COMPARISON BETWEEN THE CLASSIFICATION BASED ON FEATURES AND PERCENTAGE OF CORRECT CONSONANTS IN SPEECH DISORDERS

Comparação entre a classificação com base em traços e o percentual de consoantes corretas no desvio fonológico

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ABSTRACT

Purpose: to observe the differences between the ratings of severity of phonological disorders obtained by Percentage of Correct Consonants-Reviewed and the classification based on qualitative traits. **Methods:** data were collected on pre speech therapy 38 subjects in their phonological systems were classified according to the quantitative assessment of Percentage of Correct Consonants-Reviewed (Mild, Moderate Slightly, Moderately Severe, Severe) and qualitative assessment based on features (Mild, Moderate, Moderate-Severus, Severus). Data were analyzed by frequency tables and through the chi-square test statistical (p <0.05). **Results:** the overall gave a poor correlation between the results obtained with the qualitative and quantitative assessment of phonological disorders, only 34,79% agreement in the ratings. The analysis by degrees of severity were observed that extreme degrees (Mild and Severe), had almost the same classification with both proposals. Unlike what was observed in the intermediate grades. **Conclusion:** based on the results underscores the importance of joint evaluations, which combine qualitative with quantitative measures, especially for the differentiation and characterization of intermediate degrees of severity of phonological disorders.

KEYWORDS: Language Development Disorders; Evaluation; Diagnosis; Severity of Illness Index; Classification

INTRODUCTION

In order to begin studying phonological disorders (PD), it is important to understand how the typical phonological development takes place. One might say that the typical phonological acquisition happens when the child sets up a phonological system matching the adult target. In Brazilian Portuguese, this process happens gradually and in a non-linear way between birth and the age of 5:0, according to the individual differences of each child[1,2]. However, some children do not follow the expected development sequence and their phonological system is organized differently. Thus, it results in a system that differs from the target language and that is phonologically inappropriate to their surrounding language. Such cases are known asPD[2,3].

For rating the severity of PD, both quantitative analyses and qualitative assessments can be used. The most common quantitative analysis isthe Percent Consonants Correct – Revised (PCC-R)[4], which disregards the distortions produced by the subject. The PPC-R is based on the calculations of the percent consonants correct (PCC)[5]. The present rating was founded on speech data from subjects with PD ranked according to its severity, as suggested by the authors.

The PCC value[5] is determined by dividing the number of correct consonants by the number of correct consonants plus the number of incorrect

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consonants, multiplied by 100. The result is the PCC index[5], distributed into four levels of severity: mild, matching over 85% correct consonants; moderate-mild, ranging between 85% and 66%; moderate-severe, ranging between 51% and 65%; and severe, with values under 50%[5].

The qualitative ratings are based on the features of the children's phonological system[6,7]. A recent qualitative hypothesis ranks PD using the distinctive feature as a basic unit of analysis. The four constituent categories of phonological systems act as the parameter for this hypothesis[7]. The study suggests four categories as the basis for rating the severity of the PD. The hypothesis has taken into consideration the following categories[7]:

Category 1 – consonant systems with a minimum contrast level – presence of segments representing the classes [-sonant, –continuous] (plosives) and [+sonant, +nasal] (nasals), with the possibility of another type of co-occurrence of distinctive features of a third consonant class. It includes children with severe deviation;

Category 2 – consonant systems with an average contrast level – presence of segments representing the classes [-sonant, –continuous] (plosives), [+sonant, +nasal] (nasals), [+continuous, +approximant] (liquids), with possibility of another type of co-occurrence representing features of a fourth consonant class. It includes children with a moderate-severe deviation;

Category 3 – consonant systems with an average to high contrast level – presence of the classes [-sonant, –continuous] (plosives) and [+sonant, +nasal] (nasals); [+consonant, +approximant] (liquids), [-sonant, +continuous] (fricatives). In the last two classes, the allowed amount of co-occurrence of features concerning the place of articulation is a maximum of four. Children presenting this system are rated as having a moderate deviation;

Category 4 – consonant systems with a high contrast level, presenting the four major classes of consonants (plosives, nasals, liquids and fricatives), with five or more co-occurrences of features concerning the place of articulation. These are children with a mild deviation[7].

Rating the subjects based on the qualitative assessment of features[7]enables to formulate hypotheses on the phonological system of each child beforehand[7]. When choosing the distinctive feature as the foundation for judging the PD severity,the authors suggest that the basic unit for structuring phonological inventories must be analyzed. Therefore, the assessment might raise generalizations on the segments and segment classes. In other words, it could bring forth generalizations on the construction of atypical phonology.

Over the last years, there have been an increasing number of studies on the importance of complementary assessments for an improved PD diagnosis and a more effective therapeutic planning[8-10]. One of the advantages of the qualitative assessment was singled out by a study that demonstrated a better description of the repair strategies used by children suffering from PD[10]. Other researches point out the importance of adopting quantitative measures as a marker of phonological system normalization. Also, the PCC can be used as a control during speech therapy[8,11].

Laboring from this knowledge on qualitative and quantitative assessments used in phonoaudiological research and therapy, this study aimed to check if there are any differences between the severity ratings obtained using the PCC-R[4] and the qualitative assessment based on features[7].

■ METHODS

This study is cross-cutting, as well as quantitative and descriptive. It compiled its data from the permanent database of a research project bound to the Universidade Federal de Santa Maria (UFSM). The project has been approved by the institution's Ethics and Research Committee, with number 052/2004.

From this database, it was selected pre-therapy speech data concerning 38 subjects: 25 male children and 13 female children, with ages ranging from 4:4 to 7:1. The subjects met the inclusion and exclusion criteria for this research.

For inclusion of subjects in the study, the following selection criteria were established: the subject should present proper authorization from their parents or tutors by signing the Free and Clarified Consent Term (TCLE) for participation in the research; present a diagnosis of phonological disorders; be a monolingual speaker of Brazilian Portuguese; and have a full initial phonological assessment. As exclusion criteria, it was taken into consideration: not signing the TCLE; absence or incompletion of the initial phonological assessment; and presence of other phonoaudiological deviations besides PD.

The quantitative assessment of the disorders was carried out based on the PCC-R[4]. Since the data was obtained from a database that employs that percent as a rating measure for PD, the severity level of all the subjects was already compliant with the PCC-R[4]. The data was ranked as:

- Mild deviation – over 85% of correct consonants;
- Mild-moderate deviation –between 85% and 66%;

- Moderate-severe deviation– between 51% and 65%;
- Severe deviation– less or equal to 50% of correct consonants.

The qualitative assessment was carried out based on the hypothesis of distinctive features[7]. To that end, it was required to analyze each child's general phonological system, assessing it according to the proposed categories[7], ranked according to the deviation severity:

- Mild deviation –it includes children with systems belonging to Category 4;
- Moderate deviation –it includes children with systems belonging to Category 3;
- Moderate-severe deviation –it includes children with systems belonging to Category 2;
- Severe deviation –it includes children with systems belonging to Category 1[7].

Each of the categories has four levels of severity. An ascending numerical order was assigned to each rating, in order to perform the analysis of the concordance of the deviation degrees. Thus, mild deviations were rated as 1; mild-moderate and moderate deviations were rated as 2; moderate-severewere

rated as 3; and severe deviations were rated as 4. That enabled to assess if there was a match when a subject was ranked with either of the hypotheses (that classification was used only for data analysis).

The data were analyzed using frequency charts and the statistical test Chi-squared (p<0.05).

■ RESULTS

While generally appraising the concordance between the qualitative and the quantitative assessments of PD, the results have shown a low concordance. The hypotheses only matched on the rating of 34.79%of the assessments. However, that difference has no statistical relevance (Image 1).

When each of the severity levels were analyzed separately, it was concluded that the most extreme levels – the milder and the most severe – had almost the same rating with both of the hypotheses, unlike the middle levels(Image 2). It should be noted that the qualitative rating hypothesis held that phonological systems were more compromised than what was stated by the quantitative assessment of PCC-R[4].
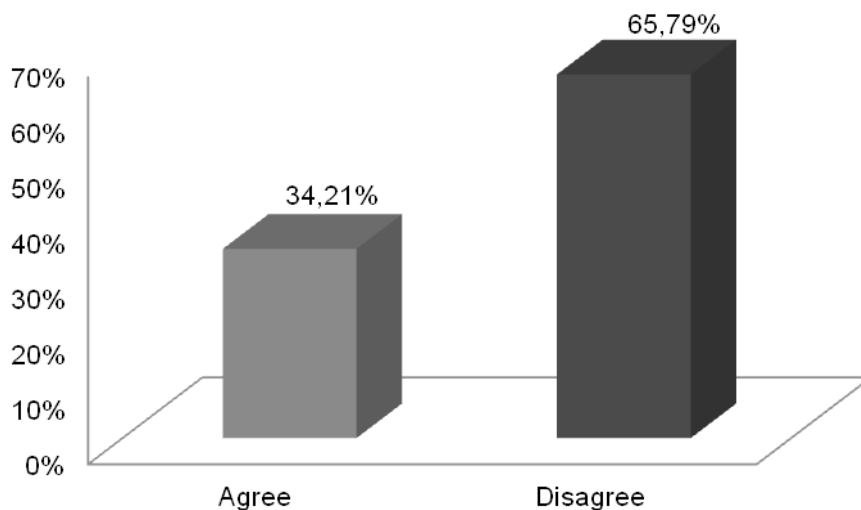

Figure 1 – Concordance percentage between quantitative and qualitative assessment when rating the severity of the phonological disorder
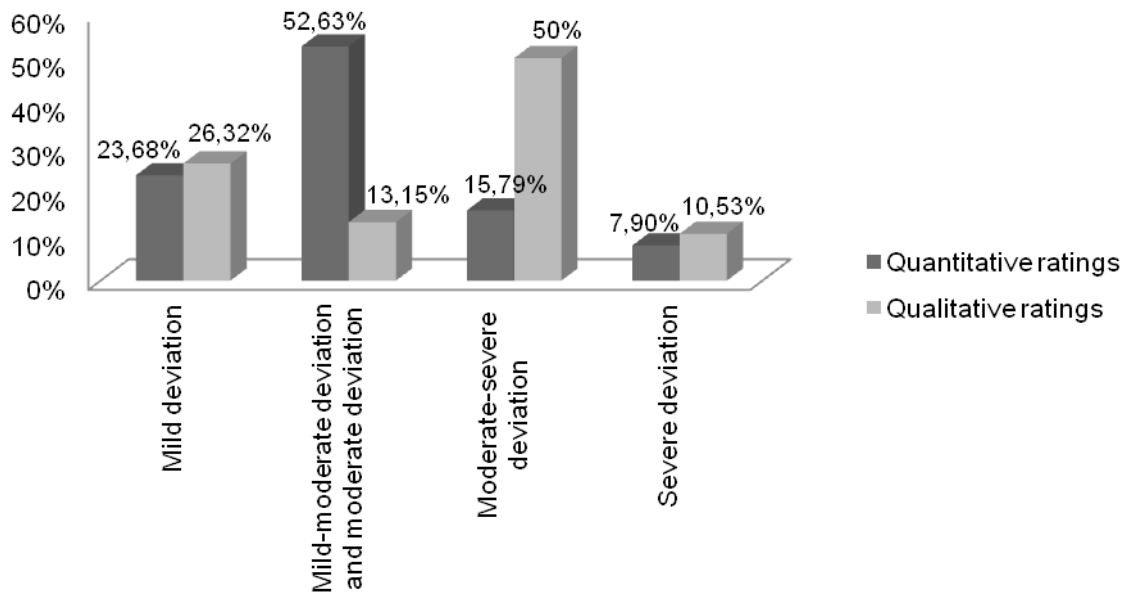
Figure 2 – Severity of the phonological disorder according to the quantitative and the qualitative ratings

■ **DISCUSSION**

There was a disparity between results for general rating when using a qualitative approach and when using a quantitative approach (Image 1). That result goes against a study[10], whose authors obtained a match between the PD severity when this was ranked using either a qualitative approach or a quantitative approach. However, the results from the present research show the relevance of joint assessments already mentioned in previous studies[6,7,10,12-16]. By joining those classifications, the speech language pathologist is able to quantify the deviation degree and is also able to infer on how the subject's phonological system is organized and devise possible therapeutic strategies.

That idea is supported by a paper that compares the quantitative rating of PCC-R[4] with a qualitative rating based on the features typology[6] of the atypical phonological system. The study found that the subjects rated under a quantitative hypothesis as mild deviation were rated under a qualitative approach as having PD with underdeveloped features. Those who were rated by the PCC-R[4] as a mild-moderate deviation, under the typology based rating were showing both underdeveloped and initial features of phonological development. Subjects with a moderate-severe level, under a qualitative approach, have shown a PD rating with initial features, and subjects with severe deviation, under a qualitative approach, were rated with PD with unusual features. From these results, the

authors of this paper came to the conclusion that there is a match between the severities used by both ratings. Furthermore, the authors stress that the ratings complement each other, enabling a better description of the child's phonological system[16].

As for the disparity on the rating of the several PD levels, on which mild and severe levels show a bigger concordance while the intermediate levels show a bigger imbalance (Image 2), previous researches had already noticed a similar behavior. These researches also portray a greater similarity when rating more extreme levels and a larger discrepancy on the intermediate levels [10,12,13,17-19]. That result was determined on a research using the Fuzzy Linguistic Model and the judgment of speech language pathologists[17]. The research validated that there was a high concordance index for the extreme PD levels, ranging from substantial to almost perfect. For the cases of moderate-severe and mild-moderate deviation (intermediate), the concordance was less relevant, ranging from regular to substantial[17].

Another study, which assessed the perceptual judgment of the severity levels, has noticed bigger accuracy and concordance when rating more extreme levels, namely mild and severe (for PD)[19]. According to research on PD, judging and rating mild-moderate and moderate-severe levels was harder when resorting to perception [19].

The greater accuracy when rating extreme deviations may be due to the fact that severe deviations present very noticeable modifications. In

most cases, children may show absence of many distinctive features and use several phonological processes, rendering speech unintelligible. In mild PD cases, there are minimal modifications, with few acting phonological processes in speech, or just a not yet stable feature, and the child's speech is easily understood. In intermediate cases, that distinction is difficult, because the child has speech productions consistent with the adult target but also makes very basic mistakes, making it hard for the other party, to understand some words or parts of the speech, and thus defining the degree of modification.

■ CONCLUSION

By the end of this study, one can conclude that the initial goal was achieved. The results show a disparity when using different types of PD rating. In this case, the authors used the PCC-R[4](quantitative assessment) and the feature rating[7] (qualitative assessment). Although it does not have statistical relevance, the difference between ratings is numerically clear, in particular when each PD degree is analyzed separately.

This study supports the importance of joint assessments, in which both qualitative and quantitative measures are used, mainly for the differentiation and the characterization of the middle levels of severity of the phonological disorder. Besides that, joint assessments enhance the relevance of the opinion and analysis by a clinical speech language pathologist.

RESUMO

Objetivo: verificar se existe diferença entre as classificações de gravidade do desvio fonológico obtido por meio do Percentual de Consoantes Corretas-Revisado e a classificação qualitativa baseada em traços. **Métodos:** avaliaram-se dados de fala pré-terapia de 38 sujeitos cujos sistemas fonológicos foram classificados segundo a avaliação quantitativa Percentual de Consoantes Corretas-Revisado (Leve, Levemente-moderado, Moderadamente-grave, Grave) e avaliação qualitativa baseada em traços (Leve, Moderado, Moderado-Severo, Severo). Os dados foram analisados por tabelas de frequência e por meio do teste estatístico qui-quadrado (p<0,05). **Resultados:** na avaliação geral verificou-se uma baixa concordância entre os resultados obtidos com a avaliação qualitativa e a quantitativa dos desvios fonológicos, apenas 34,79% de concordância nas avaliações. Na análise por graus de gravidade, observou-se que os graus extremos (Leve e Severo) obtiveram praticamente a mesma classificação com ambas as propostas, ao contrário do observado nos graus intermediários. **Conclusão:** com base nos resultados ressalta-se a importância de avaliações conjuntas, que aliem medidas quantitativas com qualitativas, principalmente para a diferenciação e caracterização dos graus intermediários de gravidade do desvio fonológico.

DESCRITORES: Transtornos do Desenvolvimento da Linguagem; Avaliação; Diagnóstico; Índice de Gravidade de Doença; Classificação

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