

ANALYSIS OF PHONOLOGICAL PROCESSES IN CHILDREN FROM THE METROPOLITAN REGION OF RECIFE

Análise dos processos fonológicos em crianças da região metropolitana do recife

Bianca Arruda Manchester de Queiroga ⁽¹⁾, Angélica Galindo Carneiro Rosal ⁽²⁾,
Ana Carolina Francisca da Silva ⁽²⁾, Ana Augusta de Andrade Cordeiro ⁽¹⁾

ABSTRACT

Purpose: to describe the phonological development of speakers of non-standard Portuguese in the metropolitan region of Recife-PE, from the model of phonological processes. **Methods:** the study included 202 children of both sexes, aged 2: 0 to 6:11 years, enrolled in kindergartens and public schools. It was used an assessment tool the Phonological Evaluation Test. Data were recorded, transcribed, coded and tabulated in a database, which enabled the realization of descriptive analyzes (means and standart desviations calculation). **Results:** the most common phonological processes were consonant cluster simplification, simplification of net, reduction and simplification of syllable final consonant. Observed delay in the elimination of reductions syllable, consonant harmony, plosivation fricative, velar fricative simplification and streamlining net. It was observed also that the process of simplification of consonant was not eliminated in this population, taking into consideration the ages of elimination described in the research literature, which may be indicative of the influence of linguistic variety on phonological acquisition. **Conclusion:** children of Portuguese speakers not standard in the Metropolitan Region of Recife have a different phonological acquisition the description of the literature in the area, which may be indicative of the influence of linguistic variety. The results call attention to the fact that this variety should be considered in phonological assessment, it is essential that new studies explore the phonological acquisition in different regions of the country.

KEYWORDS: Language; Language Development; Speech; Child; Child, Preschool; Family Relations

■ INTRODUCTION

The phonological development of a linguistic system occurs gradually, to the extent that the child experiences different situations in which it must learn which sounds are used in its language and how they are organized ^{1,2}. This development is not linear. It has individual variations, since it is fully linked to social relations, experiences and communicative

interactions that the child establishes with the environment. The social aspect develops jointly vocabulary and cognition from social interactions¹⁻⁹.

For some authors, the establishment of the age group for phonological development is widely discussed, being found in the literature ranges between 4:0 and 6:0 years¹⁰ and between 4:0 and 7:0 years¹¹. For some authors², the phase of greatest expansion of the phonological system is between 1:6 and 4:0 years, when there is an increase in the phonetic inventory of children, enabling the production of polysyllabic words and more complex syllabic structures. However, this period is characterized by substitutions and omissions of sounds.

During development, the child increases its phonetic inventory and dominates the phonological rules of its own linguistic system considering phonemes, their distribution and the type of syllabic

⁽¹⁾ Departamento de Fonoaudiologia da Universidade Federal de Pernambuco - UFPE; Recife, PE, Brasil.

⁽²⁾ Universidade Federal de Pernambuco – UFPE, Recife, PE, Brasil.

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structure where they occur². Children use resources in place of the segment or the syllabic structure that they do not know yet, or whose production they do not master. As this process unfolds, the used resources also change due to the proximity of child's and adult's phonological systems. These resources are observed both in normal as in deviant phonological development processes, with the difference that, in deviations, these features will last longer^{2,5,7,9,12,13}.

To evaluate phonological development, it is crucial to analyze the speech of the child considering the phonological system of the adult. A model that has long been used in the literature to describe a child's phonological system is phonological processes, which concerns the simplification of phonological rules involving sequences of sounds in the pronunciation of words. Most of these are part of a typical speech development, eliminated over the years. If a child shows phonological processes beyond the expected age, it is regarded as having phonological disorders¹⁴⁻¹⁶.

Phonological processes can be classified into simplification of consonant cluster, liquid consonant simplification, simplification of final consonants, devoicing of fricatives, devoicing of plosives, frontalization to palatal, velar fricative simplification, posteriorization to palatal, frontalization of velar fricatives and plosivization of fricatives¹⁷. That classification was used in this study, although other research^{13,18} present other classifications.

In general, studies that explore children's language and socio-cultural aspects report that most cognitive and/or language assessment tests are favorable to socio-culturally dominant groups and, with some frequency, the differences are interpreted as reflecting inadequate development conditions^{19,20}. However, studies identify linguistic variations in populations of specific social classes. Such variations can be attributed in part to social factors such as age, gender, social class and maternal education. They can also be correlated to independent linguistic variables such as phonological context, word length, tone, among others²⁰⁻²².

Although Brazilian Portuguese is relatively consistent, there is a diversity of linguistic variations, as pointed out by the literature²², so that particular studies of a region cannot automatically be generalized to other Brazilian regions, being necessary to consider phonological specificities of various dialects and then propose generalizations valid for Brazilian Portuguese. It would therefore be inadmissible to evaluate the language of a child regardless of the model spoken in its language community. However, not infrequently, the speech-language pathologist uses tests involving spontaneous

speech, appointment and/or repetition of words, referencing just what would be expected for each age group.

This study has a practical relevance, since it expands the prospects for a greater understanding of the child's language development. Moreover, it provide subsidies to the speech-language pathologist for a precise clinical evaluation and a more appropriated therapeutic intervention for cases of phonological changes, as well as for activities that indicate the promotion of language development. Based on the foregoing, the present study aimed to describe the phonological development of non-standard Portuguese speaking children in the metropolitan region of Recife-PE from the model of phonological processes.

METHODS

This study was approved by the Ethics Committee for Research involving Human Beings of the Health Sciences Center (CCS) of the Federal University of Pernambuco under protocol No. 115/09 from the National Health Council, thus allowing its conducting.

The methodological path suitable for the present research prioritized a quantitative analysis and the study was characterized as descriptive, exploratory and crossed.

The participants were 202 children of both genders, aged from 2:0 to 6:11 years old, enrolled in day care centers and public schools in the metropolitan region of Recife - Pernambuco, divided in ten age groups, with a six-month interval: G1 (2:0-2:5); G2 (2:6-2:11); G3 (3:0-3:5); G4 (3:6-3:11); G5 (4:0-4:5); G6 (4:6-4:11); G7 (5:0-5:5); G8 (5:6-5:11); G9 (6:0-6:5); G10 (6:0-6:11). This age subdivision is justified by children's major language acquisitions in this stage of development, as some authors describe²². Thus, longer intervals in age-group analysis could cover leaps in the language development of children.

The sample exclusion criteria were the presence of communication, learning, special educational needs, hearing impairment, neurological problems or other obvious aspect that might interfere with language development.

Data were collected from August 2009 to July 2011. Initially, individual data from the student identification card at school were obtained. Subsequently, additional information was obtained through a psychosocial questionnaire made with parents or guardians through interviews. The purpose of the questionnaire was to characterize the sample and trace a description of the reality in which children were in. Parents or guardians received an

information letter containing the study objectives and ensuring the confidentiality of information. All those who agreed to participate signed the Informed Consent - IC.

Initially, children were assessed by a clinical orofacial motor examination based on the MBGR PROTOCOL²³, observing the mobility and tone of oral myofunctional structures. The results were registered in a protocol. The purpose of this evaluation was to identify and exclude from the sample children that had phonetic changes.

Following, the assessment of phonological acquisition was carried out through a Phonological Evaluation Test (Prova de Avaliação Fonológica - PAFon)^{22,24}. This test aims to appoint 215 target-words selected in order to include Portuguese phonemes by controlling some linguistic variables such as syllabic structure and tone. The instrument is divided into six categories: AF1- Animals, AF2- Food, AF3- Body and personal items, AF4- Home objects, AF5- Child objects and AF6- Nature and transport. When the child did not spontaneously name the figures, it is asked to repeat the target-word from the model offered by the examiner.

Registration considers whether naming or repetition was performed.

Upon completion of the collection, the results were coded in numeric variables to enable the data collection for a database using the SPSS 13.0 software, which enabled the realization of descriptive statistical analysis (calculation of means and standard deviations).

Studies on phonological acquisition have considered the percentage of 80% standard production as an indication that the child has mastered the acquisition of a phonological segment^{22,24}. Similarly, in this study, it was considered as a framework for the elimination of processes a 80% reduction in the occurrence of each phonological process for the age group.

■ RESULTS

As previously stated, 202 preschool children with typical phonological development were distributed in ten age groups as shown in Table 1. The difficulty in applying the test with young children is highlighted, which explains a lower number of participants in the range of two and three years.

Table 1 – Distribution of children surveyed in age groups, Recife, 2014. (N=202)

Group	Age	N
G1	2 – 2:5	5
G2	2:6 – 2:11	5
G3	3 - 3:5	9
G4	3:6 – 3:11	7
G5	4 – 4:5	10
G6	4:6 – 4:11	23
G7	5 – 5:5	28
G8	5:6 – 5:11	41
G9	6 – 6:5	28
G10	6:6 – 6:11	46

The mean and the standard deviation for phonological processes and their relation to each age group (group) can be seen in Table 2. It is possible to see that the most frequent phonological processes in all age groups were simplification of consonant

cluster, liquid consonant simplification, syllable reduction and simplification of final consonant. It is noteworthy that the process of simplification of consonant cluster was never eliminated in the investigated age group.

Table 2 – Distribution of relative results of phonological processes evaluation (means and standard deviations), by age group, of preschool children from 2:0 to 6:11 years old, Recife, 2012. (N=203)

GROUP	Phonological processes												
	SR	CH	PF	VS	PV	PP	FV	FP	LS	SCC	SFC	DP	DF
1	11.80 (4.64)	2.00 (.84)	3.80 (.97)	6.40 (2.50)	–	.60 (.60)	.60 (.24)	1.20 (.58)	17.80 (6.58)	26.80 (9.78)	12.20 (4.95)	1.20 (.73)	1.00 (1.00)
2	7.00 (1.55)	1.60 (.93)	23.80 (12.49)	7.40 (2.48)	.20 (.20)	1.20 (.97)	1.40 (.98)	.20 (.20)	15.00 (4.18)	28.40 (5.52)	13.60 (2.84)	6.00 (3.52)	.40 (.24)
3	7.78 (1.69)	1.44 (.44)	1.33 (1.09)	1.22 (.49)	.11 (.11)	2.44 (1.18)	.44 (.18)	1.00 (.55)	13.33 (3.61)	37.56 (4.36)	11.56 (1.73)	2.56 (2.06)	.33 (.33)
4	6.86 (1.34)	1.57 (.43)	1.14 (.70)	1.57 (.87)	–	2.29 (1.97)	–	.14 (.14)	4.86 (1.40)	27.86 (5.22)	9.43 (1.74)	.43 (.43)	2.71 (1.51)
5	3.73 (1.30)	.45 (.21)	6.73 (5.84)	.36 (.20)	.55 (.31)	0.82 (.33)	.18 (.18)	.55 (.31)	8.91 (3.43)	20.00 (4.83)	6.18 (2.68)	2.18 (1.70)	.73 (.41)
6	3.57 (.65)	.74 (.17)	.48 (.16)	.61 (.39)	.004 (.004)	.65 (.32)	.004 (.004)	.17 (.12)	5.26 (1.50)	22.13 (3.56)	5.26 (.91)	.30 (.19)	.008 (.006)
7	3.72 (.85)	.28 (.009)	–	.55 (0.48)	–	.28 (.17)	.003 (.003)	.28 (.18)	4.03 (1.28)	14.41 (2.61)	3.66 (1.05)	.14 (.11)	.10 (.005)
8	2.37 (.29)	.006 (.003)	0.28 (0.16)	.14 (.006)	.002 (.002)	–	.004 (.003)	-.004 (.003)	3.58 (.98)	17.51 (2.05)	2.91 (.52)	.12 (.007)	.002 (.002)
9	2.28 (.38)	.10 (.005)	.003 (.003)	.003 (.003)	.006 (.004)	–	–	–	2.86 (.81)	12.52 (1.97)	1.79 (.38)	.38 (.14)	.006 (.004)
10	2.48 (.48)	.002 (.002)	.57 (.55)	.19 (.19)	.002 (.002)	–	–	–	2.45 (.81)	11.50 (1.88)	2.83 (.52)	.43 (.30)	–

Note: Standard deviation in parentheses

Caption: SR Syllable reduction; CH Consonant harmony; PF- Plosivation of fricative; VS- Velar simplification; PV- posteriorization to velar; PP- posteriorization to palatal; FV- Frontalization of velar; FP- Frontalization of palatal; LS- Liquid consonantal simplification; SCC- Simplification of consonant cluster; SFC- Simplification of final consonant; DP- Devoicing of plosive; DF- Devoicing of fricative.

Figure 1 shows a comparison of the expected phonological acquisition for each age group, according to Wertzner¹⁷, with the age found in this study, indicating a delayed elimination of syllable

reduction, consonant harmony, plosivation of fricatives, velar fricative simplification and liquid simplification.

Phonological processes	Age of acquisition according to WERTZNER (2003)	Age of acquisition in this study
Syllable Reduction	2.6	6:0 to 6:5
Consonant Harmony	2.6	5:0 to 5:5
Plosivation of Fricatives	2.6	4:6 to 4:11
Velar Fricative Simplification	3.6	4:0 to 4:5
Posteriorization to Velar	3.6	No mastering
Posteriorization to Palatal	4.6	No mastering
Frontalization of Velar	3	No mastering
Frontalization of Palatal	4.6	No mastering
Liquid consonant simplification	3.6	6:0 to 6:5
Simplification of Consonant Cluster	7	No mastering
Simplification Final Consonant	7	6:0 to 6:5
Devoicing of Plosives	-	-
Devoicing of Fricatives	-	-

Figure 1 – Comparison of phonological acquisition ages observed in this study and ages proposed by Wertzner (2003)

■ DISCUSSION

The results show that the phonological processes that operated most in the speech of surveyed children were consonant cluster simplification, liquid consonant simplification, syllable reduction and simplification of final consonant. Another survey conducted in the metropolitan area of Recife with children from public and private schools showed similar results, indicating consonant cluster simplification, liquid consonant simplification, final consonant simplification and syllable reduction as the most frequent processes²⁴. It is worth noting that the population of the other study²⁴ was composed of children from public and private schools, and not from public schools only, as in this study.

Other studies^{2,20} indicate that children with a typical phonological development between the ages of three and four years, use more frequently consonant cluster reduction, lateralization, and final consonant deletion processes. It is worth noting that, in the case of this study, the reduced children sample aged two to three years may limit interpretation of the results.

A study that investigated the prevalence of phonological disorders in seven-year-old children showed that the most frequent processes in children with phonological changes are simplification of consonant cluster, liquid consonant simplification, devoicing of fricatives, devoicing of plosives and elimination of final consonant⁷. These data demonstrate similarities with typical phonological development observed in children in this study, but they also ratify important differences such as the absence of devoicing of fricatives and plosives that only happen in the event of a deviant phonological development^{11,17}.

As can be seen in Table 2, syllable reduction, consonant harmony, plosivation of fricative, velar fricative simplification and liquid simplification phonological processes were overcome late if compared to the expected age according to the literature used as reference^{11,17}.

When performing a comparison between the results found and the literature, it can be seen that the elimination of the syllable reduction process proved to be very late in this study (6:0 to 6:5 years range). For some authors, this process must be overcome at around 2:6 years¹⁷. Other authors¹⁸, who investigated phonological acquisition in children with malnutrition antecedents, stated that the syllable reduction process was eliminated at about 5:6 years of age. Thus, it can be stated that, in the case of this study, there was a significant delay in the elimination of this process by the studied population.

Similarly, a significant delay was also observed in relation to the elimination of the fricative plosivation process, which happened in the speech of children in this study until 4:11 years old. According to the literature, this process must be overcome at around 2:6 years¹⁷. Other authors claim that this process will only disappear after the age of 3²⁵.

In the case of velar fricative simplification process, it was surpassed by around 4:0 to 4:5 years. There are references in the literature indicating that velar simplification is eliminated at about three years old^{17, 26}.

The results of this study indicate that posteriorization to velar, posteriorization to palatal, frontalization to velar and frontalization of palatal processes showed to have means too low to be considered as typical phonological development processes¹¹. It is noteworthy that the instrument used for the phonological evaluation (FonET) has target-words selected in order to include all phonemes of Portuguese, considering the position in the syllable and tone, having thus the possibility of the occurrence of such processes.

According to the literature, these processes are typical of development and are eliminated at about 4:6 years¹⁷. For other authors¹⁸, investigating the phonological acquisition in children with malnutrition antecedents, the frontalization of velar, frontalization of palatal, posteriorization to velar and posteriorization for palatal processes disappear for about 4 years.

The devoicing of plosives and devoicing of fricatives processes also showed a greatly reduced occurrence. These, respectively, are commonly found in children with phonological disorders^{7,27} and, when surveyed in other regions of the country², did not influence typical phonological development.

Regarding consonant cluster simplification process, it was observed that it was not overcome in any of the age groups studied. According to the literature, this process should disappear around the age of 5²⁶. It may appear in children over 7 years². It is important to note that the acquisition of consonant cluster is very influenced by the socio-cultural environment. Phonological productions such as [fror] instead of /flor/, [peda] instead of /pedra/, [pranta] instead of /planta/ can be observed.

These results point to the importance of the knowledge of a normal phonological development in populations with socio-cultural specificities, especially in different linguistic varieties of the same language, so that misinterpretations between what is linguistic variety and what is phonological disorders are avoided in the diagnosis of speech disorders. With this, it is fundamental to conduct further studies in order to verify the influence of language varieties

spoken in Brazil on the process of phonological acquisition.

■ CONCLUSION

The most frequent phonological processes were consonant cluster simplification, liquid consonant simplification, syllable reduction and simplification of final consonant. It was observed that syllable reduction, consonant harmony and plosivation of fricative phonological processes were overcome late. On the other hand, liquid consonant simplification, frontalization of palatal and posteriorization of palatal processes were eliminated before the expected age. The consonant cluster simplification process was not overcome in any group, showing the influence of socio-cultural issues.

The data suggest a possible influence of linguistic variety, which should be considered in the evaluation of phonological development, especially in children of the metropolitan region of Recife, being essential that studies further explore this acquisition in different regions of the country.

Given the above, it is concluded that the socio-linguistic context should be considered in children's phonological evaluation processes to prevent any mistaken diagnosis of phonological disorders or regional linguistic variety prejudices, as difficulties related to phonology can hinder the development of language in general, affecting one or more of its subsystems. Therefore, it is important to evaluate and understand each of these subsystems separately, considering the importance of the influence of phonological development to the success of both the understanding and the expression of language.

RESUMO

Objetivo: descrever o desenvolvimento fonológico de crianças falantes do português não padrão na Região Metropolitana do Recife- PE, a partir do modelo dos processos fonológicos. **Métodos:** participaram do estudo 202 crianças de ambos os sexos, na faixa etária de 2:0 a 6:11 anos, matriculadas em creches e escolas públicas. Utilizou-se como instrumento de avaliação a Prova de Avaliação Fonológica. Os dados foram gravados, transcritos, codificados e tabulados em um banco de dados, que possibilitou a realização de análises descritivas (cálculo de médias e desvios padrão).

Resultados: os processos fonológicos mais frequentes foram simplificação de encontro consonantal, simplificação de líquida, redução de sílaba e simplificação de consoante final. Observou-se o atraso na eliminação dos processos de redução de sílaba, harmonia consonantal, plosivação de fricativa, simplificação de fricativa velar e simplificação de líquida. Observou-se, ainda, que o processo de simplificação de encontro consonantal não foi eliminado na população estudada, levando-se em consideração as idades de eliminação descritas na literatura pesquisada, o que pode ser revelador da influência da variedade linguística sobre a aquisição fonológica. **Conclusão:** crianças falantes do português não padrão da Região Metropolitana do Recife apresentam uma aquisição fonológica diferente da descrição da literatura na área, o que pode ser indicativo da influência da variedade linguística. Os resultados chamam a atenção para o fato que tal variedade deve ser considerada na avaliação fonológica, sendo fundamental que novos estudos explorem a aquisição fonológica em diferentes regiões do país.

DESCRTORES: Linguagem; Desenvolvimento da Linguagem; Fala; Criança; Pré-Escolar; Relações Familiares

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Mailing address:

Bianca Arruda Manchester de Queiroga

Praça Professor Fleming, 50, apt 1101

Recife – PE – Brasil

CEP: 52050-180

E-mail: queiroga.bianca@gmail.com