

## Revision articles

# Nonverbal praxis in speech pathology: literature review

## *Praxia não verbal na fonoaudiologia: revisão de literatura*

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## ABSTRACT

Speech is defined as a motor representation of language, where there is a coordination of three neurological processes: organization of concepts, formulation and symbolic expression; motor act of programming involved in speech production and own motor speech production. The Motor Speech Control, that orders the muscle contraction for the execution of Speech, includes planning, preparing movements and the implementation of plans to result in muscle contractions and dislocations of structures that will culminate in the articulation of Speech. National and international scientific papers envision a new speech playing field for working with a Speech changed with the stimulation of non-verbal Praxis. The aim of this study was to review the national and international literature which the treatment given to Oral Praxis and non verbal and scores the clinical applications in the Speech therapy. We conducted a search in the databases PubMed, Lilacs and Scielo. The 40 selected citations were assessed critically as the objectives, results and conclusions. The articles showed that non-verbal praxis can be stimulated for clinical work with speech, but nevertheless, there is not a description of this speech therapy. Any article referred that the non-verbal Praxis should be worked, not even how to stimulate motor programming for Speech. This study suggests the clinical necessity to create speech therapy tools that include stimulation of non-verbal Praxis to work with the articulation of Speech.

**Keywords:** Speech; Articulation Disorder; Motor Skill; Stomatognathic System; Muscles

## RESUMO

A Fala é definida como representação motora da Linguagem, em que há a coordenação de três processos neurológicos: organização de conceitos, formulação e expressão simbólica; programação do ato motor envolvido na produção da fala; e sua própria produção motora. O Controle Motor da Fala, que ordena a contração muscular para a sua execução, inclui o planejamento, a preparação de movimentos e a execução de planos para resultar em contrações musculares e deslocamentos de estruturas que culminarão na articulação da Fala. Os estudos científicos nacionais e internacionais vislumbram um novo campo de atuação fonoaudiológica para o trabalho com a fala alterada, com a estimulação da Praxias Não Verbais. O objetivo deste trabalho é revisar, na bibliografia, o tratamento dado às praxias orais e não verbais e pontuar suas aplicações clínicas no âmbito fonoaudiológico. Realizou-se uma busca nas bases de dados PubMed, Lilacs e Scielo. As 40 citações selecionadas foram avaliadas de forma crítica. Os artigos mostraram que a Praxia Não Verbal pode ser estimulada para o trabalho clínico com a Fala, no entanto, não há descrição do trabalho fonoaudiológico, tampouco um detalhamento dos exercícios em sequência que poderiam ser utilizados. Nenhum artigo apontou para o modo como as Praxias Não Verbais deveriam ser trabalhadas, nem mesmo como estimular a programação motora para a Fala. Este estudo propõe a necessidade clínica de criar instrumentos de intervenção fonoaudiológica que incluam a estimulação das Praxias Não Verbais para o trabalho com a articulação da Fala.

**Descritores:** Fala; Transtornos da Articulação; Sistema Estomatognático; Destreza Motora; Músculos

## INTRODUCTION

Speech is defined as motor representation of language, where there is the coordination of three neurological processes: organization of concepts, formulation and symbolic expression; programming of the motor act involved in speech production; and its own motor production of speech. It requires adequate cognitive and phonological developments and full integrity of the neurological system and oral facial structures. The acquisition of phonemes implies perception, organization and production of sounds and has been widely studied<sup>1,2</sup>. It is a quick control task where movements must take place in a few milliseconds, requiring high temporal resolution<sup>3</sup>. The neurophysiological processing of fluent speech depends on the stability of temporal coordination between motor execution skills and representation of cognitive processing<sup>4</sup>.

In 2004, a scientific publication in *the Brain*<sup>5</sup> described a new cerebral area to control the articulatory movements relating to speech. By studying the cerebral subjects with apraxia of speech (articulatory planning disorder), through imaging exams, the authors found that the same cerebral area, the insular cortex in the left hemisphere, presented itself with infarction, ie, lesion. From this scientific milestone, this cerebral area becomes recognized as the *Dronkers* area, a new area involved in the movement of motor planning for speech.

Motor Control which orders the muscle contraction for the execution of speech includes the planning, preparation of movements and execution of plans, aiming muscular contractions and displacement of structures that will culminate in the articulation of speech<sup>3</sup>. Children are not born with these movements already developed<sup>1,6</sup>. Verbal apraxia, which is the sequencing capacity of syllables within words - fluency involved in the sequence of required movements for oral expression - has its functional learning, ie, the interaction with its own speech production that will lead the child to learn them<sup>1,6</sup>.

In this sense, phonological acquisition interacts with the development of speech motor control<sup>7,8</sup>. Increased accuracy of movements and the development of the phonological system and lexical and cognitive ability result in an intelligible and efficient speech system<sup>7,9,10</sup>.

The scientific papers, representative in the international literature, envision a new phonological field to work with altered speech. In Brazil, in 1996, appearing for the first time in the scientific field was a publication on Non Verbal Apraxia whose authors<sup>6</sup> expose the

need to stimulate this aspect for clinical work with oral language. Broadening the national debate in 2015, the authors show that the praxis alterations of the stomatognathic system are present in individuals with phonological disorders and should be encouraged to correct the clinical framework<sup>9-11</sup>.

Thus, the aim of the present paper is to review, in the national and international literature of the past 16 years, the treatment of Oral and Non Verbal Praxis and score their clinical applications within the phonological scope.

## METHODS

Performed for the development of the present review, was a search in the PubMed, Lilacs and Scielo databases during the months from March to December 2015. Included were abstracts of articles published in the last 16 years (2000-2015), acquired from open access journals. Also included were book chapters, ASHA guidelines (American Speech and Hearing Association), doctoral theses and master's dissertations.

In conducting the research, with respect to data collection, four constructs were used: "speech" AND "articulation disorder" AND "rehabilitation of speech AND language disorders" AND "speech praxis".

The construction of "speech praxis" was made using variations with the associations: "oral facial praxis" OR "motor speech disorders" OR "speech praxis" OR "apraxia of speech" OR "developmental motor speech disorders" OR "developmental dyspraxia" OR "developmental verbal apraxia". After systematic evaluation of the articles found with all changes for the construct of "speech apraxia," the articles were included when presenting relevant content to oral and non-verbal apraxia. The pathology of apraxia was not the focus of the present research, since it sought to reveal the relevant content to the normality of apraxia and not the pathology. Undoubtedly, the clinical data regarding the pathology elucidated important aspects, and some of them will be cited and may corroborate the central ideas of the present study.

The survey was conducted in stages. First, constructs were sought separately, each with its due keywords. From the results of each, a new search with the combination of other constructs was performed. Such words were selected in specific articles of the area.

Citations in languages other than English, Spanish and Portuguese were excluded, as well as those

repeated by overlapping keywords. Evaluated were the texts which effectively related to the proposed research.

Identified were 67 valid citations for speech studies. In the first analysis, 26 texts were excluded, which were repeated by overlapping. Of the remaining 41, only 30 presented speech data, apraxia and rehabilitation. Book chapters (4), ASHA guidelines (American Speech and Hearing Association) (1), scientific conference proceedings (2) and master's dissertations (3) were also included. Therefore, the citations included in the study were 40.

The 40 selected citations were critically assessed regarding the objectives, number and gender of

participants, age, criteria and evaluation methods, results and conclusions. It included articles related to the presence of information and definition of praxic difficulties in different groups, articles pointing to the need for stimulation of Non Verbal Apraxia in clinical phonological therapy with speech and articles that expose different protocols for evaluating apraxia.

## LITERATURE REVIEW

The search for texts in databases was performed, in full, by the researcher, in order to minimize possible losses of citations (Figure 1).

Data base	Pubmed	Scielo	Lilacs
Descriptors			
Speech	98.625	570	3498
Speech+ Problems	44.584	36	327
Speech+ Problems+ Rehabilitation	3977	4	29
Speech+ Problems+ Rehabilitation+ Apraxia	6	1	1

**Figure 1.** Article distribution in database and key words (DECs)

From the *corpus* analyzed with respect to the literature, several aspects were relevant to define the route of contributions, with a view to the production of the present article (Figure 2).

Speech Motor Control is defined as “the set of systems and strategies that control the production of speech”<sup>3</sup>. It includes the planning, preparation and execution of movements that result in muscle contractions and structure displacement. The input to the motor control system is a speech phonological representation of language, especially a sequence of abstract units, such as phonemes. Speech motor control output is a series of articulatory movements that have the function of transmitting destined linguistic messages<sup>1,3,4</sup>. In fact, speech motor control must be understood in relation to the total communication process of human speech, including phonological processes and motors, a position reaffirmed in the present article<sup>4,9,10,21,22,26,27,31,32,37</sup>. Defined as the Dronkers area was the cerebral area for the coordination of articulatory movements of speech<sup>5</sup>. Speech Motor Control is developed differently from the initial speakers and depends on the interaction with the phonological development<sup>4,6,19,22,27,28</sup>.

In this perspective, articles were selected proposing stimulation of Speech Motor Control to adapt to patterns

in patients with deviations in oral verbal production, with or without diagnosed neurological conditions, since it is part of this control<sup>6,8-10,13,15,20,21,25,31,33,36</sup>, without excluding other involved aspects<sup>1,3,6,21,24</sup>. A recent study extends the work with speech, training and strengthening the network of reading and writing to children with apraxia<sup>35</sup>. In the literature, there are specific references that Non Verbal praxia sequences of lips and tongue movements should be encouraged to work with speech, even without neurological changes<sup>6,10,16,26,29,30,31,33,36</sup>, and there is the effectiveness of a muscle approach to work with it<sup>8,33,36</sup>.

Scientific studies indicate that the praxic difficulties in their groups, and especially in neurological disorders, were also included in the present research<sup>1,2,7,9,11,15,16,18,20,22,24,32</sup>. The most mentioned diseases were Parkinson's and Alzheimer's which were also defined as apraxia, since there is a basic neurological disorder that already aggravate the production of speech. Articles that dealt specifically with the work of speech apraxia were discarded, since the objective of the present study was whether the stimulation of work of Non-Verbal praxis is relevant in cases of speech alterations without neurological disorders. However, existing in studies of apraxia, is a report that stimulation of speech motor control should be part of the scope of

AUTHORS/YEAR/TYPE OF STUDY	OBJECTIVE	RESULTS
Kent D, 2000 <sup>3</sup> (scientific article - SA)	Search regarding Motor Control Speech and its pathologies: review and prospection.	The author emphasizes the importance of adding Motor Control to phonological aspects involved in speech, pointing to recent studies (at the time) to support this theory. It features a speech production scheme including linguistic processes, cognitive and sensorimotor, involved in the production of speech.
Houghton M, 2003 <sup>12</sup> (Book chapter)	Describe the use of PROMPT methodology (Prompts for Restructuring Oral Muscular Phonetic Targets) for individuals with severe speech disorders	The results showed that five children were successful in achieving the PROMPT methodology and obtained a better standard of speech. The author argues for the inclusion of this methodology for clinical work in phonological disorders without neurological disorders.
Fonseca et al. 2003 <sup>1</sup> (SA)	To investigate the relationship between the production of r-weak and tongue praxis in two groups: one with speech alteration and another control without manifestation.	The group, which had no sound in its inventory, had difficulty in performing some lingual praxis, the acquisition process of the r-weak, as well as in the treatment planning of patients with speech deviation. The article highlights the need for discussion of the relevance of the phonetic and phonological aspects in working with speech.
Ortiz KZ, 2004 <sup>13</sup> (Book chapter)	Presenting neurological changes in speech	Differences between frames of speech disorders acquired by neurological impairment. In these disorders, it is pertinent to point out that the assessment and intervention are different and from different conducts, but both include stimulation of speech motor control.
Kent R, 2004 <sup>4</sup> (SA)	Describe motor control models of speech: Implications of recent developments in neuropsychological and neurobehavioral science.	The results of the studies reviewed in this section argue that the structural deficit in speech apraxia cannot be confined to a particular psycholinguistic stage or a given level of speech motor control. The processing levels where deficits were found include almost all speech production chains, ranging from lexical storage and retrieval motor for the act of execution.
Dronkers N, Ogar J, 2004 <sup>5</sup> (SA)	Present a new area of the brain for the production of speech.	Speech production is a complex process, involving a network system of brain areas to which each contributes in a particular way. An area beyond the Broca's area, anterior insula spin was observed in the complex process of production of speech movements. Future studies associating apraxia, more specific symptoms of speech (eg, pure grope motor) with discrete brain areas may promote the understanding that there is a distributed network for this function, with the aid of imaging methods.
Farias et al. 2006 <sup>6</sup> (SA)	Verify the existence of a relationship between speech, tone and non-verbal apraxia of the stomatognathic system in preschoolers.	There is a relationship between the tone and non-verbal apraxia of language and also between non-verbal apraxia of language and speech. The authors propose that non-verbal apraxia is encouraged to work with speech.
Walker JF, Archibald ML, 2006 <sup>14</sup> (SA)	Describe articulation processes in children, of speech in movement	The authors studied the variations of the articulation rate in children aged 4, 5 and 6, to search for possible relationships between speech velocity, the time in which the articulators move and size of the spoken text, seeking theoretical contributions to the motor aspects and speech production time for development. The findings report that there is no difference between the rate of articulation between the ages surveyed and the speech motor control seems to develop non-linearly.
ASHA - Speech-Language Pathology Medical Review Guidelines <sup>15</sup> (ASHA)	Describe procedures to be used in clinical treatments for speech disorders.	The authors divide the speech disorders in neurological and muscle stimulation and advocate Speech Motor Control in neurological cases. For phonological changes, proposed stimulation of articulatory movements present in phonemes.
Dodd B, Mcintosh B, 2008 <sup>16</sup> 2008 (SA)	To assess the participation of the linguistic aspects and oral motor skills for speech regarding phonological disorders.	The results indicated that there is a sum of motor and phonological aspects involved in phonological disorders.
Wertzner HF, Alves RR, Ramos ACO, 2008 <sup>2</sup> (SA)	Verify the performance of children with and without phonological disorders, the existence of diadochokinesia and the correlation between this and the Percentage of Revised Consonants Correct Index.	The results indicate the interrelationship between the maturation of the speech motor processing and phonological development. It showed the importance of a diadochokinetic test for the assessment and differential diagnosis of phonological disorder.
Rebecca J, McCauley, Strand EA, 2008 <sup>17</sup> (SA)	Evaluate non-verbal standardized tests and oral speech performance in children.	The authors review the content and the psychometric characteristics of 6 tests currently published to assist in the study, diagnosis and treatment of speech motor disorders in children.

AUTHORS/YEAR/TYPE OF STUDY	OBJECTIVE	RESULTS
Brabo NC, Schiefer AM, 2009 <sup>18</sup> (SA)	Characterize the skills of verbal and non-verbal apraxia in stutterers.	Regarding verbal praxis skills, there were no statistically significant differences between groups. Regarding non-verbal praxis abilities, statistically significant differences were observed. The authors propose further tests to confirm the results found, since non-verbal apraxia may be related to the change in flow.
Martins O, 2009 <sup>19</sup> (SA)	Verify the interrelationship between working memory and verbal apraxia and explore which components of this memory would be involved in motor planning of speech.	The apraxic performance in memory tests was lower than the performance of the controls. People with apraxia have a deficit in working memory, which is related to the articulatory process. The authors offer the need for stimulation of memory, enhancing motor work with speech.
Souza TNU, Payão LMC, Costa RCC 2009 <sup>20</sup> (SA)	Review speech apraxia in childhood, in recent years.	It is necessary that childhood speech apraxia therapy addresses a joint action, programming aspects of language (such as phonological disorder) and pre-articulatory sequencing and motor programming.
Santana AP et al., 2010 <sup>21</sup> (SA)	Observe the relationship of phonological and articulatory aspects of the theory and its application in clinical practice.	Although phonetic deviation, in general, is characterized as a motor error, this does not mean that all these frames refer to an organic injury situation, there is, besides the affectation of anatomical and physiological levels, sequencing of problems and motor learning and / or auditory / perceptual difficulties. The author concludes that, in dealing with speech disorders, we have to consider what other skills also need to be addressed.
Souza APR, Pergher GL, Pagliarin KC. 2010 <sup>22</sup> (SA)	To assess the physical and bodily motors in a group of children with phonological disorder / delay.	Although not presenting significant results, the group with phonological disorders showed greater changes in non-verbal apraxia and late cephalic control, suggesting relations between phonetic and phonological disorders and between neuromotor immaturity and speech disorders.
Iverson J, 2010 <sup>23</sup> (SA)	To evaluate the language in a developing body: the relationship between motor development and language development.	During the first eighteen months of life, babies acquire and refine a range of new motor skills that significantly altered the ways in which the body moves and interacts with the environment. In this article review, the argument arises that motor skills provide children the opportunity to practice the relevant skills for the acquisition of language, before the need for the articulation of speech, so that they are relevant to both the communicative and general development for language acquisition. This perspective highlights the current views of language, the co-occurrence of motor aspect and oral language.
Aziz AA <sup>1</sup> , Shohdi S, Osman DM, Habib EI, 2010 <sup>24</sup> (SA)	Characterize the differences between language, speech and oral-motor aspects among children with apraxia and phonological disorders in Cairo.	The study included three groups: (1) formed by children without speech disorders, (2) with apraxia and (3) with phonological disorders. Groups 2 and 3 showed no differences in the oral-motor tests. It is concluded that this aspect should be stimulated for the two different groups for improving the symptoms in speech.
Marini C, 2010 <sup>25</sup> (Master's Dissertation)	Evaluate praxic skills in children with phonological disorders and typical phonological development.	The author compared the results between the 2 groups studied through evaluation of the stomatognathic system, the implementation of the Protocol of Bucofacial and Oral Praxis (Hage, 2000) and the Oral Praxis protocol (Bearzotti, 2007). Children with phonological disorders had lower responses in the 3 tests, when compared to children without alterations of the same age group.
Vidor-Souza D, Mota HB, Santos RM, 2011 <sup>26</sup> (SA)	Discuss the development of phonoarticulatory awareness and the relationship between perception and production of phonoarticulatory gestures.	The Articulatory awareness improves according to age and education. The better the performance in perceptual tasks, the better the performance in articulatory awareness of production tasks.
Mezzomo C <i>et al.</i> , 2011 <sup>27</sup> (SA)	Compare and analyze the repair strategies used by children with typical phonological acquisition, atypical and verbal dyspraxia.	The group with phonological disorders significantly showed the likelihood of omitting the segment and mainly perform assimilation and usual replacement. The verbal dyspraxia group is more restricted in typical and atypical acquisition in school and the clinical reality.
Costa PP, 2011 <sup>8</sup> (Master's Dissertation)	Verify the effects of myofunctional therapy in cases of phonological, phonetic and phonetic-phonological deviations.	The author shows that the myofunctional approach was effective in cases of phonological, phonetic and phonetic-phonological cases.
Souza TNU, Avila CRB, 2011 <sup>9</sup> (SA)	Assess the severity of phonological disorder, phonological awareness and praxis articulation in preschoolers.	The research group characterized by lower performance in phonological awareness and articulatory praxis and the presence of correlation between the severity of the phonological awareness and articulatory praxis disorders.

AUTHORS/YEAR/TYPE OF STUDY	OBJECTIVE	RESULTS
De Paolis et al., 2011 <sup>27</sup> (SA)	Assess whether production patterns influence the processing of speech in infants in the pre-linguistic stage.	Oral motor experiences in babbling and pre-linguistic language affects perception and speech production, with effects on social development. The results of this study discusses the possibility that babbling increases the sensitivity of babies input channels to the phonetic aspects and the speech flow, important for the acquisition of the initial language.
Denny M, McGowan RS 2012 <sup>28</sup> (SA)	Describe the implications of anatomical development and the language of motor control for Speech Production: a review.	The authors analyze the anatomical changes suffered by the child's language to adulthood. Imaging tests show that the modifications made to the structure change the motor control of the language that will be used for the articulation of phonemes.
Werzner H et al., 2012 <sup>29</sup> (Book chapter)	Promote increased Speech Motor Control by increasing the number of sequences per second, following / pataka / sequence and increasing the articulatory rate.	The authors suggest stimulation of the motor aspect of speech before the specific work with phonemes.
Busanelo-Stella A, Silva AM, 2012 <sup>30</sup> (Book chapter)	Describe the phonological therapy for speech.	The authors point out the aspects involved in the placement of phonemes, since the correction of muscle aspects changed before placing the point and articulation mode. Indicate work with the mobility of oral facial muscles when interfering in the production of phonemes and development of non-verbal apraxia that assist in the development of verbals.
Tomé MC, 2012 <sup>10</sup> (Book chapter)	Describe the phonological therapy in speech alterations.	The author raises the question of the aspects to be worked out to suit speech, especially those whose musculoskeletal component is present. It stresses the need to stimulate various aspects, including non-verbal apraxia to adjust the speech pattern.
Ruscello D, Vallino L, 2014 <sup>31</sup> (SA)	Describe motor learning as a phonetic strategy for speech to support its use in the acquisition and development of motor skills in children with clefts.	This article discusses motor learning as a methodology for the treatment of errors of sounds of compensatory speech. Not for details on what would be the exercises to be performed.
Brumbach ACD Goffman L, 2014 <sup>32</sup> (SA)	Discuss language processing interaction and motor skills in children with specific language impairment.	The Group of Children with SLI showed greater articulatory variability in the production of a phoneme and worst gross and fine motor skills compared to the control group. The results suggest overlapping domains of language on the motors.
Giannecchini T, 2014 <sup>33</sup> (Anais Congress)	Discuss speech motor control: stimulation of non-verbal apraxia in children.	The author proposed stimulation of movements in sequence of the lip and tongue for placement of phonemes for in children. The group that trained in nonverbal apraxia had better progress than those who are not trained.
Gubiano M and col., 2015 <sup>11</sup> (SA)	Verify and relate the performance of children with phonological deviation and phonological development typical in the evaluation of the stomatognathic system and oral facial praxic skills testing, evaluating their skills.	Children with phonological disorders presented more alterations of the stomatognathic system and oral facial praxic skills than those with typical phonological development, with improved performance with advancing age, finding these changes related to speech alterations.
Gubiani MB, Pagliarin KC, Keske-Soares M, 2015 <sup>34</sup> (SA)	Systematically review the literature, the main instruments used for the evaluation of apraxia of child speech.	It was possible to identify five instruments: Verbal Motor Production Assessment for Children, Dynamic Evaluation of Motor Speech Skill, The Oral facial Praxis Test, Kaufman Speech Praxis Test for children and Madison Speech Assessment Protocol. They are intended to evaluate the performance of praxis and / or oral facial movements, sequences of oral facial movements, simple phonemes articulation, complex phonemes and syllables, spontaneous speech, the adequacy of their prosody.
Almeida-Verdu ACM, Giacheti CM, Lucchesi FDM, Freitas GR, Dutka JCR, Rovaris JA, Marques PF, 2015 <sup>35</sup> (SA)	Discuss the effect of strengthening reading relations and stimulus control transfer of the production of speech of a child with speech apraxia.	The results corroborate previous studies favoring speech through equivalence relations and data on the benefit of the work, from the strengthening of the network of reading and writing.
Giannecchini T, Padovani M, 2015 <sup>36</sup> (Anais Congress)	Encourage Non Verbal Apraxia for the adequacy of speech patterns in adults.	The authors propose the stimulation of Non Verbal apraxia of the lips and tongue in adults to improve speech. The results indicate that the training of apraxias was effective for the articulation of phonemes.

AUTHORS/YEAR/TYPE OF STUDY	OBJECTIVE	RESULTS
Lorcan K, Hill E, Hamilton AFC, 2016 <sup>37</sup> (SA)	Present relations between cognition and motor aspects in preschool children.	There is evidence that the motor and social skills are intertwined. The authors selected a cognitive approach to this question and examined the relationship between four specific cognitive areas: theory of mind, motor skills, understanding and action imitation. A sample of 101 children of preschool age was evaluated. The results showed that action-understanding and imitation are correlated. These results imply that independent cognitive processes for social interaction and motor control can be identified in school and stimulation approaches should be applied to all these areas together, since they are interrelated.

**Figure 2.** Scientific literature selected for the theme non verbal praxis

therapy with those patients diagnosed with compromises, with significant referred results<sup>7,13,15,20,22</sup>.

Before the discussion of the clinical studies with praxis, cited in the present review, evident were the articles inserted in the bibliography, which is proposed to evaluate them. There are articles with protocols for evaluation and review which aspects are relevant to the evaluation process of praxis<sup>2,17,34</sup>. Among these, we can mention: performing praxis or oral facial movement sequences of oral facial movements, parallel movements involving more than one oral facial structure, articulation of simple phonemes, joint complex phonemes and syllables, in addition to spontaneous speech.

The phonological approach to clinical work with speech alterations should include auditory aspects, involving phonological awareness, and motor aspects<sup>6,8,10,12,15,20,26,29,30,33</sup>. Specific topics for this study<sup>6,8,10,12,29,31,33,36</sup> were cited. However, there is no description of the present study, nor a breakdown of the sequence of exercises could be applied. No article detailed the way in which Non Verbal praxis should be worked, not even how to stimulate motor programming for speech.

Although not cited in “Figure 2”, there are studies that disagree with the findings that stimulation of oral and non-verbal apraxia is beneficial to clinical work with speech. It was thought appropriate to quote them in this discussion<sup>38-40</sup>. For the authors, the hypothesis that motor learning is facilitated when broken down into smaller units, in the case of speech, is not valid. This separation into parts affects the correct production, causing a break in the necessary interaction between them for proper execution. The motor and linguistic aspects, in this view, are combined in an additive way for coordination of speech.

The literature proved itself undeniable regarding the fact that when it elects the specificity of praxis movement for clinical work with speech, focusing it with one of the parts to be encouraged, it allowed to consider, which is fundamental, the relevance of the “whole”, the sum of the motor and phonological aspects to work with language and speech.

## CONCLUSION

Speech Motor Control includes planning, preparation and execution of movements that result in muscle contraction and displacement of structures for the articulation of speech. Non-Verbal Praxis can be stimulated for clinical work with speech. However, there is no description of this phonological therapy, nor a breakdown of exercises in sequence that could be applied. We suggest encouraging the publication of case study types of work or researches and publication of language intervention methods that include stimulation of Non Verbal Praxis for the adequacy of speech.

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