

Instructional material on the management of altered speech related to velopharyngeal dysfunction

Jeniffer de Cássia Rillo Dutka^{1,2} Gabriela Aparecida Prearo¹ Ana Caroline Zentil Polzin¹ Camila de Castro Corrêa³ Maria Inês Pegoraro-Krook^{1,2} Luciana Paula Maximino^{1,2} 

¹ Universidade de São Paulo, Faculdade de Odontologia de Bauru - FOB/USP, Departamento de Fonoaudiologia, Bauru, São Paulo, Brazil.

² Hospital de Reabilitação de Anomalias Craniofaciais da Universidade de São Paulo - HRAC/USP, Bauru, São Paulo, Brazil.

³ Universidade Vale do Rio Doce, UNIVALE, Governador Valadares, Minas Gerais, Brazil.

A study conducted at the Faculdade de Odontologia de Bauru - FOB/USP, Bauru, SP, Brazil.

Financial support: This research was carried out with the support of the Fundação de Amparo à Pesquisa do Estado de São Paulo, process number 2015/26741-2

Conflict of interests: Nonexistent

Corresponding author:

Jeniffer de Cássia Rillo Dutka
Al. Octávio Pinheiro Brizzola, 9-75
Zip Code: 17043-101 - Bauru, SP, Brazil
E-mail: jdutka@usp.br

Received on: August 30, 2024

Received in a revised form on: October 15, 2024

Accepted on: October 21, 2024

ABSTRACT

Purpose: to develop and evaluate an instructional material addressing steps and strategies in speech-language therapy for the treatment of speech disorders related to velopharyngeal dysfunction (VPD).

Methods: a research taking place in three phases: 1) Planning and development of the material; 2) Evaluation of the material by speech-language therapists; and 3) Application of the material to undergraduate students of Speech-Language Therapy followed by an assessment of their understanding of the topic before and after viewing the material. Inferential statistics were presented by applying the Wilcoxon test to compare responses before and after exposure to the material, considering the level of significance less than or equal to $p < 0.05$.

Results: the content of the modules included: Velopharyngeal function during speech and VPD; Velopharyngeal sufficiency; Training of "modified breath and plosion" in speech; Training with sounds; and Tips for conducting speech-language therapy. In the second phase, five speech-language therapists evaluated the material from satisfactory to excellent, making suggestions that helped to improve it. As to the third phase, the average percentage of correct answers presented a significant increase of 23% after the students viewed the material ($p = < 0.001$).

Conclusion: the instructional material had its content and format evaluated from satisfactory to excellent by professionals; viewing by undergraduate students of Speech-Language Therapy increased their knowledge on the subject.

Keywords: Cleft Palate; Velopharyngeal Insufficiency; Speech Therapy; Speech Disorders; Speech



INTRODUCTION

The frequency of searches for health information on the internet has increased¹, which also applies to speech-language therapy issues². In this way, aware of the need to build knowledge about the particularities of communication disorders in cleft lip and palate (CLP), studies address the use of different technological means to share information and knowledge in this area. Among these are online manuals, websites, videos and applications.

A referral service for care for craniofacial anomalies in Chicago demonstrated the importance of the multidisciplinary team from the moment of prenatal diagnosis, to providing the first orientations to parents through direct communications, newsletters, and the institution's own website. The empowerment of parents of information has brought important results throughout the management with regard to CLP³.

Regarding the empowerment of information on CLP, websites on this topic in the United Kingdom provide good quality information in general, however, it is difficult for the general public to select which tool to use. Therefore, Google rank was not sensitive to bring websites with more complete and reliable information first. This finding reinforces that health professionals should guide the population about instructional tools/websites⁴.

Among the websites published, some focus on neuropsychomotor stimulation techniques⁵ and on psychosocial consequences⁶. Additionally, a blog on CLP and the aspects of hearing in these cases² was created, as well as a website to provide better communication between specialized professionals in the area of CLP/craniofacial anomalies and non-specialized professionals from other locations⁷.

The objective of some initiatives is to inform the population in general, aiming at social inclusion; this is the case of *Projeto Jovem Doutor* [Junior Doctor Project] on CLP, developed with children from 13 to 15 years old, which used electronic media resources to train young people in knowledge-multiplying agents on this topic for the community⁸. Within the scope of rehabilitation, other tools have also been developed, such as the mobile application *Fala nova, treino fácil* [New Speech, Easy Training], which addresses the organization of speech training in terms of frequency and repertoire of activities planned out of therapy⁹.

A speech-language therapist with general training may see patients with speech disorders related to velopharyngeal dysfunction (VPD) in their practice and,

as a consequence, search the internet for information on cleft lip and palate. Thus, the usability of communication and information technologies also extends to training professionals in more specific areas of speech-language therapy. Considering continuing professional development in this area, in particular, there is a shortage of materials about the management of speech disorders resulting from VPD in cleft lip and palate. The development of tools that enable a better understanding of the strategies for intervention in cleft lip and palate is therefore a necessity.

More specifically, VPD can result from velopharyngeal insufficiency, velopharyngeal incompetence or, still, from velopharyngeal mislearning for speech. The etiology of insufficiency is structural and associated with the lack of tissue in the soft palate or excessive space between the soft palate and the posterior pharyngeal wall (deep nasopharynx). The etiology of velopharyngeal incompetence is neurogenic and involves neuromotor impairment (hypotonia, dysarthria, apraxia, velar fatigue and stress), while mislearning refers to the internalization of a pattern of altered velopharyngeal function in speech, where a failure in velopharyngeal closure occurs in the production of oral sounds¹⁰. The latter can take place in specific sounds or systematically involve all speech sounds, as in cases of hypodynamic velopharynx.

The treatment to achieve velopharyngeal sufficiency for speech can be surgical or prosthetic, and the choice of the best approach for each case depends on the structural and functional conditions of the velopharynx¹¹⁻¹³. On the other hand, correcting mislearning of velopharyngeal function requires speech-language therapy, also often combined with the physical treatment chosen particularly for each patient based on their speech-language assessment¹⁴.

Several studies in the literature address speech-language therapy in speech disorders in patients presented with CLP and VPD¹³⁻²³; however, few present specific strategies for rehabilitation of the hypodynamic velopharynx and other velopharyngeal function inadequacies for speech, showing the fragility of this aspect. So, this study aimed to develop and analyze an instructional material addressing strategies in speech-language therapy for the treatment of speech disorders related to problems caused by velopharyngeal dysfunction.

METHODS

This study was carried out at *Hospital de Reabilitação de Anomalias Craniofaciais* and the Speech-Language Pathology Department at University of Sao Paulo, Brazil, upon approval of the local Ethics Committee under number 1397120, CAAE 51493015.1.0000.5441. It involved three phases: 1) planning and development of the material; 2) evaluation of the material by speech-language therapists; and 3) application of the material to undergraduate students of Speech-Language Therapy, where their understanding of the topic was assessed before and after exposure to the material.

During preparation of the material, special attention was paid to the steps and strategies for treatment of velopharyngeal dysfunction in order to eliminate the failure of velopharyngeal closure (gap) to correct nasal air leak during production of oral sounds. The material evaluation by speech-language therapists focused on technical and scientific quality, while the evaluation by students focused was on usability and student learning about the content applied.

Phase 1: Planning and Development of the Material

Filatro and Piconez's²⁴ proposal on the development of instructional design, encompassing planning and development, was used to prepare the material. In the planning phase, the theme, objective and target audience were defined, while a literature review on the works in the area was started. For the development of the material, a bibliographic update of the materials described in the literature was carried out, and the work of Polzin²⁵ used as a basis. In his work, Polzin²⁵ describes strategies for treating mislearning of velopharyngeal function for speech, as proposed by Ferreira et al.¹⁵ in the *Programa de Fonoterapia Intensiva* [Intensive Speech-Language Therapy Program (ISTP)]. In the development phase, videos were made from simulations of strategies used during diagnostic therapy, inserting images from the ISTP collection and internet sources (Google Images - Public Domain), seeking to facilitate understanding of the content covered.

After structuring a conceptual model, selecting images and preparing videos with simulations, a lesson was prepared for each module defined using PowerPoint®. A text for narration was developed to complete the preparation of the material. During the narration, it sought to establish a relationship with the audience using transitional expressions such as “let's address now...”, “we can see in the video...”. On the

slides, animations in the form of short sentences were introduced in order to highlight important aspects to reinforce understanding of the content. The material is aimed at students and professionals in the field of Speech-Language Therapy; therefore, specific clinical terms in the field of Speech-Language Therapy were used.

The videos were recorded with a Sony HDR-XR260 Handycam® HD 8.9 MP camcorder, in an acoustically treated room at the Experimental Phonetics Laboratory of (X-Insert after the blind evaluation process). Altogether, 15 videos were prepared with simulations of the strategies of interest. The videos of the five modules were edited using the software Camtasia Studio 8®, which allows saving of the finished video in MP4 format.

Phase 2: Evaluation of the Material by Speech-Language Therapists

The material developed was evaluated by five speech-language therapists who manage treatments of speech disorders related to VPD. After accepting and consenting to participate in this study, the therapists received the following materials via e-mail: a Dropbox® link to access the material presented in five modules; a script (script) of the material including the narrated text and images with space for suggestions; and two questionnaires to evaluate the material (technical quality and content assessment).

For evaluation of technical quality, the Emory questionnaire adapted from the Health-Related Web Site Evaluation Form Emory²⁶ was used. This instrument allows quantitative measurement of the quality of the material available online by scoring several parameters, such as content, accuracy, audience and structure. The 9 questions addressed 1) whether the purpose of the material was clearly described; 2) the adequacy of the content regarding the aspects covered; 3) whether the information provided was correct; 4) the level of compliance of the material with the HON Code (code of conduct for making material from the health areas available on the website); 5) whether the target audience was clear; 6) appropriateness of the level of detail of the information for the target audience; 7) appropriateness of the reading level for the target audience; 8) appropriateness of the technical terms for the target audience; and 9) whether the figures and videos added value to the material. The possible answers for each question were: agree (2 points), disagree (1 point) and not applicable (0 points).

Another tool was developed to evaluate the content and design, including two essay questions (inquiring about the existence of a harmful concept error and lack of information) and 11 multiple choice questions addressing four domains: 1) presentation and quality of the material; 2) suitability to the target audience; 3) audiovisual quality; and 4) reliability, currentness, spelling and grammar of the information provided about stages and strategies. For multiple-choice questions, the possible answers were: unsatisfactory, regular, satisfactory or excellent, where each answer was to be justified; an item for suggestions was also presented. Suggestions considered relevant and important were added to the material, which was then finalized for use by students.

Phase 3: Application of the Material as Training of Undergraduate Students in Speech-Language Therapy

In this phase of the study, a questionnaire with 15 questions composed of three true/false options was prepared for each of the five modules of the material (Appendix A). Students who accepted to participate in the study answered the same questionnaire about the material in two conditions: before and after exposure to the modules. This phase was carried out in a multimedia room of the teaching building of the institution involved; all of the undergraduate students in Speech-Language Therapy enrolled in a subject on Cleft Lip and Palate were invited to participate.

The average percentage of correct answers obtained in the questionnaires in both conditions (before and after exposure) was calculated and compared. The data obtained were presented by means of a descriptive analysis using percentages described in tables, using the median, first and third quartiles. Subsequently, inferential statistics were presented by applying the Wilcoxon test to compare responses before and after exposure to the material, considering the level of significance less than or equal to $p < 0.05$. The tested hypothesis was that the percentage of correct answers would be higher after presentation of the material.

RESULTS

Phase 1: The Material Developed

The content covered was didactically divided into five modules with a total duration of 33 minutes, where modules varied between three and 12 minutes each (average of six minutes in duration per module).

All modules were presented in a sequence of slides (produced on PowerPoint®) converted into self-demonstrating videos using Camtasia Studio 8®. The content included narration, illustrative images and animation effects completed with footage of the simulations of the strategies selected for this material.

The material addressed the concept of hypodynamic velopharynx and the importance of enabling velopharyngeal sufficiency as a criterion to undergo speech-language therapy aimed at correcting speech disorders in VPD. The content of each of the five modules included:

- 1) Module 1 - *Velopharyngeal function during speech and VPD*:
 - a. Anatomy and physiology of the velopharynx during speech production without VPD;
 - b. Anatomy and physiology of the velopharynx during speech production in the presence of VPD;
 - c. General etiology of VPD;
 - d. Speech disorders associated with VPD.
- 2) Module 2 - *Velopharyngeal insufficiency*:
 - a. Clarifications on the need to create conditions for velopharyngeal insufficiency before speech-language therapy;
 - b. Diagnostic therapy and stimulability to produce oral sounds without escaping nasal air;
 - c. Objectives of speech-language therapy with a focus on velopharyngeal function for speech;
 - d. Selection of vehicle sound and target sound;
 - e. Monitoring of nasal air leakage as an indicator of the possibility of velopharyngeal sufficiency;
 - f. Use of pharyngeal obturator to establish physical conditions for velopharyngeal sufficiency.
- 3) Module 3 - *Training of "modified breath and plosion" for speech*:
 - a. Perception and manipulation of oral pressure and nasal air leakage during speech;
 - b. Sensory bombing with the aid of facilitating cues;
 - c. Differences between the two speech patterns: "new speech" and "old speech";
 - d. Training of "breath and plosion" modified for speech;
 - e. Monitoring the presence and absence of nasal air leak during speech-language therapy.

- 4) Module 4 - *Training with sounds*:
- Difference between target sound and “vehicle” sound;
 - Speech-Language Therapy to generalize velopharyngeal closure in the vehicle sound to the other target sounds;
 - Use of diagnostic therapy to list new target sounds for treatment;
 - Sound training at different levels of complexity;
 - Use of facilitating cues versus patients’ self-monitoring ability;
 - Contrast between oral productions and nasalized oral productions.
- 5) Module 5 - *Tips for speech-language therapy*:
- Differences between strategies for rehabilitation of adults and children;
 - Tips for use of and feedback on facilitating cues;
 - Importance of the family in patients’ rehabilitation process.

Figures 1 and 2 illustrate aspects covered in the material. The materials developed can be found on the institutional website of (X-Insert after the blind evaluation process) upon request in the *Telessaúde* tab.

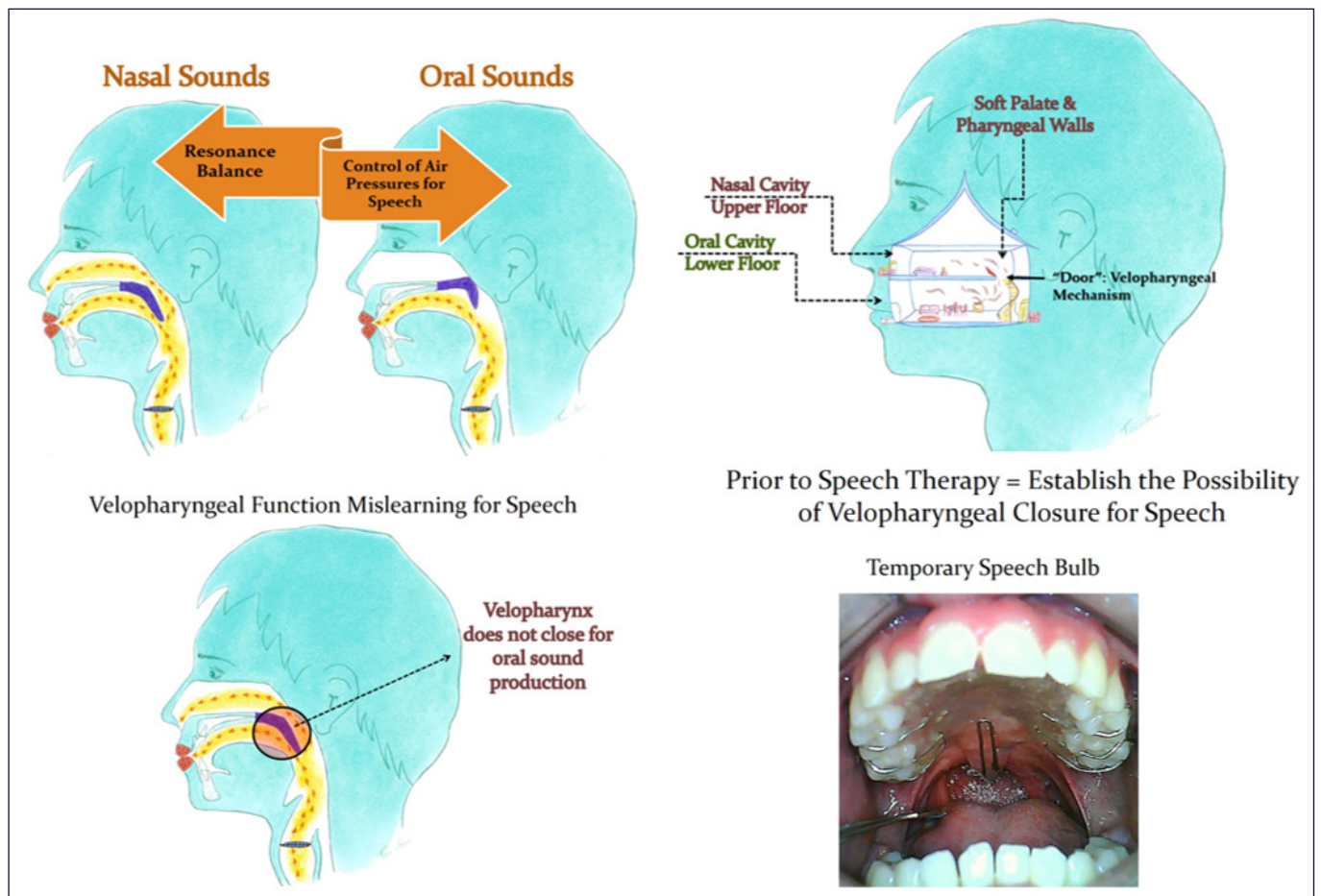


Figure 1. Examples of the illustrations that made up the instructional material on the management of altered speech related to velopharyngeal dysfunction – Diagrams to facilitate the explanation of the most theoretical content



Figure 2. Examples of the illustrations that made up the instructional material on the management of altered speech related to velopharyngeal dysfunction - Exemplified scenes of the strategies used in therapy

Phase 2: Evaluation of the Material by Speech-Language Therapists

The five evaluators indicated that they had already managed speech-language therapy aimed at achieving velopharyngeal function for speech, having between seven and 13 years of experience in treating speech disorders in VPD. The result of the Emory questionnaire indicated that the five evaluators agreed (97.5%) on the adequacy of the material regarding the four domains evaluated (content, accuracy, audience and structure). Only one question was scored as zero by all evaluators, which referred to the principles of the HON Code;

in addition, the question on appropriate technical terms was scored as one by one evaluator. All evaluators assigned the maximum score to the remaining questions, indicating satisfaction with the technical quality of the material.

With regard to the second questionnaire answered by speech-language therapists, in terms of content and design evaluation, it was observed that the evaluators classified the domains as satisfactory or excellent, making suggestions that helped to improve the material. The best items evaluated were: quality of animations, reliability and currentness, as shown in Figure 3.

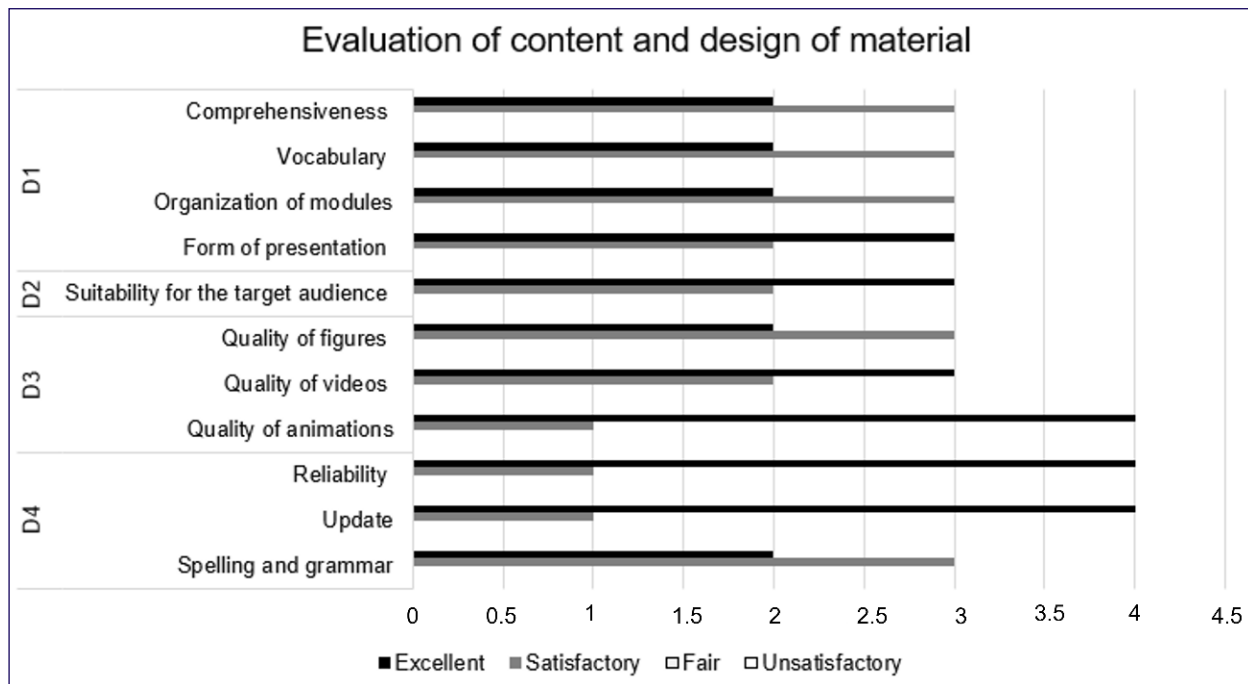


Figure 3. Questionnaire for evaluation of content and design of the material with the number of speech-language therapists who evaluated each question as: unsatisfactory, fair, satisfactory or excellent

Phase 3: Application of the Material as Training for Undergraduate Students of Speech-Language Therapy

As a final series, 17 undergraduates agreed to participate in the research and reported having basic academic knowledge in anatomy, physiology of the head and neck and rehabilitation of speech disorders in VPD. All of the participants answered the same questionnaire before and after viewing the material.

The number of correct answers to each module's questions before and after accessing the material was analyzed. An increase in correct answers was observed for all modules, with emphasis on module 2, which addressed the concept of velopharyngeal sufficiency. An average of 63% of the questions were answered correctly before viewing the material, increasing to 98% after viewing the material (an improvement of 35%) (Table 1).

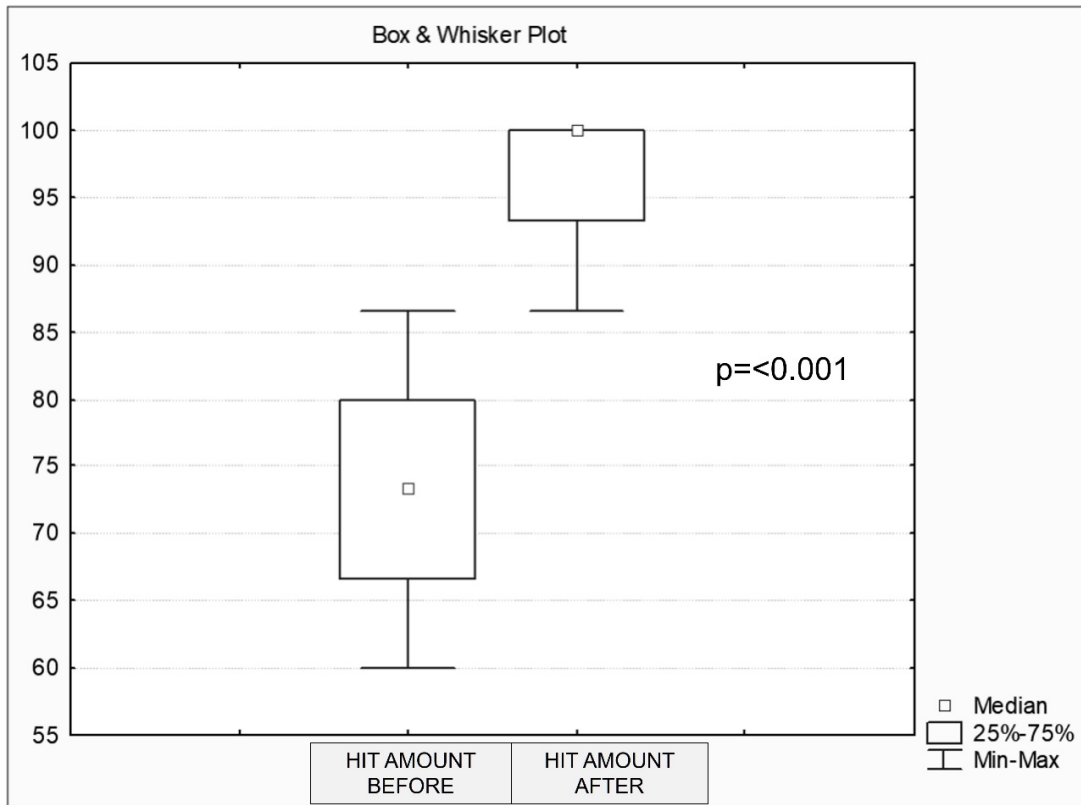
Table 1. Number of correct answers BEFORE and AFTER each module and the average of the questions, considering 17 participants

		CORRECT ANSWERS BEFORE (%)	CORRECT ANSWERS AFTER (%)
MODULE 1	Q1	13 (76.4%)	17 (100%)
	Q2	15 (88.2%)	17 (100%)
	Q3	16 (94.1%)	17 (100%)
AVERAGE		14.7 (86.2)	17 (100)
MODULE 2	Q1	10 (94.1%)	17 (100%)
	Q2	13 (47%)	16 (94.1%)
	Q3	9 (76.4%)	17 (100%)
AVERAGE		10.7 (62.7%)	16.7 (98%)
MODULE 3	Q1	16 (94.1%)	17 (100%)
	Q2	8 (47%)	15 (88.2%)
	Q3	13 (76.4%)	16 (94.1%)
AVERAGE		12.3 (72.5%)	16 (94.1%)
MODULE 4	Q1	4 (23.5%)	17 (100%)
	Q2	15 (88.2%)	17 (100%)
	Q3	17 (100%)	16 (94.1%)
AVERAGE		12.0 (70.6%)	16.7 (98%)
MODULE 5	Q1	15 (88.2%)	17 (100%)
	Q2	11 (64.7%)	14 (82.3%)
	Q3	14 (82.3%)	17 (100%)
AVERAGE		13.3 (78.4%)	16 (94.1%)

Caption: Q = question

The general average of correct answers before viewing the material increased from 74% to 97%, which reveals a significant increase of 23% in the average of correct answers after access to the material ($p < 0.001$). Figure 4 summarizes in a box-plot chart

the students' correct answers before and after viewing the materials, including: median of 73% before and 100% after; minimum hit values of 60% before and 87% after; and maximum hit values of 87% before and 100% after viewing the material.



Captions: $p \leq 0.05$; Wilcoxon test

Figure 4. Box-plot of the findings before and after viewing the material, indicating the minimum and maximum values and median of the percentage of correct answers, with a significant difference between the two conditions ($p = < 0.001$)

DISCUSSION

The present study aimed to develop an instructional material addressing steps and strategies in speech-language therapy for treating speech disorders related to VPD in patients with a history of CLP, specifically for the treatment of speech disorders caused by velopharyngeal dysfunction. The researchers' experience and the need for instructional materials for training of speech-language therapists on the subject, with updated information and based on scientific literature, were drivers for the development of this research.

The planning and development of this instructional material aimed to address scientific information while including information consistent with clinical practice, which is a complex task that involved research of references about existing approaches to the treatment of velopharyngeal dysfunction. This literature review allowed the identification of studies that describe conventional speech-language therapy approaches and that adopted the intensive speech-language therapy approach¹⁵⁻²³. This view formed the basis for the material elaborated, given the pioneering nature of

this study, no other work with a similar objective was found.

In addition to the content, this study was concerned with building an attractive material suitable for the target audience, given the importance of these factors in terms of motivation and ease of use²⁶. Thus, the content was structured in five modules properly illustrated and with adapted language, aiming to expand academic reach for clinicians^{2,8,27}. Therefore, it aimed to disseminate information about rehabilitation of patients with VPD by means of a material that can be widely disseminated in order to reach professionals from different regions of Brazil, helping care of patients in their places of origin, as well as contributing in the future to other electronic media or courses in the area of CLP and VPD. When building material aimed at a specific audience, prior evaluation by specialists is recommended². Thus, five speech-language therapists with experience in the ISTP evaluated the content and design of the material and indicated a high level of satisfaction with the product, in addition to contributing to its improvement by means of suggestions.

The third phase consisted in the application of the material to undergraduate students of Speech-Language Therapy. This phase, also called the implementation phase, allowed for verification of the usability of the material for student training²⁶. In general, a positive impact on the undergraduate students' understanding of the therapeutic strategies for VPD was observed, although they had prior knowledge on the subject matter (73% of the answers were correct before viewing the material). Regarding specifically module 2, correct answers at the moment before and after access to the material were less frequent. This module addressed topics related to the concept of velopharyngeal sufficiency and the performance of diagnostic therapy. Although the velopharyngeal function for speech is an important content to be addressed in the curriculum of Speech-Language Therapy courses, the concept of velopharyngeal insufficiency for speech is complex. The present findings suggest that a theoretical-practical approach to the teaching of this concept can optimize undergraduate students' understanding.

Based on the planning, development and analysis of the material by speech-language therapists, specialists and undergraduate students of Speech-Language Therapy, positive results were verified, suggesting the potential of the material for professional training and qualification, whereas improving and building other materials may also specifically complement the steps and strategies used in speech rehabilitation in VPD. In the current pandemic scenario of post-COVID-19, more specifically, the search for effective strategies of teleconsultation requires expanding the offer of online courses and tools. The lack of materials on the subject at hand, therefore, leads us to suggest that specialized centers, characterized as institutions dedicated to teaching, research and continuing education, invest even more in projects that disseminate information for training and qualification of speech-language therapists and undergraduate students of Speech-Language Therapy that do not have access to this information.

CONCLUSION

The instructional material was developed containing information on the steps and strategies to correct altered speech related to velopharyngeal dysfunction. The material elaborated had its content and format evaluated from satisfactory to excellent by professionals and, when applied to undergraduate students of Speech-Language Therapy, allowed for an increase in knowledge on the subject.

REFERENCES

1. Marina Ocaña J, Feliz Murias T. Perceptions about the information and education for health in virtual environments in Spanish. *Rev Esp Salud Publica*. 2018 Aug 2;92:e201808022. PMID:30066699.
2. Maximino L, Zambonato T, Picolini-Pereira M, Castro Corrêa C, Feniman M, Blasca W. Development and evaluation of a blog about cleft lip and cleft palate and hearing. *Int Arch Otorhinolaryngol*. 2018;22(1):60-7. <https://doi.org/10.1055/s-0037-1603494> PMID: 29371900.
3. Cohen M, Rosenberg J, Patel PK. Discussion on ultrasound diagnosis of prenatal cleft lip: How does its accuracy affects the family? prenatal counseling for clefts: The University of Illinois at Chicago, craniofacial center's protocols and experience. *J Craniofac Surg*. 2021;32(7):2471-4. <https://doi.org/10.1097/SCS.00000000000007746> PMID: 34074931.
4. Rangaraju M, Lloyd MS, Khan K. Empowerment of parents of children with cleft lip and palate by objective scoring of patient information websites. *J Craniofac Surg*. 2021;32(6):2050-2. <https://doi.org/10.1097/SCS.00000000000007631> PMID: 33770038.
5. Sousa LC, Moraes MCAF, Souza CDR de, Silva H da, Silva ÉG da, Reis LCS dos et al. Ambiente virtual de aprendizagem: contribuições da terapia ocupacional a pais e familiares na assistência de crianças com anomalias craniofaciais. *Cad Bras Ter Ocup*. 2017;25(2):255-66. <http://dx.doi.org/10.4322/0104-4931.ctoA00926>
6. Rafacho MB, Tavano LD, Romagnolli M, Bachega MI. Hotsite de psicologia: informações de interesse sobre anomalias craniofaciais. *Estud Psicol*. 2012;29(3):387-94. <https://doi.org/10.1590/S0103-166X2012000300009>
7. Karnell MP, Bailey P, Johnson L, Dragan A, Canady JW. Facilitating communication among speech pathologists treating children with cleft palate. *Cleft Palate-Craniofacial J*. 2005;42(6):585-8. <https://doi.org/10.1597/04-130r1.1> PMID: 16241168.
8. Corrêa C, Freire T, Zabeu J, Martins A, Ferreira R, Francisconi P et al. Teleeducation about cleft lip and palate: an interdisciplinary approach in the promotion of health. *Int Arch Otorhinolaryngol*. 2015;19(02):106-11. <https://doi.org/10.1055/s-0034-1544114>
9. Ferreira GZ, Guerra TA, Corrêa IF, Silva PP, Pegoraro-Krook MI, Silva ÉG da et al. Aplicativo móvel "Fala nova, treino fácil": inovação no tratamento de fala na fissura labiopalatina. *Salusvita*. 2018;37(1):35-48.
10. Glade RS, Deal R. Diagnosis and management of velopharyngeal dysfunction. *Oral Maxillofac Surg Clin North Am*. 2016;28(2):181-8. <https://doi.org/10.1016/j.coms.2015.12.004>
11. Almeida BK, Ferreira GZ, Aferri HC, Marino VCC, Dutka J de CR, Pegoraro-Krook MI. Passavant's ridge during speech production with and without pharyngeal bulb. *J Commun Disord*. 2019 Nov;82:105939. <https://doi.org/10.1016/j.jcomdis.2019.105939> PMID: 31561168.
12. Yamaguchi K, Lonic D, Lee C-H, Wang S-H, Yun C, Lo L-J. A Treatment Protocol for Velopharyngeal Insufficiency and the Outcome. *Plast Reconstr Surg*. 2016;138(2):290e-299e. <https://doi.org/10.1097/PRS.0000000000002386> PMID: 27465191.
13. Park Y-H, Jo H-J, Hong I-S, Leem D-H, Baek J-A, Ko S-O. Treatment of velopharyngeal insufficiency in a patient with a submucous cleft palate using a speech aid: The more treatment options, the better the treatment results. *Maxillofac Plast Reconstr Surg*. 2019;41(1):19. <https://doi.org/10.1186/s40902-019-0202-8> PMID: 31106163.

14. Paul N, Augustine C, Sharma UA, Nishant K, Jyotsna S. Intensive speech therapy programme combined with a speech bulb prosthesis in the prosthodontic rehabilitation of velopharyngeal dysfunction. *Cureus*. 2020;12(2):e6951. <https://doi.org/10.7759/cureus.6951> PMID: 32190501.
15. Ferreira GZ, Bressmann T, de Cássia Rillo Dutka J, Whitaker ME, de Boer G, de Castro Marino VC et al. Analysis of oral-nasal balance after intensive speech therapy combined with speech bulb in speakers with cleft palate and hypernasality. *J Commun Disord*. 2020 May;85:105945. <https://doi.org/10.1016/j.jcomdis.2019.105945> PMID: 31607437.
16. Dutka JDCR, Uemeoka É, Aferri HC, Pegoraro-Krook MI, Marino VCDC. Total obturation of velopharynx for treatment of velopharyngeal hypodynamism: Case report. *Cleft palate-craniofacial J*. 2012;49(4):488-767. <https://doi.org/10.1597/09-240> PMID: 21417778.
17. Pamplona MDC, Ysunza A, Chavelas K, Arámburu E, Patiño C, Martí F et al. A study of strategies for treating compensatory articulation in patients with cleft palate. *J Maxillofac Oral Surg*. 2012;11(2):144-51. <https://doi.org/10.1007/s12663-011-0314-x> PMID: 23730060.
18. Allen MM. Intervention efficacy and intensity for children with speech sound disorder. *J Speech, Lang Hear Res*. 2013;56(3):865-77. [https://doi.org/10.1044/1092-4388\(2012/11-0076\)](https://doi.org/10.1044/1092-4388(2012/11-0076)) PMID: 23275415.
19. Prathaneel B, Makarabhirom K, Jaiyong P, Pradubwong S. Khon Kaen: A community-based speech therapy model for an area lacking in speech services for clefts. *Southeast Asian J Trop Med Public Health*. 2014;45(5):1182-95. PMID: 25417522.
20. Pamplona MDC, Ysunza A, Morales S. Strategies for treating compensatory articulation in patients with cleft palate. *Int J Biomed Sci*. 2014;10(1):43-51. PMID: 24711749.
21. Makarabhirom K, Prathaneel B, Suphawattjariyakul R, Yoodee P. Speech therapy for children with cleft lip and palate using a community-based speech therapy model with speech assistants. *J Med Assoc Thai*. 2015;98(Suppl 7):S140-50. PMID: 26742382.
22. Derakhshandeh F, Nikmaram M, Hosseinabad HH, Memarzadeh M, Taheri M, Omrani M et al. Speech characteristics after articulation therapy in children with cleft palate and velopharyngeal dysfunction – A single case experimental design. *Int J Pediatr Otorhinolaryngol*. 2016 Jul;86:104-13. <https://doi.org/10.1016/j.ijporl.2016.04.025> PMID: 27260592.
23. Luyten A, Bettens K, D'haeseleer E, Hodges A, Galiwango G, Vermeersch H et al. Short-term effect of short, intensive speech therapy on articulation and resonance in Ugandan patients with cleft (lip and) palate. *J Commun Disord*. 2016 May;61:71-82. <https://doi.org/10.1016/j.jcomdis.2016.03.006> PMID: 27060419.
24. Filatro A, Piconez SCB. Design instrucional contextualizado: planejamento, elaboração e avaliação de materiais didáticos para educação a distância [Internet]. Available at: <http://www.abed.org.br/congresso2004/por/pdf/049-TC-B2.pdf>
25. Polzin ACZ. Estratégias terapêuticas para abordar o funcionamento velofaríngeo durante tratamento de distúrbios da fala relacionados à FLP e DVF: Relato descritivo. Universidade de São Paulo; 2015.
26. Breckons M, Jones R, Morris J, Richardson J. What do evaluation instruments tell us about the quality of complementary medicine information on the internet? *J Med Internet Res*. 2008;10(1):e3. <https://doi.org/10.2196/jmir.961> PMID: 18244894.
27. Costa TL da. Multimídia sobre velofaringe e palatoplastia na fissura labiopalatina [Thesis]. Bauru (SP): Universidade de São Paulo; 2012. Available at: <http://www.teses.usp.br/teses/disponiveis/61/611132/tde-26092012-112051/>

Authors' contributions:

JCRD, MIPK, LPM: Conceptualization; Investigation; Methodology; Project administration; Supervision; Writing - Original draft.

GAP: Data curation; Formal Analysis; Writing - Original draft.

ACZP: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Writing - Original draft.

CCC: Data curation; Formal analysis; Writing - Original draft.

Data sharing statement:

The original data from this research, without identifying the participants, may be made available by the authors, upon request to the corresponding author, via email.

APPENDIX A – EVALUATION QUESTIONNAIRE – UNDERGRADUATE STUDENTS

MODULE 1

1) The velopharynx structures move allowing opening and closing of the velopharynx, which enables control of oral and nasal pressure for production of sounds during speech.

TRUE **FALSE**

2) The etiology of velopharyngeal dysfunction is velopharyngeal insufficiency alone, as in the case of a short palate after surgical correction of the cleft lip and palate.

TRUE **FALSE**

3) Speech disorders related to velopharyngeal dysfunction include hypernasality, nasal air leak and low pressure, during production of oral sounds.

TRUE **FALSE**

MODULE 2

1) The therapy aimed at correcting velopharyngeal function seeks to establish velopharyngeal closure for a given sound, enabling transfer to other sounds.

TRUE **FALSE**

2) For therapy to correct velopharyngeal function, diagnostic therapy is not required.

TRUE **FALSE**

3) It is by establishing the stimulability that the speech-language therapist defines the oral sounds the patient is capable of producing without escape of nasal air.

TRUE **FALSE**

MODULE 3

1) Modified breath and plosion training involve perception of oral pressure and monitoring of nasal air leak.

TRUE **FALSE**

2) During therapy training, new speech patterns are introduced. Blowing and plosion training is gradually modified to produce oral sounds. At this stage, it is important to remind the patient that the escape of nasal air is desirable.

TRUE **FALSE**

3) Monitoring nasal air leakage is necessary only after the velopharyngeal closure capacity has been acquired by the patient.

TRUE **FALSE**

MODULE 4

1) Therapy for association of velopharyngeal closure only begins after the patient is able to produce modified murmur and plosion for speech.

TRUE **FALSE**

2) It is not necessary to train the vehicle sound repeatedly with all the vowels until it is produced properly and without difficulty.

TRUE **FALSE**

3) After velopharyngeal closure is acquired in isolated sound, it is transferred to the context of syllables, words, phrases and spontaneous speech.

TRUE **FALSE**

MODULE 5

1) There is no difference between therapeutic strategies in the treatment of children and adults.

TRUE **FALSE**

2) Auditory cues are those offered with the aid of a mirror, spoon or CD.

TRUE **FALSE**

3) Clues should be gradually eliminated in an attempt to encourage the patient to self-monitor their new speech.

TRUE FALSE