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Original articles

Relationships between chronological and linguistic age and phonological awareness in children with developmental language disorder

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ABSTRACT

Purpose: to verify whether there is a relation between linguistic age and performance in phonological awareness of children presented with developmental language disorder.

Methods: a retrospective study comprising 53 children with developmental language disorder aged between 4 and 7 years old. Their language disorder diagnosis followed the inclusion criteria internationally described and Brazilian standardized tests for language assessment were used. All children underwent phonological awareness and linguistic skills assessment via standardized tests and all data went through statistical analysis. For correlation analysis, the p-value was performed through the Pearson's test. In the regression analysis the models used expressive and receptive linguistic age as independent variables and the performance in phonological awareness as a dependent variable ($p=0.036^*$ and $p= 0.048^*$).

Results: the data indicated a strong correlation between language age and phonological awareness skills in children with language developmental disorder. A strong correlation between syllabic awareness and linguistic age was found as well. In addition, phonemic awareness was correlated to their chronological age. All correlation tests were confirmed by regression analysis.

Conclusion: the data indicated a strong correlation between linguistic age and phonological awareness in children with developmental language disorders. These findings raise discussion regarding phonemic skills in children under this condition and their literacy process.

Keywords: Evaluation; Language; Child; Specific Language Disorder; Language Tests

INTRODUCTION

Children presented with developmental language disorder (DLD) commonly show atypical and inconsistent development in language skills, as well as compromised linguistic processing[1-3]. Although the heterogeneity of linguistic skills is the main characteristic of DLD children, it is common to find idiosyncratic phonological disorders, restricted vocabulary, deficits in various linguistic areas, jeopardized working memory and deficits in linguistic comprehension[4].

In recent years, several researchers have dedicated themselves to the further study of DLD, which until recently was referred to throughout the international literature as specific language impairment (SLI) with well-defined linguistic characteristics, diagnostic criteria and manifestations described in different languages[2,3,5-9]. However, with the advancement of research, the understanding of this pathology in a more comprehensive way has led to an expansion of the concept of strict language disorders to consider other possible comorbidities and/or disorders that may permeate or intensify language disorders, such as intellectual, cognitive and/or attentional disorders[2]. In addition, the understanding of such a disorder as a developmental type implies more holistic attention to the acquisition of language as a whole, including a greater concern and investigation regarding the reading and writing process, which is not very common in some countries, such as Brazil.

It is known, however, that when entering school, this group of children usually presents difficulties in the acquisition of language in its written mode, which is usually associated with impairments in phonological processing and is possibly due to perceptual difficulties of speech sounds, in addition to other areas of language[5]. Recent studies carried out in Brazilian Portuguese (BP) have indicated that children with DLD present impairments in metalinguistic skills, specifically in phonological awareness, compromising the learning process of reading and writing[10-13]. Phonological awareness lead to the identification and manipulation of the units of words and occur at two levels: syllabic and phonemic. Such skills evolve with oral language experience and, when properly developed, play an important role in the acquisition and development of reading and writing, especially in an alphabetic language such as BP[10,14,15]. In the case of disorders or deficits in these skills, the acquisition and development of reading and writing may be jeopardized.

Children with DLD have marked deficits in phonological processing, thus placing them at a higher risk of a reading deficit. A study[12] investigated the influence of phonological and lexical characteristics of words on phonological awareness, comparing children with typical development, DLD and dyslexia. The results produced three main findings: (a) children with typical development had an advantage for uncommon words, (b) children with DLD presented a lower performance than that of typical children, and (c) children with dyslexia exhibited an immature performance pattern when compared to children with DLD and those with typical development.

Collectively, the results themselves reinforce the theory of the phonological deficit hypothesis, centered on the influence of the characteristics of speech sounds and on the ability to manipulate them. This theory postulates that children with deficits in phonological awareness skills have difficulty storing and processing word sounds. However, it should be reiterated that lexical characteristics also influence phonological awareness; that is, the mental representations of words become increasingly detailed as the child's vocabulary grows. Thus, the greater and more structured the vocabulary of a child, the better their phonological representations will be, which are necessary for the proper processing of information and for the manipulation of linguistic structures in a conscious way[12].

Various longitudinal studies have repeatedly demonstrated that children with SLI are at risk of subsequent literacy difficulties due to their early phonological deficit[5,6,11,16]. The disorder, however, may be extremely diverse in nature, and children with SLI vary in terms of both the specific linguistic deficits they exhibit and the severity of these deficits such as differences in the severity of the phonological and/or morphosyntactic deficits[16].

A study[17] investigated the reading outcomes of 328 kindergartners with language impairments at grades 2 and 4. According to the results, approximately 50% of the sample exhibited significant reading difficulties after 2 or 4 years of schooling. Nonetheless, these results also show that some children with SLI seem to develop the same literacy skills as children with normal language development, indicating that those children seem to overcome language deficits before the age of 5 years old to have better reading outcomes[1,17,18].

Following this hypothesis, the relationship between the processing deficits, language production problems and literacy difficulties in children with SLI is fundamental. A development causal model that takes into account the mutual interdependence between

cognitive and linguistic deficits may shed some light on this issue[19]. According to this model, reading difficulties in children with SLI might be an extension of their previously existing language problems.

Thus, their language profiles would change with the acquisition of new skills, while previous abilities would remain underdeveloped. Hence, children with SLI might show different patterns of difficulty at distinct developmental stages. These difficulties might not only be caused by a common factor affecting the entire acquisition process but also might arise from a causal influence of previous problems (e.g., poor lexical knowledge) that would have an impact on subsequent acquisitions (e.g., reading comprehension). Consequently, current research on SLI addressing the relationship of a linguistic deficit with a limited processing capacity is becoming a growing focus of interest[5,6,13,20].

In this sense, several studies have already demonstrated that the development of language in children with DLD occurs more slowly when compared to the development of typical children. Thus, in many cases, children with DLD present a linguistic age different from chronological age[1,4]. A test widely used for the characterization of linguistic age is the Test of Early Language Development (TELD-3)[3,21-24]. In Brazil the test have been mainly in researches and have been lead to a better understanding regarding on the stage of the language development that a child is; the test has also been shown to be an important instrument for determining and characterizing the linguistic age of children with language-specific alterations[4].

Knowing that the development of metalinguistic skills is intrinsically connected to oral language proficiency and that this is altered in children with DLD, it is important to investigate the extent to which the gap between linguistic and chronological age may be related to phonological awareness, and therefore, it may help in understanding the development of such abilities in children with TDL. In addition, these study results can provide data indicating how this population's acquisition process of reading and writing occurs and provide subsidies for a better therapeutic design including, if necessary, activities involving metalinguistic skills in the therapeutic use process of DLD children. Thus, the present study aimed at verifying whether there is a relation between linguistic age and performance in the metalinguistic abilities of children presented with DLD.

METHODS

A retrospective study approved by the Ethics Committee of the School of Medicine of the University of Sao Paulo, Brazil, under nº. 406.97. All the parents/caretakers signed the Free Informed Consent Form for their children to participate in the present study when they entered the service where the data were collected.

Participants

For the present study, it was used data from DLD children aged between 4 years and 7 years and 11 months with a mean age 6 years and 2 months in the moment in which data were collected. Data were selected from 41 male subjects and 12 female subjects, totaling 53 subjects. All children attended the school clinic of the School of Medicine of the University of São Paulo from 2012 to 2017. Data analyses occurred between 2018-2019. The diagnosis of DLD was based on inclusion and exclusion criteria described internationally, as follows: impairment in at least two language measures that make up the complete assessment of language which comprises symbolic play measures, working memory, mean length utterance, expressive and receptive vocabulary measures and discourse as conducted in a previous study[3], performance within the normal criteria of the intellectual quotient (IQ) measure, and the absence of neurological, psychiatric and/or sensory impairment.

Data regarding the performance of metalinguistic skills were collected through a phonological awareness test standardized for Brazilian Portuguese, namely, the Instrument of Sequential Assessment of Phonological Awareness (CONFIAS)[25]. The assessment of expressive and receptive linguistic age was performed through the Test of Early Language Development (TELD-3). It is important to highlight that the first assessment of phonological awareness was used as a marker to compare children's performance in the tests used in the study. In this way it was compared the performance in TELD-3 that child presented in the same year in which his first PA's assessment occurred. Thus, the data used to gauge the possible relationships between the variables investigated in this study are from the assessment of phonological awareness and linguistic age at five years of chronological age.

Regarding the tests, the CONFIAS comprises two parts. The first is the syllabic level, consisting of nine items of assessment in increasing level of difficulty, which are syllabic synthesis, segmentation, initial

syllable identification, rhyme identification, word with given syllable, identification of the syllable medial, production of rhyme, exclusion and syllabic transposition. Second, the phoneme level is also organized in increasing order of difficulty and consists of seven items: word production that starts with the given sound, identification of the initial phoneme, identification of the final phoneme, exclusion, synthesis, segmentation, and phonemic transposition.

All children were assessed following the test instructions, which included for all tasks two test stimuli to ensure that the child understood what was expected of them in the execution of the proposed activities. The data were scored in a specific protocol, and the score was performed according to the test parameters. Thus, the punctuation followed the criteria established by the authors (correct answers are worth one point and incorrect answers worth zero points), with the possibility of reaching 40 points in the syllabic part and 30 in the phonemic part.

The Test of Early Language Development (TELD-3) is an early identification protocol for language development disorders that assesses the receptive and expressive skills in semantics, syntactic and morphological linguistic components. This test can be applied in children aged from 2 years to 7 years and 11 months and provides an index for receptive linguistic age and another index for expressive linguistic age, in addition to a spoken language index, which corresponds to the combination of these measures and is a general indicator for the ability of oral language. The original test was composed of form A and form B, which according to the authors are equivalent. It is important to note that the adaptation to Brazilian Portuguese was performed only for form A, which was used in the present study[23].

The receptive language subtest has 37 items, 24 semantic items and 13 morphosyntactic items, that verify the child's oral comprehension skills. On the other hand, the subtest of expressive language consists of 39 items, with 22 semantic and 17 morphosyntactic items. The scores obtained on both subtests are converted into quotients and can receive seven possible ratings, ranging from much greater than average to very poor. In addition, the sum of the raw score allows us to find the spoken language quotient, which provides an overview of the child's performance in language.

The translation and validation of the TELD-3 into Portuguese has shown that this version is usable for the diagnosis, the verification of gravity and the observation of the clinical evolution of children with language disorders[23].

Considering that this was a specific study for DLD children, all participants data were analyzed as a single group and the analysis focused on their performance in both test and its correlations. All data were organized and underwent statistical analysis. Significant value adopted was 5% ($p \leq 0,05$). The SPSS software Statistic, version 25.0 (IBM Corp., Armong, NY, USA) was used to run statistical analysis. To calculate the 95% confidence intervals, the corrected and accelerated bias method was used based on 2000 bootstrap samples. The values in square brackets in the tables indicate the upper and lower limits of the 95% confidence intervals. For the correlation analysis, the correlation coefficient and p value were calculated using the Pearson correlation test (parametric), since all variables had a sufficient sample size ($n>30$) for use. of parametric tests by virtue of the Central Limit Theorem.

In the regression analysis, the models had the expressive and receptive linguistic age obtained in the TELD-3 as independent variables and the total performance in the syllabic and phonemic levels of the CONFIAS as the dependent variable. Chronological age was entered as a first step in the model, in order to control its effect. Independent variables were entered simultaneously in the second step.

RESULTS

A descriptive analysis shows better performance in syllabic synthesis and segmentation and lower score in rhyme production and syllabic transposition. With regard to the total score, the mean achieved by the children was less than half of the maximum test score (Table 1).

Table 1. Performance of children with developmental language disorder in syllabic awareness

Syllabic Skills	n	Mean	SD	Median	Min	Max
Synthesis	53	3.26 [2.87, 3.60]	1.29	4.00 [4.00, 4.00]	0.00	4.00
Segmentation	53	3.25 [2.86, 3.58]	1.28	4.00 [4.00, 4.00]	0.00	4.00
Identifying initial syllable	53	2.25 [1.87, 2.60]	1.41	3.00 [3.00, 3.00]	0.00	4.00
Identifying rhyme	53	2.19 [1.83, 2.55]	1.36	2.00 [2.00, 3.00]	0.00	4.00
Producing word with a given syllable	53	2.55 [2.11, 2.98]	1.49	3.00 [2.00, 3.00]	0.00	4.00
Identifying medial syllable	53	1.75 [1.38, 2.15]	1.39	2.00 [1.00, 3.00]	0.00	4.00
Rhyming	53	0.72 [0.43, 1.00]	1.08	0.00 [0.00, 0.00]	0.00	4.00
Exclusion	53	2.45 [1.70, 3.23]	3.00	1.00 [1.00, 1.00]	0.00	9.00
Transposition	53	1.19 [1.81, 1.58]	1.53	0.00 [0.00, 0.00]	0.00	4.00
Total	53	19.70 [16.85, 22.57]	10.72	19.00 [19.00, 19.00]	0.00	39.00
Phonemic Skils	**n**	**Mean**	**SD**	**Median**	**Min**	**Max.**
Producing a word with a given phoneme	53	1.17 [0.85, 1.53]	1.41	1.00 [1.00, 1.00]	0.00	4.00
Identifying initial phoneme	53	1.60 [1.23, 1.96]	1.54	1.00 [1.00, 1.00]	0.00	4.00
Identifyng final phoneme	53	1.13 [0.83, 1.45]	1.23	1.00 [1.00, 1.00]	0.00	3.00
Exclusion	53	0.92 [0.57, 1.30]	1.60	0.00 [0.00, 0.00]	0.00	5.00
Synthesis	53	0.77 [0.49, 1.06]	1.20	0.00 [0.00, 0.00]	0.00	4.00
Segmentation	53	0.36 [0.15, 0.62]	1.04	0.00 [0.00, 0.00]	0.00	4.00
Transposition	53	0.26 [0.08, 0.47]	0.84	0.00 [0.00, 0.00]	0.00	4.00
Total	53	6.30 [4.53, 8.13]	7.42	4.00 [3.00, 4.00]	0.00	26.00

Captions: SD: Standard Deviation; Min.: Minimum; Max.: Maximum; n: number of participants

The data in Table 1 also show that, in relation to phonemic awareness, the means were low in all tasks, with emphasis on phonemic segmentation and transposition. The best mean was observed in the initial phoneme identification and, even so, with a very low value. With regard to the total score, the average presented by the group is less than a third of the maximum score.

In the analysis of the TELD-3 results, the data indicate better means in receptive language and a high standard deviation in spoken language activities (Table 2).

Table 2. Performance of children with developmental language disorder in the Test of Early Language Development

TELD-3	n	Mean	SD	Median	Min	Max
Spoken Language Quotient	53	87.92 [83.76, 91.92]	15.50	87.00 [80.00, 96.00]	54.00	125.00
Receptive linguistic age (years old)	53	6.33 [5.85, 6.78]	1.73	6.50 [6.17, 6.50]	2.08	8.33
Expressive linguistic age (years old)	53	5.02 [4.69, 5.35]	1.34	4.83 [4.83, 4.83]	2.83	8.17

Captions: SD: Standard Deviation; Min.: Minimum; Max.: Maximum; n: number of participants

The correlation analysis shown in Table 3 indicates positive correlations between expressive linguistic age in various syllabic tasks. It is also possible to observe a correlation between the total syllabic awareness score and chronological age.

Table 3. Correlation analysis between syllabic skills and in the Test of Early Language Development tasks

Variable		TELD Spoken Language Quotient	TELD Receptive Linguistic Age	TELD Expressive linguistic age	Chronological age
Synthesis	Coef.	0.171 [-0.026, 0.355]	0.156 [-0.147, 0.423]	0.264 [0.091, 0.439]	-0.037 [-0.431, 0.339]
	p	0.222	0.264	0.056	0.792
Segmentation	Coef.	0.106 [-0.125, 0.328]	0.180 [-0.080, 0.435]	**0.283 [0.088, 0.455]**	0.117 [-0.269, 0.502]
	p	0.449	0.198	**0.040***	0.402
Identifying initial syllable	Coef.	**0.407 [0.172, 0.615]**	**0.412 [0.163, 0.640]**	**0.514 [0.336, 0.670]**	0.093 [-0.227, 0.440]
	p	**0.003***	**0.002***	**< 0.001***	0.507
Identifying rhyme	Coef.	0.221 [0.000, 0.421]	0.237 [-0.011, 0.449]	**0.338 [0.140, 0.520]**	0.083 [-0.251, 0.382]
	p	0.112	0.088	**0.013***	0.556
Producing word with a given syllable	Coef.	**0.310 [0.041, 0.521]**	**0.394 [0.153, 0.601]**	**0.474 [0.280, 0.626]**	0.259 [-0.080, 0.550]
	p	**0.024***	**0.004***	**< 0.001***	0.061
Identifying medial syllable	Coef.	**0.457 [0.253, 0.626]**	**0.497 [0.288, 0.680]**	**0.548 [0.353, 0.698]**	0.243 [-0.029, 0.476]
	p	**0.001***	**< 0.001***	**< 0.001***	0.080
Producing rhyme	Coef.	0.211 [-0.048, 0.438]	0.144 [-0.11, 0.384]	0.260 [-0.006, 0.493]	0.038 [-0.214, 0.297]
	p	0.129	0.302	0.060	0.792
Exclusion	Coef.	**0.365 [0.103, 0.622]**	**0.360 [0.132, 0.574]**	**0.492 [0.226, 0.712]**	0.129 [-0.096, 0.373]
	p	**0.007***	**0.008***	**< 0.001***	0.359
Transposition	Coef.	**0.415 [0.160, 0.642]**	**0.481 [0.284, 0.653]**	**0.481 [0.210, 0.699]**	**0.283 [0.013, 0.542]**
	p	**0.002***	**< 0.001***	**< 0.001***	**0.040***
Total	Coef.	**0.413 [0.207, 0.584]**	**0.442 [0.225, 0.630]**	**0.559 [0.366, 0.711]**	0.196 [-0.149, 0.512]
	p	**0.002***	**0.001***	**< 0.001***	0.160

Pearson's Correlation Test.
Captions: Coef.: Coefficient; *: Statistically significant value ($p \leq 0.05$): TELD: Test of Early Language Development

Regarding phonemic awareness, the correlation analysis also occurred between phonemic awareness and expressive linguistic age, however, in only one of the phonemic tasks. Contrary to what happened in the syllabic tasks, there was a correlation between phonemic tasks and chronological age, as well as in relation to the total score of phonemic awareness (Table 4).

Table 4. Correlation analysis between phonemic skills and in the Test of Early Language Development tasks

Variable		TELD Spoken Language Quotient	TELD Receptive Linguistic Age	TELD Expressive linguistic age	Chronological age
Producing word with a given syllable	Coef.	0.250 [0.005, 0.497]	**0.299 [0.080, 0.502]**	**0.392 [0.083, 0.638]**	0.167 [-0.050, 0.411]
	p	0.072	**0.030***	**0.004***	0.233
Identyfing initial phoneme	Coef.	0.140 [-0.096, 0.399]	**0.314 [0.077, 0.534]**	**0.312 [0.028, 0.562]**	**0.323 [0.036, 0.587]**
	p	0.317	**0.022***	**0.023***	**0.018***
Identifying final phoneme	Coef.	0.001 [-0.25, 0.270]	0.128 [-0.121, 0.387]	0.110 [-0.17, 0.383]	0.144 [-0.127, 0.413]
	p	0.997	0.360	0.432	0.303
Exclusion	Coef.	0.169 [-0.036, 0.387]	0.233 [0.036, 0.417]	**0.321 [0.009, 0.598]**	0.157 [-0.086, 0.404]
	p	0.226	0.093	**0.019***	0.260
Synthesis	Coef.	**0.362 [0.10, 0.602]**	**0.405 [0.212, 0.574]**	**0.538 [0.277, 0.731]**	**0.415 [0.153, 0.635]**
	p	**0.008***	**0.003***	**< 0.001***	**0.002***
Segmentation	Coef.	0.190 [0.007, 0.378]	0.230 [0.030, 0.411]	**0.391 [0.073, 0.636]**	0.239 [0.048, 0.452]
	p	0.172	0.098	**0.004***	0.84
Transposition	Coef.	0.241 [0.061, 0.426]	**0.300 [0.169, 0.430]**	**0.332 [-0.093, 0.597]**	**0.278 [-0.068, 0.614]**
	p	0.083	**0.029***	**0.015***	**0.044***
Total	Coef.	0.225 [0.008, 0.462]	**0.322 [0.124, 0.509]**	**0.412 [0.117, 0.662]**	**0.289 [0.035, 0.531]**
	p	0.105	**0.019***	**0.002***	**0.036***

Pearson's Correlation test.
Captions: Coef.: Coefficient; *: Statistically significant value ($p \leq 0.05$); TELD: Test of Early Language Development

In order to further investigate whether linguistic or chronological age correlates with phonological awareness, a regression analysis was performed. The model used the TELD-3 tasks as independent variables and syllabic and phonemic awareness as dependent variables. Chronological age was entered into the model in order to control its effect and the independent variables were entered simultaneously afterwards (Table 5).

Table 5. Regression linear model of Test of Early Language Development performance as a predictor of syllabic and phonemic awareness

Syllabic Awareness				
Pass		**b**	**β**	**p**
1	Constant	10.68 [-2.33, 23.70]	-	0.106
	Chronological age	1.26 [-0.51, 3.03]	0.20	0.160
2	Constant	-2.02 [-14.53, 10.49]	-	0.747
	Chronological age	-0.74 [-2.70, 1.23]	-0.12	0.454
	Receptive linguistic age	1.33 [-0.99, 3.65]	0.21	0.255
	Expressive linguistic age	3.70 [1.22, 6.18]	0.46	**0.004***
Phonemic Awareness				
1	Constant	-2.89 [-11.68, 5.90]	-	0.513
	Chronological age	1.28 [0.09, 2.48]	0.29	**0.036***
2	Constant	-8.48 [-18.00, 1.04]	-	0.080
	Chronological age	0.73 [-0.76, 2.23]	0.16	0.331
	Receptive linguistic age	-0.08 [-1.84, 1.69]	-0.02	0.930
	Expressive linguistic age	2.00 [0.11, 3.88]	0.36	**0.038***

$r^2 = 0,04$ ($p = 0,160$) to step 1; $r^2 = 0,33$ ($p < 0,001$*) to step 2
0$r^2 = 0,06$ ($p = 0,036$*) to step 1; $r^2 = 0,19$ ($p = 0,048$*) to step 2
Caption: *: Statistically significant value 5% ($p \leq 0.05$).

The data in Table 5 show that expressive and receptive linguistic age was effective in explaining 29.0% ($r^2 = 0.29$, $p < 0.001$) of the variance in the total score of syllabic skills. It was also observed that only the expressive linguistic age was considered a statistically significant predictor for the performance in syllabic awareness. The non-standardized b coefficient shows that, keeping all values constant, when one year is added to the expressive linguistic age, there is an increase of 3.7 points in the total syllabic awareness score.

Also, with regard to the data in Table 5, it was evident that the expressive linguistic age was effective in explaining 13.0% ($r^2 = 0.13$, $p < 0.048$) of the variance of the total score of phonemic awareness. It was also observed that only the expressive linguistic age was considered a statistically significant predictor for phonemic awareness performance. The non-standardized b coefficient indicates that keeping all values stable and increasing by one year in the expressive linguistic age, the score on the total value in phonemic awareness increases by 2 points.

DISCUSSION

The great difference between the minimum and maximum values for the phonological awareness scores demonstrates the great heterogeneity of children with regard to phonological abilities. The data also indicated better performance in syllable synthesis and segmentation, followed by initial syllable identification. It is important to emphasize that such tasks are simpler, compared to rhyme, exclusion and syllabic transposition, which demand more complex skills both from a linguistic and phonological processing point of view. Regarding phonemic awareness, there are higher

averages in the identification of the initial phoneme and word production with the given sound, tasks that involve sound and visual cues, since such tasks involve the use of labiodental fricatives.

When analyzing more deeply the syllabic and phonemic awareness, task by task, the standard deviations are low, however, considering the total values, they are high. In this sense, it is possible to observe a pattern in this population when observing greater rates of correct answers in tasks that demand less linguistic and phonological processing and very low results in tasks that involve greater linguistic complexity. It is noteworthy, however, that even though they present better scores in linguistically simpler tasks, the results of children with DLD are much lower than expected for their typical peers[10,14,15]. Furthermore, verifying the results of children with DLD, when compared to the results of dyslexic children from other Brazilian studies, it is observed that children with DLD seem, once again, to present inferior results[26,27].

The results lead us to speculate that performance heterogeneity may be related to the variability of alterations that this population presents in oral language, as reported by several studies and, mainly, taking into account the correlation between oral language skills and phonological awareness described in literature[3,10,12,13]. One study[5] showed that metaphonological skills, such as phonological awareness, have been increasingly explored as an important facet of language development in monolingual children. This study also highlights the importance of phonological awareness, not only for literacy, but also the influence of the oral language repertoire for the proper development of phonological awareness, a hypothesis that corroborates the results of the present study.

When comparing the chronological age to the linguistic age of DLD children, it was noticed a difference between them, confirming that receptive and expressive language are lower than their chronological age. Similar results have been reported in previous studies[4,10,8,28]. It is important to note that researchers around the globe have reported such a gap, and it is also considered an important inclusion criterion for DLD diagnosis[10,18]. Data from the present study highlight this hypothesis, indicating a significant difference between chronological and linguistic age, and indicating a greater jeopardization in expressive linguistic skills than in receptive skills for DLD children.

With regard to the correlation analysis, the fact that syllabic awareness was correlated with the TELD-3 variables allows us to hypothesize that the phonological awareness skills of children with DLD are associated with their receptive and expressive linguistic repertoire, mainly concerning syllabic awareness. These data are reinforced by regression analysis, which confirms this relationship and indicates linguistic age as an important predictor of syllabic awareness. Thus, the analyzes of the present study provide important evidence regarding the development of phonological awareness in children with DLD, suggesting that, despite their persistent language alterations, these children have a path of metaphonological skills development similar to that observed in their typical peers, however, with its particularities. In this sense, the inclusion of phonological awareness activities in the rehabilitation process of children with DLD is of fundamental importance[5,20].

The fact that phonemic awareness is only correlated with chronological age reinforces data from previous studies that indicated that this ability develops more strongly after the child enters formal education, since the discovery of the graph-phonemic relationship enhances acquisition of phonemic awareness[14,29]. It should be noted that, unlike what was observed in other studies[14,15,20,30] a positive correlation was found only between chronological age and phonemic awareness. A possible hypothesis for such correlation stems from the fact that Brazilian Portuguese is a language with transparent spelling, which leads to an easier learning of graph-phonemic relationships and, consequently, expands the child's attention to the existence of the phoneme. Despite this fact, however, the use and encouragement of educational policies aimed at global methods is still prevalent in the country, which can be a hindering factor for the development of phonemic awareness of Brazilian students[14,26].

The data from the present study allow us to speculate that for Brazilian children with DLD, syllabic skills are more related to their linguistic repertoire and phonemic skills are more dependent on the schooling process, which favors phoneme discovery. This is an important fact that can be expanded in cross-linguistic studies with languages of different degrees of transparency and opacity in order to better understand these processes.

In a study[16] that evaluated the phonological awareness of children with TDL longitudinally before and after a phonological remediation program, the authors indicated a great improvement in the subjects after the implementation of the program. The researchers indicated that the literacy process

increased the perception of the phoneme's existence, which contributed not only to phonemic awareness itself, as hypothesized in the present study, but also to the literacy process as a whole.

Thus, the present study offers important data regarding the correlation between linguistic age and phonological awareness skills in children with DLD. These data are essential for a better understanding of the development of oral language in these children and provides a path for better therapeutic orientation to minimize deficits in metalinguistic abilities and, consequently, in the future acquisition of reading and writing in this group.

It is important to emphasize that this cross-sectional study may not accurately represent the relationships between linguistic skills, chronological age and metalinguistic abilities in children with DLD. Longitudinal studies are needed to verify the correlation between these skills in the developmental process of these children throughout infancy. In addition, it is also interesting to study the effect of speech-language intervention in these variables, investigating whether how they interact throughout the time is also fundamental for the field.

CONCLUSION

The data indicated a strong correlation between language age and phonological awareness skills in children with language developmental disorder. In addition, the data showed evidence that this correlation exists for both expressive and receptive linguistic age, but only for syllabic skills. Additionally, the results of this research promote important reflections on phonemic awareness and the reading and writing acquisition process of children presented with DLD.

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