RELATION BETWEEN PHONOLOGICAL DEVELOPMENT AND WRITING INITIAL LEARNING IN DIFFERENT SOCIO-EDUCATIONAL SETTINGS

A relação entre o desenvolvimento fonológico e aprendizagem inicial da escrita em diferentes contextos socioeducacionais

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ABSTRACT

Purpose: to investigate the relationship between phonological development and early learning of writing in different social and educational contexts. **Methods:** we conducted in a kindergarten, a public school and private school, totaling 100 children, aged 2:0 and 6:11 years. To phonological assessment, Proof of Phonological Assessment was used. To evaluate the reading was applied to the task of Rapid Serial Naming. For assessing writing, we proposed a roadmap of activities, as dictated words and phrases. **Results:** it was observed that some phonological processes were positively correlated with the task of Appointment. This task was also positively correlated with writing and with age. Ie, the better the performance in Task Nomination, more advanced level in which they were written and in older age. It was also observed that private school children showed a better performance in writing and Task Appointment. **Conclusion:** from these data, it was observed that there is a relationship between phonological development and early learning of reading and writing, as the overcoming of phonological processes are related to the Nomination and writing in children aged 2:0-6:11 years. It is believed that these findings may be related to social and educational aspects.

KEYWORDS: Language; Reading; Language Development; Child; Preschool

INTRODUCTION

Phonological system development occurs gradually and non-linearly. During development, phonological language component maturing occurs, resulting in a phonological system establishment that is similar to the adult target[1-5]. The target language phonological system domain is reached spontaneously, in a common sequence and age group to most children[1,4,6-9]. In typical phonological acquisition, there are phonological processes. These processes are simplifications made by children to facilitate adult speech complex aspects. These processes are present in language development early stages, and must be overcome and eliminated during preschool years. Then, adequacy to adult standards occurs[4,5,8,10,11].

According to a study[12], phonological processes are thirteen in number, namely: Syllable reduction; Consonant harmony; Fricative plosivation (with overcoming recommended at 2:6 years old); Velar simplification, Velar posteriorization, Liquids simplification (with overcoming recommended at 3:6 years old); Palatal posteriorization (with overcoming

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recommended at 4:6 years old); velars fronting (with overcoming recommended at 3:0 years old); Palatal fronting (with overcoming recommended at 4:6 years old); Consonant cluster simplification; Final consonant simplification (with overcoming recommended at 7:0 years); Plosive devoicing and Fricative devoicing. The latter two were not observed during typical phonological development.

Other authors claim that some phonological processes usually disappear before three years of age, such as Final consonant simplification[13]. Another study found consonant cluster reduction and final consonant deletion processes in children aged 7 years and 1 month old and 8 years and 11 months old[14].

It changes a bit in children who speak another language. A survey found that, among English-speaking children, phonological processes found in the age group from 3:0 to 3:11 years old were consonant cluster reduction, final consonant deletion, unstressed syllable deletion, anteriorization, stopping, semivocalization and assimilation. The ones found in children with four years old were consonant cluster reduction, unstressed syllable deletion and semivocalization processes, and children with five years old had epenthesis, metathesis and unaffrication processes. And from the age of six, children with normal phonological development did not make more use phonological processes anymore[15].

Written language learning differs from oral language acquisition, as these processes require different skills from the developing child, as well as different environment resources and stimuli. Oral language is largely sustained by innate presets, biologically determined, which are activated during an infant's interaction with others, in daily life different communicative situations[16]. As for written language learning, the learner will have to be attentive and take ownership of aspects that have never been demanded in oral language, needing a help that comes through formal education, that is, through school[17].

Researchers[18] described writing appropriation evolution by the child, in languages that, like Portuguese, use an alphabetic writing system, in five levels. The first level is called pre-phonetic or pre-syllabic and covers the period in which the child registers their ideas with vertical or wave traces. The second level is the syllabic stage, in which the graphic form is better set, and closer to the letters. The third level is called syllabic-alphabetic, and is part of a transition between syllabic and alphabetical writing. Finally, the fourth level is called alphabetic stage, in which the child has a domain of the phonological representation principle, establishing sound value to letters[19].

Written language learning is the primary objective in schooling early stages, and it determines school learning success in the next stages. Reading is a formal linguistic activity, and children need to develop an explicit awareness of linguistic structures, which must be intentionally manipulated, in order to learn it[16]. The time it takes to a child to process visual written information and/or an image can point to difficulties in naming and reading, leading to hypothesis about its development, both in language and cognition[20]. Proficient readers are able to read words at a very fast speed, reaching 300 words per minute, or five words per second[21].

Skills needed for rapid naming involve: stimulus attention, visual processes responsible for discrimination, letter identification and its standard, visual features integration and visual pattern information with orthographic representations storage, phonological representation access and recovery, phonological access and recovery, semantic and conceptual information activation and integration, and articulation motor activation[22]. Thus, it is known that rapid naming has a relation with reading, primarily in decoding, fluency and understanding skills, and is considered in international literature as a predictor for reading and writing development[23].

Opportunities that the environment provides for children are of fundamental importance in adequate linguistic development[24]. In this sense, experiences children have with written language practice depends on social factors that surround them, and those experiences can add or limit their knowledge on writing and reading[25]. Models that the medium may provide to a child influence language by quantity, quality and situations experienced by the child. Stimulation is an important factor in children's language development. Thus, if a child lives in an unfavorable environment, such as orphanages or hospitals, without the mother's presence, their language may change, including with regard to schooling[26].

Given the above, this study aimed to: investigate the relation between phonological development and reading and writing initial learning in different socio-educational settings. Specific objectives were: to assess public and private schools children's phonological development and analyze reading and writing learning of these same children.

METHODS

This study was approved by the Ethics Committee for Research involving Human Beings, Health Sciences Centre (SCC) of the Federal

University of Pernambuco, in the opinion 250.889 CAAE No. 13475813.6.0000.5208 of the National Health Council.

The methodological path indicated for the present research prioritized a quantitative analysis, and the study is characterized as descriptive correlational and cross-sectional study.

Research was conducted in a nursery and a school, which were both municipal, and a private school, in Recife Metropolitan Area (RMR), in the state of Pernambuco. The study enrolled 100 children of both genders, aged between 2 years old to 6 years and 11 months old, which were divided into five age groups: G1 (2:0-2:11); G2 (3:0-3:11); G3 (4:0-4:11); G4 (5:0-5:11); and G5 (6:0-6:11), with 20 children in each group.

Sample exclusion criteria were: children who, according to teachers' analysis, had communication or learning problems, or special educational needs; children that, during assessment period, were identified with a phonological disorder or other language problems; and children with hearing loss or neurological problems history, or other evident aspect that might interfere with language development.

Data were collected from May to November 2013. Initially, individual data was obtained through school student identification card. Subsequently, socio-educational information was obtained through a questionnaire administered to parents or guardians. The questionnaire purpose was to characterize the sample and know the context in which children were placed. Parents or guardians received an information letter containing study objectives and ensuring confidentiality. Subjects who agreed to participate signed the Informed Consent – IC.

After questionnaire application, phonological evaluation was held through the Phonological Assessment Test (PAFon)[27]. Rapid Serial Naming and writing assessment were also carried out.

PAFon is a figure naming test consisting of 06 figure sessions grouped based on semantic categories: animals, food, body and personal belongings, home, children's games, nature and transport. Figures were shown to children in digital media (through a power-point presentation) or in a printed album. Each figure had one or more target words to be named by the child. In all, the child was asked to nominate 214 target words. During test application, the examiner asked the child to say what he/she saw in the figure, and when the target word was not produced, the examiner asked directly (E.g. and this here? – while pointing – What is this? What is the name of it? What is the name of this part?). If, anyway, the target word was not produced, or if the child answered that he/she did not know, the examiner then would say the word and ask the child to repeat it. All productions were digitally recorded and transcribed according to IPA (International Phonetic Alphabet) by a researcher, and reviewed by another experienced researcher. Words used in PAFon preparation were selected according to children's lexicon, with criteria that allowed syllabic structure and tone influence analysis, in addition to the opportunity of testing all Brazilian Portuguese phonemes.

Afterwards, Rapid Serial Naming skill assessment was carried out[28], being divided into four stages: letters, numbers, objects and colors. Steps were shown in two boards, composed of five different stimuli, which were randomly repeated and distributed in five rows and ten columns in A and B boards, being applied in sequence, without interruption. The letter task showed "a", "m", "o", "r" and "s" graphemes, and numbers task used five numbers, all single-digit disyllables "4"; "5"; "7"; "8" and "9". Objects step used figures that were among the five most typical items in their respective categories, such as: ball; car; moon; door; and cat. Finally, colors stage was composed of the following colors: blue; yellow; green; red; and black.

Participants were instructed to appoint visual stimuli as soon as possible, following the direction from top to bottom and from left to right. Each task had a training sheet, containing five different stimuli present in the experimental plates, being certified that children knew the colors, objects, numbers and letters. In younger children's case, when they did not know certain items, guidance that they name only what they knew was given. Errors were considered when the child made omissions and incorrect naming. However, spontaneously corrected wrong answers were not considered as errors. For each task, two scores were computed: mean time and mean number of errors, which were then registered in the rapid serial naming application and analysis protocol.

In order to assess writing, two activities were performed: initially, oral assessment nominal realism was carried out, which allows to analyze the child metaphonological competence (an important precursor for writing) by means of a request and a question: "Tell me two big words and two little words", "What is the biggest word: ox ('boi') or ant ('formiga')?". The goal was to see if the child adopted referring quantifiable properties as criterion to decide on words spelling differences.

Afterwards, word dictation was applied, using equally distributed monosyllabic, disyllabic, trisyllabic and polysyllabic words, with two of each. Subsequently, participants performed a two

sentences dictation: “The cat drank milk” and “I like to play.”

Each task was applied following the roadmap order. Tasks have sequential character, that is, were carried out respecting a complexity order, with the first step, nominal realism, being followed by words and sentences dictation. All steps were filmed and results were analyzed according to child’s writing development stages, described in four levels: pre-syllabic writing (when representation is performed by drawings, sketches or scribbling, for example); syllabic writing (when the child begins to establish a relation between sounds and letters, trying to represent syllables); syllabic-alphabetic writing (when child representation happens sometimes in syllabic form and sometimes alphabetically), and finally, alphabetic writing. These levels, which purport to describe initial writing appropriation sequence, were proposed by Emília Ferreiro and collaborators[18]. All activities were applied to all children who participated in the study.

After data collection completion, held at the school, results were coded in numeric variables to enable a database use, through SPSS 13.0 software, which consented to conduct descriptive and analytical statistical analysis. In order to compare means between groups, Pearson correlation test was performed to analyze the relation between phonological development, rapid serial naming and writing.

RESULTS

In order to characterize the study population, questionnaire socio-educational results will be firstly presented. When analyzing public school and nursery parents/caregivers answers, it was observed that 58% had up to one minimum wage, 66% of caregivers were the genitors and 38% of fathers and 40% of mothers had high school education as educational level. With regard to naturalness, 74% of fathers and 70% of mothers were from Recife Metropolitan Area. From surveyed children, 40% watched television up to three hours a day, 24% did not have any books at home and 28% had up to three children’s stories books. Regarding parents’ reading habits, 10% reported to read often and 10% to read daily. When analyzing private school parents/caregivers answers, it was observed that only 2% received up to two minimum wages, 30% received up to six times the minimum wages and 44% did not know or refused to report income. It was found that 66% of caregivers were the genitors; and 62% of fathers and 74% of mothers had higher education as educational level. With regard to naturalness, 48% of fathers and 62% of mothers were from Recife Metropolitan Area. From surveyed children, 62% watched television until three hours a day and 68% have more than six children’s stories books. Regarding parents’ reading habits, 40% reported to read often and 50% to read daily.

According to Table 1, it can be observed that public and private school/nursery children showed similarities regarding the most frequent phonological processes in all age groups, namely: syllable reduction, liquid simplification, consonant cluster simplification and final consonant simplification. It was also possible to verify that the fricative plosivation process appeared more in public school/nursery children. Regarding late overcoming processes, there were also similarities, with syllable reduction, consonant harmony, fricative plosivation, palatal fronting and liquid simplification processes being those who took longer to be overcome, at both schools. However, velar posteriorization process was later surpassed only by public school/nursery children, and the velar simplification process was later surpassed only by private school children. Other data that stand out is that consonant cluster simplification process was not overcome by public school/nursery children, and the final consonant simplification process remained in operation in both groups children’s speech. These findings may reflect, in the first case, in socio-economic aspects influence on public school/nursery children, and in the second case, in regional linguistic variety influence. Plosive and fricative devoicing processes, which are not observed in typical phonological development, were not shown by any researched child.

	PUBLIC Total (%)	PRIVATE Total (%)
Income		
Up to 1 minimum wage	58	0
From 1 to 2 minimum wages	30	2
From 2 to 4 minimum wages	4	24
More than 6 minimum wages	2	30
Could not inform	6	44
Caregiver		
Mother	66	66
Father	8	4
Relative	22	10
Neighbor	0	2
Other	4	18
Father education		
None	2	0
Elementary school I	14	0
Elementary school II	28	4
High school	38	34
Higher education	2	62
Could not inform	16	0
Mother education		
None	0	0
Elementary school I	16	0
Elementary school II	34	0
High school	40	26
Higher education	2	74
Could not inform	8	0
Father naturalness		
RMA	74	48
Pernambuco countryside	8	18
Another city	6	34
Could not inform	12	0
Mother naturalness		
RMA	70	62
Pernambuco countryside	18	12
Another city	10	26
Could not inform	2	0
Hours the child watches TV		
None	22	2
Up to 3 hours	40	62
Between 3 and 6 hours	30	34
More than 6 hours	8	2
Story books amount		
None	24	0
Up to 3 books	28	12
Between 3 and 6 books	26	20
More than 6 books	22	68
Parents' reading habit		
Never	20	0
Rarely	60	10
Often	10	40
Daily	10	50

Figure 1 – Socio-educational questionnaire results characterization in Public and Private Schools/Nursery children's Education and Elementary School I 1st grade children (n=100)

Table 1 – PAFon phonological acquisition results mean distribution (means and standard deviation) by age group in Public and Private Schools/Nursery children's Education and Elementary School I 1st grade children. Higher scores indicates lower performances

School / Age Group	Phonological Processes												
	RS	HC	PF	SV	PV	PP	FV	FP	SL	SEC	SCF	EP	EF
Public													
2 years old	16.00	1.80	19.20	2.10	.10	.10	1.40	.30	19.20	26.30	10.70	.00	.00
	(23.1)	(2.15)	(28.6)	(2.64)	(.32)	(.32)	(2.12)	(.67)	(11.2)	(14.6)	(4.72)	(.00)	(.00)
3 years old	2.80	.60	8.20	.20	.30	.00	.00	.20	3.90	9.60	5.40	.00	.00
	(1.81)	(.84)	(24.8)	(.63)	(.67)	(.00)	(.00)	(.42)	(4.33)	(9.14)	(7.29)	(.00)	(.00)
4 years old	2.10	.70	2.30	.50	.40	.80	.00	.80	5.90	10.00	5.50	.00	.00
	(2.47)	(1.25)	(7.27)	(1.27)	(1.26)	(1.55)	(.00)	(2.53)	(6.98)	(13.4)	(6.64)	(.00)	(.00)
5 years old	2.10	.40	.10	.00	.20	.30	.00	.00	2.60	7.80	1.80	.00	.00
	(1.79)	(.84)	(.32)	(.00)	(.63)	(.95)	(.00)	(.00)	(3.10)	(13.3)	(2.66)	(.00)	(.00)
6 years old	1.90	.20	.40	.00	.10	.30	.00	.30	5.00	12.80	4.50	.00	.00
	(1.28)	(.42)	(.69)	(.00)	(.32)	(.67)	(.00)	(.95)	(8.34)	(13.2)	(5.80)	(.00)	(.00)
Private													
2 years old	32.30	.20	.90	3.50	.10	.10	.30	.20	11.60	28.20	11.70	.00	.00
	(24.6)	(.42)	(1.60)	(3.10)	(.32)	(.32)	(.48)	(.42)	(7.37)	(16.1)	(6.73)	(.00)	(.00)
3 years old	4.00	.10	11.60	1.10	.00	.00	.00	.40	11.60	23.90	9.40	.00	.00
	(4.03)	(.32)	(26.2)	(2.80)	(.00)	(.00)	(.00)	(1.26)	(8.37)	(13.9)	(6.43)	(.00)	(.00)
4 years old	2.10	.00	.60	.00	.00	1.10	.10	1.40	17.80	25.60	8.90	.00	.00
	(3.00)	(.00)	(1.35)	(.00)	(.00)	(3.48)	(.32)	(3.78)	(15.8)	(18.8)	(6.66)	(.00)	(.00)
5 years old	.90	.00	7.70	.60	.10	.30	.00	.00	9.80	20.10	9.90	.00	.00
	(1.66)	(.00)	(21.9)	(1.58)	(.32)	(.67)	(.00)	(.00)	(10.9)	(16.9)	(9.24)	(.00)	(.00)
6 years old	.20	.00	.20	.00	.00	.30	.00	.00	1.20	3.10	4.80	.00	.00
	(.42)	(.00)	(.63)	(.00)	(.00	(.95)	(.00)	(.00)	(1.14)	(1.85)	(4.26)	(.00)	(.00)

Note: Standard deviation in parentheses
Legend: RS- Syllable reduction; HC- Consonant harmony I; PF-Fricative plosivation; SV-Velar simplification; PV-Velar posteriorization; PP-Palatal posteriorization; FV –Velars fronting; FP – Palatal fronting; SL – Liquid simplification; SÉC – Consonant cluster simplification; SCF – Final consonante simplification; EP – Plosive devoicing; EF- Fricative devoicing.

Rapid Serial Naming – NSR – tasks mean and standard deviation and its relation to each age group, regarding public and private school/nursery children, are observed in Table 2. In relation to public school/ nursery children, there was better performance in objects task, followed by colors. G1 children failed to perform letters and numbers sub-items. It can be seen that, with increasing age, there was a decrease in errors, although increasing NSR tasks performance. With regard to private school children, there was also better performance in objects task, followed by colors. G1 children failed to perform any of the sub-items, with worst performance compared to public school. It can be seen that, with increasing age, there was a decrease in errors. Unlike public school children, private school children showed decreasing NSR tasks performance time.

Table 3 shows public and private school children Rapid Serial Naming task errors mean and standard deviation. It is possible to see performance differences in all tasks between public school/nursery children and private school children.

Table 2 – Rapid Serial Naming results distribution (means and standard deviation) by age group in Public and Private Schools/Nursery children's Education and Elementary School I 1st grade children. Recife, 2014. (N=100)

GROUP	Object		Color		Letters		Numbers	
	Errors	Time	Errors	Time	Errors	Time	Errors	Time
PUBLIC								
2 years old	74.60	53.20	73.00	60.50	.00	.00	.00	.00
	(24.39)	(31.32)	(35.36)	(34.65)	(.00)	(.00)	(.00)	(.00)
3 years old	81.25	78.75	71.50	107.80	81.00	167.67	50.00	60.00
	(22.37)	(21.31)	(30.16)	(76.90)	(26.85)	(11.68)	()	()
4 years old	41.83	155.67	75.33	141.00	100.00	108.00	97.50	48.00
	(30.11)	(74.38)	(22.81)	(64.90)	(.00)	(31.11)	(3.54)	(11.31)
5 years old	13.78	185.00	18.50	166.00	61.00	119.25	20.60	177.00
	(15.14)	(61.39)	(31.14)	(29.28)	(11.94)	(47.54)	(19.07)	(81.37)
6 years old	3.22	159.00	7.11	178.56	22.89	154.11	8.43	147.14
	(4.18)	(34.01)	(12.94)	(47.38)	(28.01)	(56.61)	(10.24)	(17.82)
PRIVATE								
2 years old	.00	.00	.00	.00	.00	.00	.00	.00
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
3 years old	31.00	148.56	20.11	221.00	37.17	163.50	40.00	177.60
	(34.76)	(66.20)	(18.19)	(91.21)	(23.61)	(59.68)	(35.19)	(51.69)
4 years old	8.90	183.80	17.89	204.67	19.50	156.00	19.86	167.86
	(11.35)	(54.90)	(25.78)	(65.42)	(25.75)	(45.41)	(21.13)	(52.73)
5 years old	4.50	160.00	1.30	154.90	14.10	138.80	2.30	134.90
	(9.51)	(48.57)	(3.13)	(40.90)	(13.21)	(30.31)	(3.89)	(30.52)
6 years old	2.60	159.20	3.80	156.60	5.90	121.20	8.60	166.20
	(3.92)	(37.34)	(7.79)	(37.52)	(11.79)	(49.50)	(14.54)	(134.49)

Note: Standard deviation in parentheses

In order to check whether these differences were statistically significant, Manova with School Type and Rapid Serial Naming task as inter-subjects and number of error on each task as dependent variable was held. Task type significant main effect was observed [F(3.117) = 16.90; p <.001 – Means: Object 6.789, Color 7.853, Letter 29.253, Number 15.598]. School x Task Type interactive effect was also significant [F (3.117) = 4.11; p <.008]. School main effect: [F (1.39) = 2.63; p <0.5] was not significant – Public school/nursery mean 19.36; Private school mean 10.38.

A posteriori Tukey analysis, in order to check the interactive effect between school and task type, showed statistically significant differences between letters task and other tasks, considering public school students (p<.01). Differences between private and public school/nursery in the letter task were also observed. In the Task main effect case, Duncan *a posteriori* analysis revealed statistically significant differences between letters and color and objects tasks (p <.01). As it can be seen, there is no difference between letters and numbers tasks performance.

Table 3 – Rapid Serial Naming task means and standard deviation related to errors in Public and Private Schools/Nursery children's Education and Elementary School I 1st grade children. Recife, 2014. (N=100)

RSN Tasks	School	Mean	SD
Objets	1 Public	33.39	35.40
	2 Private	11.26	20.87
	Total	**21.40**	**30.36**
Color	1 Public	34.71	37.84
	2 Private	10.34	17.41
	Total	**19.77**	**29.44**
Letters	1 Public	49.61	36.88
	2 Private	16.88	20.25
	Total	**28.66**	**31.36**
Numbers	1 Public	27.13	32.94
	2 Private	14.00	21.96
	Total	**18.19**	**26.33**

Legend: RSN = Rapid Serial Naming. SD= Standard deviation

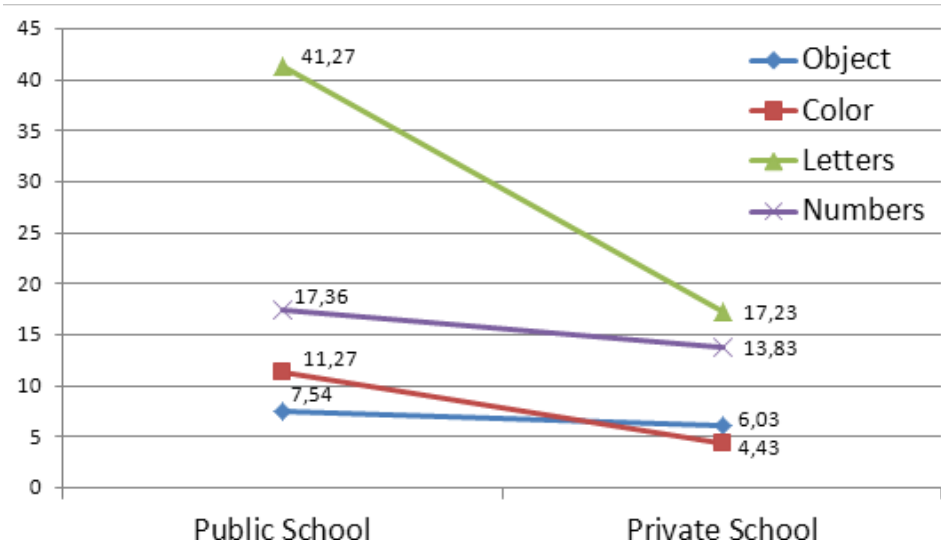

Figure 2 – Rapid Serial Naming Task School Type *versus* Number of Errors interaction

Table 4 shows written phases distribution by school type. It was shown that from 50 children surveyed in public school/nursery, 92% are in the pre-syllabic writing phase, 4% in the syllabic and 4% in the syllabic-alphabetical phase, with no child having alphabetic writing. With regard to private school children, it turns out that of 50 surveyed children, 62% are in the pre-syllabic writing phase, 14% in the syllabic, 14% in the syllabic-alphabetical and 10% in alphabetical phase. Contrasting pre-syllabic and syllabic levels with syllabic-alphabetic and alphabetic, considering both schools (total score), proportions test showed a statistically significant difference (z=2.882, p = .003).

Table 5 shows nominal realism overcoming frequency. It is possible to see that 22% of public school children and 28% of private school children exceeded nominal realism. As it can be seen, there was no statistically significant difference between schools with regard to this data (z=-0.6928, p= .4902).

Table 6 shows Phi correlations between Phonological Processes and Rapid Serial Naming task. It was found that syllable reduction, consonant harmony, velars fronting, cluster simplification and final consonant simplification processes positively correlated with Rapid Serial Naming task.

Table 4 – Phases absolute frequency results distribution by schools in Public and Private Schools/ Nursery children's Education and Elementary School I 1st grade children. Recife, 2014. (N=100)

		Writing Level				Total
		Pre-Syllabic	Syllabic	Syllabic-Alphabetical	Alphabetical	
School	Public	46	2	2	0	50
		92.0%	4.0%	4.0%	0.0%	100.0%
		59.7%	22.2%	22.2%	0.0%	50.0%
	Private	31	7	7	5	50
		62.0%	14.0%	14.0%	10.0%	100.0%
		40.3%	77.8%	77.8%	100.0%	50.0%
Total		77	9	9	5	100
		77.0%	9.0%	9.0%	5.0%	100.0%
		100.0%	100.0%	100.0%	100.0%	100.0%

Table 5 – Nominal realism absolute frequency results distribution by schools in Public and Private Schools/Nursery children's Education and Elementary School I 1st grade children. Recife, 2014. (N=100)

		Nominal Realism		Total
		1 Overcome	2 Has not overcome	
School	1 Public	11	39	50
		22.0%	78.0%	100.0%
		44.0%	52.0%	50.0%
	2 Private	14	36	50
		28.0%	72.0%	100.0%
		56.0%	48.0%	50.0%
Total		25	75	100
		25.0%	75.0%	100.0%
		100.0%	100.0%	100.0%

Table 6 – Pearson correlation between Phonological Processes and Rapid Serial Naming Task in Public and Private Schools/Nursery children's Education and Elementary School I 1st grade children. Recife, 2014. (N=100)

Phonological processes	Object	Color	Letters	Numbers
Syllable reduction	.334(**)	.354(**)	.549(**)	.435(**)
Consonant harmony	.377(**)	.311(*)	.396(**)	.358(*)
Fricative plosivation	.226	.110	.109	-.091
Velar simplification	.135	.029	.095	-.082
Velar posteriorization	-.032	.054	.257	-.134
Palatal posteriorization	-.042	-.040	-.035	.066
Velars fronting	.278(*)	.170	.(a)	.(a)
Palatal fronting	.093	.233	.067	.218
Liquid simplification	.016	-.122	-.038	.146
Consonant cluster simplification	.046	-.030	.116	.308(*)
Final consonant simplification	.181	-.073	.042	.359(*)
Plosive devoicing	.(a)	.(a)	.(a)	.(a)
Fricative devoicing.	.(a)	.(a)	.(a)	.(a)

Legend: (*) – p<.05; (**) – p<.01; (a) – analysis was not performed due to process the non-occurrence

Table 7 shows Phi correlations between Phonological Processes, Writing and Age. It is possible to observe that syllable reduction, liquid simplification, consonant cluster simplification and consonant harmony processes correlated with writing and age. Velar posteriorization, velar simplification and final consonant simplification processes correlated only with age.

Table 8 shows Phi correlations between Rapid Serial Naming, Writing and Age. It is possible to observe that all Rapid Serial Naming task sub-items errors correlated with writing and age. Over time, only objects sub-item has not correlated with writing and age.

Table 7 – Biserial point correlation between Phonological Processes and Writing and Age variables

Phonological Processes		Writing	Age
Syllable reduction	r_{pb}	**.358****	**.528****
	p	**.000**	**.000**
Consonant harmony	r_{pb}	**.226***	**.295****
	p	**.024**	**.003**
Fricative plosivation	r_{pb}	.137	**.303****
	p	.174	**.002**
Velar simplification	r_{pb}	.177	**.512****
	p	.078	**.000**
Velar posteriorization	r_{pb}	.059	.052
	p	.560	.606
Palatal posteriorization	r_{pb}	.098	-.061
	p	.334	.546
Velars fronting	r_{pb}	.155	**.395****
	p	.123	**.000**
Palatal fronting	r_{pb}	.182	.239*
	p	.069	.016
Liquid simplification	r_{pb}	**.277****	**.425****
	p	**.005**	**.000**
Consonant cluster simplification	r_{pb}	**.306****	**.382****
	p	**.002**	**.000**
Final consonant simplification	r_{pb}	.141	**.325****
	p	.162	**.001**
Plosive devoicing	r_{pb}	.(a)	.(a)
	p		
Fricative devoicing.	r_{pb}	.(a)	.(a)
	p		

Legend: (*) – p<.05; (**) – p<.01; (a) – analysis was not performed due to process the non-occurrence. r_{pb}-Biserial Point Correlation. P- Probability.

Table 8 – Biserial point correlation between Rapid Serial Naming and Writing and Age variables

Rapid Serial Naming		Writing	Age
Object Errors (1=Low/0=High)	r_{pb}	**.487****	**.648****
	p	**.000**	**.000**
Color Errors (1=Low/0=High)	r_{pb}	**.482****	**.520****
	p	**.000**	**.000**
Letter Errors (1=Low/0=High)	r_{pb}	**.611****	**.539****
	p	**.000**	**.000**
Number Errors (1=Low/0=High)	r_{pb}	**.521****	**.530****
	p	**.000**	**.000**
Object Time (1=Low/0=High)	r_{pb}	.168	.088
	p	.094	.382
Color Time (1=Low/0=High)	r_{pb}	**.317****	**.318****
	p	**.001**	**.001**
Letter Time (1=Low/0=High)	r_{pb}	**.475****	**.425****
	p	**.000**	**.000**
Numbers Time (1=Low/0=High)	r_{pb}	**.466****	**.397****
	p	**.000**	**.000**

Legend: (*) – p<.05; (**) – p<.01; r_{pb}-Biserial Point Correlation. P- Probability.

DISCUSSION

As described above, it was observed that the most frequent phonological processes in all public and private school/nursery children age groups were syllable reduction, liquid simplification, consonant cluster simplification and final consonant simplification.

Corroborating with this result, a research conducted in Southeastern Brazil, aimed at describing Minas Gerais Brazilian Portuguese variant preschool age speakers phonological development, found that the most frequent phonological processes were liquid consonants replacement (liquid simplification), consonant cluster reduction (consonant cluster simplification), final consonant deletion (the final consonant simplification) and devoicing[29].

Another research conducted in Recife metropolitan area with public and private school children showed similar results. It was found that the most frequent processes were consonant cluster simplification, liquid simplification and final consonant simplification[30].

In general, both public and private schools/nursery had delays in processes overcoming in relation to what was recommended by a study[12]. One possible explanation for these data would be regional language varieties, as well as socio-educational variables. For example, there is the final consonant simplification process, which was not overcame this study's children, with its overcoming being recommended at 7:0 years old. Thus, the importance of studying phonological acquisition considering regional linguistic varieties is observed. Sociolinguist studies showed that missing the final consonant is common in some dialects adult standard, not being considered as a phonological change[31].

It was observed that phonological processes were decreasing with increasing age in both public and private schools/nursery children. A similar result was found in a survey conducted in Southeastern Brazil that aimed to verify phonological processes use in a population with normal phonological development, in which 240 individuals participated, who were aged between 3 and 8 years old[4].

Regarding Rapid Serial Naming tasks, both public and private schools/nursery children had better performance in objects and colors tasks.

This finding does not match with those described in the literature, in which better results were found in letters and numbers tasks[32]. However, this result can be explained by two reasons: children's age (2 years old to 6 years and 11 months old) and children's educational level (kindergarten to first year) who participated in this study.

In literature, in general, participants described age is between 7 and 11 years old, i.e., not including children from early childhood education. This has a direct reflection on results, because as these children are older, they had higher exposure time to formal education. Colors and objects concepts are learned routinely, in informal contexts. In contrast, letters and numbers learning are intrinsically linked to formal education. As 60% of children participating

in this study were less than five years old, they were not exposed to alphabet and number system learning systematically, according to their actual maturity and age. It was also observed that, in both populations, with increasing age, and consequently increasing education level, there was a better performance on letters and numbers tasks.

Although studies on rapid serial naming are concentrated in children from 6/7 years old, i.e., in alphabetization period, it is important to note that it is possible to investigate rapid serial naming skills even with younger children, since they respond to several tasks.

Interestingly, while G1 (2:0 to 2:11 years old) public school/nursery children failed to perform letters and numbers sub-items, private school children failed to perform all sub-items. However, analyzing this data more thoroughly, it was found that as private school children grew older, both rapid serial naming tasks errors and performance time decreased, unlike public school children, in which in a decrease in errors with increasing age was also observed, but with an increase in tasks performance time. Such data need to be further investigated by other studies, once it may reflect different stimuli access opportunities in family and school environment.

It was observed that younger children underperformed in rapid serial naming compared to older children. These data were corroborated by a survey with 71 children divided into three groups (children with reading disorder, children with attention deficit and hyperactivity disorder and control group) that compared alternated colors, letters, numbers, objects, numbers/letters and letter/number/colors rapid serial naming tasks, with the youngest children having the worst performance[33].

The fact that older children had better results can be explained by school time, as they had higher contact with formal education. It is noteworthy that among this study children, about 80% were still in children's education.

As results described above, private school children performed better than public school/nursery children in all rapid serial naming tasks, having statistically significant differences for the task involving letters.

This data was also found in a study that aimed to assess rapid serial naming skill in 62 children considered as 1st and 2nd grades public and private elementary schools good readers. Results showed statistically significant differences in reading, writing and rapid serial naming tests related to the children's grade. That is, the more advanced their grade, the better their performance. It was also noted that public school children performed worse than the private school children, regardless of grade[34].

Another study with public and private school children with and without school problems history investigated 137 children aged between 7 and 11 years old. Results also showed public school children underperformed in the rapid serial nomination test, when compared to private school children[32].

Literature points out that rapid serial naming task performance easiness is more evident in upper grades because children had overall processing speed maturation, thus corresponding to the school context demands[35].

It is known that rapid serial naming is related with reading, especially in decoding, fluency and comprehension skills, and is considered in international literature as a predictor for reading and writing development[21,23].

Speed is an important factor for fluent text reading. Thus, it is known that there is correlation between rapid serial naming tasks performance and fluent text reading measures performance[20].

The time a child takes to process a written and/or an image visual information can point to naming and reading difficulties, and leads to hypotheses on both language and cognition development, as the higher the competence in recognizing written words quickly, higher the available cognitive resources to the reading comprehension task[18]. Proficient readers are able to read words at a very fast speed, reaching 300 words per minute, or five words per second[21].

The statistically significant differences found in this study among public and private schools/nursery children in the letters task, as mentioned earlier, is a fact that brings reflection to socio-educational differences between these populations, especially in regard to the amount of books that the children had at home, parental education and reading habits aimed at children.

While about half the public schools/nursery children did not have any books at home or had up to three books, more than half of private school children had more than six books. While nearly all private school parents read to their children frequently or daily, only a very small number of public school/nursery parents read frequently or daily to their children. This data can be interrelated with parents' education level, since most private school child mothers completed university education, and only one public school/nursery child's mother concluded it.

After Pearson correlation analysis, it was observed that syllable reduction, consonant harmony, velars fronting, consonant cluster simplification and final consonant simplification processes are positively correlated with rapid serial naming task. This means that children who had not yet

overcome such processes underperformed in rapid serial naming task. The syllable reduction process, with overcoming recommended at 2:6 years old, was later overcame by both public and private schools/ nursery children, having been one of the processes that more often appeared. It was observed in higher numbers in younger children, what may explain the fact that children who had overcome this process had worse naming results. Consonant cluster simplification and final consonant simplification processes are more complex processes, with recommended overcoming at 7:0 years old. They were also shown in higher numbers by younger children and it was observed that they were not exceeded by a significant group portion. This finding may explain rapid serial naming task poor performance by children who did not have them yet overcome.

With regard to writing, it was observed that most public school children were in pre-syllabic writing stage, and no child had alphabetic writing. As for the private school children, just a little over half of them were in the pre-syllabic writing phase and a small part in the alphabetical phase. It is expected that children between 5 and 6 years old would be in the syllabic-alphabetical and alphabetical phases.

A survey to assess the written phases noted that most of the study children were in the pre-syllabic stage, and these children were between 5 and 6 years old[36]. These data corroborate with the results found in this study.

Children who performed better in the written assessment were those from private school. It was observed that these children had more books than public school/nursery children, and most parents had higher education and frequent reading habits. This shows that, probably, these children are stimulated in the home environment with respect to reading.

Studies showed that children comprehend written language through interactions with literate adults even before they are literate in the conventional order[37].

About nominal realism, it was found that most children had not overcome it in both schools, although public school children had not overcome it in a higher frequency. This may explain why most children in this study were in the pre-syllabic stage.

A research conducted with non-flunking children alphabetization classes in three Recife schools, with one public school in socioeconomic disadvantage and two private schools in advantaged socioeconomic levels, showed similar results to this study. It was observed that reading and writing learning was more effective in better developed children in nominal realism aspect, regardless of the type of school[38].

Another research has also shown that children who had overcome nominal realism could write alphabetically, but those who were still heavily based on meaning found themselves in pre-syllabic and alphabetic syllabic hypotheses[39], confirming data found in this study.

A survey with 4 to 6 years old children also noted that with nominal realism was overcome with increasing age[40].

After Pearson correlation analysis, it was observed that children who had overcome syllable reduction, liquid simplification, consonant cluster simplification and consonant harmony were in a more advanced writing phase and age. Liquid simplification and consonant cluster simplification processes are more complex processes and, therefore, are overcome later. Thus, children that had surpassed it were those of more advanced age, lying in an also advanced writing stage.

In relation to rapid serial naming task, it was found that children who performed well were in a writing phase and with advanced age. This suggests that older children have better results in rapid serial nomination, although younger children are also able to perform them, although with lower performance.

CONCLUSION

The occurrence of some processes that were not observed in surveys conducted in other regions of the country was observed. It is possible that these findings were derived from the spoken language variety in Recife influence. Thus, this factor must be considered in phonological development assessment, in order to prevent any errors in speech disorders diagnosis.

It was also observed that children had a better result in Rapid Serial Naming task in colors and objects sub-items. This result can be explained in part by participating children age, as well as by socio-educational issues.

The study also showed that children from private schools showed better results in the Rapid Serial Naming compared to public school/nursery children.

With regard to writing, it was found that most public school/nursery children were still in pre-syllabic stage and had not yet overcome nominal realism, showing once again that private school children performed better.

It was observed that overcoming of more complex phonological processes will result in rapid serial naming better performance and better writing development.

It is possible to conclude from this study data that there is a relation between phonological development and initial reading and writing learning, because process overcoming was related to rapid serial naming ability and writing development in children aged 2 to 6 years and 11 months old.

RESUMO

Objetivo: investigar a relação entre o desenvolvimento fonológico e aprendizagem inicial da escrita em diferentes contextos socioeducacionais. **Métodos:** realizado em uma creche, uma escola municipal e escola particular, totalizando 100 crianças, entre 2:0 e 6:11 anos. Para avaliação fonológica, foi utilizado a Prova de Avaliação Fonológica. Para avaliação da leitura, foi aplicada a tarefa de Nomeação Seriada Rápida. Para avaliação da escrita, foi proposto um roteiro de atividades, como ditado de palavras e frases. **Resultados:** foi possível observar que alguns processos fonológicos apresentaram correlação positiva com a Tarefa de Nomeação. Essa tarefa também se correlacionou positivamente com a escrita e com a idade. Ou seja, quanto melhor o desempenho na Tarefa de Nomeação, mais avançado o nível em que se encontravam na escrita e maior faixa etária. Foi observado, ainda, que as crianças de escola particular mostraram um melhor desempenho na escrita e na Tarefa de Nomeação. **Conclusão:** a partir desses dados, foi observado que existe uma relação entre o desenvolvimento fonológico e aprendizagem inicial da leitura e escrita, pois a superação dos processos fonológicos se relacionou com a Nomeação e a escrita em crianças na faixa etária de 2:0 a 6:11 anos. Acredita-se que estes achados podem estar relacionados a aspectos socioeducacionais.

DESCRITORES: Linguagem; Leitura; Desenvolvimento da Linguagem; Criança; Pré-Escolar

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