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Artigo Original

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Performance of public and private school students in auditory processing, receptive vocabulary, and reading comprehension

Desempenho de alunos de escola pública e privada em processamento auditivo, vocabulário receptivo e compreensão leitora

Keywords

Vocabulary
Hearing
Auditory Perception
Comprehension
Learning
Child

ABSTRACT

Purpose: To characterize the performance of 5th grade students from public and private elementary schools in auditory processing, receptive vocabulary, and reading comprehension. **Methods:** The study sample was composed of 34 Elementary School (5th grade) students: 16 from public school (PubG) and 18 from private school (PrivG), whose parents and teachers responded to questionnaires on their language development, socioeconomic level, and academic performance. The auditory skills of figure-ground, association between auditory and visual stimuli, figure-ground for linguistic sounds, binaural integration, temporal ordering, and temporal resolution were assessed using the following auditory behavioral instruments: Pediatric Speech Intelligibility (PSI) test, Dichotic Digits Test (DDT), Auditec® Frequency Pattern Test (FPT), and Gaps-in-Noise (GIN) test. Receptive vocabulary and reading comprehension were evaluated using the TVF-usp and PROLEC tests, respectively. **Results:** Statistically significant differences were observed between the socioeconomic level of students in both schools. Although the results obtained in the applied tests were within the reference values in both groups, there was a tendency to higher scores in the PrivG. Differences between the groups were also verified in the DDT and FPT. Values similar to normality were obtained in the temporal resolution and reading comprehension assessments. On the vocabulary test, most school children in the PrivG were concentrated in the 'high' and 'middle' categories, whereas those in the PubG were in the 'middle' and 'low' categories. **Conclusion:** There are differences in performance between students from private and public schools. Public school children presented right ear advantage in the dichotic task, whereas private school children showed more efficient mechanisms and strategies regarding auditory stimuli for the tasks of binaural integration, temporal ordering, and interhemispheric transfer. Temporal resolution reached values expected for the adult population in both groups. Better vocabulary performance was observed in the most economically favored children. Elementary School (5th grade) students from both school networks present developed reading.

Descritores

Vocabulário
Audição
Percepção Auditiva
Compreensão
Aprendizagem
Criança

RESUMO

Objetivo: caracterizar o desempenho de escolares de 5º ano do ensino fundamental de escola pública e privada em processamento auditivo, vocabulário receptivo e compreensão leitora. **Método:** foram avaliadas 34 crianças do 5º ano do ensino fundamental (GPub: 16 de escola pública; e GPriv: 18 de escola privada), cujos pais e professores responderam a questionários sobre o desenvolvimento da linguagem, nível socioeconômico e desempenho acadêmico. As habilidades auditivas de figura-fundo e associação de estímulos auditivos e visuais, figura-fundo para sons linguísticos, integração binaural, ordenação temporal e resolução temporal foram avaliadas com os testes comportamentais *Pediatric Speech Intelligibility Test*, Dicótico de Dígitos, Teste Padrão de Frequência versão da Auditec® e *Gaps-in-Noise*. O vocabulário foi avaliado com o Teste de Vocabulário por Figuras USP e a compreensão leitora com teste PROLEC. **Resultados:** houve diferença significante entre o nível socioeconômico dos grupos pesquisados, embora, em ambos os grupos, pôde-se observar resultados dentro dos valores de referência nos testes aplicados. Houve uma tendência a pontuações mais elevadas no grupo de alunos da escola privada. Houve diferença nos testes Dicótico de Dígitos e Padrão de Frequência. Os valores obtidos no teste de resolução temporal se equipararam à normalidade, assim como na avaliação da compreensão leitora. A maioria das crianças do ensino privado concentrou-se nas categorias 'elevado' e 'médio' do teste de vocabulário. As crianças do ensino público concentraram-se nas categorias 'médio' e 'rebaixado'. **Conclusão:** as crianças do ensino público apresentaram uma vantagem da orelha direita na tarefa dicótica. A resolução temporal atingiu valores esperados para a população adulta em ambos os grupos. Melhor desempenho em vocabulário foi observado nas crianças mais favorecidas economicamente. A leitura encontra-se desenvolvida no 5º ano do ensino fundamental de ambas as redes.

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INTRODUCTION

Every three years, the Programme for International Student Assessment (PISA) evaluates reading, mathematics, and science skills in a worldwide sample of students, and produces education quality indicators in the participating countries. According to the National Institute of Educational Studies and Research "Anísio Teixeira" (INEP), statistics from the same program showed that Brazilian students' performance in 2015 was below the average compared with that of students from member countries of the Organization for Economic Cooperation and Development (OECD). This information allows governments to define and improve educational policies, as well as instigate studies related to the learning and profile of national schoolchildren. Furthermore, knowledge about the neurobiological pathways and mechanisms associated with the literacy process enables school teams and other education professionals to identify early difficulties, in addition to being the basis to develop effective strategies and appropriate referrals.

Aiming to disseminate information to professionals involved in the teaching and learning process, this study addressed three areas of language development: auditory processing (AP), receptive vocabulary (RV), and reading comprehension (RC).

Development of the nervous system and hearing skills in children depends on their social relationships and experiences with the environment. The quality and number of auditory stimuli will directly influence the development and functioning of this system[1,2,3]. Children who experience sensory deprivation as a result of recurrent ear infections or impoverished hearing stimulation may present changes in AP[4]; in contrast, those who experience favorable developmental conditions and receive stimuli, such as learning a second oral language[5] or music[6,7], tend to show better performance in hearing skills.

Assessment of auditory skills can contribute to identification and intervention in children with low academic performance[8], since difficulties in interpreting sound patterns and in the processing of auditory perceptual information can cause behavioral changes, leading to school failure[9]. Such information suggests that it is import the team have knowledge on hearing skills and on how they influence oral and written language.

Similarly, mastery of oral language is a good indicator of intelligence and development of formal academic skills[10,11], and reading and writing could be included among these skills.

Oral language vocabulary is defined as the set of words that an individual can use efficiently[10]. The vocabulary development occurs properly when there is brain maturation, social and family environments, the stimulation received by the child, and sensory integrity are fundamental to the proper development of oral vocabulary[12].

Reading is a complex process that involves inter- and intra-dependent skills from various systems. Perceptual, auditory, visual, cognitive, and linguistic skills are related to these processes, which are developed so that the reader can perform decoding and RC[13]. Reading comprehension is one of the most important aspects of learning given the role it plays in the processes of sharing, building and acquiring knowledge.

Studies have shown that socioeconomic status (SES) is associated with opportunities for children to be exposed to new learning and, consequently, to language development[15,16], which lead to the presence or absence of learning complaints and difficulties. In contrast, family involvement in children's lives, that is, shared activities and moments of child-parents interaction, provide better physical and social conditions in child stimulation[17].

According to Schoon et al.[18], the education network and the education attainment the individual vary according to academic performance: children with low school performance tend to achieve lower levels of education than children with good school performance. In contrast, educational level seems to have an influence on SES, health, and quality of life[19]. Motivation to study together with the incentive and academic assistance offered to students contribute positively to the socioeconomic mobility of families and, consequently, of the population[20]. From this perspective, the variables of academic performance, educational level and SES are part of a set that should be considered within teaching and learning from start to end of the literacy process.

According to the Brazilian National Curriculum Parameters (PCNs), students are expected to be able to read, understand the content read, and use oral language effectively by the end of Elementary School. Thus, when evaluating students at this stage of schooling, it is expected that they have developed reading competence.

In this context, this study aimed to characterize the performance of 5th grade students from public and private schools in AP, RV, and RC.

METHODS

This cross-sectional, prospective, descriptive study was approved by the Research Ethics Committee, College of Medicine, University of São Paulo (FMUSP) under protocol n. 008/16.

Prior to data collection, those responsible for the participating educational institutions signed an Authorization Form, and the teachers and parents of the participating students signed an Informed Consent Form (ICF). The students were verbally and individually informed about their participation in the study and, in case of agreement, they signed an Assent Form. In addition, the parents and teachers of the participating schoolchildren were asked to respond to questionnaires that provided relevant information on their children's academic performance (Questionnaire for Teachers of the school program of the Speech Therapy, Physiotherapy and Occupational Therapy Department - FOFITO-FMUSP), language development (Questionnaire for Parents of the school program of the FOFITO-FMUSP), and socioeconomic level (Brazilian Criteria of Economic Classification Brazil of the Brazilian Association of Research Companies, 2015).

After application of these questionnaires, the schoolchildren were divided into groups according to the inclusion criteria of this study, namely, being regularly attending the 5th grade

at the selected Elementary Schools; absence of indicators of hearing and/or vision changes and neurological, behavioral or cognitive disorders (assessed using questionnaires); pure-tone air-conduction thresholds ≤20 dBHL for 500-4000 Hz frequency confirmed by the basic pure-tone audiometry performed in a booth using a Grason-Stadler GSI-61 audiometer (calibrated according to ANSI S3.6-1989 and ANSI S3.43-1992 standards) on a date previously scheduled with those responsible for the participants.

This study was carried out in two environments: in the first stage, when the RV and RC tests were applied, it was conducted in the school space during the students' counter class shift, and the average time of individual evaluations was 30 min; in the second stage, the behavioral evaluations of auditory skills were carried out at the Teaching and Research Center of the referred Institution on a date previously scheduled with those responsible for the students, and lasted 60 min on average.

Students from two public and private regular education schools located in the west zone of the city of São Paulo participated in this study. In these schools, the quietest environments were selected for the first stage of data collection. It was stipulated that the room chosen should be the one with the lowest level of sound pressure, and it was expected that this value would be close to that allowed for environmental noise in institutions according to the Brazilian Association of Technical Standards (ABNT)[21]. The Brazilian Registered Standard NBR 10152 foresees an acceptable noise level of 50 dB for classrooms. An Instrutherm DEC-460 sound pressure level meter was used to measure the average level of environmental noise according to the manufacturer's instructions. Mean sound pressure levels of 67 and 52 dB were verified the selected rooms of the public and private schools, respectively, both in the morning and afternoon. The pedagogical demand and the absence of flow of people in these spaces were also considered.

The study sample was composed of 34 Elementary School (5th grade) students: 16 from public school (PubG) and 18 from private school (PrivG). Age of the participants ranged from 10 years and 1 month to 10 years and 11 months in both groups (median of 10 years and 4 months).

The first test performed by the participants in the school environment was the auditory vocabulary test TVF-usp[10], which verifies the children's ability to understand words. To evaluate RV the PubG, the original version of the TVF-usp (TVF-usp - 139o) was used. This version consists of 139 test items and has been validated to evaluate students from the 1st to the 4th grades of public elementary school, from low, medium-low or medium SEL. Students in the PrivG were evaluated using the shortened version of the TVF-usp (TVF-usp - 92o), which is composed of 92 test items and has been validated to evaluate students from the 1st to the 4th grade of private elementary school children, from medium, medium-high or high SEL. The choice from application of different versions of the same test was based on the different SEL observed in the groups.

In both versions of the TVF-usp, the schoolchildren hear a word and select the corresponding picture from four alternatives. One point is added for each correct response. According to the rules established by the test authors (for each version), the total score obtained by the participants was classified as: very low, low, medium, high, or very high.

On the same occasion, RC of the students was assessed through application of number 10 of item IV of the PROLEC test[22], which consisting of four short texts (two narrative and two expository). This test aims to investigate whether schoolchildren able to understand the text read and integrate it into their knowledge. Each oral reading was followed by four oral questions worth one point each: two literal and two inferential, according to instructions described in the test manual. For classification of the participants' performance, the normative criteria was considered according to the number of correct answers: normal (12-16), presents difficulty (10-11), and presents great difficulty (≤9).

Behavioral assessment of AP was carried out at the Teaching and Research Center of the aforementioned institution after previously scheduled appointments with those responsible for the schoolchildren. To this end, the Pediatric Speech Intelligibility (PSI) Test[1] was applied under monotic conditions to measure the auditory figure-ground skills and the association between auditory and visual stimuli, involving the identification of phrases with a competitive message, with visual support for the correct answer. The test result was classified according to the percentage of correct responses (normality for the age group: signal-to-noise ratio -15 dB = ≥60% right ear (RE) / left ear (LE). Application of the PSI test was decided due to the reading difficulties found in some of the individuals investigated.

The Dichotic Digit Test (DDT)[1] was applied to assess the ability of binaural integration based on the identification and repetition of four different numbers presented simultaneously, two in each ear. It was expected that the percentage of correct answers in both ears would be ≥95%, according to the normality of the test for the age group.

The Frequency Pattern Test (FPT) (Auditec® version) (1997)[23] was used to evaluate the temporal ordering ability. For application of the FPT in this study, students were requested to identify and name of sequences formed by three consecutive stimuli, differentiated by the frequency characteristic. Prior to the test application, students underwent a training track containing sequences of only two stimuli. The FPT was applied in a monoaurally (only RE) to make the assessment faster. According to Corazza[24], the variable side of the ear (right and left) does not influence the overall test result. The normality standard for ten-year-old children is 85% of correct responses.

Finally, in order to assess temporal resolution, the Gaps-in-Noise (GIN) Test[25] was applied to a single ear (RE), also aiming to reduce the evaluation time and avoid tiredness, since studies have reported no difference in performance at the GIN test with respect to the ear evaluated[25]. According to the normality standards of this test, identification of intervals ≤5 ms was classified as adequate.

The PSI test was applied at 40 dBNS, whereas the DDT, FPT and GIN tests were applied at 50 dBNS.

Aiming to eliminate the "fatigue" bias in the application and interpretation of the auditory processing behavioral assessment tests, two different sequences were used, as shown in Chart 1.

Chart 1 – Sequences of application of the auditory processing behavioral assessment tests

Sequence 1	Sequence 2
1st Temporal	1st Temporal
2nd Dichotic	2nd Monotic
3rd Temporal	3rd Temporal
4th Monotic	4th Dichotic

After collecting the experimental data, the scores were tabulated according to the instructions of the standardized tests. A professional statistician analyzed the data after a discussion with the authors of this article on all the information relevant to interpret the results obtained for each objective proposed in the research.

The following statistical measures were used: Mann-Whitney test, Likelihood-Ratio test, Student's t-test, Analysis of Variance (ANOVA) with repeated measures, Tukey's test, and Residual analysis. The data were processed using Minitab 18 and SPSS 18 software. A significance value of 5% ($p<0.05$) was adopted for all statistical analyses.

RESULTS

The study sample was composed of 34 5th grade students (17 boys and 17 girls) from private and public elementary schools divided into two groups: PrivG (18; 53%) and PubG (16; 47%).

Most children in the PrivG were classified as high SES (76%), whereas most students in the PubG were classified as medium SES (66%). The likelihood ratio test showed a significant difference between the percentage distributions in the two groups ($p<0.001$).

All parents of children in PrivG had higher education or post-graduation level. A for those in the PubG, most parents presented elementary, middle or high school level. Statistically significant difference was observed between the groups ($p<0.001$).

In the PSI test, means for the RE were higher than those for the LE, and the percentage of correct answers was similar in both groups (Figure 1).

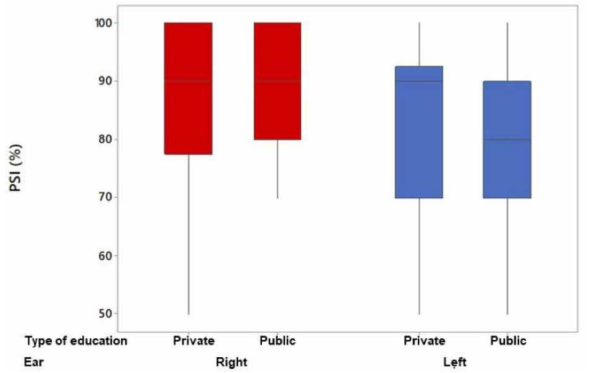

Figure 1 – Box-plots for the PSI test according to group and ear

Captions: Private: participants in the PrivG. Public: participants in the PubG.

The results obtained in the repeated measures ANOVA showed a statistically significant difference between the PSI means in both ears ($p=0.013$) regardless of the group ($p=0.181$). There was no statistically significant difference between the PSI means in both groups ($p=0.969$), and this conclusion was valid for both ears ($p=0.181$).

The residual analysis did not show gross deviations from the assumptions of the adopted analysis technique.

Figure 2 shows the box-plot distributions of the DDT results by ear and group.

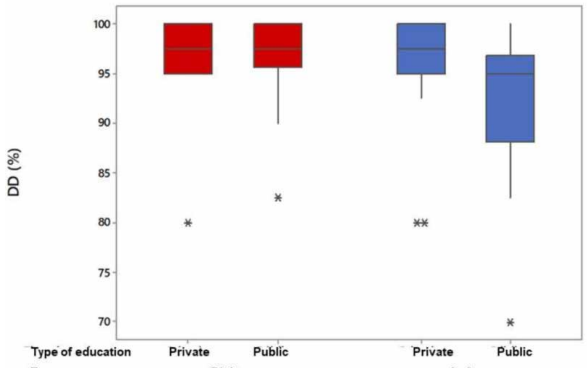

Figure 2 – Box-plots for the DDT according to group and ear

Captions: Private: participants in the PrivG. Public: participants in the PubG. *: an outlier in the sample. **: two outliers in the sample.

The residual analysis performed after the repeated measures ANOVA showed discrepant behavior in two children in both

ears, one from each group. These children were excluded from the study and the analysis was repeated, with a conclusion that there was an interaction between groups and ear (p=0.019). This means that the difference between the DDT means in both ears was dependent on the school network. In addition, the difference between the DDT means in both groups was not the same in both ears. The analysis was continued with the objective of localizing the differences between the DDT means in both groups and ears (Tukey's test).

There was no statistically significant difference between the DDT means in PubG and PrivG when RE was considered (p=0.805). In the LE, the DDT mean in the PrivG was higher than that in the PubG (p=0.001). In PrivG, no statistically significant difference was found between the DDT means in both ears (p>0.999), whereas in the PubG, the DDT mean for the RE was greater than that for the LE (p=0.001).

Figure 3 shows that the percentage values of correct responses in the FPT tended to be higher in the PrivG.

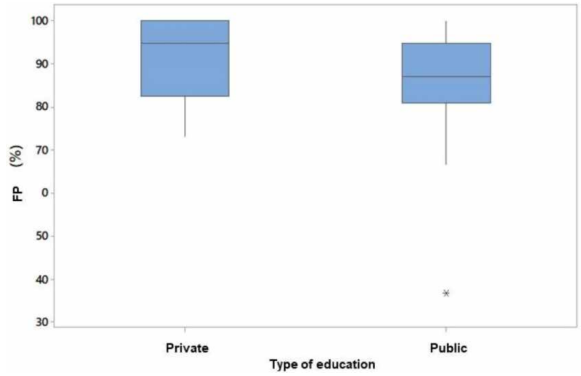

Figure 3 – Box-plots of the percentage of correct responses for the FPT according to group

Captions: Private: participants in the PrivG. Public: participants in the PubG *: outlier

The Mann-Whitney test showed that there was no statistically significant difference between the distributions of the percentage of correct answers in the FPT in both groups (p=0.115).

Figure 4 shows the individual values of time in the GIN test per group, where similar response behavior in both groups can be observed.

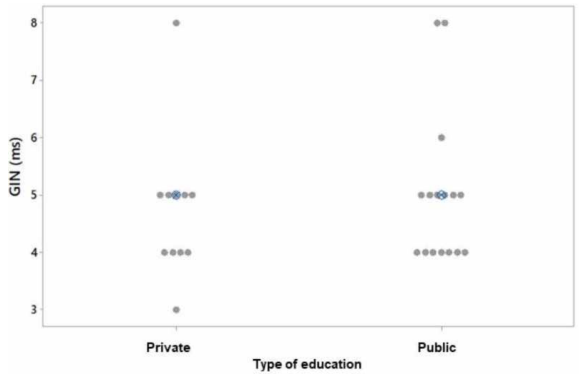

Figure 4 – Individual and median values of time in the GIN test (ms) according to group

Captions: Private: participants in the PrivG. Public: participants in the PubG.

Seven schoolchildren in the PrivG were not tested.

The Mann-Whitney test showed that there was no statistically significant difference in the response distribution in the GIN test between the groups (p=0.633).

Table 1 shows that most of the children in the PrivG were concentrated in the 'high' and 'medium' categories on the RV test, whereas those in the PubG were in the 'medium' and 'low' categories. When comparing the classification distributions in the RV test in both groups, p=0.05 was obtained.

Table 1 – Frequencies and percentages of classification in the receptive vocabulary test according to group

Group	Receptive vocabulary test			
	High	Medium	Low	Total
PrivG	7	9	2	18
	38.9 %	50.0 %	11.1%	100 %
PubG	1	11	4	16
	6.3 %	68.8 %	25.0 %	100 %
Total	8	20	6	34
	23.5 %	58.8 %	17.7 %	100.0

The results in the graphs of individual and average values of the number of correct responses in the RC test show similar behaviors of the children in both groups (Figure 5). Participant number 7 in PubG was highlighted for presenting a much lower number of correct responses compared with those of the other participants.

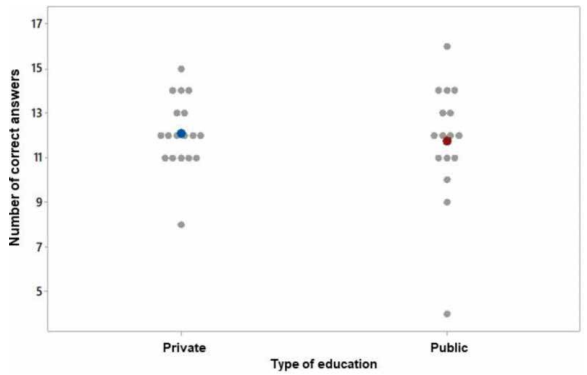

Figure 5 – Individual and mean values of the number of correct answers in the reading comprehension test according to group

Captions: Private: participants in the PrivG. Public: participants in the PubG.

No statistically significant differences were observed between the distributions of the number of correct responses in the groups (p=0.860).

DISCUSSION

In general, the results showed that the education network influenced the students' performance in all experimental tests.

The higher educational level of those responsible for the schoolchildren in the PrivG compared with that of those responsible for the students in the PubG (p<0.001), in addition

to the difference in SES between the groups, which was higher in the PrivG ($p<0.001$), corroborate the conclusion by Von Stumm et al.[19], who reported that educational level positively influences the SES, that is, the higher the educational level of parents and/or legal guardians, the higher the family SES. The opposite also seems to be true: family SES influences the educational level reached by its members.

In this sense, Federal Law no. 12.711/2012, which guarantees that a portion (currently 50%) of vacancies in federal universities and technical institutes be reserved for students from public schools, may motivate the increase in the educational level of economically less privileged families. However, the need for investments in quality basic education is not ruled out so that students have real conditions to develop throughout their academic life. Browman et al.[20] stated that, regardless of the SES, academic motivation positively contributes to students' academic results.

Moreover, not only the SES and the parents' educational level, but the pedagogical context in which the children are inserted can predict their behavior and learning process. Therefore, although SES is an important factor in physical and social conditions, the quality of family stimulation, the participation of parents in the academic life of their children (regardless of SES), and the educational opportunities that the children are exposed increase their global development. From this context, training professionals involved in the teaching and learning process and encouraging the search for knowledge based on new strategies that involve multiple forms of learning (involving sensory, motor and linguistic aspects) can foster a favorable pedagogical context, regardless of the education network where students are inserted.

The behavioral assessment of AP showed that the PSI test averages for the RE were higher than those for the LE ($p=0.013$). Although this difference did not depend on the group ($p=0.181$), Figure 1 shows that at least half of the participants in both groups had a performance ≥80% in both ears. A previous study observed statistically significant differences between the results obtained for both ears, with better results found for the ear that was tested second (LE). This fact suggests a "learning effect of the task"[27], which did not seem to have influenced the test results in the present research.

In order to assess binaural integration, the DDT was applied. Analysis of the DDT results (Figure 2) showed a RE advantage in the PrivG compared with the PubG ($p=0.001$). In the PrivG, no statistically significant difference was observed between the DDT means in both ears ($p>0.999$). In the PubG, the DDT average for the RE was higher than that for the LE ($p=0.001$). Thus, participants in the PrivG seem to have no preference for an ear in a dichotic task, whereas students in the PubG tended to present a RE advantage. The differences between the right and left ears in verbal tests of dichotic listening may reflect functional differences between the cerebral hemispheres, as well as the fact that each ear has a stronger connection with the contralateral hemisphere[28].

Although the Mann-Whitney test did not show any difference between the percentage distributions of correct responses in the two education networks ($p=0.115$), the descriptive analysis displayed in Figure 3 shows that the percentage values of the correct responses in the FPT tend to be greater in the PrivG. The worse results obtained in the AP behavioral tests by the participants from lower SEL may be associated with late maturation[29]. The children of the PrivG had more efficient mechanisms and strategies in the auditory stimuli for the tasks of binaural integration and temporal ordering. As previously mentioned, this suggests that the worse performance of the PubG was related to immaturity of auditory skills.

The GIN test assessed temporal resolution, which is an auditory skill that is part of temporal processing and refers to the minimum time required for an individual to perceive and discriminate acoustic stimuli. Similar response behavior in the GIN test were observed in both groups (Figure 4). The Mann-Whitney test showed that there was no statistically significant difference between the response distributions in the GIN test in the two education networks ($p=0.633$). The mean threshold for identifying gap intervals found in this study was 4.9 ms (PrivG: 4.7 ms; PubG: 5.0 ms). These values are close to those reported in a previous national study[26].

When proposing the Brazilian standardization for the GIN test, Samelli and Schochat[26] evaluated a sample of 100 normal-hearing adult individuals (50 males and 50 females). According to their results, the general mean gap-detection threshold was 3.98 ms, and thresholds up to 5 ms are considered within the normality range for the adult population. In this sense, the results observed in both groups of the present study (PubG and PrivG) showed that 10-year-old children, with normal temporal resolution skills, perform within normality in the GIN test, and their performance is similar to that of adults.

Considering that the GIN test uses non-verbal stimuli and answers and that, from the age of 8, auditory pathway responses for this test[6] are similar to those in the adult population[25], it can be inferred that the good performance of the children in this study is associated with the proper maturation of their auditory system. Furthermore, unlike the previous tests (PSI, DDT, and FPT), which were permeated by understanding, association, and linguistic answers, the GIN test was able to assess the mature and efficient functioning of the auditory system of children at 10 years of age, without the influence of language.

In the statistical analysis of the RV test results, most children in the PrivG were concentrated in the high and medium categories of the test, whereas those in the PubG were in the medium and low categories. This difference was statistically significant ($p=0.05$), and can be justified by the fact that the social environment where the children in the PrivG were inserted seemed to offer greater learning opportunities, thus resulting in language development. In addition to the content recommended by the Brazilian Ministry of Education (MEC), the private school where the research was conducted offers students opportunities to participate in extracurricular activities, such as language (English and Spanish), music, art, swimming, planting and gardening, computer science and chess classes (all offered weekly). In this context, the education network and the opportunities for children to be exposed to new learning, and the consequent language development related to SES influenced the RV evaluation[13,14].

Although participants in the PubG presented medium-low performance, 68.8% of these children (n=11) achieved average performance when the absolute values were analyzed. This fact

confirmed the conclusions by Cartmill et al.[30], who reported that although the SES is related to the linguistic stimuli offered to children, quality of interaction was not associated with SES, justifying the good performance within the average of children in the PubG.

Duursma et al.[13] examined the frequency at which American parents of low SEL read to children aged 2 to 5 years old. The parents of the aforementioned study participated in an interview using questionnaires (Early Head Start), and the children were evaluated using standardized measures. The results showed that the parents who read the most to their children had completed high school and, consequently, the children performed better in language tests (including RV tests). These results showed that although the SEL and educational level of the parents in the PubG are lower than those of the parents in the PrivG, the first can offer effective linguistic stimulation for language (and reading) development through reading practices started in early childhood.

Coddington et al.[14] emphasized the importance of public strategies aimed at increasing family educational levels (offering training to parents) as a tool for children's linguistic development. According to previous studies[13,14], family socioeconomic components can be strengthened by training active parents in the formal education of their children. This also provides a stimulating family environment, since acquisition and development of vocabulary are continuous processes. Delays in this process can interfere with intellectual skills and academic achievement rates. The data of this research corroborate these findings since, in addition to the higher educational level of their parents, participants in the PrivG were classified into more privileged SEL. Additionally, the teachers of the students in this group highlighted the concern and participation of parents in the school routine of their children.

A final aspect to be considered regarding this item is that the TVF-usp proved to be a good instrument in the evaluation and comparison of students. When using the standardized versions for public (TVF-usp - 139o) and private (TVF-usp - 92o) education networks, the evaluation was easy to understand and perform in both groups of students (high percentages of medium and high performance were observed in both groups).

Regarding the results obtained in the RC test (Figure 5), similar behaviors were observed in both types of education regarding this skill. At least 50% of the participants in both groups showed normal results. There was no statistically significant difference between the percentage distributions in both groups (p=0.800).

The good performance of both groups in the RC test is justified by the fact that 5th grade schoolchildren are expected to have correctly developed the necessary reading and writing skills[31,32]. According to MEC, students at this stage should autonomously read texts of different genres and length and select strategies to understand their explicit and implicit messages. The use of the PROLEC test in this study also seems to have been adequate to evaluation and compare the students. Observing the good performance of both groups in RC, it is possible to conclude that PROLEC test easily guaranteed the assessment of this skill, without letting its level of difficulty harm public school students.

Therefore, a teaching unit that offers extracurricular resources and activities, in addition to expanding the world knowledge of their students, encourages the development of oral language, acquisition of vocabulary and, consequently, their better performance in reading, which was reflected in the better performance in RC of private school students in this study. However, although such opportunities are differential in the educational process of children, it is expected that 5th grade students from both networks have correctly developed the necessary reading and writing skills.

Limitations to this study include the initial difficulty in finding schools that would establish a partnership with the research, the small sample size, and the data collection carried out on two different days/places, which hindered the scheduling of the participants in the extra-school environment (due to the limitations of parents and/or legal guardians).

The findings of this research alert to the importance of public strategies aimed at increasing family educational levels (by offering training to parents) and continuing education for teachers, speech-language therapists, and education professionals, as a tool for child linguistic development.

CONCLUSION

Parental educational level and the pedagogical context in which the children are inserted interfere in their behavior and learning process.

Private schoolchildren showed more efficient mechanisms and strategies regarding auditory stimuli for the tasks of binaural integration, temporal ordering, and interhemispheric transfer. The temporal resolution of 5th grade students in public and private elementary schools reached values expected for the adult population.

The social environment of children from the private network offer greater opportunities for learning new words, resulting in better language development. Ability to understand written material was observed in both groups; however, the public school network group showed better performance in this task.

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Author contributions

AFON performed data collection and analysis and writing of the manuscript. ES was responsible for the project orientation, data analysis, and writing and reviewing of the manuscript.