PERSISTENT DEVELOPMENTAL STUTTERING: FLUENCY ASSESSMENT PRE- AND POST-TREATMENT

Gagueira desenvolvimental persistente: avaliação da fluência pré e pós-programa terapêutico

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ABSTRACT

Purpose: to compare the fluency of children who stutter as to the percentage of stuttered syllables, percentage of speech disruption, flow of syllables and word per minute and severity of stuttering in pre and post-therapeutic program. **Method:** 10 children, who stutter, aged from 6.0 to 11.11 years old, being 9 males and 1 female, from the Laboratório de Estudos da Fluência. All the participants underwent the following procedures: (a) initial assessment of fluency; (b) development of the therapeutic process, and (c) reassessment of fluency. **Results:** regarding the assessment post-treatment, there was a significant improvement in the fluency profile, because most of the analyzed measures (speech disruption, frequency of stuttered syllables, flow of syllables per minute and severity of stuttering) showed statically significant differences. The findings indicate that there was a quantitative reduction in the disruption in the flow of speech, which causes an increase in flow of syllables per minute, and also a decrease of the severity of stuttering. These results confirm the therapeutic efficacy of the applied therapy program. **Conclusion:** the results can assist the phonoaudiologist, in the therapy, both in the diagnostic assessment and in the control of therapeutic efficacy.

KEYWORDS: Speech, Language and Hearing Sciences; Stuttering; Speech Disorders; Speech; Speech Therapy

INTRODUCTION

Stuttering is a chronic condition mainly characterized by involuntary disruption in the speech fluency [1], beyond to a broad spectrum of consequences [2-6]. For this reason, stuttering is subject of investigations under several perspectives. However, the number of research about speech therapy is lower when compared to other themes. Therefore, the importance of research in this area was highlighted by some scholars[7,8].

Stuttering therapy has become a hot topic worldwide because of the release of the film The King's Speech [8]. In this sense the Journal of Fluency Disorders, the official journal of the International Fluency Association (IFA) and specific about fluency disorders with major impact in the scientific community, published a special issue in 2011 on various therapeutic approaches to stuttering.

The fact that stuttering is considered a multifactorial disorder, contributes to the possibility of various therapeutic approaches. The fluency shaping approach prevents the emergence of stuttering by changing the entire speech production, using, for example, the reduction of speech rate, prolongation of syllables, among other techniques.

Van Riper, Bryngleson and Johnson were responsible for developing the approach entitled stuttering modification [9]. They added the notion of reducing the stuttering of the person who stutters

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Source of financial support: FAPESP - Scientific Initiation Scholarship Process No. 2010/18223-8.
Conflict of interest: non-existent

(PWS), rather than eliminate it, and recognized the importance of driving to the psychological aspects of the disorder. Thus, the person learns to identify and modify the moment of stuttering. This approach continues to have a strong influence and currently persists in the treatment of many countries [10].

The step towards an integrated approach took some time [11], and thus confirmed that both approaches are useful, but in different ways and guide to various aspects of the disorder [10].

The recognition of the presence of cognitive and affective components in stuttering fostered interest in Cognitive-Behavioral Therapy (CBT) [12,13]. In this approach, the speech therapist helps the person who stutters to understand how your negative automatic thoughts affect their feelings, causing physical effects and aggravate their behavior [10].

The Speech-Language therapy should also consider the perspective of the person who stutters. Therefore, the speech therapy program, focus of this research, found that the goals of therapy should include: the promotion of fluency; the modification of the way that the person stutters, the reduction of negative attitudes and feelings related to the disorder, which are the central part of the approach of stuttering modification [14] of which are associated with the success of stuttering therapy in the long-term [15], the reduction of negative environmental reactions, since the negative stereotype has also been proven as a problem for people who stutters [16] thus providing an effective and participative communication [17]. This study reveals that the treatment that addresses all of these aspects may facilitate the transference of the fluency for everyday speaking situations and their extended maintenance after completion of treatment.

From this perspective, intervention in childhood stuttering must involve the parents as key figures that can facilitate the transference of the fluency and help the child deal with possible relapses. For this reason, the family is increasingly being included as part of the process of the assessment and therapy programs[10,18,19].

The intervention in childhood stuttering aims to improve the fluency skills. In the age group of this study, 6.0 and 11.11 years**,** the integrated approach showed to be the most appropriate. For this reason, the main guiding goals of speech therapy for school-age children who stutter are presented in a hierarchical sequence: encourage motivation, promote learning about the anatomy and physiology of the speech process [17]; identify fluency, the disfluencies, physical concomitants, emotions involved in stuttering, and all the behaviors used in an attempt to avoid disruptions [14,17]; reduce negative feelings and attitudes toward stuttering, and eliminate avoidances [17,20]; establish and maintenance of eye contact; suit muscle tone, control of the speech rate [17]; reduce specific speech tension[21]; soften the beginning of speech (Easy Relaxed Approach, Smooth Movement – ERA– SM) [21]; to provide a continuity of utterrances to reduce the number of starts speech and consequently stuttering (Phrasing technique [22]); resist the time pressure [21] and, transfer and maintenance of acquired fluency.

The overall goal of speech therapy, therefore, is to promote fluency and reduce stuttering. The reduction in the amount of disfluencies will encourage a greater flow of information and faster speech rate. The process of intervention also targets a speech as natural as possible that sounds normal for both the speaker and the listener. Some patients may achieve spontaneous fluency, others, however, the maximum that they will reach is acceptable stuttering, which is remarkable speech with disfluencies, but not severe [14]. Therefore, to verify whether the goal has been reached, or to know the effectiveness of therapy is necessary to compare the data from the fluency assessment before and after therapy. The assessment of treatment efficacy contributes to the knowledge base that enables the speech-language therapist to provide an evidence-based treatment for stuttering [23].

Various methods of stuttering therapy are currently used, however, the evidence related to the effectiveness of many of them is rare [7,24].

The most well-known measures of communicative function for the population of people who stutter are checking the quantitative aspects (such as the frequency of disfluencies that is more appropriate in the literature – [5,13,24-27] and qualitative fluency aspect (as for example, the types of disfluencies [26]), and speech rate (indicates the communicative productivity [28]) [24,26,27]. The use of standardized tests in the assessment process can facilitate both the implementation and the analysis of the results that can be compared with normative data. In Brazil, the Fluency Test [26] is widely used and identifies three measures, namely the typology of the disfluencies, the speech rate and the frequency of the disfluencies.

The stuttering severity must also be determined in the assessment of the skills of speech, to verify if it decreases after the intervention. For this classification the Stuttering Severity Instrument (SSI) is indicated, internationally recognized by the scientific community [25], is based on the score of the frequency of disfluencies, duration of the disfluencies and physical concomitants.

Therefore, the purpose of this study was to compare the fluency of children with persistent developmental stuttering as the percentage of

stuttered syllables, percentage of speech disruption, flow of syllables and words per minute and stuttering severity in pre– and post-implementation of speech therapy intervention program.

METHOD

This research is an experimental and longitudinal study conducted with children with the diagnosis of persistent development stuttering established according the assessment criteria adopted by the *Laboratório de Estudos da Fluência* [Fluency Study Laboratory] – LAEF of the *Centro de Estudos da Educação e da Saúde* [Education and Health Study Center] (CEES) of Universidade Estadual Paulista – FFC – Marilia.

The study included 10 children, aged between 6.0 and 11.11 years old (mean age of 8.46 years, SD = 1.61), with 9 males and 1 female, and their parents / guardians residents in Marília-SP and region. All participants were attended by the same person, in LAEF, from March 2011 to August 2011.

The inclusion criteria for participants were: to present stuttering complaint by parents / guardians; present the disfluencies for more than 12 months, a minimum of 3% of stuttering-like disfluencies (SLD), and present at least mild stuttering according to the Stuttering Severity Instrument (SSI– 3) [25].

The exclusion criteria were: present any other communication deficits or neurological disorders, genetic syndromes, mental retardation, epilepsy, conductive or sensorineural hearing, attention deficit hyperactivity disorder (ADHD) or psychiatric symptoms or conditions.

The parties responsible for all children of this study have agreed in writing to their participation, based on the clarifications contained in the Informed Consent form that was presented to them.

All participants of this study underwent the following procedures grouped in into three phases: (a) initial fluency assessment; (b) development of the therapeutic program, and (c) reassessment of fluency.

A) Initial fluency assessment: This phase was to obtain data about the stuttering of the children before the treatment program by fluency assessment, performed to confirm the diagnosis of stuttering, to characterize the frequency of disfluency, the flow of syllables and words per minute, according to Fluency Test [26], and to assess the severity of the disorder (SSI-3) [25].

After collecting the speech of the participants, they were transcribed, considering the fluent and non-fluent syllables. Subsequently, was realized the analysis of the speech sample and characterized the typology of the disfluencies [26]. To characterize the frequency of the disruption were used the following measures: percentage of speech discontinuity or disruption in speech, and percentage of stuttering-like disfluency (SLD) or stuttering rate [26]. The number of words per minute is the speech rate that the speaker is able to produce the flow of information. The flow of syllables per minute is the articulatory speech rate, in others words, the rate that the speaker can move the speech structures [26].

The Stuttering Severity Instrument (SSI-3) [25] was used in order to classify stuttering as mild, moderate, severe or very severe. This test assessed the frequency and duration of stuttering-like disfluency, as well as the presence of physical concomitants associated with disfluencies. The scale was scored according to the instructions of the examiner test manual [25].

B) Development of the therapeutic program: The program was based on the literature studied and clinical experience, and was developed through 4 phases, totaling 18 sessions of 50 minutes each.

Phase 1 – Provide information and guidance to families (2 sessions) was conducted with support from a brochure used in routine of the LAEF, and has previously published [19]. The main information contained in the brochure are relating to the promotion of fluency in the speech of the child through some suggestions of communicative interaction, models of speech and language, and appropriate attitudes toward stuttering.

In the first session were explained speech-language manifestations of child, the presence of other disfluencies and stuttering-like disfluencies and the reason of the occurrence of these disruptions. Secondly, explained each topic of the guideline brochure, using examples of communicative situations, as well as verbal and nonverbal fluency models promoters.

In the second session, the counseling concerned the importance of slow speech rate, the smoothness of articulatory contacts, as well as the continuous speech by parents / guardians, becoming models for the child and thus facilitating the acquisition of fluency.

Phase 2 – Explore the process of the speech and of the stuttering (4 sessions)

2.1 – Motivate the child to therapy: the cooperation of the child is important for obtaining therapeutic results, and therefore it was necessary to work in order to improve the child's motivation to increase fluent speech.

2.2 – Encourage learning about the anatomy and physiology of the speech process: it was explained

to the child about the issues involved in speech production, showing the parts of the human body as well as explaining about the necessary coordination of respiration, phonation, and articulation for a fluent utterance. This work can be described as learning the "Machine Speech" [17].

2.3 – Identify fluency, disfluency, physical concomitants, negative feelings and attitudes toward stuttering [14,17]: aimed to provide to the patient the knowledge and acceptance of his stuttering, as well as understanding that it is composed of behaviors that can be controlled and / or modified. To this end, each child identified – with the help of the speech-language therapist – fluency, disfluency, stress points in the body, the incoordination of respiration, phonation and articulation, physical concomitants as well as negative attitudes and feelings associated with stuttering.

2.4 – Reduce feelings and attitudes negative toward stuttering and eliminate avoidances [20]: when healthy expressions of those attitudes and feelings are not encouraged, the child may try to resist to these negative feelings they experience. This "resistance" can trigger physical tension, and this in turn can affect the child's ability to conduct his stuttering. In this sense, through the results of assessment and as required, the speech-language therapist encouraged the reduction and elimination of feelings and attitudes that acted as maintainers and aggravating stuttering.

2.4.1 Establish and maintain eye contact: the speech-language therapist offered a suitable model favoring eye contact, for example, maintain a position in front of the patient and with his head at the same height as the patient's head. Also used finger snaps in the height of the patient's face aiming to address the attention to establish and maintain eye contact.

2.5 Adequate muscle tone: this work was developed at the beginning of the sessions, and was adapted to each patient, in others words, depending on the body region affected, the exercise was performed.

Phase 3 – Promote fluency (10 sessions)

3.1 Adjust the speech rate: the stretching of each vowel of the syllables, as well as the increased pause time and the number of pauses was used to slow the rate, and thus improve motor control of speech, resulting in more fluent speech.

3.2 Reduce the specific speech tension (Negative Practice) [21]: initially the speech-language therapist imitated the stuttering of the child with 100% of tension (as closely as possible), then with 50% of the tension and finally the word was spoken smoothly. Later the child who stutter and the speech-language therapist speak together the word intentionally presented in three ways, and finally only the child speak the three utterances reducing muscle tension.

3.3 Smooth articulatory contacts (Easy Relaxed Approach, Smooth Movement – ERA-SM) [21]: was emphasized to begin the speech without tension, with smooth contact of the articulators and related muscles, reducing disfluencies.

3.4 Provide continuity of utterance (Phrasing technique) [22]: the number of beginning speech was reduced by modeling of continuous speech (as amended), and consequently decreased stuttering. With the Phrasing technique the patient learned to use breathing, using pauses into meaningful language units, allowing smooth transitions between words, reducing the disfluencies.

3.5 Resist time pressure [21]: led to the child who stutters courage to avoid the rush to speak. The technique was developed by introducing a pause of 2 seconds before emission.

During this phase, parents / guardians observed some therapeutic sessions, to know and experience the techniques that promote fluency, and were worked with the child. At the end of each session observed, the family interacted with the child in the presence of the speech-language therapist, putting into practice the guidance received.

Phase 4 – Transfer and maintenance the speech fluency (2 sessions)

The transfer and maintenance of fluency is a goal that has been working since the beginning of therapy, through various planned activities. Family members helped the child to transfer and maintain fluency for the home environment. The use of hierarchy in speech sample was also a strategy that facilitated the transfer and maintenance of fluency. Hierarchy examples include gradual increase length of the complexity utterances and Extended Length of Utterances (ELU) [29].

C) Reassessment of fluency

The reassessment of fluency aimed to verify the results obtained in relation to the percentage of stuttering-like disfluencies, speech disruption, flow of syllables and words per minute, as well as the stuttering severity, comparing them with data obtained at baseline. The interval between the first and last phase was 18 sessions or 9 weeks.

This study was approved by the originating institution's Research Ethics Committee under protocol No. 1060 /2010.

The Wilcoxon Signed Posts test was used for statistical analysis in order to investigate possible differences between the variables considered in the two fluency assessments. Another statistical analysis method used was the application of the Likelihood Ratio test in order to verify possible

differences between groups regarding a variable of interest stuttering severity. The significance level adopted for the application of statistical tests was 5% (0,050). Data analysis was conducted using the SPSS (Statistical Package for Social Sciences) software, version 20.0.

RESULTS

According to the purpose of the study, the results obtained are presented in the following Tables. When comparing the measurements analyzed in the pre– and post-therapeutic program assessments, a statistical difference was observed in speech disruption, stuttering-like disfluencies, syllables per minute and stuttering severity (Table 1). In the post-therapeutic program assessment, speech disruptions and stuttering severity have decreased, while the flows of syllables and words per minute have increased.

The other disfluencies found in the participating group are distributed by typology in Table 2, at the pre– and post-therapeutic program assessment. A significant decrease was found in just one type of other disfluency: interjection (p=0.011), at the post-therapeutic program assessment. Most other disfluencies (hesitation, revisions, unfinished words, segment and word repetition) presented quantitative similarities between the two assessments. Note that the only disfluency that increased at the post-therapeutic program assessment was unfinished word. The most frequent other disfluency typology at the pre-therapeutic program assessment was word repetition, and at the post-therapeutic program assessment was hesitation. Phrase repetition did not occur in any assessment.

Table 1 – Distribution of the means values, standard-deviation, minimum and maximum of the measures analyzed in the pre– and post-therapeutic program assessments

	Pre-therapeutic program				Post-therapeutic program				p-value
	Mean	SD	Minimum	Maximum	Mean	SD	Minimum	Maximum	
Speech disruption	26.50	7.41	16.00	39.00	12.20	8.46	3.00	34.00	**0.005***
Stuttering-like disfluencies	9.60	4.88	6.00	19.00	2.80	2.94	0.00	10.00	**0.005***
Syllables per minute	106.77	14.37	85.00	134.00	133.63	29.38	102.00	185.00	**0.005***
Words per minute	77.40	15.61	51.00	109.00	86.05	20.29	61.00	127.00	0.113
Stuttering severity (mean of total score)	18.10	6.44	12.00	28.00	9.40	7.50	0.00	24.00	**0.012***

Note: SD = standard deviation.
*Statistical significance (p≤0.05) – Wilcoxon Signed PostsTest – significant values are shown in bold and with an asterisk

Table 2 – Comparison regarding the hesitation, interjection, revision, unfinished word, segment and word repetition in the pre– and post-therapeutic program assessment

	H		I		Rv		UW		SegR		WR	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Pre-therapeutic program	4.40	3.63	3.70	3.34	1.70	1.34	0.00	0.00	0.90	1.20	6.20	3.26
Post-therapeutic program	4.10	3.54	0.90	1.45	0.0	0.79	0.10	0.32	0.60	0.84	3.20	3.36
p-value	0.812		**0.011***		0.104		0.317		0.750		0.102	

Note: M= mean; SD = standard deviation; H = hesitation; I = interjection; Rv = revision; UW = unfinished word; PR = phrase repetition; SegR = segment repetition; WR = word repetition.
*Statistical significance (p≤0.05) – Wilcoxon Signed Posts Test – significant values are shown in bold and with an asterisk

Upon analyzing the occurrence of stuttering-like disfluencies in pre– and post-therapeutic program assessments, it is noted that although there was a decrease in all types stuttering-like disfluencies typologies in post-therapeutic program assessment, the difference was statistically significant only for sound repetition (p=0.026) and block (p=0.041). The most frequent stuttering-like disfluency typology in both assessments was part-word repetition.

Table 3 – Comparison regarding repetition of part of the word, sound repetition, prolongation, block, pause and intrusion in the pre– and post-therapeutic program assessment

	RPW		SR		P		B		Pa		In	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Pre-therapeutic program	3.50	3.24	1.50	1.35	1.70	3.40	2.30	2.45	0.40	1.27	0.30	0.48
Post-therapeutic program	1.80	2.44	0.20	0.42	0.40	0.52	0.40	0.84	0.00	0.00	0.00	0.00
p-value	0.260		**0.026***		0.380		**0.041***		0.317		0.083	

Note: M = mean; SD = standard deviation; RPW = repetition of part of the word; SR = sound repetition; P = prolongation; B = block; Pa = pause; In = intrusion.
**Statistical significance ($p \leq 0.05$) – Wilcoxon Signed Posts Test – significant values are shown in bold and with an asterisk

The following two tables (Tables 4 and 5) refer to stuttering severity. The first table shows the scores obtained from the three measurements taken in the test, namely stuttering-like disfluency frequency, average length of the three longest stuttering-like disfluencies, and physical concomitants, in addition to the total score (Table 4). In the pre– and post-therapeutic program assessment there was a statistically significant difference for frequency (p=0.005) and physical concomitants (p=0.028), as well as for total test score (p=0.012).

Table 4 – Comparison regarding to the scores of the three measures analyzed in the Stuttering Severity Instrument (Riley, 1994), frequency, duration and physical concomitants in the pre– and post-therapeutic program assessment

	Scores of the Stuttering Severity Instrument							
	Frequency score		Duration score		Physical concomitants score		Total score	
	M	SD	M	SD	M	SD	M	SD
Pre-therapeutic program	11.00	4.03	4.90	3.67	3.20	1.75	18.10	6.44
Post-therapeutic program	3.40	3.41	4.80	3.68	1.20	1.75	9.40	7.50
p-value	**0.005***		0.957		**0.028***		**0.012***	

Note: M= mean; SD= standard deviation.
**Statistical significance ($p \leq 0.05$) – Wilcoxon Signed Posts Test – significant values are shown in bold and with an asterisk

The participants' stuttering severity in the pre– and post-therapeutic program assessments are presented in Table 5. Although the p-value does not indicate a statistically significant difference, it is observed that 8 of the 10 participants presented a decrease of at least one degree of severity, and 2 participants remained at the same severity level.

Table 5 – Comparison regarding the stuttering severity in the Stuttering Severity Instrument (Riley, 1994) in the pre– and post-therapeutic program assessment

Stuttering severity in the pre-therapeutic program	Stuttering severity in the post-therapeutic program				Total
	Very mild	Mild	Mild to moderate	Moderate to severe	
Mild N=4	2	2	0	0	4
	20.00%	20.00%	0.00%	0.00%	40.00%
Mild to moderate N=3	3	0	0	0	3
	30.00%	0.00%	0.00%	0.00%	30.00%
Moderate to severe N=1	1	0	0	0	1
	10.00%	0.00%	0.00%	0.00%	10.00%
Severe N=2	0	0	1	1	2
	0.00%	0.00%	10.00%	10.00%	20.00%
p-value			**p = 0.270**		

P-value – Likelihood Ratio test

DISCUSSION

Stuttering is widely studied due to the strong impact this disorder causes on the stutterer's quality of life. There are many published studies regarding the genetic aspects involved in the transmission of this disorder, its risk factors, characterization of its manifestations, the auditory aspects involved, its implications on quality of life, among others. However, few references in the literature regarding the efficacy of therapeutic programs for school-age who stutter were found. Some scholars have conducted work on the importance of evidence-based practice in research involving stuttering treatment [9,10,27]. Although the small sample size limitation should be considered, the results in this research obtained were relevant to provide a better understanding of stuttering.

Regarding the assessment made after the applied therapeutic program, there was a significant improvement in fluency profile, as most of the analyzed measurements (speech disruption, stuttering-like disfluencies, flow of syllables per minute and stuttering severity) have shown statistically significant differences. The findings indicated that there was a quantitative reduction in disruptions, which led to an increased flow of syllables per minute and decreased stuttering severity. These results confirm the therapeutic efficacy of applied therapy program.

Despite the statistically significant difference in the measurement of speech disruption percentage, only one other disfluency and two stuttering-like disfluencies showed a significant difference between the compared assessments. The minimum values obtained in post-therapeutic program assessment for speech disruption and stuttering-like disfluencies have decreased considerably.

The average speech disruption rates found in this study correspond with the reference values for speakers of Brazilian Portuguese [30]. The average of 26.50 occurrences of disruptions before the therapeutic program is at the maximum speech disruption limit indicated by the author in the study conducted within the age group analyzed in this research. The average of 9.60 disruptions corresponds to a value below the minimum normal limits (12.2 to 26.4). Thus, there is a noticeable improvement in the reduction of the number of disfluencies presented by children at the post-therapeutic program assessment.

By comparing the values of stuttering-like disfluencies, it is observed that for the age range between 6 and 11 years old the values were from 1.3 to 6 [30],

while at the initial assessment the values were from 7 to 19, that is, higher than expected given the stuttering diagnosis. At the post-therapeutic program assessment the values found were from 0 to 10. Therefore, some children presented values within the normal limits; however, other children continued to show an increased number of stuttering-like disfluencies.

The results of this study in relation to other disfluencies agree with researchers who claim that disfluencies are part of language production, as they help the speaker to produce a more suitable speech, both in content and in form [31]. Therefore, even after the therapeutic program, it is known that stutterers, as well as every speaker, will continue to present other disfluencies in their utterances, which will generally be related to linguistic questions, and they indicate that the speaker is searching for a solution [32].

The main manifestations of stuttering are stuttering-like disfluencies. Thus, the therapeutic program was effective, considering the significant reduction in the number of such disruptions.

When analyzing the data on speech rate, the statistical analysis showed no differences in the results related to flow of words per minute, also called production of information. This result suggests that despite the improvement in fluency, increased flow of syllables per minute, and reduced stuttering severity, the group did not present a significant increase in the production of information. In an attempt to better understand this information, an individual analysis of each participant was conducted, and the results revealed an increased flow of words per minute in 70% of cases. Thus, although the statistical test did not show a significant difference, the descriptive results are considerable, as they demonstrate the importance of developing new studies with larger samples.

However, this study revealed an increase in articulatory rate when comparing the pre– and post-therapeutic program assessments. According to the reviewed literature, other studies have also found a lower speech rate in stutterers, and they justify it by the need for more time to process language and phonological information, as well as by the underlying neuromotor and rhythmic disorder, which are directly associated to articulatory rates, and are reflected in compensating control movements 33.

Studies show that there is a relationship between stuttering severity and information production (flow of words per minute) and articulatory (flow of syllables per minute) rates, that is, as stuttering becomes more severe, the stutterers' information production and articulation rates are reduced 33,34. The greater the stuttering severity, the greater the delay at the onset of sound, and the longer the articulatory transition period, thus creating a smaller flow of syllables and words per minute 14,33.

Please note that the findings of this study partially support the literature, as the data on articulation rates are similar, but the data related to information production rates do not confirm the literature, based on statistical analysis. However, the group (70%) has also shown a tendency to exhibit an increased flow of words per minute, with reduced stuttering severity. This could be explained by the fact that this population is young, and because the assessment was done immediately after the end of the therapeutic program. It is suggested that children start adjusting to the newly acquired speech pattern, and over time as they develop, children can balance their production of information.

The Stuttering Severity Instrument [25] is considered an important test used to assess therapeutic efficacy. The findings revealed important data: the program prompted a significant reduction of frequency measurements regarding final test score, stuttering-like disfluencies and physical concomitants. Please note that some researchers believe that this test is less objective than other speech measurements (stuttering-like disfluency percentage, flow of words and syllables per minute), and should be used carefully, as it involves the attribute of scores, especially related to physical concomitants for areas that are more vulnerable to environmental factors [35]. However, there was little change with respect to the average length of the three longest stuttering-like disfluencies. This finding may be associated with the small number of research participants, since the small sample size may not have provided sufficient statistical power to the study with regard to this parameter. Studies with more significant sample sizes are needed to clarify this issue.

Following are a few considerations for future stuttering therapy studies. The first one relates to monitoring the fluency transfer and maintenance process over time. Currently, speech therapy may use technology to facilitate obtaining more satisfactory results. Virtual reality (VR), a human-computer interface that simulates real-life situations [36], is an example of a resource that has been used in therapy for stutterers, as it has shown a potential to increase the transfer and generalization of the fluency achieved in therapy [37]. It is suggested that technological resources are added to "traditional" therapy in order to increase stutterers' motivation and therapeutic efficacy.

The second suggestion is to assess topics related to stutterers' quality of life before and after the therapy [5,7], since stuttering causes an impact on their thoughts, feelings and behaviors [7]. In that

sense, subjective data such as those obtained from self-reports developed by stutterers should be added to the objective speech data assessed by the therapists [4,5,13,24].

The addition of speech naturalness assessment before and after the therapy is relevant [9,38], since speech literature shows that stutterers' post-treatment speech is perceived as less natural than the speech of those who are typically fluent [39].

CONCLUSION

Based on the pre– and post-therapeutic program assessment applied to the 10 school-age children with persistent developmental stuttering, it can be concluded that:

1) There was a decrease in the frequency of other and stuttering-like disfluencies at the post--therapeutic program assessment;
2) Most of the group presented a decreased stuttering severity, mainly related to stuttering--like disfluencies frequency and physical concomitant scores after the therapeutic program, and;
3) There was an increased articulation rate or in flow of syllables per minute, and a tendency for the group to increase production of information or flow of words per minute.

Thus, the results may assist speech-language therapists in their clinical practice, both in therapy and in diagnosis and control of therapeutic efficacy. An important addition would be to examine the degree of satisfaction with the program, both from the child's as well as the family's point of view, in order to ensure an improved quality of life for these subjects.

Finally, it is worth noting that the fluency assessment test and the Stuttering Severity Instrument used proved to be useful tools to monitor the therapeutic process and fluency improvement, thus it should be included in routine clinical diagnostic and therapy effectiveness assessments.

ACKNOWLEDGMENTS

We would like to thank the Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP) for their support with the development of this research, under process number 2010/18223-8.

RESUMO

Objetivo: comparar a fluência de crianças com gagueira quanto à porcentagem de sílabas gaguejadas, porcentagem de descontinuidade da fala, fluxo de sílabas e palavras por minuto e gravidade da gagueira, em situação de pré e pós-aplicação do programa de intervenção fonoaudiológica. **Método:** participaram 10 crianças, na faixa etária de 6.0 a 11.11 anos, sendo 9 do gênero masculino e 1 do gênero feminino, provenientes do Laboratório de Estudos da Fluência. Todos os participantes deste estudo foram submetidos aos seguintes procedimentos agrupados em três etapas: (a) avaliação da fluência inicial; (b) desenvolvimento do processo terapêutico, e; (c) reavaliação da fluência. **Resultados:** em relação à avaliação após o programa terapêutico, observou-se uma melhora relevante no perfil da fluência, pois a maioria das medidas analisadas (descontinuidade de fala, disfluências gagas, fluxo de sílabas por minuto e gravidade da gagueira) apresentou diferenças estatisticamente significantes. Os achados indicaram que houve uma redução quantitativa nas rupturas o que ocasionou um aumento no fluxo de sílabas por minuto, e também uma diminuição na gravidade da gagueira. Estes resultados confirmam a eficácia terapêutica do programa de terapia aplicado. **Conclusão:** os resultados encontrados podem auxiliar o fonoaudiólogo em sua prática clínica, tanto na terapia como na realização do diagnóstico e do controle da eficácia terapêutica.

DESCRITORES: Fonoaudiologia; Gagueira; Distúrbios da Fala; Fala; Fonoterapia

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Received on: 16/02/2012
Accepted on: June 19, 2012

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