ASPECTS OF SPEECH FLUENCY IN CHILDREN WITH AND WITHOUT EVOLUTIVE PHONOLOGICAL DISORDER

Aspectos da fluência da fala em crianças com e sem desvio fonológico evolutivo

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ABSTRACT

Purpose: to describe and to compare the fluency patterns of children speech with or without evolutive phonological disorder. **Methods:** the sample was made up by 20 subjects aged between 4:6 and 7:6; 10 with diagnosis of evolutive phonological disorder and 10 with a typical speech development. The subjects of both groups were submitted to speech fluency evaluation, which is part of the Language Test for Young Children – ABFW. Based on this protocol, we analyzed the typologies of speech flow ruptures, which are classified as common disfluency and stutterer's non-fluency. We calculated the speech rupture frequency and the percentage of stutterer's disfluency. Through this test we also analyzed the speech speed, measuring the flow of words and syllables per minute. **Results:** there was no statistically significant difference between the groups related to the analyzed variables. However, we could perceive that in all variables, except for the flow of words and syllables per minute, that the group with evolutive phonological disorder shows higher averages than the group with typical phonological development. As for the speech speed, there seems to be a mild trend for the flow of syllables per minute, in which the group with evolutive phonological development showed a lower flow value. **Conclusion:** we were able to verify that there is a trend to occur disfluency in the group of children with evolutive phonological development, as well as a slower speech in all subjects making up this group.

KEYWORDS: Speech Disorders; Speech-Language Pathology; Child Language; Child; Speech

INTRODUCTION

The acquisition of speech occurs in a gradual way until approximately five years old[1], and some authors[2] say that the age of four is the limit for the normal process of phonological acquisition. This process is necessary for the complete establishment of the phonological system.

Nevertheless, some children with more than four years old present what is called Evolutive Phonological Disorder (EPD), which is characterized by alterations in the normal speech development, which becomes, in some cases, unintelligible[3].

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The EPD refers itself to the disorders in organization and classification on speech sounds. In this case, the child will produce inadequate phonemes, or inadequately use the phonological rules of the language[3,4]. This inappropriate production is called strategy of repair and when it occurs beyond the expected age, the EPD[1,5,6] is characterized.

The fluency is defined by constant and soft flow of speech, which is due to an harmonic integration between the neural processes involved in the language and in the motor act[7].

Both the flow breaks of the intended message and the discontinuity in the flow are determined by strange elements such as repetitions, pauses, false initiations or interjections along the speech. The continuity of speech can be understood as the amount of correspondence between intention and actual sound[8].

Another important parameter of the fluency is the speech rate, which can be analyzed in two levels: of

word and syllable. The word level means the rate in which the person is able to produce the flow of information, as the syllable level reflects the ability over the movements of the speech structures. The articulatory speed measures more accurately the motor control of the speech[8].

It is not rare to find children with language disturbances concomitantly with fluency alterations. The results of some studies have revealed the existence of an association between many linguistic factors and the rise of disfluencies. It's asserted that children with language disorders manifest a rise of disfluency, as a result of a weak integration between the lexical and morphosyntactical processes[9].

Some authors[10] have found in their studies that there are frequent speech disruptions in the functional words (especially articles, pronouns and conjunctions). These words generally begin phrases and can be used by children as a tactic of delaying, when the word of subsequent subject is not ready to be executed.

In a study[11] about the speech rate in children with EPD, it has been found that the speech rate is slower in children who also have a phonological disorder. That occurs because of possible motors or linguistic deficits. The reduction of speed may occur due to some form of compensation presented by these subjects, for example, some specific adjustment for a determined problematic sound or even in the attempt to improve and upgrade the intelligibility. Therefore, it's believed that the fluency in children with EPD might be altered, as a way of attenuating some difficulties in speech.

As it was previously seen, studies about disfluencies in children with a phonological disorder are found in literature, even though this subject is still rather unexplored. It's expected that this research might contribute with more adequate subsidies on speech alterations treatments, preventing or minimizing the possible alterations that might be related, like speech fluency or phonology.

The objective of this research was to describe and compare the patterns of fluency in the speech of children with and without EPD, speakers of Brazilian Portuguese language, in the intent to answer if children with EPD present a different profile in terms of fluency, considering the following variables: typology of speech disruptions, speech rate and frequency of speech disruptions, when compared to children without EPD.

METHODS

This research is of an experimental type, it is descriptive and prospective, involving both quantitative and qualitative measures of analysis.

A group of children who manifested a typical phonological development has participated as the Control Group (CG) and the children with the diagnosis of EPD were part of the Study Group (SG).

The criteria of subjects inclusion in the CG were: not presenting the diagnosis of phonological disorder or other phonological alterations; not presenting evident commitments in the neurological, cognitive and psychological aspects; not presenting auditory loss of any sort and being authorized by the parents or legally responsible to participate in the research through the signing of the TFEC, having age between 4:0 and 7:11 and accepting to participate in the research.

The criteria for the children that were in the SG group was similar to the ones that were chosen for the CG, although in this second group, the children had to present the diagnosis of EPD to be able to participate.

The children selection that were supposed to be part of the CG was made in a state educational institution and in an infant school in the city of Santa Maria. Primarily, the schools' responsible wardens signed the Term of Institutional Consent (TIC), authorizing the research to take place with the students. Secondly, the parents or legally responsible signed the Term of Free and Enlightened Consent (TFEC) authorizing the participations of the children in this research.

Following the signature of the TIC and TFEC, the children were submitted to the phonoaudiological triage, composed by the following evaluations: evaluation of the stomatognathic system, of language, of speech, of voice and auditory triage. This procedure was done in order to discard any phonoaudiological disorder that might influence in the results of the research.

The children with EPD that were in the SG made part of the research project, since they had already been through the phonoaudiological triage and were waiting for attendance in the area of speech by the means of the service of phonoaudiological attendance, that is linked to a Superior Educational Institution.

To establish the diagnosis of EPD, the *Avaliação Fonológica da Criança* (AFC)[13], was performed. This procedure is constituted of five thematic drawings ("bathroom", "kitchen", "living room", "vehicles" and "Zoo"). This evaluation makes possible to spontaneously nominate all the contrastive phonemes of the Portuguese language in all the positions in which they occur in relation with the syllable and word structures.

Therefore, after the procedures of sample selection, this research had 20 children accounted,

being 10 with a typical phonological development, that were part of the control group (CG) and 10 children diagnosed with EPD that were a part of the Study Group (SG). In the CG there were six female children and four males with ages that were between 4:6 and 7:00. The SG was constituted by five female children and five males, with ages between 5:3 and 7:6.

After this, the children in both groups were submitted to a fluency evaluation. In these evaluations, it was accomplished the gathering and recording of the subjects' oral productions, through a condition of enunciation (telling a story using drawings). The collected samples were of at least four minutes of speech, to guarantee that there was the necessary number of syllables (200), as was proposed by Andrade[14], for further analysis.

The procedure of analyzing the speech samples was determined by the *Protocolo de Avaliação da Fluência da Fala*, which is a part of the *Teste de Linguagem Infantil* - ABFW[14]. This protocol is an original test, entirely directed to the Portuguese language that is spoken in Brazil.

Based on the *Protocolo de Avaliação da Fluência da Fala* , the typologies speech flow were analyzed, being classified as typical disfluencies and less typical disfluencies. The disfluencies that were considered typical are: hesitation, interjection, revision, unfinished words, word repetitions, segment repetition and phrase repetition. The less typical disfluencies are: syllables repetition, sound repetition, prolonging, blockage, pause and sound or segment intrusion.

The speech rate was analyzed by this test, measuring the flow of words and syllables per minute. In order to obtain the speech rate in syllables per minute, the total number of fluent syllables (200) of each participant was divided by the total speech time , including the pauses. The speech rate in words per minute was obtained by the calculus of the total number of produced words by the participant divided by the total time of speech, including the pauses. A chronometer was used for this procedure.

It was also analyzed the frequency of speech disruptions, calculating the percentage of speech discontinuity, in which there were considered the typical and less typical disfluencies. This calculus is performed by adding the number of typical disfluencies and less typical disfluencies and multiplying the sum by 100; after this, we divide the result by the total number of syllables, obtaining the percentage of discontinuity of speech.

The second calculated index represents the percentage of less typical disfluencies, where the only considered disfluencies are the less typical disfluencies ones. The calculus is accomplished by multiplying the number of less typical disfluencies by 100 and dividing the result by the total number of syllables.

This procedure was approved by the Committee of Ethics and Research of the Federal University of Santa Maria by the protocol number of 052/04.

After that the data was organized in tables and, afterwards, it has been analyzed in an statistical approach. For the comparison between the variables of SG and CG the Mann-Whitney statistical test was used, being the level of significance fixed in 0.05 ($p<0,05$).

RESULTS

The Chart #1 presents the comparison between the results found in group CG and SG comparing the following variables: typical and less typical disfluencies, speech discontinuity, word flow and syllables per minute. It can be seen that in this chart there was no statistically significant difference between both groups. However, it was possible to realize that in all the variables, except in the syllables flow and in words per minute, that the SG has higher averages than the CG. On the speech rate variable, there was a tendency of a lower flow of syllables per minute in the SG ($p<0,10$).

The Chart #2 shows the comparison between the groups regarding the types of typical disfluencies. As can be seen below there was no difference between the groups.

The Chart 3 presents the comparison between the groups concerning the types of less typical disfluencies. Although the averages of the SG had been higher in all the aspects analyzed (repetition of syllables, repetition of sound, prolonging, blockage, pause and intrusion of segment), there were no significant statistical differences between the groups. Also on Chart 3, it was verified that the less typical disfluencies that occurred with higher frequency in the group with EPD were: pause, repetition of sounds and prolonging.

Table 1 – Comparison between the total number of typical and less typical disfluencies, percentages of discontinuity of speech, percentages of less typical disfluencies and the speech rate between control group and study group.

Variables	Averages CG	Averages SG	p
Typical disfluencies	5.60	7.20	0.362
Less typical disfluencies	3.30	6.40	0.118
Percentage of Discontinuity of Speech	4.63	6.80	0.104
Percentage of Less Typical Disfluencies	1.77	3.20	0.137
Flow of Words per minute.	90.84	85.00	0.385
Flow of syllables per minute.	163.08	139.12	0.070

Caption 1: Averages CG – averages of the control group; Averages SG – Averages of the study group; Statistical test used: *U de Mann-Whitney*, level of significance fixed in 0,05 (5%). The asterisk indicates the standards of p with statistical significance (p<0,05).

Table 2 – Comparison between the typical disfluencies in the control group and in the study group.

Variables	Averages CG	Averages SG	p
Hesitation	2.50	2.10	0.908
Revision	0.60	0.60	0.789
Unfinished Words	1.10	1.10	0.874
Reppetition of Words	0.60	1.50	0.277
Repetition of Segments	0.00	0.10	0.317
Repetition of Phrases	0.80	1.80	0.228

Caption 2: Averages CG – Averages of the control group; Averages SG – Averages of the group of study; Statistical test used: *U de Mann-Whitney*, level of significance fixed in 0,05 (5%). The asterisk indicates the standards of p with statistical significance (p<0,05).

Table 3 – Comparison referring to the less typical disfluencies between the control group and the study group.

Variables	Averages CG	Averages SG	p
Repetition of syllables	0.20	0.30	0.584
Repetition of sounds	0.40	1.40	0.140
Prolonging	0.60	1.10	0.732
Blockage	0.00	0.10	0.317
Pause	2.10	3.40	0.590
Intrusion of segment	0.00	0.10	0.317

Caption 3: Averages CG – averages of the control group; Averages SG – Averages of the study group; Statistical test used: *U de Mann-Whitney*, level of significance fixed in 0,05 (5%). The asterisk indicates the standards of p with statistical significance (p<0,05).

DISCUSSION

Frequency of speech disruptions: Percentage of Less Typical Disfluencies and Discontinuity of Speech.

As it was initially proposed, the present study had the goal of verifying whether if there is a difference in the fluency of speech between a group of children with EPD and a group of children with typical phonological development.

The results have showed that there was no significant statistical difference between the groups relating to the percentage of less typical disfluencies and the discontinuity of speech (Chart #1 above), although a bigger average of these variables were observed in the group who had EPD, when compared to the group without EPD. It is believed that these results might have been influenced by the limited size of the sample.

These findings are agreeing with the results of a study[15] in which the authors have found the

presence of hesitative marks in 49 (27,22%) of the 180 productions of children with EPD. In contrast, they have noticed the presence of hesitative marks in only 8 (4,44%) of the 180 productions in the children that presented a typical development of the language.

In a research[9] about language and fluency in children with language disorders, it has been found a result that suggests that the fluency might be a sign of variations in the language development, at least to some children with language disorders. According the author, the increase on children's disfluencies can create difficulties to integrate the various aspects of language (for example, lexical and morphossyntactical). These discoveries suggest the presence of deficits in the structural language aspects in the majority of subjects, giving support to the hypothesis that the impaired morphossyntactical abilities (and phonological) might contribute to problems in fluency.

With the objective of evaluating the effect of language disorders and its relation to the speech fluency, authors[16] performed a study with two groups of subjects: one group of children that presented language disorders and another group that didn't. After the comparison between groups, it wasn't found any proper difference that is statistically significant concerning the speech fluency between both groups. According to the authors, this result might have been found due to the fact that the criteria used to choose the subjects, which was based on the definition of language disorders, was not subdivided between the subjects that had and those that hadn't been through phonoaudiological therapy. The results of that research corroborate the result of this research (as presented above), meaning that there was no significant statistical difference between the two groups, but there is the possibility of achieving a different result if there is a bigger sample.

As to the occurrence of the phonological disorder in stuttering children, an author[17] has observed that the stuttering in the co-occurrence with the phonological disorder is nowadays a theme that is emphasized in the literature. It has been observed many children presenting a phonological disorder concomitantly with alterations in fluency.

In another study[18], there was relevant results concerning the speech delay and language delay concomitantly with fluency disorders. In the results, the authors verified the presence of speech delays and language delays in order of 31% of the prompt--books on stuttering individuals that were evaluated.

As described above, it's believed that these disorders might affect each other, although the relation between stuttering and phonology is not well based by empirical evidences.

Speech rate: word flow and syllables per minute

Regarding to the speech rate in the subjects, and observing the average word flow and syllables per minute in Chart #1 above, it can be noted a slower speech in the group of children with EPD when compared to the children in the control group. Although this difference has not been statistically significant, there was a minor tendency as to the variable flow of syllables per minute, in which the SG has presented a lower flow.

This finding corroborates the results of a study[11], in which it was verified that the speech rate values in the group with phonological disorder showed a slower speech in all measures and proofs, even if this difference hasn't always been statistically significant.

In another performed research[12], it was found that the group of children that had already completely normalized their speech presented higher values of speech rate when compared to the group of children that still maintained distortions in speech. According to the author, this slower speech may occur as a form of compensation presented by these subjects that might do it as a specific adjustment for a determined problematic sound in the attempt to improve the intelligibility of their speech.

Furthermore, the results that were found in this present study concerning the speech rate, agree with the results obtained in a study[19] in which the authors concluded that the oral motor control, analyzed by the speech rate and measured by the PCC, varies according to the performance of speech, meaning that the lower the percentage of correct consonants, slower was the speech of the children analyzed.

Typology of typical and Less typical disfluencies

Concerning the typology of speech disruptions, as it can be observed in Charts #2 and #3, the SG presented a bigger average in some variables referring to typical disfluencies and also in all the variables referring to less typical disfluencies, when compared to the results of CG.

Still on Chart #3 it can be observed that the less typical disfluencies were the ones that occurred more frequently in the group with EPD, being the following disfluencies: syllables repetition, sound repetition, prolonging, blockage, pause and segment intrusion. Regarding the different sorts of speech disruptions found in children with EPD, an author[20] observed the occurrence of pauses, lengthening and insertion of initial sounds in speech. The occurrence of these disfluencies wasn't interpreted by the author as a "dysfunction", rather as a strategy that constitutes the process of establishing phonic functions.

According to the author, that may be considered as if the register of these speech disruptions was a flagrant of an instant in which the child demonstrates preoccupation with a determined phonic language aspect.

In that sense, the occurrence of speech disruptions suggests that, in some moments, the subjects with the EPD diagnosis support themselves in pauses, insertion of initial sounds and lengthening to decide between the different forms that are conflicting in sound production. Despite these speech disruptions that mark an apparent breakage in the infantile productions, they demonstrate the children's negotiation between the different phonic possibilities that are competing[20].

Still agreeing with the results mentioned above regarding the less typical disfluencies that occurred more frequently in the study group, there is a research[15] where a higher occurrence of hesitative marks was observed (specially the lengthening and the silent pauses) in the vehicle-phrases produced by the children with EPD. It was also observed the preferential occurrence of hesitative marks in the production of aim-sounds, indicating an attempt of the child with EPD to approximate his or her pronounce to the aimed pronounce. So, it's believed that the children's fluency with EPD might be altered, as a form of attenuating certain speech difficulties.

Authors[21] have found that for fluent children, the hesitation was the only typology observed with bigger occurrence when compared to the group of stuttering children, and even so, there was a significant statistical difference between the groups. As it's observed in Chart #2, the results of the present research agree with the above-mentioned study, since the only typology of speech disruption that occurred with bigger frequency in the CG was hesitation.

It's important to emphasize that the total of less typical disfluencies was low in both groups, as it can be observed in Chart #3, which was already expected, since this variable is characteristic in speech fluency disorders and the subjects of both groups in this research did not possess any diagnostic of stuttering.

CONCLUSION

This research has attended its initial objective, and by the means of its results it is possible to verify that the children with evolutionary phonological disorders and the children with typical phonological development are not so different statistically, considering the aspect of speech fluency.

There is, however, a tendency to a greater occurrence of disfluencies in the group of children with EPD, and there is also a slower speech rate in all the subjects of this group.

The less typical disfluencies which occurred more frequently in the group with EPD were: pause, repetition of sounds and prolonging.

These findings might contribute to subsidize more adequately the realization of better speech disorders treatments, preventing or minimizing possible alterations that might be involved or might even be interfering the speech fluency.

Since this study has presented limitations related to its reduced sample size, it is suggested that other studies involving a larger sample should be performed, in a way of confirming or not these findings.

RESUMO

Objetivo: descrever e comparar os padrões de fluência da fala de crianças com e sem desvio fonológico evolutivo. **Métodos:** a amostra foi constituída de 20 sujeitos com idades entre 4:6 e 7:6 anos, sendo 10 crianças com diagnóstico de desvio fonológico evolutivo e 10 com desenvolvimento fonológico típico. Os sujeitos de ambos os grupos foram submetidos a uma avaliação da fluência da fala que faz parte do Teste de Linguagem Infantil-ABFW. Com base neste protocolo, analisaram-se as tipologias das rupturas do fluxo de fala, as quais são classificadas como disfluências comuns e disfluências gagas. Foi realizado o cálculo da freqüência de rupturas da fala e da porcentagem de disfluências gagas. Por meio deste teste também se analisou a velocidade de fala, medindo-se o fluxo de palavras e de sílabas por minuto. **Resultados:** não houve diferença estatisticamente significante entre os grupos quanto às variáveis analisadas. Contudo, pode-se perceber que o grupo com desvio fonológico evolutivo apresentou maiores médias do que o grupo com desenvolvimento fonológico típico na maioria das variáveis, com exceção do fluxo de sílabas e palavras por minuto. Quanto à velocidade de fala, no que se refere ao fluxo de sílabas por minuto houve uma tendência de um menor fluxo no grupo com desvio fonológico evolutivo. **Conclusão:** no grupo estudado, crianças com desvios fonológicos evolutivos e crianças com desenvolvimento fonológico típico não diferem quanto aos aspectos de fluência de suas falas.

DESCRITORES: Distúrbios da Fala; Patologia da Fala e Linguagem; Linguagem Infantil; Criança; Fala

REFERENCES

1. Keske-Soares M, Pagliarin KC, Ceron MI. Terapia fonológica considerando as variáveis linguísticas. Rev Soc Bras Fonoaudiol. 2009;14(2):261-6.

2. Grunwell P. Os desvios fonológicos numa perspectiva lingüística. In: Yavas, M. (org.). Desvios fonológicos em crianças: teoria, pesquisa e tratamento. Porto Alegre: Mercado Aberto, 1990. cap. 3, p. 53-77.

3. Wertzner HF, Amaro L, Galea DE. Phonological performance measured by speech severity indices compared with correlated factors. Med J. 2007;125(6):309-14.

4. Linassi LZ, Keske-Soares M, Mota HB. Habilidades de memória de trabalho e o grau de severidade do desvio fonológico. Pró-Fono R Atual Cient. 2005;17(3):383-92.

5. Wertzner HF; Pagan LO; Galea DES; Papp ACCS. Características fonológicas de crianças com transtorno fonológico com e sem histórico de otite média. Rev Soc Bras Fonoaudiol. 2007;12(1):41-7.

6. Ghisleni MRL, Keske-Soares M, Mezzomo CL. O uso das estratégias de reparo, considerando a gravidade do desvio fonológico evolutivo. Rev. CEFAC. 2010;12 (5):766-71.

7. Andrade CRF, Juste F. Aplicação de um teste americano de severidade de gagueira (SSI) em crianças fluentes falantes do português brasileiro. Pró-Fono Rev. Atual. Cient. 2001;13(2):177-80.

8. Andrade, CRF. Fonoaudiologia em Pediatria. São Paulo: Sarvier, 2003.

9. Hall, NE. Language and Fluency In Child Language Disorders: changes Over Time. J. Fluency Disord.1996; 21:1-32

10. Au-Yeung, J, Gomez, IV, Howell, P. Exchange of disfluency with age from function words to content words in Spanish speakers who stutter. J. Speech Lang. Hear. Res. 2003;46:754-66.

11. Wertzner HF, Silva LM. Velocidade de fala em crianças com e sem transtorno fonológico. Pró-Fono Rev. Atual. Cient. 2009 jan –mar;21(1):19-24.

12. Flipsen P Jr. Articulation rate and speech-sound normalization failure. J Speech Lang Hear Res. 2003 Jun;46(3):724-37.

13. Yavas M, Hernandorena CLM, Lamprecht RR. Avaliação fonológica da criança: reeducação e terapia. Porto Alegre: Artes Médicas; 1992

14. Andrade CRF, Befi-Lopes DM, Fernandes FDM, Wertzner FH. ABFW teste de linguagem infantil nas áreas de fonologia, vocabulário, fluência e pragmática. São Paulo: Casa do Fonoaudiólogo; 2000.

15. Berti, LC; Marino, CC. Marcas Linguísticas Constitutivas Do Processo De Aquisição Do Contraste Fônico. Revista do GEL. 2008;5(2):103-21.

16. Less R, Anderson H, Martin P. The Influence Of Language Disorder On Fluency: a Pilot Study. J. Fluency Disord. 1999;24:227–38.

17. Nippold, MA. Stuttering and Phonology: Is There an Interaction? American Journal of Speech-Language Pathology. 2002May;11:99–110.
18. Duarte TF, Crenitte, PAP, Lopes-Herrera, SA. Caracterização dos indivíduos com distúrbios da fluência, atendidos na clínica-escola do curso de fonoaudiologia da USP-Bauru. Rev. CEFAC. 2009Jul-Set; 11(3):396-405.
19. Folha GA, Felício CM. Relações entre idade, porcentagem de consoantes corretas e velocidade de fala. Pró-Fono Rev. Atual. Cient. 2009Jan-Mar;21(1):39-44.
20. Freitas, MCC. Relações entre fluência e aquisição fônica em crianças com desvios fonológicos. CELSUL – Círculo de Estudos Lingüísticos do Sul; 2008Out 29-31; Porto Alegre, RS – Brasil. Pelotas: EDUCAT; 2008.
21. Juste F, Andrade CRF. Tipologia das rupturas de fala e classes gramaticais em crianças gagas e fluentes. Pró-Fono Rev. Atual. Cient. 2006Mai-Ago;18(2):129-40.

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