DOI: 10.1590/2317-1782/20152014114

Original Article

Artigo Original

Suellen Vaz[1]
Isabela de Oliveira Pezarini[2]
Larissa Paschoal[2]
Lourenço Chacon[2]

Characteristics of the acquisition of sonorant consonants orthography in Brazilian children from a São Paulo municipality

Características da aquisição da ortografia de consoantes soantes em crianças de um município paulista

Keywords

Handwriting
Language Development
Child
Phonetics
Linguistics

ABSTRACT

Purpose: To describe the spelling performance of children with regard to the record of sonorant consonants in Brazilian Portuguese language, to verify if the errors in their records were influenced by the accent in the word, and to categorize the kinds of errors found. **Methods:** For this current survey, 801 text productions were selected as a result of the development of 14 different thematic proposals, prepared by 76 children from the first grade of primary school, in 2001, coming from two schools of a city from São Paulo, Brazil. Of these productions, all words with sonorant consonants in a syllabic position of simple onset were selected. They were then organized as they appeared as pre-tonic, tonic, and post-tonic syllables, unstressed and tonic monosyllables. **Results:** The following was observed: the number of hits was extremely higher than that of errors; higher occurrence of errors in non-accented syllables; higher occurrence of phonological substitutions followed by omissions and, at last, orthographic substitutions; and higher number of substitutions that involved graphemes referring to the sonorant class. **Conclusion:** Considering the distribution of orthographic data between hits and errors, as well as their relationship with phonetic–phonological aspects, may contribute to the comprehension of school difficulties, which are usually found in the first years of literacy instruction.

Descritores

Escrita manual
Desenvolvimento da Linguagem
Criança
Fonética
Linguística

RESUMO

Objetivos: Descrever o desempenho ortográfico de crianças, no que se refere ao registro de consoantes soantes do Português Brasileiro; verificar se os erros em seus registros sofrem influência do acento no interior da palavra e categorizar os tipos de erros encontrados. **Métodos:** Para a presente pesquisa, foram selecionadas 801 produções textuais resultantes do desenvolvimento de 14 diferentes propostas temáticas, realizadas por 76 crianças da primeira série do ensino fundamental, em 2001, de duas escolas de um município paulista. Dessas, foram selecionadas as palavras com ocorrência de consoantes soantes em posição silábica de ataque simples. Foram, então, organizadas conforme aparecessem em sílabas pré-tônicas, tônicas, pós-tônicas, monossílabos átonos e tônicos. **Resultados:** Observou-se: quantidade de acertos extremamente maior do que de erros; maior ocorrência de erros em sílabas não acentuadas; maior ocorrência de substituições fonológicas seguida de omissões e, por fim, de substituições ortográficas; e maior número de ocorrência de substituições que envolveram grafemas referentes à classe das consoantes soantes. **Conclusão:** Considerar a distribuição de dados ortográficos entre acertos e erros, bem como suas relações com aspectos fonético-fonológicos, pode contribuir para o entendimento das dificuldades escolares encontradas nas séries iniciais de alfabetização.

Correspondence address:
Suellen Vaz de Souza
Rua Hermes da Fonseca, 163, Vila Nova, Marília (SP), Brasil, CEP: 17510-412.
E-mail: suellenvazz@gmail.com

Received: 08/12/2014

Accepted: 12/09/2014

CoDAS 2015;27(3):230-5

Study carried out at the Language Research Group, Speech Language Pathology and Audiology Department, Universidade Estadual Paulista "Júlio de Mesquita Filho" – UNESP – Marília (SP), Brazil.
(1) Graduate Program in Speech Language Pathology and Audiology, Universidade Estadual Paulista "Júlio de Mesquita Filho" – UNESP – Marília (SP), Brazil.
(2) Speech Language Pathology and Audiology course, Universidade Estadual Paulista "Júlio de Mesquita Filho" – UNESP – Marília (SP), Brasil.
Financial support: Fundação de Amparo à Pesquisa do Estado de São Paulo – FAPESP; e Conselho Nacional de Desenvolvimento Científico e Tecnológico – CNPq.
Conflict of interests: nothing to declare.

INTRODUCTION

The acquisition of writing has become a constant object of investigation, both nationally and internationally. In the past five years, different questions about this matter have been investigated under different theoretical and methodological perspectives.

In this diversification, the analyses have mainly addressed the spelling performance in tasks characterized as reading, writing, and phonological awareness[1-7]. Less common, however, not less relevant, are investigations addressed to the spelling errors, characterized not only by the type of errors but especially by the way it progresses during the process of writing[8-10]. Finally, there are studies addressed to the efficacy of speech language programs on the performance of students[11].

Besides the aforementioned analyses, other investigations have focused on the relationship between speech and writing[12]; between spelling and literacy[13]; the matter of authorship in writing[14]; and the questioning regarding the criteria that should consider the errors in children's writing as pathological[15].

There is little reference on the relationships between spelling and phonetic-phonological aspects of language in this literature. Such relationships, however, have been investigated by the research groups *Estudos sobre a aquisição da linguagem escrita* (GEALE/CNPq)[16-18] — located at Universidade Federal de Pelotas — and *Estudos sobre a linguagem* (GPEL/CNPq)[19-25] — located at the School of Philosophy and Sciences at Universidade Estadual Paulista "Júlio de Mesquita Filho" (UNESP).

Three studies carried out in GPEL stand out: two of them show the relationship analyzed by the authors between spelling records, syllabic position, and word accent[19,22]; and the third one verifies the record of nasality in syllable onset and coda positions[21]. Besides, the fact that they approach the relationships between phonetic-phonological aspects and spelling among children in the final grade of elementary education is also important.

Investigating the action of these aspects (phonetic-phonological ones) in spelling acquisition is the most general concern of the analysis reported in this article. More specifically, considering the phonology/spelling relationship, its proposal is to investigate the spelling performance of children in relation to sonorant consonants in the position of simple syllable onset, in the production of uncontrolled words.

The reported study aimed at describing the spelling performance of children regarding the record of sonorant consonants in Brazilian Portuguese (BP), verifying if the errors in the records of these consonants were influenced by the accent in the word, and categorizing the type of errors found.

METHODS

This study was approved by the Research Ethics Committee in the School of Philosophy and Sciences (FFC) at UNESP, no. 0856/2013.

Database

The analyzed data were extracted from text productions composing a database that subsidizes investigations from GPEL/CNPq. It is constituted of text productions from children attending the first to the fourth grades of elementary school, who were followed up from 2001 to 2004; they attended two public schools in a city from the countryside of São Paulo. These productions were collected by GPEL researchers, approximately every 15 days, with a total of 12 to 15 thematic proposals a year. The children's productions were digitalized and organized by school and year.

Children who did not show complaints of language and/or learning-related difficulties reported by parents and/or teachers were included in the database.

Sample

Creations resulting from the development of 14 different thematic proposals were selected, comprising 76 first graders, in elementary school, in 2001, from two schools where the data were collected. From the 1,064 expected productions (14 proposals versus 76 children): 199 did not occur because children were absent on the days of collection or because some arrived in school after the productions were being collected; 64 were ruled out because the text could not be interpreted. Therefore, 801 productions were analyzed. Among these, words with sonorant consonants in syllabic onset position were selected. These situations were then organized as they appeared in pre-tonic, tonic, and post-tonic syllables, and unstressed or stressed monosyllables.

Criteria for data analysis

In order to describe how the data were analyzed, we turn back to the main goals of this research. Regarding the first one, that is, describing the spelling performance of children with regard to the record of sonorant consonants from Brazilian Portuguese, the following were adopted as criteria to analyze this performance: hits, records of graphemes according to conventional spelling; and errors, nonconventional data or omission of graphemes referring to sonorant consonants.

As to the analysis of results related to the second objective, that is, to verify if the errors in the records of these consonants were influenced by the accent in the word, the errors were divided into two large groups, as they occurred in non-stressed syllables, pre- and post-tonic and unstressed monosyllables; and stressed syllables, tonic and tonic monosyllables.

Finally, the analysis of the results regarding the third objective, that is, to categorize the types of errors found, were distributed into three main categories:

- omissions, when there was no record of graphemes referring to a sonorant, such as in the word "*mata*", written as "*ata*";

- spelling substitutions, when the grapheme substitution did not change the phonological value of the word, for instance, in the word "*rato*", written as "*rrato*";
- phonological substitutions, when the grapheme change altered the phonological value of the word, for instance, the word "*palha*" written as "*pala*".

Phonological errors were also subdivided for involving elements in the same phonological classes (of sonorant phonemes), categorized as substitutions inside the class (IC); or for mobilizing elements of a different one (more specifically, from the great class of obstruent phonemes), referred as substitutions out of class (OC).

Statistical analysis

Data were statistically analyzed using Statistica software, version 7.0. Descriptive and inferential analyses were conducted. For the descriptive analysis, two central tendency measurements were used (mean and median), as well as one dispersion measurement (standard deviation).

The nonparametric Sign test was used to analyze the dependent variables: hits and errors; errors in stressed and non-stressed syllables; omissions/spelling/phonological errors in stressed and non-stressed syllables; and phonological errors IC and OC. Also, the non-parametric χ^2 analysis of variance test was used to analyze the dependent variables "phonological substitutions IC/OC" and "stressed/non-stressed syllables." These instruments were chosen based on the verification of the curve violation in the Shapiro-Wilk normality test, using a significance level of (α) $\leq$0.05.

RESULTS

Considering exposure, the results found will be shown according to the research guidelines.

Regarding the results obtained for the first objective, 12,619 possibilities of records of simple onset sonorant consonants were found, which were distributed in hits and errors. Table 1 shows that distribution.

It was possible to observe many more hits than errors. Besides, the distribution of errors is more consistent than that of hits.

As shown, the data found for the second objective were grouped in stressed and non-stressed syllables. The values corresponding to this group are shown in Figure 1 and Table 2.

A higher occurrence of errors was observed in non-stressed syllables. Besides, errors were more consistently distributed in stressed syllables than in non-stressed ones.

Finally, regarding the results found for the third objective, it was possible to observe the distribution of errors between omissions, spelling, and phonological substitutions (Figure 2 and Table 3).

The highest occurrence of errors was found for phonological substitutions, followed by omissions and, finally, spelling substitutions — both in stressed and non-stressed syllables. There was also a difference in omission values between stressed and non-stressed syllables.

Still regarding the third objective, there were phonological substitutions inside and outside the phonological class of sonorants, whose results are given in Table 4.

To visualize the distribution of substitutions inside and outside the phonological class of sonorant consonants and to verify a possible relationship between this distribution and the stressed or non-stressed position of syllables, the results were rearranged as shown in Figure 3 and Table 5.

There were more substitutions involving graphemes referring to the class of sonorant consonants (IC) in comparison to those referring to other phonological classes (OC). However, no relationship was found between that distribution and the stress in the word.

DISCUSSION

Regarding the result found for the first objective — more hits than errors —, it is possible to observe that the analyzed children, even at early stages of literacy, mainly tend to stability by graphically registering sonorant consonants. This is noteworthy because studies addressed to spelling matters in writing acquisition[8-10] mostly emphasize error. Even though in the so-called 'error', instead of the 'hit', it is possible to

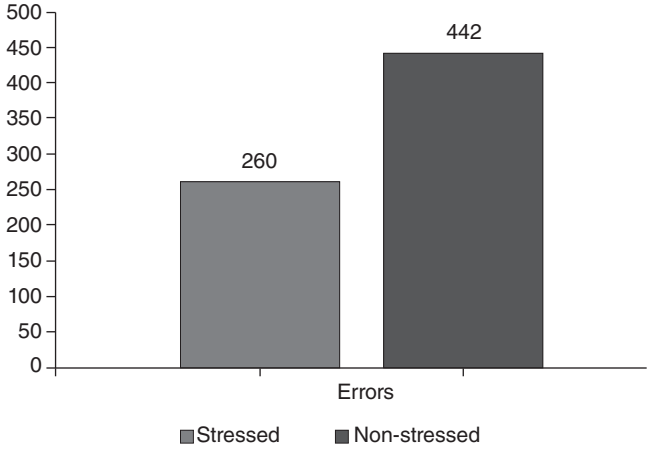

Figure 1. Distribution of errors in stressed and non-stressed syllables

Table 1. Distribution of hits and errors

Accuracy	Number of occurrences	Mean	Median	Standard deviation	Sign test
Hits	11,917	851.21	775	381.10	z=3.47
Errors	702	50.14	47	30.17	p=0.00

Sign test ($\alpha \leq 0.05$)

Table 2. Distribution of errors in stressed and non-stressed syllables

Syllables	Mean	Median	Standard deviation	Sign test
Stressed	18.57	16	11.42	z=2.40
Non-stressed	31.57	26	21.05	p=0.02

Sign test ($\alpha \leq 0.05$)

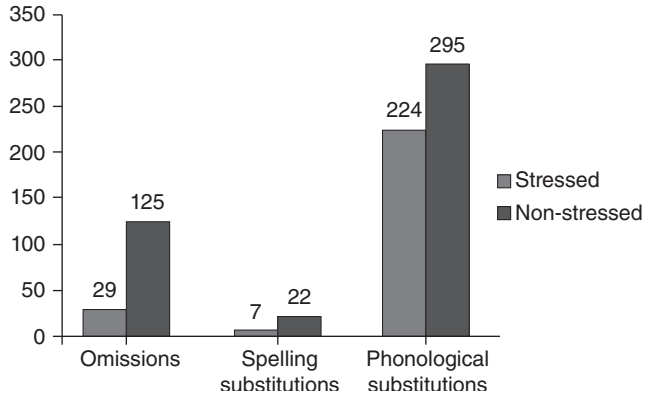

Figure 2. Distribution of omissions, spellings, and phonological distributions in stressed and non-stressed syllables

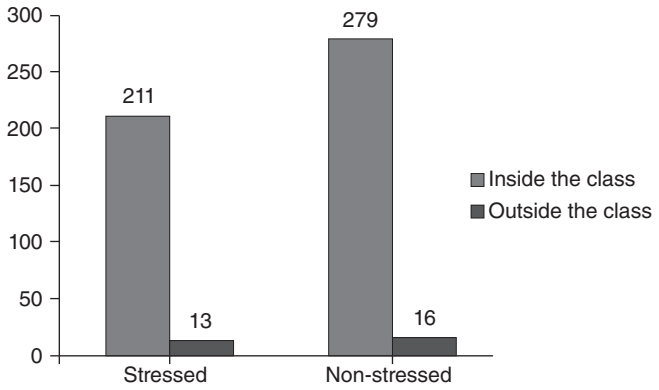

Figure 3. Distribution of substitutions inside and outside the class of sonorants in stressed and non-stressed syllables

Table 3. Distribution of omissions, spelling, and phonological substitutions in stressed and non-stressed syllables

Errors	Stressed syllables		Non-stressed syllables		Sign test
	Mean (SD)	Median	Mean (SD)	Median	
Omissions	2.07 (1.73)	1.5	8.93 (7.99)	7	z=2.77 p=0.00
Spelling	0.5 (0.76)	0	1.57 (2.53)	0	z=0.9 p=0.37
Phonological	16 (11.45)	11.5	21.07 (14.51)	16.5	z=1.34 p=0.18

Sign test ($\alpha \leq 0.05$).
Caption: SD = standard deviation.

Table 4. Distribution of phonological substitutions inside and outside the phonological class of sonorants

Substitutions	Mean	Median	Standard deviation	Sign test
Inside the class	35	26.5	22.8	z=3.47
Outside the class	2.08	1.5	2.02	p=0.00

Sign test ($\alpha \leq 0.05$).

Table 5. Distribution of substitutions inside and outside the phonological class of sonorants in stressed and non-stressed syllables

Phonological substitutions	Stressed	Non-stressed	χ^2
Inside the class	211	279	χ^2=0.03 p=0.85 df=1
Outside the class	13	16	

Nonparametric 2x2 table test: χ^2 ($\alpha \leq 0.05$).

count on the visibility or transparency of the relationship of the child with the language being acquired",[26] most of the spelling stability of the children analyzed in this study points out to the importance of the hits in the characterization of spelling acquisition.

As to the conclusion of the second objective — prevalence of errors in non-stressed syllables —, its explanation can be based on phonetic aspects regarding the stress. The syllable can be understood, from the motor-phonetics perspective, as the "result of muscle movements, when the muscles of respiration change the respiratory process, adapting to the speech process"[27]. Therefore, in motor terms, muscles contract and relax, thus changing the expiratory current and expelling the air in small jets, each one corresponding to a syllable.

However, this muscle effort is not always identical. Sometimes, it requires more vigor and duration, and that difference will lead to the production of stressed and non-stressed syllables. Therefore, a stressed syllable in BP, phonetically, will have more intensity, longer duration, and higher frequency, whereas a non-stressed syllable will have less intensity, shorter duration, and lower frequency. Therefore, the non-stressed syllables become less perceptible in auditory terms, which would justify the children having spelling difficulties specifically on these syllables.

Finally, the results found for the third objective are discussed. The higher number of phonological substitutions compared to spelling ones can be explained by the prevalence of transparency for writing sonorant consonants in BP. In fact, the spelling of six of seven phonemes is transparent, that is, these six only show one possibility of graphemic representation. So, any replacement will mandatorily lead to changes in the phonological value of the word.

However, the lower number of omissions, in comparison to the number of substitutions, indicates that children tend to preferentially register the grapheme, thus suggesting that, somehow, these children perceive the structure of the syllable and tend to orthographically fill in each essential position (that is, onset and nucleus). Therefore, even if they do not completely grasp the graphic symbols to be used, they use a grapheme and fill out the space corresponding to the simple syllable onset.

It is worth to mentioning that only omissions were in the contexts of stressed and non-stressed syllables. The prevalence absence in non-stressed syllables is once again explained by their phonetic aspects — lower intensity, shorter duration, and lower frequency. Therefore, it is observed that the general difficulty previously indicated in non-stressed syllables is essentially justified by the presence of more omissions in such syllables.

Still regarding the results found for the third objective, there were more substitutions involving graphemes referring to the class of sonorant consonants (IC) when compared to those of other phonological classes (OC). This tendency indicates that children mostly dominate the phonetic aspects that distinguish obstruent sonorant phonemes, that is, the phonological aspects of the language, as well as the knowledge of graphemes that represent such phonemes in writing.

Besides the studies mentioned in this discussion, in the literature no similar or different results to those found in this study were found because the accessed analyses were not carried out with the same material and procedures to the ones used in this study.

CONCLUSION

The conclusion is that the investigated children, even in the early stages of literacy, preferentially tend to correctly record the graphemes corresponding to sonorant consonants.

Regarding the errors, it was observed that these are influenced by the accent, especially in relation to the record/non-record of the grapheme, once the act of writing sonorant consonants in non-stressed syllables was more difficult for the children.

Finally, the phonological substitutions were the most frequent ones among the errors found, followed by omissions and spelling substitutions. Phonological substitutions also were more prevalent among graphemes referring to the same class of sonorants.

This study points out to the importance of analyzing spelling data, considering their distribution in hits and errors, as well as their relationships with phonetic-phonological aspects of the language. The investigation of these relationships may help to understand the students' difficulties found in the early grades of literacy, once not only the proportion between hits and errors but also its relationship with phonetic-phonological aspects, allow the detection of different spelling difficulties found in the same phonological class.

Investigations on the relationships between spelling and phonetic-phonological aspects are suggested and should be carried out with varied populations to allow the understanding of these connections, as well as to enable the generalization of the inferences found.

ACKNOWLEDGMENTS

We acknowledge financial support provided by FAPESP and CNPq for this research.

**SV was in charge of elaborating the study and the schedule, literature survey, data collection and analysis, writing the article, submitting and handling the article; IOP conducted the literature survey, data collection and analysis and writing the article; LC was in charge of coordinating the research, analyzing data, correcting the article and approving the final version.*

REFERENCES

1. Furnes B, Samuelson S. Preschool cognitive and language skills predicting Kindergarten and Grade 1 reading and spelling: a cross-linguistic Comparison. J Res Reading. 2009;32(3):275-92.
2. Nunes C, Frota S, Mousinho R. Consciência fonológica e o processo de aprendizagem de leitura e escrita: implicações teóricas para o embasamento da prática fonoaudiológica. Rev CEFAC. 2009;11(2):207-12.
3. Paolucci JF, Avila CR. Competência ortográfica e metafonológica: influências e correlações na leitura e escrita de escolares da 4ª série. Rev Soc Bras Fonoaudiol. 2009;14(1):48-55.
4. Ferreira F, Correa, J. Consciência metalinguística e a representação da nasalização na escrita do Português Brasileiro. Rev CEFAC. 2010;12(1):40-50.
5. Furnes B, Samuelson S. Predicting reading and spelling difficulties in transparent and opaque orthographies: a comparison between Scandinavian and US/Australian Children. Dyslexia. 2010;16:119-42.
6. Galletly SA, Knight BA. Because trucks aren't bicycles: orthographic complexity as an important variable in Reading research. Aust Educ Res. 2013;40(2):173-94.
7. Pontes VL, Diniz NL, Martins-Reis VO. Parâmetros e estratégias de leitura e escrita utilizados por crianças de escolas pública e privada. Rev CEFAC. 2001;15(4):827-36.
8. Capellini AS, Amaral AC, Oliveira AB, Sampaio MN, Fusco N, Cervera-Mérida JF, et al Desempenho ortográfico de escolares do 2º ao 5º ano do ensino público. J Soc Bras Fonoaudiol. 2011;23(3):227-36.
9. Capellini SA, Romero AC, Oliveira AB, Sampaio MN, Fusco N, Cérvera-Mérida JF, et al. Desempenho ortográfico de escolares do 2º ao 5º ano do ensino particular. Rev CEFAC. 2012;14(2):254-67.
10. Rosa CC, Gomes E, Pedroso FS. Aquisição do sistema ortográfico: desempenho na expressão escrita e classificação dos erros ortográficos. Rev CEFAC. 2012;14(1):39-45.
11. Brito CL, Uzeda CP, Vieira JG, Cavalheiro LG. Habilidades de letramento após intervenção fonoaudiológica em crianças do 1º ano do ensino fundamental. Rev Soc Bras Fonoaudiol. 2010;15(1):88-95.
12. Mezzomo CL, Mota HB, Dias RF. Desvio fonológico: aspectos sobre produção, percepção e escrita. Rev Soc Bras Fonoaudiol. 2010;15(4):554-60.
13. Carnio MS, Pereira MB, Alves DC, Andrade RV. Letramento escolar de estudantes de 1ª e 2ª séries do ensino fundamental de escola pública. Rev Soc Bras Fonoaudiol. 2011;16(1):1-8.
14. Machado ML, Berberian AP, Santana AP. Linguagem escrita e subjetividade: implicações do trabalho grupal. Rev CEFAC. 2009;11(4):713-9.
15. Massi G, Signor R, Berberian AP, Munhoz CM, Guarinello AC, Krüger S, et al. A análise de elementos de referenciação em textos produzidos por sujeitos em processo de apropriação da escrita. Dist Comun. 2009;21(2):169-78.
16. Adamoli MA, Miranda AR. Do conhecimento fonológico ao conhecimento ortográfico: as diferentes grafias dos ditongos orais mediais ai e ei em textos de escrita inicial. Cad Pesq Ling. 2009;4:232-55.
17. Teixeira SM, Grassi LH, Oliveira ND, Miranda AR. Uma reflexão acerca do erro ortográfico: a importância do conhecimento sobre a língua para a prática pedagógica de professores das séries iniciais. Verba Volant. 2011;2:78-94.
18. Miranda AR, Matzenauer CL. Aquisição da fala e da escrita: relações com a fonologia. Cad Educ. 2010;35:359-405.
19. Cardoso MH, Rodrigues LL, Freitas MC, Chacon L. A complexidade da coda silábica na escrita de pré-escolares. Dist Comum. 2010;22:213-21.
20. Berti LC, Chacon L, Santos AP. A escrita de /aN/ por pré-escolares: pistas acústico-auditivas. Cad Edc. 2010;19:195-291.

21. Chacon L, Berti LC, Burgemeister A. Ortografia da nasalidade em ataque e coda silábica na escrita infantil: características fonéticas e fonológicas. Verba Volant. 2011;2:1-21.
22. Amaral AS, Freitas MC, Chacon L, Rodrigues LL. Omissão de grafemas e características da sílaba na escrita infantil. Rev CEFAC. 2011;13:846-55.
23. Tenani LE, Reis, MC. "E veveram felizes para sempre": análise de grafias não-convencionais de vogais pretônicas. Verba Volant. 2011;2:22-43.
24. Schier AC, Berti LC, Chacon L. Desempenho perceptual-auditivo e ortográfico de consoantes fricativas na aquisição da escrita. Codas. 2013;25(1):45-51.
25. Chacon L, Vaz S. Relações entre aquisição da percepção auditiva e aprendizagem da ortografia: consoantes soantes em questão. Ling (Dis)curso. 2013;13(3):695-719.
26. Figueira RA. Os lineamentos das conjugações verbais na fala da criança. Multidirecionalidade do erro e heterogeneidade linguística. Letr Hoje. 1998;33(2):73-80.
27. Stetson RH. Motor phonetics: a study of speech movements in action. 2nd ed. Oxford, England: North-Holland Publishing Co; 1951.