►**Fig. 1**).

The test battery of the CAP evaluation was performed in an acoustic booth, using a 2-channel audiometer AD229-e, which was coupled to a computer, and it was applied by an audiologist.

The SIN test evaluates the auditory ability of closure, being a monotic task. A list of 25 monosyllables with a competitive message of white noise was displayed, in which the competitive message was in a signal-to-noise ratio at +10 dB, monaurally, and the main message was at an intensity of 40 dBSL. The adolescents were instructed to repeat the monosyllables orally. The reference criterion adopted as normality was to reach several correct answers ($\geq 70\%$) in both ears or a difference between the percentage of SRI and SIN results > 20%, considering the same ear.[21]

The SSI test with competitive message is used to evaluate the auditory ability of figure-ground for verbal sounds and the association of auditory and visual stimuli. This test consists of 10 sentences, displayed simultaneously to a competitive message composed by a story. The stimuli were displayed monaurally in two signals to noise ratios (SNR), 0 and -10 dB, and the main message (phrase) was displayed at an intensity of 40 dBSL. The adolescent was positioned in front of a poster containing the sentences, and for each sentence heard, he or she should point to the corresponding phrase on the poster. The reference criterion adopted for normality was to reach several correct answers ($\geq 70\%$) for the signal-to-noise ratio -10 dB.[21]

Another test applied was the DDT, which evaluates the figure-ground ability for verbal sounds. The test consists of displaying 4 lists of 20 items each, in which each item containing 4 digits, selected from numbers 1 to 9. In this study, only the binaural integration stage was applied at an intensity of 50 dBSL. The adolescent was instructed to orally repeat the four digits displayed, regardless of their presentation order. The reference criterion adopted for normality was to reach several correct answers ($\geq 95\%$) in both ears.[21]

Name: _____

Date of birth: ___/_____/_____ Schooling: _____

Signature of the subject or responsible: _____

Date: _____/_____/_____

Behavior items	Frequent	Almost always	Sometimes	Sporadic	Never
1. Difficulty listening or understanding in noisy environment	1	2	3	4	5
2. Does not understand well when someone speaks fast or "muffled"	1	2	3	4	5
3. Difficulty following oral instructions	1	2	3	4	5
4. Difficulty identifying and discriminating speech sounds	1	2	3	4	5
5. Inconsistency of response to auditory information	1	2	3	4	5
6. Poor reading ability	1	2	3	4	5
7. Ask to repeat things	1	2	3	4	5
8. Easily distracted	1	2	3	4	5
9. Academic or learning difficulties	1	2	3	4	5
10. Short Attention Period	1	2	3	4	5
11. Dream awake, seem inattentive	1	2	3	4	5
12. Disorganized	1	2	3	4	5

Source: Nunes; Pereira e Carvalho (2013).

Fig. 1 Scale of auditory behaviors (SAB). **Fonte**: Nunes; Pereira e Carvalho (2013).

The PPT evaluates the temporal ordering ability. In this study, the PPS (adult version) proposed by Auditec, Inc. (St. Louis. MO, USA) (1997) was applied because this version shows potential to identify normality in the temporal ordering ability.[22] This test consists of 30 sequences of 3 tones, which can be low frequency (880 Hz) or high frequency (1,430 Hz). Each tone has duration of 200 milliseconds (ms), with an interval of 150 ms between tones and 7 seconds between sequences. The test allows six combinations between the low (L) and high (H) stimuli: HHL, HLH, HLL, LLH, LHL, and LHH. Prior to the beginning of the test, the patient underwent a training to ensure the perception of the difference between tones to be tested and the understanding of the task to be performed. The test was binaurally displayed at an intensity of 50 dBSL. Participants were instructed to name the stimuli in the same presentation order. The normality criterion adopted was to reach a percentage of correct answers $\geq$ 90%.[23] Finally, the RGDT was applied to evaluate temporal resolution ability. The test consists of displaying pure tones paired with short silent intervals ranging from 0 to 40 ms randomly presented. The interval detection threshold is considered to be the shortest interval from which the individual is able to consistently identify the occurrence of two stimuli. This test was displayed binaurally at an intensity of 50 dBSL. The patient was instructed to lift the finger each time he or she heard one or two stimuli. The normality criterion adopted was values $\leq$ 10 ms.[24]

The CAP evaluation was classified as normal or altered based on the criteria established by the Diagnostic Forum of the 31st International Audiology Meeting,[25] according to which alteration in only one physiological mechanism, being observed the conditions of the test application regarding the individual's attention and the compatibility of the alteration with the patient's history and test/retest in the case of very small alterations.

To compare adolescents' self-perception of their auditory behavior, parents' perception of their children's auditory behavior, and to analyze the relationship between the adolescents' performance in each test and the final outcome of the behavioral evaluation of the CAP, the test for equality of two proportions was applied. To compare adolescents' self-perception with parents' perception about the auditory behavior, the Chi-squared test and the Kappa concordance index were applied to measure the degree of agreement between these variables.

To verify the relationship between adolescents' self-perception and parents' perception regarding the auditory behavior and the performance in the behavioral evaluation of the CAP (normal or altered), the Chi-squared test was applied. The significance level adopted was 5% ($p \leq 0.05$) and, for the Kappa concordance index, the following values were considered: < 0.200 negligible; between 0.210 and 0.400 minimum; between 0.410 and 0.600 regular; between 0.610 and 0.800 good and; above 0.810 great.

Results

The analysis of the SAB questionnaire answered by the adolescents showed that the auditory behavior of most participants was classified as "low risk," but this difference was significant in relation to "high risk" (►**Table 1**).

Regarding the parents' perception, 65% of parents rated the adolescents' auditory behavior as "typical." Comparison between the other classifications, "low risk" and "high risk," showed a significant difference (►**Table 2**).

When analyzing the agreement index between adolescents' self-perception and parents' perception in relation to the auditory behavior, a significant difference was found. However, as the agreement value was minimal, it should be disregarded (►**Table 3**).

When comparing adolescents' self-perception with their parents' perception in relation to the auditory behavior with performance of the behavioral evaluation of the CAP, a significant difference was found only for adolescents' self-perception (►**Table 4**).

►**Table 5** shows the classification of adolescents' performance in the tests that comprised the behavioral evaluation of CAP. It was observed that in the DD, SIN, SSI, and RGDT, there was a higher percentage of normal results and this difference was statistically significant. However, the PPS showed a higher percentage of altered results.

Table 1 Characterization of the classification of auditory behavior based on adolescents' self-perception

Auditory behavior	N	%	*P*-value
High risk	1	2.5%	$<$ **0.001***
Low risk	23	57.5%	Ref.
Typical	16	40.0%	0.117

Abbreviations: N, casuistry; Ref, reference.
Test for equality of two proportions
*Significance level $p \leq 0.05$

Table 2 Characterization of the classification of auditory behavior based on parents' perception

Auditory behavior perception	N	%	*P*-value
High risk	3	7.5%	$<$ **0.001***
Low risk	11	27.5%	$<$ **0.001***
Typical	26	65.0%	Ref.

Test for equality of two proportions
Caption: N, casuistry; Ref, reference
*Significance level $p \leq 0.05$

Table 3 Concordance Index between adolescents' self-perception and parents' perception about auditory behavior

Adolescents' self-perception versus parents' perception	
Kappa	0.397
P-value	0.001*

Kappa concordance index
*Significance level $p \leq 0.05$

Discussion

The application of well-designed questionnaires that have questions specifically related to auditory behaviors may assist in the referral of at-risk populations to specialized evaluation and, consequently, assist the diagnostic process of CAPD.[7]

In this study, the SAB questionnaire was applied as a screening instrument, with the purpose of evaluating adolescents' self-perception regarding their auditory behavior and also their parents' perception. Assuming that self-perception refers to the manner in which an individual understands his/her own attitudes based on his/her behavior in certain situations.

Considering the classification of auditory behavior based on the SAB score[19] and the adolescents' self-perception findings in relation to their auditory behavior, it was observed that adolescents had an average score of 43.9 points, which corresponds to the classification "low risk" for CAPD.

It is also worth mentioning that 57.5% of the adolescents in this study classified their behavior as "low risk." These results suggest that most adolescents were able to identify, in their daily routine, situations in which they had difficulty understanding information aurally received, especially in background noise.

Regarding the parents' perception of the auditory behavior of their adolescents, it was observed that the average score of the SAB questionnaire answered by the parents was 46.4 points, which corresponds to "typical" auditory behavior.[19] It is also highlighted that 65% of parents rated their adolescents' auditory behavior as "typical."

Findings of adolescents' self-perception and their parents' perception are relevant, since no previous studies that used a screening instrument to characterize adolescents' auditory behavior were found in the literature.

Table 4 Comparison between adolescents' self-perception and parents' perception about the auditory behavior and the adolescents' performance in the behavioral evaluation of central auditory processing

Behavioral evaluation outcome of CAP		Altered		Normal		Total		*P*-value
		N	%	N	%	N	%	
Auditory behavior self-perception (adolescents)	High risk	1	5.9%	0	0.0%	1	2.5%	0.005*
	Low risk	14	82.4%	9	39.1%	23	57.5%	
	Normal	2	11.8%	14	60.9%	16	40.0%	
Auditory behavior perception (parents)	High risk	1	5.9%	2	8.7%	3	7.5%	0.058
	Low risk	8	47.1%	3	13.0%	11	27.5%	
	Normal	8	47.1%	18	78.3%	26	65.0%	

Abbreviations: N, casuistry; CAP, central auditory processing.
Chi-square test
*Significance level $p \leq 0.05$

Table 5 Classification of the adolescents' performance, normal or altered, in the tests that composed the behavioral evaluation of central auditory processing

Classification of the behavioral evaluation of CAP	Altered		Normal		*P*-value
	N	%	N	%	
DDT	2	5.0%	38	95.0%	< **0.001***
SIN	2	5.1%	37	94.9%	< **0.001***
SSI	5	12.5%	35	87.5%	< **0.001***
PPS	16	40.0%	24	60.0%	0.074
RGDT	2	5.0%	38	95.0%	< **0.001***

Abbreviations: CAP, central auditory processing; N, casuistry; DDT, dichotic digits test; SIN, speech in noise; SSI-synthetic sentence identification; PPS, pitch pattern test; RGDT, random gap detection test.
Test for equality of two proportions
*Significance level $p \leq 0.05$

The analysis of agreement between adolescents' self-perception and parents' perception regarding auditory behavior was minimal, and thus was disregarded.

In the reviewed literature, there are few studies that investigated the agreement between adolescents' self-perception and parents' perception regarding auditory behavior. However, a study which aimed to compare the students' and parents' responses using a questionnaire found similarity in the results between the parents' and students' responses.

Thus, the authors suggested that, based on the findings, there was greater reliability, so that the questionnaire could be applied only to the student.[26] The findings of this study differ from those of a previous study,[26] most likely due to the different population's age range and the parents' attention level in relation to the school difficulties shown by their children.

A study investigated children's hearing complaints and parents' opinions about their children's hearing and concluded that the children's hearing complaints were prevalent and relevant, but most of them had never undergone an audiological assessment and most parents were unaware of the hearing complaints reported by their children[27].

The results of the present study showed the importance of valuing the individual's self-perception regarding his/her auditory behavior in the diagnosis process of CAPD, especially in the adolescent population, since they were able to identify and report their difficulties in daily life activities, both at home and at school. Possibly, due to the maturation process of the central auditory nervous system is complete in the adolescence stage.

In terms of behavioral evaluation of the CAP, the analysis of the adolescents' performance showed that 42.5% had alterations in this evaluation. The analysis by test showed that the adolescents had performance compatible with normality in most tests (DD, SIN, SSI ipsilateral competing message, and RGDT), and this difference was significant. The only test in which 40% of adolescents had altered performance was the PPT.

This high rate of alteration (42.5%) in the behavioral evaluation of the CAP is probably due to the fact that the present study adopts the criterion established by the Diagnostic Forum of the 31st International Audiology Meeting[25] as reference, which considers alteration in only one test. Thus, it is worth mentioning that the adolescents who had alterations in a single test were retested and confirmed, and there was confirmation of such findings in this research.

The PPT evaluates the temporal ordering auditory ability, which has currently been extensively investigated due to its importance for speech perception. This auditory ability refers to the processing of two or more acoustic stimuli according to the order of occurrence, in a certain time

interval.[28] Thus, any inability to sequence the order of occurrence of sound events can impair the perception of verbal and nonverbal sounds, the understanding of information about things, places and events around us, as well as the perception of prosodic aspects of speech and reading.[29–31]

A study that verified the relationship between academic performance and auditory temporal aspects of adolescents in the 6th grade of elementary school showed that the results of temporal tests were not influenced by the variables: gender, age, musicalization, and manual preference; However, a significant difference was observed between the speech-language management variable and the findings obtained in the GIN test. Regarding the academic performance test, it was observed that the subtests that had the greatest influence on the duration pattern (DP) and pitch pattern tests were writing, followed by reading and arithmetic. The researchers concluded that there is a correlation between academic performance and auditory temporal aspects, specifically for temporal ordering ability.[31]

A study by Machado[32] investigated and analyzed the CAP and some neuropsychological aspects of a group of adolescents with chronic non cholesteatomatous otitis media and a control group. The results showed a significant difference for the averages obtained between the two groups in all CAP tests applied, including the PPT. This study concluded that non-cholesteatomatous chronic otitis media had an influence on both CAP evaluation and attention, memory, and executive function subtests.

Another study compared the adolescents' performance exposed and not exposed to metallic mercury in the behavioral tests of the CAP. The analysis of the results showed a significant difference between groups, and the group of adolescents exposed to mercury underperformed in the majority of the applied tests, especially in the PPT, DP and ADDT.[33]

The findings of the present study corroborate the literature regarding the higher occurrence of alteration in temporal ordering auditory ability for the adolescent population. In the current study, the adolescent's self-perception was compared with his/her performance in the auditory processing evaluation and the results showed a significant difference between adolescents' self-perception and their performance in the PPT, DD, and SSI - ipsilateral competing message. However, there were no studies in the international and national literature comparing the self-perception and performance of adolescents in the CAP evaluation.

However, a national study analyzed the students' performance in the simplified auditory processing test and compared it with a self-perception questionnaire based on the SAB. These questions were modified to a more accessible and direct language to facilitate the participants' understanding. The analysis of the results showed that worse performance for both the SAP test and the self-perception questionnaire (SAB) occurred in the group of children who had school difficulties. From the correlation analysis, the authors concluded that the SAP test and the self-perception questionnaire should be used as complementary diagnostic methods.[26]

The findings of the present study also suggest that the SAB questionnaire was a good screening instrument when applied to adolescents and that self-perception of this population should be valued in the diagnostic process.

To verify one of the hypotheses of this study, the authors compared adolescents' self-perception and parents' perception regarding the auditory behavior and performance in the behavioral evaluation of the CAP. A significant difference was observed between the adolescents' self-perception and their performance in the CAP evaluation, since the 15 adolescents who had alterations in the behavioral evaluation of the CAP classified their auditory behavior as "high risk" (5.9%) and "low risk" (82.4%) for CAPD. It is also noteworthy that the same did not occur in relation to the parents' perception.

The disagreement between findings of the adolescents' self-perception and their parents' perception can be explained due to the fact that self-perception is an individualized process, characterized by a unique perception, and that cannot be measured equally by the individuals around them, for example parents and/or teachers.

However, a study whose objective was to investigate the auditory abilities of European Portuguese children and verify their correlation with the scale of auditory behaviors (SABs) score answered by parents, concluded that this correlation exists.[19]

A study conducted with 60 Brazilian children diagnosed with learning disabilities and dyslexia had as one of its specific objectives to verify the degree of agreement between the SAB questionnaire answered by parents and the CAP evaluation. In this study, a 95% agreement between the questionnaire score and the result of the behavioral evaluation of the CAP was found.[16]

In the aforementioned studies, there was an agreement between the parents' perception, obtained through the SAB questionnaire and the performance in the behavioral evaluation of the CAP. However, such finding did not occur in this study.

In this study, the lack of agreement between parents' perception and performance in the behavioral assessment of CAP may be explained by the average age of adolescents, which was 14.82 years. In the other studies, the participants' age was lower, which probably made parents more attentive to their children's auditory difficulties.

Finally, we believe in the design of new studies with greater investment of researchers in non-invasive evaluations that provide evidence of central auditory nervous system involvement in specific language and learning disorders in the adolescent population; in validating questionnaires that can be used as screening instruments for CAPD; in the inclusion of screening instruments in clinical routine of the audiologist for the diagnosis of CAPD; and in the inclusion of temporal processing tests in the behavioral test battery of the CAP.

Absence of a correlation between adolescents' self-perception and parents' perception with the adolescents' school performance is highlighted as a limitation of this study. Thus, new study designs with the adolescent population are needed to correlate these aspects.

Conclusion

Most adolescents were able to perceive difficulties regarding their auditory behavior and characterized it as "low risk" for

CAPD but the same did not occur with their parents. There was agreement only between the adolescents' self-perception and their performance in the behavioral evaluation of the CAP.

Conflict of Interests
The authors have no conflict of interests to declare.

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