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Integrated assessment of fluency: a magnified view of the speech care

Avaliação integrada da fluência: uma perspectiva ampliada do cuidado fonoaudiológico

La evaluación integrada de la fluidez: una vista ampliada del cuidado fonoaudiológico

*Débora Vasconcelos Correia**
*Attanna Thuanna Ferreira de Andrade**

Abstract

The fluency is a skill that involves the participation of multiple neural systems, mainly the processing of language, speech, voice and hearing. Such interfaces justify the need to consider in its dynamic speech evaluation, its interactions with other specific content of the Speech-Language and Hearing Sciences. The present article, theoretical, consists in a non-systematic review of the literature that aims to discuss the process of speech-language assessment of fluency, through a perspective of integrality of care. This discussion is intended to contribute to the consolidation of the cross-sectional nature of fluency in the national literature, consistent with the complexity of its neurophysiologic nature; as well as to promote the speech pathologist, information and observations necessary for its applicability in practical context. For this reason, the communication was structured in two main sections: presentation of the evaluation process of the fluency, and discussion about integrated assessment of fluency. Thus, concluded that, for an integrated assessment of speech fluency, is necessary to go beyond the identification of observing, and completion of the calculations of speech speed. Requires in-depth knowledge about the nature of the fluency, while skill and area of Speech-Language and Hearing Sciences, for the exercise of clinical reasoning that contemplates the unicity of each subject, as well as its communicative needs in addition to the complaint, glimpsing the health of your communication.

Keywords: Speech, Language and Hearing Sciences; Comprehensive Health Care; Stuttering; Childhood-Onset Fluency Disorder.

* Universidade Federal da Paraíba, João Pessoa, Paraíba, Brazil.

Authors' contributions:
DVC – Study conception and writing; ATFA – Literature review and study writing.

Correspondence address: Débora Vasconcelos Correia fgadebora@gmail.com
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Resumo

A fluência é uma habilidade que envolve a participação de múltiplos sistemas neurais, principalmente, dos processamentos da linguagem, fala, voz e audição. Tais interfaces justificam a necessidade de considerar na dinâmica avaliativa fonoaudiológica, suas interações com os demais conteúdos específicos da Fonoaudiologia. O presente artigo de cunho teórico, consiste em uma revisão não-sistemática da literatura que objetiva discutir acerca do processo de avaliação fonoaudiológica da fluência, mediante uma perspectiva de integralidade do cuidado. Tal discussão visa contribuir para a consolidação do caráter transversal da fluência na literatura nacional, coerente com a complexidade da sua natureza neurofisiológica; bem como favorecer ao fonoaudiólogo, informações e reflexões necessárias para a sua aplicabilidade em contexto prático. Para isso, estruturou-se esta comunicação em duas principais seções: apresentação do processo de avaliação da fluência, e discussão acerca da avaliação integrada da fluência. Dessa forma, conclui-se que, para uma avaliação fonoaudiológica integrada da fluência é necessário ir além da identificação das rupturas e realização dos cálculos de velocidade de fala. Requer conhecimento aprofundado sobre a natureza da fluência, enquanto habilidade e área da Fonoaudiologia, para o exercício do raciocínio clínico integrado que contemple a unicidade de cada sujeito, bem como suas necessidades comunicativas para além da queixa, vislumbrando a saúde da sua comunicação.

Palavras-chave: Fonoaudiologia; Assistência Integral à Saúde; Gagueira; Transtorno da Fluência com Início na Infância.

Resumen

La fluidez es una habilidad que implica la participación de múltiples sistemas neuronales, principalmente el procesamiento del lenguaje, el habla, la voz y la audición. Esas interfaces, justifican la necesidad de considerar en su discurso de evaluación dinámica, sus interacciones con otros contenidos específicos de la Fonoaudiología. El presente artículo, teórico, consiste en una revisión no sistemática de la literatura que tiene como objetivo analizar el proceso de evaluación de la fluidez, a través de una perspectiva de integralidad de la atención. Esta discusión se destina a contribuir a la consolidación de la naturaleza transversal de la fluidez en la literatura nacional, en consonancia con la complejidad de su naturaleza neurofisiológica; así como promover la logopeda, información y las observaciones necesarias para su aplicabilidad en el contexto práctico. Por esta razón, el artículo se estructura en dos secciones principales: presentación del proceso de evaluación de la fluidez y discusión sobre la evaluación integrada de la fluidez. Por lo tanto, se concluye que, para una evaluación integrada de la fluidez es necesario ir más allá de la identificación de las disfluencias, y la realización de los cálculos de velocidad de habla. Requiere un conocimiento en profundidad acerca de la naturaleza de la fluidez, mientras que la habilidad y el área de la Fonoaudiología, para el ejercicio de razonamiento clínico que contempla la unicidad de cada asignatura, así como sus necesidades comunicativas además de la denuncia, vislumbrando la salud de su comunicación.

Palabras clave: Fonoaudiología; Atención Integral de Salud; Tartamudeo; Transtorno de Fluidez de Inicio en la Infancia.

Introduction

Speech fluency refers to the continuity and smoothness of speech that involves a complex integration and synchronization of linguistic, cognitive and motor elements necessary to produce a fluent speech[1]. In order to explain its neural basis, fluency was analyzed in cases of change of its typical pattern, which is characterized by the predominance of disfluencies, through the analysis of its neurophysiological dynamics under fluency-inducing conditions. Based on this research perspective, the Dual Premotor Model, which addresses the hypothesis that premotor systems, medial and lateral, control the timing of the articulatory speech segments under different conditions, contributed to clarify the neural basis of stuttering, besides explaining about the neurophysiology of fluency.

The Dual Premotor Model assumes that the medial premotor system controls the motor timing of spontaneous propositional speech, whose main components are the base core and the supplementary motor area; while the lateral premotor system controls the timing of speech segments linked to external stimuli, such as the metronome, and has the lateral premotor cortex and the cerebellum as its main components[2]. This operation of different motor systems for different speech conditions affects the fluency that may have more or less discontinuity, according to its communicative production context.

Given this neurophysiological and theoretical framework, there are two key terms that can be selected to reflect on fluency, namely: **timing** and **speech**. Considering that fluency requires timing patterns, and that some situations that affect fluency in people who stutter occur when there is a change in the auditory feedback of their own speech; leads to the reflection that auditory processing issues should be considered, especially time processing in cases of fluency changes. On the other hand, when analyzing the association of fluency with speech, it is important to address it in a broader perspective, that is, to understand speech as the motor expression of language, which is made possible through the mechanisms of vocal production. This fluency approach leads to a broader view of speech-language pathology and audiology and audiology care and, consequently, results in a therapy consistent with the dynamic complexity of the area.

Therefore, this theoretical study consists of a non-systematic literature review that aims to discuss the speech-language pathology and audiology evaluation process of fluency, through a perspective of comprehensive care. In order to indicate and provide space for reflections that are required to deepen the topic in the national literature, and its applicability in the therapeutic context. To this end, the discussion should be guided by the fluency assessment procedures that lead to a broader clinical reasoning; as well as by the need for interdisciplinary integration, which highlights the cross-sectional character of the area through its associations with other specific contents of Speech-Language Pathology and Audiology and: fluency and orofacial motricity; fluency and vocal aspects; and fluency and auditory processing.

Speech-Language Pathology and Audiology assessment process of fluency

The Speech-Language Pathology and Audiology assessment process of fluency basically involves three steps: the initial interview (anamnesis); the evaluation of fluency; and the analysis of qualitative and quantitative data for diagnostic conclusion and design of the proposed therapy. Regarding these steps, the initial interview and data analysis stand out as the most relevant for the application of a clinical reasoning, which is required for the development of an integrated fluency assessment.

The **initial interview** consists of questions related to the patient's complaint. It addresses the collection of information related to the onset of fluency changes, its duration and description; risk factors, such as inbreeding, heredity and brain damage; language development in general, with its respective milestones; and health history, with an analysis of medication use and history including infections, poisoning, accidents and hospitalizations[4]. It should be noted that the initial interview should be adjusted to the age group of the patient, so that it also must address questions associated with the quality of life, educational and/or professional aspects and analyze the fluency-inducing factors, as well as aggravating factors of the disorder.

During the initial interview, the speech-language pathologist is able to raise hypotheses on the observational data related to fluency that will be obtained in the next step of the assessment process. As an example, it is possible to consider

a patient who reports too much effort to talk during the initial interview. In this case, blocking will probably be one of the most frequent disruptions in the subject's speech, so that fluency may have a predominance of change in the effort and continuity parameters. Thus, since the initial interview, the speech-language pathologist may raise the possibility of performing evaluations related to other speech-language aspects that are necessary to better elucidate and conduct the case.

The **fluency assessment** refers to the second step of the speech-language pathology evaluation process for people with complaints of changes in their language skills. Currently, this step involves the collection and transcription procedures of speech samples, identification of typical stuttering disfluencies (TSD) and other disfluencies (OD), as well as the respective calculations of disruption frequency and speech rate[5]. This entire process occurs through the visual and auditory analysis of fluency, which is video-recorded.

The **analysis of qualitative and quantitative data** is the third step of the assessment process. Initially, this step is performed for diagnostic conclusion, interventional projection and identification of aspects that require further and or complementary evaluation. However, such analysis should be perpetuated throughout the therapeutic process, since it will ensure the flexible nature of interventional practices and the quality of the care provided.

As in the case of a qualitative data that indicates the possibility of complementary speech-language assessment, it is possible to consider the case of a preschool child with complaints of change in fluency. His family reports observing that the child has difficulty "obeying" commands and seems to "forget" them quickly, as well as being "lost" when trying to perform the commands. This kind of data raises the need to investigate the hearing skills of this child, as well as the aspects related to his fluency complaint. This is especially due to the fact that some fluency disorders, such as stuttering, are associated with factors linked to central auditory processing[6].

Data of a quantitative nature may also indicate the need to investigate the other specific contents of Speech-Language Pathology and Audiology, in addition to fluency. As an example, we can use an adult patient who has numerous speech segments characterized by oscillations of vocal intensity and frequency, along with a high percentage of TSDs highlighting blocking. For this case, it is important to consider the need to evaluate vocal aspects, since there are factors that may cause vocal changes when manifested, such as the inadequate coordination between breathing and phonation; as well as the specific tension in the vocal tract during speech; contraction of cervical and/or abdominal muscles during emission; the use of basal registration in habitual emission and undifferentiated articulation[7]. Changes in respiratory, phonatory and articulatory synchrony may occur in people who stutter due to involuntary interruptions that take place during the stuttered word[8].

In addition to the components and parameters related to the fluency, the speech-language pathologist and audiologist who works in the area should also be aware of the research on linguistic aspects, in terms of language processing levels. Especially for cases that arise in childhood, in which a careful analyze beyond fluency is required, mainly due to the fact that this age group is in the process of language acquisition and development[9]. In this regard, researchers[10] have focused on the study through electroencephalographic techniques, such as the linguistic processing of stuttering preschool children, at the semantic and syntactic processing levels of language. Such an investigation was the first to prove that differences in brain potentials related to events that reflect language processing occur early in preschool-stuttering children. In addition to providing the first evidence that the atypical lateralization of hemispheric language functions, which were previously observed in the brain of stuttering adults, begins to appear in the early phase of stuttering, even in the absence of any requirement to speak.

These findings indicate the need to progress and refine the speech-language assessment process since, although the language skills measured by standardized tests may be within the normal range, the underlying brain activity regulating some aspects of semantic and syntactic processing may have a different impact in adults[11] and children[10] who stutter. Therefore, it is necessary to diversify the nature of evaluative data by prioritizing qualitative and quantitative analyzes in order to have a broader view of the clinical needs of the patient. To this end, the speech-language pathologist uses resources that assist in recording and analysis activities, such as camcorders, video display and editing software, digital spreadsheets, etc[12,13]. The

use of such resources provides time optimization and greater accuracy of results, enabling the construction of evolutionary graphs that may assist in the development of speech-language pathology and audiology reports.

It should be noted that the use of such resources assists the evaluation process, which occurs through protocols available in the literature; however, the selection of such instruments and procedures is not a simple task[14]. The speech-language pathologist who is not aware of the neurophysiological dynamics of fluency may still have difficulties in designing a broader clinical reasoning for the care of this specific audience. Given that fluency, in neurophysiological terms, is a highly refined skill that establishes multiple intersections with the neural systems that underlie the organization and functioning of language, motor skills, voice processing and sounds.

This clinical screening insight, which aims at diagnostic completion and at the design of a customized and efficient therapeutic proposal, should be initiated from the first contact with the patient. In order to develop a deeper professional performance in the area, since August 19, 2017, speech-language pathologists and audiologists in Brazil may have a specialization in fluency, according to Resolution No. 507 of the Brazilian Federal Council of Speech-Language Pathology and Audiology[15], which regulated the Specialization in Fluency in Speech-Language Pathology in the country. And it enabled the opportunity of specialized care for people with fluency disorders, and also favored the development of the profession.

Integrated fluency assessment: cross-sectional nature and clinical reasoning

The argument on the importance of developing an interventional practice based on comprehensive care can often suggest the refusal to a specialized approach. As if the specialized practices were designed in opposition to the perspective of comprehensiveness. However, the purpose in this communication is to show the importance of being a professional with the knowledge required to exercise the specific skills and competencies of the speech-language pathologist, that is, to be a specialist in fluency with mastery. This statement may seem redundant, but the clarity of this structural idea raises the degree of commitment and responsibility towards the practice of fluency teaching in undergraduate courses, as a key content with other Speech-Language and Hearing Sciences expressed in the National Curriculum Guidelines[15] in force.

Thus, working with fluency requires considering its relations with the other interfaces of speech-language pathology, ranging from the evaluation process to discharge. In this context, the professional performance in cases of fluency occupies higher levels in their practice, as they move away from the reductionist perspective of care focused on the complaint and move to a broader and far-reaching perspective that sees the subject, as well as their several clinical needs occupying not only the locus of the complaint, but also the perimeter that surrounds other Speech-Language and Hearing Sciences.

The implementation of this broad perspective on fluency in the speech-language pathologist knowledge equally favors the two cases of vocational training: the generalist (undergraduate), for not depriving the student of knowing fluency and its cross-sectional nature as a clinical specificity of speech-language pathology, and the possibility of having a specialization on it or not; and the specialist (graduate), as it provides a tangible understanding of the complexity of their object of study and performance, as well as locating and directing it in the performance of their role in a scientific updated and integrated manner, according to the permeability and depth of knowledge that the area allows to achieve.

In this context, the speech-language pathology evaluation process starts to consider the implications of changes in fluency in the communication health of those who affected, which makes it possible, therefore, to include the evaluation of motor skills as a complementary procedure in the dynamics of speech-language evaluation of fluency. This relationship between **fluency and motricity** is justified by the common neurophysiological basis, since the premotor systems that control fluency also impact on speech and other automatic motor skills. This sharing of neural bases establishes the interface between fluency and motricity, and gives significance to the assessment of articulation patterns, breathing, body posture organization and identification of specific tension points that can aggravate the fluency change and/or intensify the physical concomitants, thus causing greater communicative damage.

The relationship between fluency and orofacial motricity was discussed in a study[16] on the analysis of the national speech-language pathology production related to stuttering, between 1980 and 2008. In this analysis, the productions related to Orofacial Motricity and Language were significantly higher than the others. Of the 131 publications analyzed, 48 were focused on stuttering and motor skills, and 43 were related to the interface with language. This evidence of the last decades strengthens the link between fluency and motor skills, and indicates the need to invest in this relationship both in the clinical setting and in the context of research.

In this regard, an assessment protocol for measuring the orofacial skills of children who stutter, namely the MANS (The Movement, Articulation, Mandibular and Sensory Awareness), has been a valid and reliable tool in order to assess orofacial skills and distinguishing fluent children and children who stutter[17]. Therefore, it was observed that fluent children had better orofacial skills than those who stutter; and, among those who stutter, children who had better orofacial skills also had better prognosis.

In Brazil, there is the Speech Motor Performance Protocol (PPMF)[18] which is intended for the assessment of children who stutter, while other age groups may apply existing and widely used instruments in the area of Orofacial Motricity. As an example, there are the protocols of Orofacial Myofunctional Assessment (MBGR)[19] and the Orofacial Myofunctional Assessment with Scores (AMIOFE)[20], with emphasis on the use of the sections of greatest interest to fluency, such as those dedicated to the assessment of the phonoarticulatory organs, articulatory dynamics, speech and breathing.

It is interesting to emphasize that fluency skills depend on the speech and breathing functions, since changes in the articulatory and respiratory pattern may lead to a discontinuity in the speech. With respect to articulation, Merlo and Barbosa[21] conducted a case study comparing several acoustic parameters of smooth speeches with the usual speech of a person who stutters. The authors noticed that smooth speeches are presented as a hypoarticulated mode of speech, without changing the articulatory precision, so that smoothing allowed the reduction of disruptions, affecting the glottic level and significantly modifying the prosody of speech.

Smoothening is one of the therapeutic strategies used in speech-language pathology care for people who stutter and who have other fluency disorders. This communication will not focus on the smoothing strategy itself, but on its impact on fluency. When referring to the glottic level and prosodic modification, the clinical speech-language pathology reasoning will automatically refer to the contents of the Voice area. This association is possible due to the existing interface between **fluency and vocal aspects**.

Tangibly, the Speech-Language Pathologists need a background on the dynamics of vocal processing and production, as well as knowledge about the implications that changes in fluency may have on this dynamics. In this context, it is important to understand that the auditory-perceptual assessment is one of the most traditional, but no less effective, ways to investigate vocal parameters. This assessment is regarded as a basic, indispensable and sovereign procedure for the speech-language pathology clinical practice in the Voice area[22]. However, when associated with acoustic evaluation, it enriches the qualitative and quantitative data of the patient assessed, besides assisting to choose the clinical procedures used in therapeutic practice[23].

Both auditory-perceptual assessments and acoustic data, through spectrographic tracings, allow a thorough analysis of tension and phonatory effort, as well as the changes of vocal frequency and intensity evidenced by the patient, favoring a broader speech-language pathology perspective on their clinical needs. Caputo[24], aiming to describe the perceptive and acoustic vocal aspects and the vocal tract adjustments in subjects with different degrees of stuttering, noticed that those who had higher degrees of severity of the disorder had the most changes in the three aspects evaluated. Similar to the relationship established between the presence of changes in orofacial skills in stuttering children and the therapeutic prognosis[17], changes in vocal aspects in adults were also found as factors that aggravate stuttering.

These aspects indicate the need to include fluency and its interfaces in the evaluation process. Since the synchronization of breathing, phonation and articulation requires harmony in the motor act, which generates the fluency[25]. In cases of stuttering, all of these domains are subject to changes and are prone to the incorrect adjustment of the parameters of continuity, rate/time and effort involved in speech.

The idea of flow is also highlighted when time is highlighted as an aspect related to fluency. In a way that all this mechanism of harmonic speech processing and production, sequentially and also in the chain of time, situates fluency as a skill that is responsible to conduct it. According to the concept proposed by ASHA[26], fluency is presented as an aspect of verbal production that is related to the parameters of rate, continuity and effort with which the phonological, lexical, morphological and/or syntactic units are produced. As it involves rate and continuity, it is also necessary to discuss the interface between **fluency and auditory processing**.

The possibility of investigating auditory skills in cases of fluency is based on behavioral and electrophysiological findings that support the hypothesis of stuttering, which is the primary fluency disorder, being associated with deficits in cortical auditory system modulation during speech motor planning. Such disorders are due to difficulties in speech sensorimotor integration, which contribute to the inefficient monitoring of auditory feedback and increased disfluencies[27]. Therefore, fluency and hearing interface cannot be neglected in order to develop a broad and scientifically based speech-language pathology assessment practice. Since this relationship has already been established in the therapeutic context as auditory temporal cues, through delayed auditory feedback (DAF), for example, it have been used as strategy to promote fluency in stuttering cases[3].

When analyzing this interface, researchers[28] are suggesting incorporating the behavioral assessment of auditory processing in the specific assessment dynamics for stuttering, in accordance with the high rate of central auditory processing changes in this population. As a screening instrument, the speech-language pathologist may use the Auditory Processing Domains Questionnaire (APDQ), which is validated for Brazilian Portuguese[29], in addition to referral to perform standardized cabin tests, especially those for temporal auditory processing. Such emphasis on this type of processing is due to studies conducted with people who stutter, whether they are children[30] or adults[6], who observed a poor performance in tasks involving temporal auditory processing.

It can be observed that most of the studies that establish the relationship between fluency changes and other Speech-Language Pathology interfaces were conducted with people who stutter. However, although much of the literature used in the preparation of this study fosters the discussions of fluency in light of clinical cases of stutterers, the proposal for an integrated assessment of fluency as a broader perspective of speech-language pathology presented here goes beyond stuttering, or any other fluency disorder. Since it lies in facing fluency as an inherent skill in the development of the communication health of any speaker; therefore, the target of speech-language pathology care.

Addressing a clinical performance based on connectivity and sharing of specific knowledge, scientific evidence, techniques and interdisciplinary procedures of speech-language pathology in the context of evaluation will affect the performance of speech-language pathology not focused on the complaint, but on the subject. Thus, the work of speech-language pathology in fluency will be focused on the assistance of all cases a difficulty is found in this language skill and the consequent damage to the health of communication.

Final Considerations

This study allowed noticing that the speech-language pathology and audiology assessment of fluency is not restricted to the identification of disruptions and speech rate calculations. This "beyond" is due to the cross-sectional character of fluency, arising from its neurophysiological nature involving multiple neural systems and cognitive domains. The low flexible profile gives uniqueness to the fluency of each speaker, which implies the need to conduct a thorough and specialized evaluation process.

Therefore, with the regulation of specialization in Fluency in Speech Therapy in Brazil, a larger number of scientific production is expected in the area, with studies focused on the investigation of the typical development and deviation of fluency, to the profiling of fluency in many regions of the country, the analysis of fluency in the various communication disorders, as well as the investment in the development of assessment tools and improvement of techniques for collecting and analyzing qualitative and quantitative data. All these possibilities of scientific development in the area will assist speech-language pathologists in the clinical setting, so that they will be able to make use of these studies to support their practice in a broader perspective of care.

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