

Analysis of the criteria of three different instruments for assessing phonological awareness

Análise dos critérios de três diferentes instrumentos de avaliação da consciência fonológica

Análisis de los criterios de tres instrumentos diferentes para la evaluación de la conciencia fonológica

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Abstract

Introduction: Phonological awareness is a language skill that involves perception and reflection on the sounds of the language, that is, listen, think and transform words, syllables and phonemes, thinking consciously about the linguistic code. Thus, it is understood that the relationship between PA and literacy is necessary for good performance in the process of acquiring reading and writing. **Objective:** to describe and compare the performance of children in three different instruments for assessing phonological awareness, relating it to age, school year and writing hypothesis. In addition to observing whether, among these, there is one or more criteria that presents statistical significance to the development of Phonological Awareness. **Methods:** The sample consisted of 60 children, enrolled in the 1st, 2nd and 3rd year of elementary school at two schools in Santa Maria – Rio Grande do Sul public network. To evaluate the children, three phonological awareness assessment instruments were used, in addition to

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one prior to the application of instruments relating to learning to read, write and oral myofunctional system, voice, language and hearing. The instruments selected were: Phonological Skills Profile, Tests of Metalinguistic and Reading Skills and Phonological Awareness: Sequential Assessment Instrument, which analyze their results by age, school year and writing hypothesis, respectively. The data received statistical treatment using the Computational Program The SAS System for Windows (Statistical Analysis System), version 9.2. **Results:** It was possible to observe that the children's performance in the three instruments presented important results to justify the selected evaluation criteria, however only the PHF instrument presented statistically significant data for all of them. **Conclusion:** the instrument that presented statistically significant data for the relationship between performance and criterion was the Phonological Skills Profile, with chronological age being the one that was most strongly related to performance in Phonological Awareness.

Keywords: Child development; Child language, learning, process assessment; Mental processes.

Resumo

Introdução: A Consciência Fonológica é uma habilidade da linguagem que envolve a percepção e reflexão sobre os sons da língua, ou seja, ouvir, pensar e transformar as palavras, sílabas e fonemas, pensando conscientemente sobre o código linguístico. Assim, entende-se que a relação entre a Consciência Fonológica e a alfabetização é necessária para um bom desempenho no processo de aquisição da leitura e escrita. **Objetivo:** descrever e comparar o desempenho de crianças em três diferentes instrumentos de avaliação da Consciência Fonológica relacionando-o aos critérios de idade, ano escolar e hipótese de escrita. Além disso, pretende-se observar se, dentre esses, há um ou mais critérios que apresentam significância estatística ao desenvolvimento da Consciência Fonológica. **Métodos:** A amostra foi composta por 60 crianças, matriculadas no 1º 2º e 3º ano do ensino fundamental de duas escolas da rede pública estadual de Santa Maria – Rio Grande do Sul. Para avaliar as crianças, foram utilizados três instrumentos de avaliação da Consciência Fonológica, além de uma anterior às aplicações dos instrumentos referentes à aprendizagem da leitura, escrita e sistema miofuncional oral, voz, linguagem e audição. Os instrumentos selecionados foram: Perfil de Habilidades Fonológicas, Provas de Habilidades Metalinguísticas e de Leitura e Consciência Fonológica: Instrumento de Avaliação Sequencial, que analisam seus resultados por idade, ano escolar e hipótese de escrita, respectivamente. Os dados receberam tratamento estatístico através do Programa Computacional The SAS System for Windows (Statistical Analysis System), versão 9.2. **Resultados:** foi possível observar que o desempenho das crianças nos três instrumentos apresentou resultados importantes para justificar os critérios de avaliação selecionados. No entanto, apenas o instrumento de Perfil de Habilidades Fonológicas apresentou dados estatisticamente significantes para todas as variáveis de consciência fonológica analisadas. **Conclusão:** o instrumento que apresentou dados estatisticamente significantes para a relação entre desempenho e os critérios foi o Perfil de Habilidades Fonológicas, sendo a idade cronológica aquela que se relacionou mais fortemente com o desempenho em Consciência Fonológica.

Palavras-chave: Desenvolvimento infantil; Linguagem infantil, aprendizagem, avaliação de processos; Processos mentais.

Resumen

Introducción: La conciencia fonológica es una habilidad lingüística que implica la percepción y reflexión sobre los sonidos de la lengua, es decir, escuchar, pensar y transformar palabras, sílabas y fonemas, pensando conscientemente en el código lingüístico. Así, se entiende que la relación entre AF y alfabetización es necesaria para un buen desempeño en el proceso de adquisición de la lectura y la escritura. **Objetivo:** describir y comparar el desempeño de niños en tres instrumentos diferentes de evaluación de conciencia fonológica, relacionándolo con la edad, el año escolar y la hipótesis de escritura. Además de observar si entre estos existe uno o más criterios que presenten significancia estadística para el desarrollo de la Conciencia Fonológica. **Metodos:** La muestra estuvo compuesta por 60 niños, matriculados en 1º, 2º y 3º año de educación básica de dos colegios de la red pública estatal de Santa Maria – Rio Grande

do Sul. Para avaliar a los niños se utilizaron tres instrumentos de evaluación de la conciencia fonológica, además de uno previo a la aplicación de instrumentos relacionados con el aprendizaje de la lectura, la escritura y el sistema miofuncional oral, la voz, el lenguaje y la audición. Los instrumentos seleccionados fueron: Perfil de Habilidades Fonológicas, Tests de Habilidades Metalingüísticas y Lectoras y Conciencia Fonológica: Instrumento de Evaluación Secuencial, los cuales analizan sus resultados por edad, curso escolar e hipótesis de escritura, respectivamente. Los datos recibieron tratamiento estadístico mediante el Programa Computacional The SAS System para Windows (Statistical Analysis System), versión 9.2. **Resultados:** se pudo observar que el desempeño de los niños en los tres instrumentos presentó resultados importantes para justificar los criterios de evaluación seleccionados, sin embargo sólo el instrumento PHF presentó datos estadísticamente significativos para todos ellos. **Conclusión:** El instrumento que presentó datos estadísticamente significativos para la relación entre desempeño y criterio fue el Perfil de Habilidades Fonológicas, siendo la edad cronológica la que se relacionó más fuertemente con el desempeño en Conciencia Fonológica.

Palabras clave: Desarrollo infantil; Lenguaje infantil, aprendizaje; evaluación de procesos; Procesos mentales.

Introduction

Communication is used constantly, whether speaking, listening or writing. Language is present in everyday life from the beginning of the life of a person, which is why it is so important to understand it. Phonological Awareness (PA) is a language skill that involves perceiving and reflecting on the sounds of language, that is, listening, reflecting and understanding that words are made up of different sounds and groups of sounds^{1,2,3,4}.

PA is a complex skill and can be divided into different levels that are achieved during child development and are related to other important factors, such as cognitive maturation, social and linguistic interaction and even the school literacy period itself. Then, it is possible to say that the acquisition of PA occurs gradually, being improved during the literacy period⁵.

The levels of PA have their continuous development and are consolidated during the learning process of reading and writing, because, as the child advances in their academic skills and appropriates their written code, their ability to reflect on the smallest sound units becomes more refined. According to some authors, it is possible to say that some PA skills can be inserted into the daily life of the child, even before they have access to basic education, that is, they can be acquired even in early childhood education, favoring the learning process of reading and writing in the elementary school stage^{5,6,7}.

From this perspective, it is possible to reflect on which factors influence the advancement and im-

provement of metaphonological skills, and whether variables such as age, school year, and the literacy process of the child interfere in the development of PA. Therefore, the objective of this research is to describe and compare the performance of children in three different PA assessment instruments, relating them to age, school year, and writing hypothesis. In addition, it aims to investigate whether there are one or more criteria that present statistical significance with the promotion of PA.

For this, three PA assessment instruments were used that classify the results which were obtained based on three different criteria: age, school year and writing hypothesis.

Methods

This research is associated to an existing project authorized by the Research Ethics Committee of the institution of origin, authorized under number 046/2011. The research was carried out in two public schools in Santa Maria – Rio Grande do Sul as well as the necessary assessments. This is a retrospective study, since the research was carried out in 2015, being an integral part of a Master's dissertation by one of the authors. To participate in the study, parents or guardians of the students were asked to read, understand and sign the Free and Informed Consent Form (FICF).

The assessing instruments of PA were chosen considering the main objective of the research, the frequency with which they are mentioned in research in the area, because they are available for purchase and also because they are the most

widely used instruments in speech-language and psychopedagogical clinical practices. Based on this, we sought PA assessment instruments that used different assessment criteria – age, school year and writing hypothesis. The instruments selected were: Profile of Phonological Skills – PPS⁸, Metalinguistic and Reading Skills Tests – Part A – PROHMELE⁹, Phonological Awareness: Sequential Assessment Instrument – CONFIAS³.

The sample selection and data collection procedures were carried out during the school year, from March to December 2015. Sixty children between the ages of six and ten were evaluated. They were enrolled in 1st, 2nd and 3rd grade elementary school classes, with 10 students from each school year. The two schools which were chosen to conduct the PA assessments were already associated to previous projects, thus having an alignment between researchers and educational institutions, facilitating the relationship with the school community. At the time of the assessment, the school had two classes from each school year in the early years. Therefore, all teachers in charge of these classes were offered participation in the study, since they would receive, after the assessments, a general diagnosis of the PA level of their class. However, only three teachers expressed interest in participating, one from each school year, and these classes were chosen to participate in the study at school 1. At school 2, there was only one class corresponding to each school year of elementary school, and it was agreed that all three classes would participate in the research. The choice of the first three school years of elementary school was justified because they were studying the literacy stage and also because of the intention to observe whether advancing in school year is a determining and statistically significant factor in the best scores for PA tasks.

To be included in the study, students had to present typical global development and be monolingual speakers of Brazilian Portuguese. For these children, a consultation of school documents and speech-language screening was carried out, involving the assessment of the oral myofunctional system, voice, language and hearing. In the review of school documents, aspects related to the eligibility criteria were observed, such as absence of neurological, psychological and learning impairment, as well as a history of bilingualism.

For speech-language screening, the stomatognathic system was evaluated, that is, the morphology of the face, tonicity, shape, posture and mobility of the phonoarticulatory organs (lips, tongue, soft and hard palate, teeth, cheeks and jaw)¹⁰. Breathing functions (nasal, oral and mixed), chewing, phonoarticulation and swallowing were also assessed. The participants' voices were assessed using the Glottal Source Perceptual Assessment Scale – RASATI¹¹. For hearing screening, the external auditory canal was inspected and then pure tone audiometry was performed by using the Interacoustics Screening Audiometer AS208, duly calibrated. The thresholds were investigated at frequencies of 0.5 KHz, 1 KHz, 2 KHz, 3 KHz and 4 KHz, tested at an intensity of 20 dB - scanning mode¹². These assessments were carried out by a speech therapist who were collaborating on the research project.

The observation of comprehensive and expressive language was carried out through narration and spontaneous conversation, from which constitutive aspects of language such as syntax, morphology, semantics, phonology and pragmatics were observed. In addition, the skills for learning to write were collected in order to determine the hypothesis of this skill¹⁴ for all children, using two monosyllabic words, two disyllabic words, two trisyllabic words, two polysyllabic words and two sentences, so that there would be a larger sample of writing.

The pre-syllabic hypothesis was considered to be that in which the child does not establish any relationship between sound and letter, being possible to represent writing in any way, including letters, numbers, scribbles or drawings. The syllabic writing hypothesis was considered to be the correspondence of a letter to a syllable. For the syllabic-alphabetic writing hypothesis, we considered writings in which, in the same word, a representation of a letter to a syllable and syllables written correctly, demonstrating the process of transition from syllabic to alphabetic writing. And, finally, the alphabetic writing hypothesis that corresponds to the correct representation of letters to sounds, although spelling errors may still occur¹³.

Children who, after screening, presented speech and/or language delay, evident neurological and/or psychological issues and hearing problems, as well as those who were undergoing or had previously undergone psychopedagogical and/or speech therapy, were excluded from the sample.

After the sample was selected, data collection started. For data collection, children were called individually, starting with the 1st grade and ending with the 3rd grade children. The assessment instruments were applied on consecutive days in the following order: PPS, PROHMELE and CONFIAS. The idea of using different days for the application of the instruments was designed to avoid causing fatigue in the children and/or a possible change in the data due to this. This fact is justified because the three assessment protocols were applied to all sixty research subjects.

To quantify the results of each instrument, the original evaluation criteria of each protocol were used. However, to classify them equivalently, two modifications were necessary, one for CONFIAS and another for PROHMELE, since this research observed the total performance and not by level of PA. In order for the score to be considered 'expected' for CONFIAS, the score that was between the minimum and maximum for each of the two levels presented by the authors of the instrument was considered.

Chart 1. Expected results according to CONFIAS³

Levels of the Writing Hypotheses Instrument	Syllable		Phoneme	
	Minimum	Minimum	Maximum	Maximum
Pre-Syllabic	18	29	6	10
Syllabic	23	32	6	12
Syllabic-Alphabetic	27	36	12	18
Alphabetic	31	40	15	26

For PROHMELE classification, a chart was created that corresponds to the sum of the minimum and maximum values in each school year and, to

be considered 'expected', the child needed to have a performance within these values, as exemplified below.

Chart 2. Expected results according to the number of errors in PROHMELE⁹

PROHMELE	Minimum	Maximum
1 st grade	3	121
2 nd grade	2	119
3 rd grade	1	124

The collected data were distributed in a spreadsheet of Microsoft Excel (2007) and then forwarded to the statistician responsible for data analysis. The 'syllabic' and 'syllabic-alphabetic' writing hypotheses were grouped by the statistician in order that the data could be better analyzed. The chi-square test or Fisher's exact test (for expected values less than 5) were used to compare categorical variables. The Mann-Whitney test was used to compare numerical variables between 2 groups, and the Kruskal-Wallis test was used between 3 or more groups, due to the lack of normal distribution of the variables, using the SAS System for Windows

(Statistical Analysis System) software, version 9.2. SAS Institute Inc, 2002-2008, Cary, NC, USA, significance level 5% ($p < 0.05$).

In relation to the variables for the study, the chronological age, the school year and the writing hypothesis were chosen, correlating them with each other and with the development of PA in each of the chosen tests. Then, with this design, the aim was to statistically measure whether there would be an improvement in PA performance of children during the literacy period in relation to their chronological age, school year and writing hypothesis.

Results

After data collection, the results were statistically analyzed and organized in the charts

presented here.

Regarding the performances of the subjects in the three instruments, relating them to their school years, the results are presented in Chart 3.

Chart 3. Comparison of PA performance according to school year.

Tests	PPS		CONFIAS		PROHMELE	
School Year	Mean	S.D.	Mean	S.D.	Mean	S.D.
1st	38.4	11.8	28.6	13.9	93.2	24.1
2nd	55.4	7.8	46.3	12.9	51.6	27.6
3rd	60.8	8.4	52.7	10.3	45.3	29.7
p-value	P<0.001		P<0.001		P<0.001	

Caption: P-value for the Kruskal-Wallis test for comparing values between 3 groups with a significance level of 5% ($p<0.05$); PPS: Profile of Phonological Skills; CONFIAS: Phonological Awareness: Sequential Assessment Instrument; PROHMELE: Metalinguistic Skills Test; bold: significant results; S.D.: standard deviation.

We aimed to find data that would confirm the hypothesis that as the school year progressed, the performance in PA would also develop in relation to the three chosen instruments. According to chart 3, it was possible to note that both PPS and CONFIAS showed an increase in the average number of correct answers as the school year progressed, agreeing with PROHMELE, which shows a decrease in the

mean, since this instrument accounts for errors. In all school years of the three instruments, it was possible to find statistical significance, thus contributing to the confirmation of one of the hypotheses of this study.

Chart 4 presents the results regarding the performance of the children in the PA assessment instruments, relating them to their ages.

Chart 4. Comparison of PA performance on different instruments according to age.

Tests	PPS		CONFIAS		PROHMELE	
Ages	Mean	S.D.	Mean	S.D.	Mean	S.D.
6	35.6	11.5	27.3	14.7	94.4	26.4
7	53.7	7.1	43.8	13.9	59.9	31.0
8	60.7	8.8	48.7	10.8	44.5	25.4
9 – 10	59.3	8.3	53.9	10.1	47.8	47.8
p-value	P<0.001		P<0.001		P<0.001	

Caption: Kruskal-Wallis test to compare values between 4 groups with a significance level of 5% ($p<0.05$); PPS: Profile of Phonological Skills; CONFIAS: Phonological Awareness: Sequential Assessment Instrument; PROHMELE: Metalinguistic Skills Test; S.D.: standard deviation; bold: significant results.

Likewise, we aimed to find statistical data that would confirm that chronological age is a relevant and significant factor for improving the results of PA assessments. In Chart 4, it can be seen that the performance of the subjects has a statistically significant increase according to age for the PPS and

CONFIAS instruments and a decrease in the error score for the PROHMELE instrument, showing that PA performance is positively correlated with the chronological age of the child, corroborating the initial hypothesis.

Chart 5 shows a comparison of performances in the different PA assessment instruments for the writing hypotheses. With this comparison, the idea was to present data that the writing hypothesis is also a statistically significant factor for good per-

formance in metaphonological skills. Therefore, the results of the assessments of the three instruments were compared with the individual writing hypothesis of each child.

Chart 5. Comparison of CF performances according to the writing hypothesis.

Tests	PPS		CONFIAS		PROHMELE	
W.H.	Mean	S.D.	Mean	S.D.	Mean	S.D.
PS	31.7	9.0	20.1	6.4	104.0	15.1
S/ SA	49.6	3.2	37.0	10.6	85.2	18.8
A	58.5	8.2	51.1	10.4	45.3	26.3
p-value	P<0.001		P<0.001		P<0.001	

Caption: Kruskal-Wallis test to compare values between 3 groups with a significance level of 5% ($p<0.05$); PPS: Profile of Phonological Skills; CONFIAS: Phonological Awareness: Sequential Assessment Instrument; PROHMELE: Metalinguistic Skills Test; S.D.: standard deviation; T.A: application time in minutes; bold: significant results; W.H.: Writing hypothesis; PS: pre-syllabic hypothesis; S/SA: syllabic and syllabic-alphabetic hypothesis; A: alphabetic hypothesis.

As shown in the chart, it was not possible to observe statistical significance between the results of the PA assessments with all writing hypotheses. Although a better performance was observed for the hypotheses closest to the alphabetic hypothesis, no data was scored that statistically supported this relation.

Discussion

According to the results presented in Chart 3, which refers to the 'school year' criterion, the three selected instruments presented data that statistically corroborate that the influence of the school year contributes to the advancement and better performance of metaphonological skills. These results are justified by the fact that as the school year progresses, PA also develops. Thus, as children acquire greater academic skills, they are also able to demonstrate greater understanding of oral language^{1,14,29}.

Regarding the performance criterion 'age', presented in chart 4, this criterion corresponding to the results of the PPS assessment, it was possible to verify and present statistical significance correlated to the PPS and CONFIAS instruments, for the ages of seven, eight and nine-ten years, enabling the understanding that age and writing hypothesis also present a good relationship with the advancement of PA.

These findings are in agreement with the literature that states that the higher the chronological age of the child and their contact with reading and writing, the greater awareness of the sounds of the language that child will have, thus having a better performance in PA.^{5,15,16,17,18,27,28}

Still relating the instruments to the 'age' criterion, it can be observed that, even though they presented a decrease in the scores for the PROHMELE instrument, it was not possible to statistically confirm this relation.

Regarding the 'writing hypothesis', we can see in Table 5 that PPS and CONFIAS instruments presented statistical relevance only for the 'alphabetic' writing hypothesis, and for the 'syllabic and syllabic-alphabetic' writing hypothesis there was statistical agreement between the three instruments used. It is understood that, despite not presenting statistically significant data for all hypotheses, the instruments demonstrated sensitivity to the performance in PA correlated with the writing hypotheses of the children.

Some studies highlight that the development of writing is a complex process and that the child establishes hypotheses to construct conventional writing¹⁹. Therefore, in agreement with the author and the results presented, it is possible to hypothesize that as the acquisition of writing skills reaches levels closer to the alphabet, their performance in PA assessments also increases. In addition, other research also supports that PA skills seem to be

influenced by increasing age and mastery of writing.^{16,20,21,22,23,24,25,27,28,29}

One factor observed during the application of the assessments was the time of application of the instruments. It was observed that the period of application of the instruments was shorter according to the advancement of the school year and age of the children. Although this finding is important, no significant evidence was found to justify this information. What can be understood is that the school year and age are relevant factors for understanding PA skills that help in a faster and more effective understanding of the test tasks.

Conclusion

Based on the results we presented, it is possible to state that PA and its evolution establish a correlation with the criteria analyzed: age, school year and writing hypothesis. However, it can be shown that by analyzing the statistically significant results, it is assumed that the assessment instrument that best corresponded to the correlations between age, school year and writing hypothesis was the PPS instrument. It is possible to ratify the hypothesis that the school year is a determining factor for the best performance in PA for all the criteria listed.

Considering the comparison between the selected instruments and the statistically significant data, it can also be stated that PPS and CONFIAS established greater sensitivity to the advancement of PA, considering their relationship with the three criteria.

PROHMELE instrument presented statistically significant data regarding its results classification model: school year. Compared to the other criteria, it did not present sufficient statistical data, even though it has shown itself to be an important variable and directly related to the advancement of PA.

Thus, it is worth noting that the criteria considered in this research and related to PA are equally relevant and considerable regarding the performance of the students in metaphonological skills, demonstrating that age, school year and writing hypothesis are sensitive and decisive for a better understanding and advancement of CF skills. However, it is also worth noting that, based on the data analyzed, the school year proved to be the criterion that establishes a decisive relationship for achieving the best scores in PA assessments and, consequently, a better performance of this skill.

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