Original Article

Artigo Original

The interaction between awareness of one's own speech disorder with linguistics variables: distinctive features and severity of phonological disorder

A interação da consciência do próprio desvio de fala com as variáveis linguísticas: traços distintivos e gravidade do desvio fonológico

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Keywords

Child
Speech
Speech disorders
Speech perception
Child language

ABSTRACT

Purpose: To analyze the possible relationship among the awareness of one's own speech disorder and some aspects of the phonological system, as the number and the type of changed distinctive features, as well as the interaction among the severity of the disorder and the non-specification of distinctive features. **Methods:** The analyzed group has 23 children with diagnosis of speech disorder, aged 5:0 to 7:7. The speech data were analyzed through the Distinctive Features Analysis and classified by the Percentage of Correct Consonants. One also applied the Awareness of one's own speech disorder test. The children were separated in two groups: with awareness of their own speech disorder established (more than 50% of correct identification) and without awareness of their own speech disorder established (less than 50% of correct identification). Finally, the variables of this research were submitted to analysis using descriptive and inferential statistics. **Results:** The type of changed distinctive features weren't different between the groups, as well as the total of changed features and the severity disorder. However, a correlation between the severity disorder and the non-specification of distinctive features was verified, because the more severe disorders have more changes in these linguistic variables. **Conclusion:** The awareness of one's own speech disorder doesn't seem to be directly influenced by the type and by the number of changed distinctive features, neither by the speech disorder severity. Moreover, one verifies that the greater phonological disorder severity, the greater the number of changed distinctive features.

Descritores

Criança
Fala
Distúrbios da fala
Percepção da fala
Linguagem infantil

RESUMO

Objetivo: Analisar a possível relação entre a consciência do desvio de fala e alguns aspectos do sistema fonológico, como o número e o tipo de traços distintivos alterados e a gravidade do desvio fonológico, bem como a interação entre a gravidade do desvio e a não especificação de traços distintivos. **Métodos:** O grupo pesquisado constitui-se de 23 crianças com diagnóstico de desvio fonológico na faixa etária de 5:0 a 7:7 anos. Os dados de fala foram analisados a partir da Análise por Traços Distintivos e classificados pelo Percentual de Consoantes Corretas. Aplicou-se ainda o Teste de Consciência do Próprio Desvio de Fala. As crianças foram divididas em dois grupos: com consciência do próprio desvio de fala estabelecida (mais de 50% de identificação correta) e com consciência do próprio desvio de fala não estabelecida (menos de 50% de identificação correta). Por fim, as variáveis desta pesquisa foram submetidas à análise estatística descritiva e inferencial. **Resultados:** O tipo de traços distintivos alterados não se mostrou distinto entre os grupos, assim como o total de traços alterados e a gravidade do desvio. Já uma relação entre a gravidade do desvio e a não especificação de traços distintivos foi verificada, na medida em que os casos mais graves apresentam mais alterações destas variáveis linguísticas. **Conclusão:** A consciência do próprio desvio de fala parece não ser diretamente influenciada pelo tipo e número de traços distintivos alterados, nem pela gravidade do desvio fonológico. Além disto, verificou-se que quanto maior a sua gravidade, maior o número de traços distintivos alterados.

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INTRODUCTION

Speech development is intimately associated to auditory perception, to the extent that initially, before uttering their first words, children show perceptive levels that are superior to their ability for oral production[1,2]. However, the vast majority of studies on phonological disorders focus on the deviant production of these children, without analyzing how they perceive speech sounds, which is fundamental for comprehending the pathology in question[2].

Newborns are able to discern the majority of sound contrasts of all languages, given that they are ready to learn any of them from the moment they are born[3]. For this reason, understanding how the sounds that compose a certain language are formed and organized, is one of the most important aspects, in studying how human beings perceive the linguistic input provided by speakers of their target language.

In this study, we understand that speech sounds are constituted by distinctive features, that is, minimal acoustic articulatory properties, such as "sonority" and "nasality", for instance. According to autosegmental phonology theory, these features are organized hierarchically upon formation of the segments of a language[4]. In addition to having acoustic and articulatory properties, distinctive features have the purpose of differentiating lexical items (for instance, *faca* x *vaca*), and grouping sounds in natural classes, that is, phoneme groups, with correlation among one another, which suffer the same changes or obey the same phonological rules (for instance, plosive and fricative consonants)[5,6].

In phonological deviation, also known as phonological disorder, speech difficulty is characterized by the inadequate use of sounds, according to age and regional variations that might involve mistakes in their production, perception, or organization[7].

Phonological deviations can be classified under different degrees of severity or types by means of quantitative[8] or qualitative[9] analyses. In clinical speech language pathology and audiology, quantitative analysis is more frequently used to classify these deviations. The calculation of the percentage of correct consonants (PCC)[8] is the method most applied in the cases we target in this research work. Through PCC calculation, the disorder can be classified as mild (MD), slightly moderate (SMD), moderately severe (MSD), and severe (SD).

In Brazil, several studies, all conducted in the country's southern region, have demonstrated that children with phonological disorders might be aware of the speech deviations produced by themselves[10-13]. In the research conducted by the authors, who proposed the test of self-awareness of speech disorder (SASD)[10], they verified that children with phonological disorders in the literacy phase were able to judge words produced by themselves, with deviations in speech and writing as deviant, thus classifying them as incorrect.

Later, other authors also investigated this ability. Among the most important results, we highlight the positive relation between SASD and the severity of the phonological disorder[11], and between SASD and writing hypotheses[12]. It was verified that the children with the least severe disorders presented higher SASD, and the children with syllabic writing hypotheses obtained higher averages of SASD than their pre-syllabic counterparts. In the investigation of the relation between SASD and a few extra-linguistic variables, it was evidenced that the child's sex and age are factors that do not interfere with the development of this ability[13].

Based on the aforementioned presuppositions, it is believed that SASD can be influenced by the quantity and types of distinctive features altered in phonological disorders, as well as by the severity of the disorder. Considering these factors, SASD can be classified as established or non-established SASD. Moreover, it is considered that the degree of the phonological disorder and the altered features can also be intimately associated.

Therefore, the present study aimed to analyze the possible relation between SASD and some aspects of the phonological system, such as the quantity and the type of altered distinctive features and the severity of phonological disorders, and the interaction between the severity of the disorder and the non-specification of distinctive features.

METHODS

This is an exploratory and transversal study. It was approved by the Ethics Committee of Universidade Federal de Santa Maria, approval report number 0103.0.243.000-07. Data collection was conducted at UFSM's Student Clinic and in a state public school, which also located in the city of Santa Maria. To proceed with the study, the institutional consent was signed by the individuals responsible for the institutions.

To include the children in the study sample, it was necessary that they aged between four years and eight years and 11 months, should be native speakers of Brazilian Portuguese language, should have no history of bilingualism, should have diagnosis of phonological disorder, and should have no history of previous phonological therapy.

We excluded children with vocal, auditory, and language alterations, evident neurological, cognitive, psychological, and/or emotional delays, and alterations in phono-articulatory organs associated to the phonological system. The parents and/or legal guardians and the school were informed about the necessity of new evaluations (for instance, complete audiologic assessments) and/or complementary examinations upon detection of these alterations. Based on each child's requirements, we also referred them to other professionals, when necessary.

In addition to these criteria, the informed consent signed by the parents or legal guardians, whose children also consented to participate in the study, was also an indispensable condition for including the individuals in this study.

Twenty-three children diagnosed with phonological disorders, including 15 boys and eight girls, met the inclusion and exclusion criteria of our research. Their ages ranged between five years and seven years and seven months.

With the purpose of diagnosing the phonological disorders and selecting the sample, the children underwent a complete triage composed of initial interview with the parents or legal guardians; assessment of the stomatognathic system; language, speech, and voice assessments; and an auditory

triage performed according to the procedures reported in another study[14].

We collected the data through the spontaneous naming of the images included in the phonological assessment of children (PAC)[5] performed by each of the participants individually. The registers were recorded in a silent environment and stored in a computer.

Next, we conducted the phonetic transcription of the words produced and the contrastive data analysis for each child in accordance with the instrument's instructions[5].

With the purpose of verifying the distinctive features altered in the sample studied, we then applied the analysis by distinctive features through the verification of repair strategies in the contrastive analysis, both in simple and in coda onsets. For this analysis, we used the phonological grid of consonantal segments in Brazilian Portuguese language[15]. We considered all the assimilations/substitutions made in more than 10% of the possibilities, according to the criteria adopted in another study[9]. It is worth highlighting that we considered the assimilations/substitutions employed from one phoneme to the other, as well as from a phoneme to a glide. We did not analyze assimilations/substitutions in affricated allophones, because they do not present differences in meaning, in Brazilian Portuguese language.

For the classification of the severity of phonological disorders, we used the PCC[8], which is calculated by dividing the number of correct consonants by the total number of consonants (correct and incorrect), multiplied by 100. Based on the percentage obtained, the disorder can be classified as follows: MD (86–100%); SMD (66–85%); MSD (51–65%); and SD (< 50%). Out of the 23 children included in the sample, seven children presented with MD, nine children presented with SMD, six children had MSD, and only one child presented with SD.

Another evaluation conducted in the present study was the SASD[10]. This assessment has the purpose of prompting the child to hear and judge the deviations that exist in his/her own speech. Its application followed the instructions available in the work[10] that proposes it, described below.

Based on the speech sample of each child, obtained through PAC images[5], we randomly selected 10 words produced with deviation. They were edited, that is, cropped from the speech sample so that there was no influence of other clues when the children judged the words, such as the recording context. For this purpose, we used the program *GoldWave audio digital editor*, which enabled the isolation and separation of words in each speech recording. In this manner, an individual instrument was assembled for each child.

After approximately one week had elapsed since the collection of speech samples, the 10 words selected were presented to each child through earphones. We explained that he/she was about to hear words spoken "by another child" and that he/she should judge whether they had been produced adequately or inadequately. According to the test instructions[10], the question should be, "Is this child saying the word right?". The child was not informed, at any moment, that those words had been produced by him/herself. Our purpose was to avoid the interference of emotional factors with the test.

Once the words were edited and therefore, extracted from their context, we used images that corresponded to each of the 10 stimuli, so that the children could identify what they heard. In this manner, each of the images was shown to the child so that he/she could name it. Then, he/she heard the words and judged his/her own production. The 10 words produced with deviation were presented twice, sequentially, in the same session and following the same procedures used in the first presentation. Thus, we obtained a total of 20 judgments, in accordance with the test instructions[10]. We emphasize the importance of using the images to prevent the children's access to the evaluator's speech pattern during the test. Moreover, given that the main goal was to prompt the individuals to judge their own speech exchanges, the support of the images was fundamental in the sense that it enabled the children to pay attention to the way a certain word had been produced, instead of trying to recognize which one was being presented.

We attributed one point to correct judgments, and zero to incorrect judgments. Therefore, the maximum punctuation possible was 20.

In the individual analysis of the participants, we stipulated that percentages equal to or higher than 50% of correct judgments indicated that the SASD had been established. Results that presented below 50% of correct judgments indicated that the SASD had not yet been established for the child. These percentages were stipulated in analogy with another work[16], which aimed at creating an instrument for assessing phonological awareness. In that study, the maximum punctuation, which could be obtained in each task of phonological awareness, was found to be 10. Scores that were equal to or higher than 50% indicated that the acquisition of a certain task had been consolidated[16].

After this test, we verified that out of all the children assessed in this study, 11 children presented established SASD and 12 children presented non-established SASD.

Thus, the variables considered in this study were as follows: quantity and type of altered distinctive features (sounded, approximant, *vocoid*, voice, continuous, labial, coronal, and dorsal), degree of phonological deviation (MD, SMD, MSD, and SD), and SASD. Initially, the data were tabulated individually. Later, we divided the sample in two groups as follows: children with established SASD and children with non-established SASD.

The variables of this study were submitted to descriptive and inferential statistical analyses. Using the computer program, *The SAS System for Windows*, version 8.02, we applied three statistical tests as follows: (1) for the comparison of altered distinctive features between the groups with established and non-established SASDs, we used Mann-Whitney's test; (2) to compare the severity of the phonological disorders between the groups, with established and non-established SASDs, we employed Fisher's Exact Test; and (3) to compare the altered distinctive features and the severity of the phonological

deviations, we used Kruskal-Wallis' Test. The significance level adopted was 5% ($p<0.05$).

It is important to mention that we excluded one child, with SD, from the statistical analysis that compared the altered distinctive features and the severity of phonological deviations, because he/she was the only representative of this group. Therefore, the sample submitted to the statistical analysis with the purpose of comparing the variables distinctive features and disorder severity (MD, SMD, and MSD) was composed of 22 individuals.

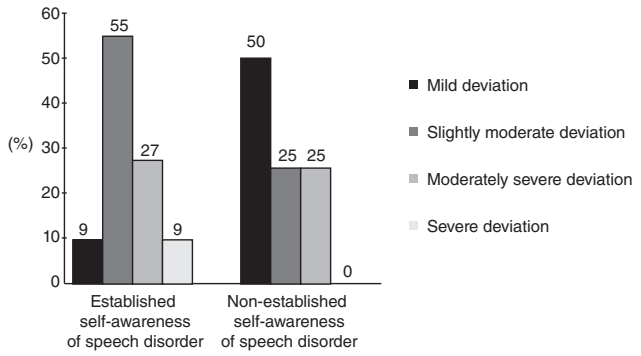
RESULTS

The type of altered distinctive feature ([sounded], [approximant], [vocoid], [voice], [continuous], [labial], [coronal], and [dorsal]) was not different between the groups with established and non-established SASDs with p values >5%. However, we noticed that for the [voice] feature, the group with established SASD obtained an alteration average, considerably higher than the other group. Likewise, in comparison to the other features, [voice] was the most altered of them. In regards to a difference in the quantity of altered distinctive features, we observed that there was no significant difference between the groups. However, descriptively, we verified a higher average of altered features in children with established SASD (Table 1).

We did not register a significant difference between the groups with established and non-established SASDs concerning the four degrees of phonological disorder severity (p=0.120). However, the results evidenced that the group with established SASD was formed mainly by children with SMD, followed by children with MSD and MD/SD. On the other hand, the group with non-established SASD concentrated the majority of individuals with MD, followed by SMD/MSD. Only one child presented with SD and recognized his/her own speech as altered in more than 50% of the presentations in the SASD test. Therefore, this individual's SASD was already established (Graph 1).

In the analysis of altered distinctive features and their relation with the degree of severity of the phonological disorder, the results pointed a significant difference for the [voice] feature (p=0.019) and for [dorsal] (p=0.014). Thus, the degree that presented the highest averages of alteration in the features mentioned above was the MSD (Table 2).

We perceived that the MSD presented the highest average of altered distinctive features when the averages of MD and SMD were also considered after analysis of the total number of altered distinctive features in relation to the severity of phonological deviation. This result is statistically significant (p=0.001) (Graph 2).



*Statistical test used: Fisher's Exact – p<0.05. p=0.120.

Graph 1. Comparison of the severity of phonological disorders (percentage of correct consonants) between the groups with established and non-established self-awareness of speech disorders

Table 1. Comparison of altered distinctive features between the groups with established and non-established self-awareness of speech disorders

Features	SASD	n	Mean	SD	Minimum	Median	Maximum	p-value
Sounded	E	11	0.09	0.30	0.00	0,00	1.00	0.296
	NE	12	0.00	0.00	0.00	0.00	0.00	
Approximant	E	11	0.18	0.40	0.00	0.00	1.00	0.131
	NE	12	0.00	0.00	0.00	0.00	0.00	
Vocoide	E	11	1.27	1.56	0.00	1.00	4.00	0.999
	NE	12	1.17	1.40	0.00	1.00	4.00	
Voice	E	11	3.82	3.54	0.00	6.00	8.00	0.118
	NE	12	1.50	2.71	0.00	0.00	7.00	
Continuous	E	11	2.18	2.60	0.00	1.00	8.00	0.823
	NE	12	1.67	1.87	0.00	1.00	7.00	
Labial	E	11	0.09	0.30	0.00	0.00	1.00	0.598
	NE	12	0.17	0.39	0.00	0.00	1.00	
Coronal	E	11	1.91	1.04	0.00	2.00	3.00	0.147
	NE	12	1.33	1.67	0.00	1.00	5.00	
Dorsal	E	11	0.91	1.81	0.00	0.00	5.00	0.880
	NE	12	0.75	1.29	0.00	0.00	4.00	
Total of altered features	E	11	10.45	7.20	4.00	7.00	27.00	0.155
	NE	12	6.58	5.62	1.00	5.50	18.00	

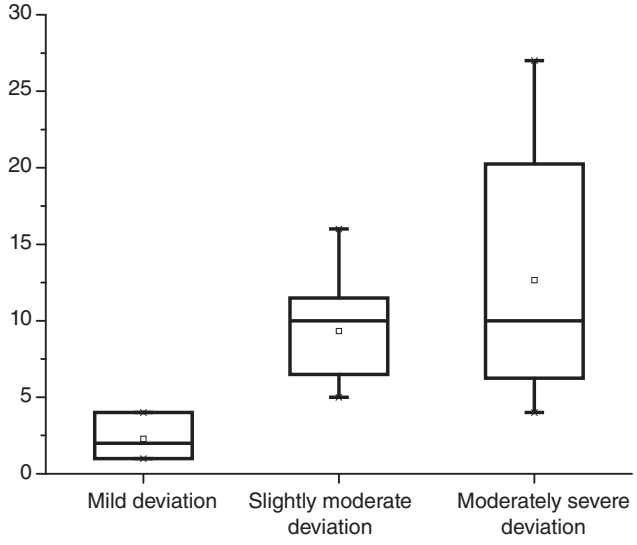
*Statistical test used: Mann-Whitney – p<0.05.

Caption: SASD = self-awareness of speech disorder; SD = standard deviation; E = established; NE = not established

Table 2. Comparison between altered distinctive features and severity of phonological disorder (percentage of correct consonants)

Features	Degrees of speech disorder	n	Mean	SD	Minimum	Median	Maximum	p-value
	MD	7	0.00	0.00	0.00	0.00	0.00	
Sounded	SMD	9	0.11	0.33	0.00	0.00	1.00	0.486
	MSD	6	0.00	0.00	0.00	0.00	0.00	
	MD	7	0.00	0.00	0.00	0.00	0.00	
Approximant	SMD	9	0.22	0.44	0.00	0.00	1.00	0.219
	MSD	6	0.00	0.00	0.00	0.00	0.00	
	MD	7	0.57	0.53	0.00	1.00	1.00	
Vocoid	SMD	9	1.11	1.36	0.00	1.00	4.00	0.618
	MSD	6	1.67	1.86	0.00	1.00	4.00	
	MD	7	0.00	0.00	0.00	0.00	0.00	
Voice	SMD	9	3.22	3.63	0.00	1.00	8.00	0.019*
	MSD	6	4.17	3.31	0.00	4.50	8.00	
	MD	7	0.71	0.76	0.00	1.00	2.00	
Continuous	SMD	9	2.00	1.80	0.00	1.00	6.00	0.167
	MSD	6	3.17	3.43	0.00	1.50	8.00	
	MD	7	0.14	0.38	0.00	0.00	1.00	
Labial	SMD	9	0.00	0.00	0.00	0.00	0.00	0.197
	MSD	6	0.33	0.52	0.00	0.00	1.00	
	MD	7	0.86	1.21	0.00	0.00	3.00	
Coronal	SMD	9	2.44	1.51	0.00	2.00	5.00	0.067
	MSD	6	1.17	0.98	0.00	1.00	3.00	
	MD	7	0.00	0.00	0.00	0.00	0.00	
Dorsal	SMD	9	0.22	0.44	0.00	0.00	1.00	0.014*
	MSD	6	2.17	2.04	0.00	2.00	5.00	

*Statistically significant values. Statistical test used: Kruskal-Wallis – p<0.05.
Caption: SD = speech deviation; SD = standard deviation; MD = mild disorder; SMD = slightly moderate disorder; MSD = moderately severe disorder



*Statistical test used: Kruskal-Wallis – p<0.05. p=0.001
Graph 2. Comparison between the total number of altered distinctive features and the severity of phonological deviation (percentage of correct consonants)

DISCUSSION

The types of distinctive features considered in the present study can be divided in root node ([sounded], [approximant], and [vocoide]), laryngeal node ([voice]), and oral cavity node ([continuous], [labial], [coronal], and [dorsal]). According to the autosegmental phonology theory, these features present a hierarchy of complexity among them[15]. To the detriment of the accentuation or lessening of this complexity, one could suppose that the types of the features influence the perception of speech signs by children with phonological disorder, which was not verified in the results of this study, specifically in relation to SASD.

The data obtained revealed that children with phonological disorders can be aware of the exchanges performed in their own speech, regardless of the quantity and the type of altered distinctive features. However, they might be unable to produce it in accordance with their target language, as it is the case in the group with established SASD. On the other hand, these children might not have the target sounds adequately organized in their minds, and/or not perceive all the auditory clues of a certain sound, which makes them unable to produce these sounds adequately, as it occurred in the group with non-established SASD. These results reinforce what is known about phonological deviations or disorders, characterized by the inadequate use of speech sounds involving possible mistakes of production, perception, or organization[7].

In the analysis of the types of altered distinctive features, the [voice] feature stood out. The group with established SASD obtained a considerably higher average of alteration for this feature, which suggests that although frequent, alterations in its production do not prevent individuals from reflecting about it. Similar to what was observed in the present study, there is evidence that children with phonological disorders are able to discern the [voice] feature, even though they may not produce it adequately[17].

According to the Implicational Model of Feature Complexity[15], the [+voice] feature is on the second level of phonological acquisition. However, although it is one of the first to be specified, it is commonly non-established in phonological disorders[18]. This finding corroborates the data obtained here and in another study[17], given that the difficulty lies, above all, in the adequate production of this feature in relation to motor gestures, and not in its perception and/or mental organization per se.

Although the difference in the quantity of altered distinctive features does not seem to have been significant between the groups studied, we descriptively observed that the total average of altered features was considerably higher among the children with established SASD. This indicates that the majority of the children, who demonstrated that they were aware of mistakes made in their own speech, were the ones, who had less specified distinctive features and supposedly, poorer phonological knowledge, a finding that opposes the initial hypothesis of this study.

The results reported here reveal that phonological knowledge will not always be expressed through the ability to produce the sounds of a language, considering that the children, with more restrictive distinctive features, were the ones who also perceived and reflected about the alterations present in their own speech. This fact does not corroborate the findings of another author[2], who mentioned the existence of a relationship between production and perception. According to her, if one of these elements is altered, the other will also be modified in the same proportion.

Although the results did not show significant differences in their totality, we believe, based on another study[19] that the children, who were part of the group with established SASD, had difficulty to organize and represent perceptive and productive knowledge about phonemes and their contrasts in a precise manner, and/or failed to translate this knowledge into appropriate motor actions with the purpose of achieving perceptually distinct productions. Therefore, the fact that children with phonological disorders are able to recognize alterations made in their own speech does not guarantee that they are able to produce all the sounds of their language[10-12].

The results found for the group with established SASD can be understood considering the Model of Two Lexicons[20,21], in which there is an input and an output lexicon. The first lexicon is used in word recognition, i.e., perceptive representation, and the latter lexicon is responsible for articulatory representation, i.e., word production. The authors of the studies mentioned above, defend that the phonological system presents differentiations between subjacent representation and articulatory representation, and that failure between these abilities can occur.

From a different perspective, another author[22] observed that children with phonological disorders have difficulty to identify contrasts based on typical categorical stimuli. However, when faced with their own gradient stimuli (in other words, with the presence of concealed contrasts that correspond to acoustically distinct productions regarded as identical through perceptive-auditory analysis), their perception tends to be more heightened. This, in turn, refers back to the possibility of relying on non-standard (or secondary) acoustic and auditory clues, both in production and perception. Therefore, we suppose that the children evaluated in the present study, were possibly guided by other secondary acoustic clues in their speech, and not exclusively by the type and quantity of altered distinctive features in their linguistic system.

In regards to the comparison between the severity of the phonological disorder and SASD, we verified that the latter is not affected by the first, which diverges from the findings reported in another study[11]. Although the levels of phonological disorder severity provide many predictive elements about the speech production of children with phonological disorders, a research study[23] mentioned the absence of relation among the severities (MD, SMD, MSD, and SD) and the use of the strategy of compensatory elongation, which similarly to SASD, can infer a learner's deeper phonological knowledge.

Although they did not analyze SASD ability, other authors[24] demonstrated that the performance in phonological awareness exercises and the severity of phonological disorders are associated within the task of syllabic segmentation, and not in other abilities of phonological awareness (synthesis, manipulation, and transposition). When compared to the performance in the test of sequence of patterns (PPS) and severity (MD and SMD), they verified an influence of this variable on the individuals' performance in the test of frequency ordering[25]. We believe that these contradictions and findings deserve to be highlighted in new studies, as they have not been completely elucidated so far.

Finally, in the comparison between the altered distinctive features and the severity of the phonological disorders, the group of children with the most severe phonological disorders considered in the statistical analysis of this study, that is, MSD displayed the largest number of altered distinctive features in a significant manner. This finding corroborates a proposal for qualitative classification[26] of phonological disorders, in which the authors take into consideration distinctive features and the establishment of their contrasts. In this classification, four categories of consonantal systems were defined. They represent different degrees of phonological disorder depending on the level of contrast of distinctive features of high or low (category 1, category 2, category 3, and category 4).

In the same study[26], the qualitative classification proposed was correlated to the PCC[7]. MSD corresponded to category 2, characterized by consonantal systems with a medium level of contrast and representative segments of the classes [-sounded, -continuous] (plosive), [+sounded, +nasal] (nasal), and [+consonantal, +approximant] (liquid). As it occurred with MSD and the MD and SMD severities, the data obtained in the present study also showed correlation with the qualitative classification mentioned above. In other words, the quantity of altered distinctive features can reveal the degree of phonological disorder severity, both qualitatively and quantitatively.

In studies on therapy for phonological disorders, the results obtained showed that children with more severe phonological disorders (MSD and SD) and therefore, more altered distinctive features, were the ones, who achieved the highest percentages of generalization and changes in their phonological inventory

with the aid of phonological therapy[27]. Considering the data obtained in the present study, we observed that the children with the largest quantity of altered distinctive features seem to perceive the mistakes made in their speech more easily, thus optimizing the therapeutic process.

This study aimed at approaching and propagating a topic little explored in the literature, that is, SASD, which can provide important information to speech language pathologists and audiologists in regard to the auditory perception of children with phonological disorders, as mentioned in another study[28], this type of perception involves the identification of contrastive characteristics under acquisition in other people's speech, as well as the child's perception of his/her own speech. Considering children's perception of the distancing between their own production and the speech produced by adults, they initiate the process of abandoning stable patterns in their speech in favor of new attempts. Therefore, this is a facilitating period, and it is up to speech language pathologists and audiologists to provide clues and adequate means to favor an approximation to the standards of a certain language.

Moreover, it is believed that the contributions of SASD are not limited to the scope of oral language, but they also encompass the process of written language acquisition in children[12]. Thus, the comparison of SASD to other linguistic variables (distinctive features and severity of phonological disorder) can be useful in understanding self-awareness of speech impairments and therapeutic prognoses, which can help clinical professionals in speech language pathology and audiology to define the treatment that better suits each case.

One of the limitations of the present study is that we did not conduct an assessment of the children's auditory processing, which might have contributed to limitations in the analysis of the results obtained. Without measuring the individuals' ability in relation to suprasegmental clues of speech sounds, provided by the assessment of auditory processing, the discussion concerning the data presented here is limited to analyses and inferences about the recognition and non-recognition of distinctive features. For this reason, we suggest that other studies on SASD are conducted with a larger number of individuals and auditory processing assessments.

CONCLUSION

SASD does not seem to be directly influenced by the type and quantity of altered distinctive features. Likewise, it appears that there is no relation between SASD and the severity of phonological disorders. Nevertheless, some inferences can be made based on these comparisons, such as the influence, albeit non-significant, of alterations in the [voice] feature and in the total number of altered features on the self-judgment of "speech mistakes" of children, with phonological disorders.

In summary, our findings lead to a new hypothesis that the phonological characteristics investigated here are not exclusively and perhaps, not primarily responsible for the establishment or non-establishment of SASD.

On the other hand, we verified a relation between the severity of the disorder and the non-specification of distinctive features, in the sense that the most severe disorders present more alterations of these linguistic variables.

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REFERENCES

1. Tsao FM, Liu HM, Kuhl PK. Speech perception in infancy predicts language development in the second year of life: a longitudinal study. Child Dev. 2004;75(4):1067-84.
2. Nijland L. Speech perception in children with speech output disorders. Clin Linguist Phon. 2009;23(3):222-39.
3. Gervain J, Mehler J. Speech perception and language acquisition in the first year of life. Annu Rev Psychol. 2010;61:191-218.
4. Bisol L (Org.). Introdução a estudos de fonologia do português brasileiro. Porto Alegre: EdiPUCRS; 2010.
5. Yavas M, Hernandorena CLM, Lamprecht RR. Avaliação fonológica da criança. Porto Alegre: Artes Médicas; 2001.
6. Oliveira KLC, Costa RCC. Phonemic discrimination and its relation to phonological disorder. Rev CEFAC. 2012;14(6): 1209-14.
7. Wertzner HF. Fonologia: desenvolvimento e alterações. In: Ferreira LP, Befi-Lopes DM, Limongi SCO (Orgs.). Tratado de fonoaudiologia. São Paulo: Rocca; 2004. p.772-86.
8. Shriberg LD, Kwiatkowski J. Phonological disorders I: a diagnostic classification system. J Speech Hear Disord. 1982;47(3):226-41.
9. Keske-Soares M. Terapia fonoaudiológica fundamentada na hierarquia implicacional dos traços distintivos aplicada em crianças com desvios fonológicos [Tese]. Porto Alegre: Pontifícia Universidade Católica do Rio Grande do Sul; 2001.
10. Menezes G, Lamprecht RR. A consciência fonológica na relação fala-escrita em crianças com desvios fonológicos evolutivos (DFE). Letras de Hoje. 2001;36(3):743-9.
11. Dias RF, Mota HB, Mezzomo CL. A consciência fonológica e a consciência do próprio desvio de fala nas diferentes gravidades do desvio fonológico. Rev CEFAC. 2009;11(4):561-70.
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. Dias RF, Melo RM, Mezzomo CL, Mota HB. Variáveis extralinguísticas, sexo e idade, na consciência do próprio desvio de fala. Pró-Fono R Atual Cient. 2010;22(4):439-44.
14. Barrett KA. Triagem auditiva de escolares. In: Katz J. (ed.). Tratado de audiologia clínica. São Paulo: Manole; 1999. p.472-85.
15. Mota HB. Aquisição segmental do português: um modelo implicacional de complexidade de traços [Tese]. Porto Alegre: Pontifícia Universidade Católica do Rio Grande do Sul; 1996.p.472-85.
16. Cielo CA. Avaliação de habilidades em consciência fonológica. J Bras Fonoaudiol. 2003;4(16):163-74.

17. de Souza AP, Scott LC, Mezzomo CL, Dias RF, Giacchini V. Avaliações acústica e perceptiva de fala nos processos de dessonorização de obstruintes. Rev CEFAC. 2011;13(6):1127-32.
18. Melo RM, Mota HB, Mezzomo CL, Brasil BC, Lovatto L, Arzeno L. Desvio fonológico e a dificuldade com a distinção do traço [voz] dos fonemas plosivos: dados de produção e percepção do contraste de sonoridade. Rev CEFAC. 2012;14(1):18-29.
19. Tyler AA, Edwards ML, Saxman JH. Acoustic validation of phonological knowledge and its relationship to treatment. J Speech Hear Disord. 1990;55(2):251-61.
20. McGregor KK, Schwartz RG. Converging evidence for underlying phonological representation in a child who misarticulates. J Speech Hear Res. 1992;35(3):596-603.
21. Baker E, Croot K, McLeod S, Paul R. Psycholinguistic models of speech development and their application to clinical practice. J Speech Lang Hear Res. 2001;44(3):685-702.
22. Berti LC. Produção e percepção da falaemcrianças com distúrbios fonológicos: a ancoragem empistas fonético-acústicas secundárias. In: Ferreira-Gonçalves G, Brum-de-Paula MR, Keske-Soares M. Estudos emaquisição fonológica. Pelotas: Editora e Gráfica Universitária – UFPel; 2011. p.153-74.
23. Brasil BC, Melo RM, Mota HB, Dias RF, Mezzomo CL, Giacchini V. O uso da estratégia de alongamento compensatório em diferentes gravidades do desvio fonológico. Rev Soc Bras Fonoaudiol. 2010;15(2):231-7.
24. Souza APR, Pagliarin KC, Ceron MI, Deuschle VP, Keske-Soares M. Desempenho por tarefa em consciência fonológica: gênero, idade e gravidade do desvio fonológico. Rev CEFAC. 2009;11(4):571-8.
25. Santos JLF, Parreira LMMV, Leite RCD. Habilidades de ordenação e resolução temporal em crianças com desvio fonológico. Rev CEFAC. 2010;12(3):371-6.
26. Lazzarotto-Volcão C, Matzenauer CLB. A severidade do desvio fonológico com base em traços. Letras de Hoje. 2008;43(3):47-53.
27. Ceron MI, Keske-Soares M, Gonçalves GF. Escolha dos sons-alvo para terapia: análise com enfoque em traços distintivos. Rev Soc Bras Fonoaudiol. 2010;15(2):270-6.
28. Freitas MCC. O gesto fônico na aquisição "desviante": movimentos entre a produção e a percepção [Tese]. Campinas: Universidade Estadual de Campinas; 2012.