REVISTA CEFAC
SPEECH, LANGUAGE, HEARING SCIENCES AND EDUCATION JOURNAL
Rev. CEFAC. 2022;24(1):e10521 https://doi.org/10.1590/1982-0216/202224110521

Original articles

Electromyographic biofeedback and visual feedback in myofunctional therapy: usage profile by speech-language-hearing pathologists

Mariana da Silva Corrêa[1]
https://orcid.org/0000-0002-3059-7368

Angela Ruviaro Busanello-Stella[2]
https://orcid.org/0000-0003-3144-5857

[1] Universidade Federal de Santa Maria - UFSM, Curso de Fonoaudiologia, Santa Maria, Rio Grande do Sul, Brasil.

[2] Universidade Federal de Santa Maria - UFSM, Santa Maria, Rio Grande do Sul, Brasil.

Research support source: Research Incentive Fund – Universidade Federal de Santa Maria, 2021 (Resolution no. 022/1983).

Conflict of interests: Nonexistent

Received on: November 22, 2021
Accepted on: March 30, 2022

Corresponding address:
Angela Ruviaro Busanello-Stella
Avenida Roraima nº 1000, Cidade Universitária, prédio 26E, Bairro Camobi
CEP: 97105-900 - Santa Maria, Rio Grande do Sul, Brasil
E-mail: angelabusanellostella@gmail.com

ABSTRACT

Purpose: to identify the usage profile of mirrors and electromyographic biofeedback to support myofunctional therapy by speech-language-hearing therapists who work with oral-motor function in Brazil.

Methods: a quantitative cross-sectional study with an online (SurveyMonkey) questionnaire, which was structured with questions on the use of mirrors and/or electromyographic biofeedback. A descriptive analysis was made, and the Mann-Whitney U test and the chi-square test were applied ($p < 0.05$).

Results: most professionals (23 [82.14%]) used mirrors, whereas only five (17.85%) used electromyographic biofeedback. The electromyographic biofeedback was used at some point with all age groups, to treat mastication and swallowing functions and facial mimics. Dysphagia and facial palsy were regularly or occasionally treated with it. The patients' perception was significantly associated with the use of either instrument. The electromyographic biofeedback group showed a consensus among patients, while approximately half of the mirror group (12 [52.17%]) were indifferent to its use.

Conclusion: the profile showed young adult professionals, who used national equipment. The findings reinforce the need for research on complementary therapeutic procedures in the field of oral-motor functions, particularly, electromyographic biofeedback.

Keywords: Electromyography; Mirror Neurons; Speech Therapy; Feedback, Sensory; Speech, Language and Hearing Sciences

INTRODUCTION

Various oral-motor control factors facilitate the rehabilitation process. Some of them are adequate assessments, the patient's perception of their difficulty, assiduity, and the choice of proper methodologies to use in therapy. Hence, the patients' awareness of their problem stands out, as it leads to greater adherence to the treatment and understanding of the right model of the function being addressed[1].

Visual cues can be used to this end, given the physiological basis related to visual feedback – the mirror neurons. These are responsible for transforming sensory information into motor action by performing and observing motor gestures, which results in the process of learning by imitation[2].

Instruments have been described as an aid in myofunctional treatment – e.g., surface electromyography (SEMG), which has a complementary role in speech-language-hearing (SLH) diagnoses. When it contributes to orofacial therapy, it is used as electromyographic biofeedback (EB)[3], which helps follow up, perceive, and reinforce changes in muscle physiological processes and thus achieve behavior changes[4]. Its applicability in oral-motor functions has been described in cases of peripheral facial palsy, atypical swallowing, mouth-breathing, and temporomandibular joint disorders[5]. Moreover, the graph presented in the SEMG device helps patients understand better the muscle dynamics[6]. On the other hand, it has some limitations: it only picks up surface muscle activity and various methodologies are used regarding the intervention method, number of therapy sessions, and patient eligibility criteria[7,8].

Nevertheless, mirrors are still the most used strategy to provide visual support in myofunctional exercise in SLH clinical practice[6]. It has the advantage of being easily accessible and low-cost[9] to both therapists and patients, although only the movement of the structures involved can be seen in it.

Hence, mirror and EB usage profile by SLH therapists still needs to be understood. Such a characterization would help better comprehend and explore the possibilities of use – especially of EB – in both research and clinical practice. Digital questionnaires are an alternative to research during a pandemic such as the current one[10]. Few SLH studies so far have used this methodology, and the existing ones mostly approach professionals, who answered forms in Google[11,12] and via SurveyMonkey[13].

Therefore, this study aimed at identifying the mirror and EB usage profile as a support to myofunctional therapy by SLH therapists who work with oral motor function in Brazil.

METHODS

This research was approved by the Human Research Ethics Committee of the *Universidade Federal de Santa Maria* (Federal University of Santa Maria – UFSM), Brazil (no. 23081.058738/2020-61), and complied with the norms in Resolution no. 466/2012.

This is a quantitative cross-sectional study with a data survey. An online questionnaire investigated the use of EB and mirror, both alone and in combination, as support to myofunctional therapy.

Before being administered, the questionnaire was assessed by eight judges experienced in oral-motor function. They analyzed its interfaces, presentation, question content, and answer options. After making the suggested adjustments, the instrument was structured in its final form in SurveyMonkey. This platform was chosen because it enables standardized construction and a single response per Internet Protocol (IP) address, thus avoiding duplicated answers by a single subject.

The research link led to the presentation of the study and its eligibility criteria, namely: being an SLH therapist who worked with oral-motor function in Brazil. The following session presented an informed consent form (ICF) that ensured subjects were free to stop filling in the questionnaire without any problem. All research volunteers had access to an ICF and agreed to participate.

To reach the research objective, the questionnaire structure first addressed sample characterization sociodemographic data, namely: age, year of graduation, occupation, and academic training. Then, the subjects were led to the session where they indicated the type of instrument they used in myofunctional therapy – whether mirror, EB, or both. Upon the alternative they chose, participants were directed to sessions on that specific instrument.

In the mirror session, SLH therapists were asked about the number of sessions in which it is used, in what moment of the therapy it is used, the patients' perception of mirror use, the indication of home therapy exercises, and whether they knew EB, had access to SEMG, and were interested in learning about EB.

If they chose EB in the questionnaire, SLH therapists were asked how long they had been using it,

how they learned to use it, equipment information, frequency of use in the various age groups, functions, and pathologies, number of sessions in which they use EB, in what moment of the therapy it is used, whether they combine exercises and/or orofacial function with EB, the patients' perception of the equipment use, and indication of home therapy exercises. If they chose both EB and mirror, SLH therapists answered the questions present in both sessions.

The research was publicized through weekly messages on social media, message applications, and e-mails to SLH undergraduation and postgraduation students and SLH therapists specialized in oral-motor function. Data were collected between May and September 2021.

A database was automatically created in Excel as questionnaires were answered. The data were then tabulated and adjusted for the study. Data were analyzed with descriptive analysis of the mean values, standard deviations, percentages, and frequency. After assessing the normality of the data, the Mann-Whitney U test and the chi-square test were applied to compare the types of instruments and analyze the association between variables. Values lower than 5% ($p < 0.05$) were considered significant. The analysis was made with Statistica 9.0.

RESULTS

A total of 28 Brazilian SLH therapists participated in the research – 23 (82.14%) answered they used the mirror as support to myofunctional therapy (Mirror Group – MG), whereas only five (17.85%) used a combination of EB and mirror (EB Group – EBG). As no one answered they used EB alone, the responses indicated below regarding EB were from the questionnaire session that addressed both EB and mirror.

The mean age of the total sample was 40.41 years (SD = 11.89); in MG, it was 38.62 years (SD = 11.72), and in EBG, 48.60 years (SD = 9.83).

As this was nationwide research, a territorial analysis was made. The Southeast Region of Brazil had the most participants, with 11 SLH therapists (39.28%), followed by the South, with 10 (35.71%), the Northeast, with four (14.28%), and the Central-West, with three (10.71%). The states with the most participants were Rio Grande do Sul, with 10 SLH therapists (35.71%), Minas Gerais, with five (17.85%), São Paulo with four (14.28%), and the Federal District, with three (10.71%).

The descriptive analysis categorizing professionals who used mirrors and EB is shown in Table 1.

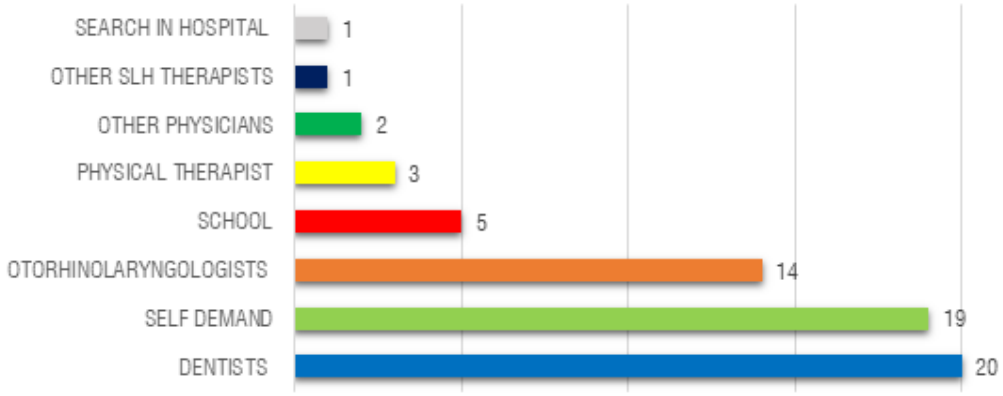
Table 1. Overall and group characterization of the speech-language-hearing therapists

Variables			MG	EBG	Overall
Time since graduation	Graduation	Years, Mean (SD)	14.69 (12.33)	25.60 (9.04)	16.64 (12.41)
		0 to 5 years, n (%)	7 (30.43)	-	7 (25.00)
		6 to 10 years, n (%)	2 (8.70)	-	2 (7.14)
		11 to 15 years, n (%)	5 (21.74)	-	5 (17.85)
		Over 16 years, n (%)	6 (26.09)	4 (80.00)	10 (35.71)
		Over 30 years, n (%)	3 (13.04)	1 (20.00)	4 (14.28)
	Specialization	Years, Mean (SD)	12.46 (8.33)	18.20 (4.81)	14.05 (7.84)
		0 to 5 years, n (%)	3 (23.08)	-	3 (10.71)
		6 to 10 years, n (%)	2 (15.38)	-	2 (7.14)
		11 to 15 years, n (%)	3 (23.08)	2 (40.00)	5 (17.85)
		Over 16 years, n (%)	5 (38.46)	3 (60.00)	8 (28.57)
	Master's	Years, Mean (SD)	18.15 (26)	17.80 (5.44)	18.05 (18.05)
		0 to 5 years, n (%)	3 (23.08)	-	3 (10.71)
		6 to 10 years, n (%)	5 (38.46)	1 (20.00)	6 (21.42)
		11 to 15 years, n (%)	1 (7.69)	-	1 (3.57)
		Over 16 years, n (%)	4 (30.77)	4 (80.00)	8 (35.71)
	Doctoral	Years, Mean (SD)	23.67 (38.82)	8.20 (5.97)	16.63 (28.86)
		0 to 5 years, n (%)	4 (66.67)	1 (20.00)	5 (17.85)
		6 to 10 years, n (%)	1 (16.67)	2 (40.00)	3 (10.71)
		11 to 15 years, n (%)	-	2 (40.00)	2 (7.14)
		Over 16 years, n (%)	1 (16.67)	-	1 (3.57)
Employment relationship		Public, n (%)	7 (30.43)	2 (40.00)	9 (32.14)
		Private, n (%)	8 (34.78)	2 (40.00)	10 (35.71)
		Autonomous, n (%)	8 (34.78)	1 (20.00)	9 (32.14)
Workplace		Outpatient, n (%)	11 (47.83)	2 (40)	13 (46.42)
		Teaching, n (%)	5 (21.74)	2 (40)	7 (25.00)
		Hospital, n (%)	4 (17.39)	-	4 (14.28)
		Clinic, n (%)	2 (8.70)	-	2 (7.14)
		Home, n (%)	1 (4.35)	1 (20)	2 (7.14)

Captions: MG = Mirror Group; EBG = Electromyographic Biofeedback Group; SD = standard deviation; n = number; % = percentage

Oral-motor function was the most frequently reported specialization in SLH therapy. Nine SLH therapists (32.14%) earned their title from the *Conselho Federal de Fonoaudiologia* (Federal SLH Council), followed by specialization in another institution, with eight professionals (28.57%), master's degree, with seven (25.00%), and doctoral degree, with five (17.85%).

The most frequent origins of referrals pointed out by participating SLH therapists are shown in Figure 1. They were free to choose more than one and indicate others that had not been presented.



Caption: SLH = Speech-Language-Hearing

Figure 1. Patient referral characterization

In MG, 17 (85%) of the 23 SLH therapists answered they knew EB, though only three (17.64%) had access to such an instrument. Moreover, 20 (89.95%) reported an interest in learning more about EB. As for the reason for such interest, 11 (55%) indicated complementary and auxiliary use in SLH therapy, five (25%) reported professional update, three (15%) mentioned the scientific evidence of its positive results, and one (5%) wanted it for research.

Most (three SLH therapists) learned about EB in courses (60%), while the others (two SLH therapists) learned in postgraduation (40%). They had been using EB for a mean of 10.60 years; the minimum was 4 years and the maximum was 15 years.

As for the specificities of SEMG equipment used for EB, SLH therapists reported using those manufactured by Miotec®, along with Miotec-Suite and Biotrainer software. They used from two to eight channels per equipment, always with surface electrodes and disposable adhesives.

The EBG responses on EB use per age group, functions, and pathologies are shown in Table 2.

Table 2. Frequency of use of electromyographic biofeedback per age group, function, and pathologies in the Electromyographic Biofeedback Group

Variables		Frequency of use		
		Never	Occasionally	Always
Age group, n (%)	Children	1 (20)	4 (80)	-
	Adolescents	-	5 (100)	-
	Adults	1 (20)	3 (60)	1 (20)
	Older people	1 (20)	3 (60)	1 (20)
Function, n (%)	Speech	4 (80)	1 (20)	-
	Mastication	-	4 (80)	1 (20)
	Swallowing	-	3 (60)	2 (40)
	Breathing	4 (80)	1 (20)	-
	Facial Mimics	-	5 (100)	-
Pathologies, n (%)	Dysphagia	2 (40)	1 (20)	2 (20)
	TMD	3 (60)	2 (40)	-
	Orofacial Pain	3 (60)	2 (40)	-
	Facial Palsy	2 (40)	2 (40)	1 (20)

Captions: n = number; % = percentage; TMD = temporomandibular disorder

The association between the number of sessions, the moment when mirrors and EB are used, and the patients' perception of the use of these instruments is presented in Table 3. The patients' perception was associated with the use of either instrument (p = 0.01) – most of them reported a greater interaction.

Table 3. Comparison between the Mirror and Electromyographic Biofeedback Groups regarding the number of sessions, moment of use, and patients' perception

Variables		MG	EBG	P
Number of sessions, mean (SD)		9.30 (5.66)	11.20 (10.98)	1.00 [d]
Moment of use, n (%)	3 moments[a]	10	4	1.74 [e]
	2 moments[b]	6	-	
	1 moment[c]	7	1	
Patients' perception, n (%)	Not manifested	11	-	0.01* [e]
	Greater interaction	12	5	

Captions: MG = Mirror Group; EBG = Electromyographic Biofeedback Group; SD = standard deviation; n = number; % = percentage;
[a] = beginning, middle, and end; [b] = middle and end, or beginning and end; [c] = beginning or middle; [d] = Mann-Whitney U test; [e] = chi-square test, *p < 0.05.

The association between the indication of myofunctional exercises (time and number of repetitions), the indicated frequency with which to do them at home (weekly and daily), and the types of instruments is shown in Table 4.

Table 4. Comparison between the Mirror and Electromyographic Biofeedback Groups regarding the indication of myofunctional exercises (time and number of repetitions) and indicated frequency to do them at home (weekly and daily)

Exercises and Indication		MG	EBG	p
Isometric, mean (SD)	Time	10.34 (4.94)	11.00 (5.47)	1.00 [a]
	Number Repetitions	9.26 (5.41)	8.60 (7.73)	0.71 [a]
Isotonic, mean (SD)	Number Repetitions	11.04 (6.40)	12.60 (7.33)	0.53 [a]
Isokinetic, mean (SD)	Time	8.78 (5.82)	11.00 (5.47)	0.84 [a]
	Number Repetitions	9.04 (6.43)	8.60 (7.73)	0.52 [a]
Frequency at Home – per week, n (%)	2X	1 (4.35)	-	0.70 [b]
	4X	1 (4.35)	-	
	5X	2 (8.70)	-	
	6X	1 (4.35)	-	
	7X	18 (78.26)	5 (100.00)	
Frequency at Home – per day, n (%)	1X	4 (17.39)	2 (40.00)	0.57 [b]
	2X	6 (26.09)	1 (20.00)	
	3X	13 (56.52)	2 (40.00)	

Captions: MG = Mirror Group; EBG = Electromyographic Biofeedback Group; SD = standard deviation; n = number; % = percentage; X = times;
[a] = Mann-Whitney U test; [b] = chi-square test; *p = < 0.05.

DISCUSSION

This research was conducted to understand the use of visual support instruments to aid oral-motor function therapy. It is expected to have reached its objective as a scientific study, not only addressing the initial research issues but also raising in both authors and readers new questions for further investigation[14].

The results indicate a predominance of oral-motor function specialists with various degree levels. Along with the rather young sample (mean of 40 years old) and the various postgraduate degrees, this suggests an effort to modernize their work in this field. It also indicates that most SLH therapists who work with oral-motor function are young adults – which agrees with

other studies on complementary strategies associated with myofunctional therapy (such as photobiomodulation), in which the mean ages were 43[15] and 38 years old[16].

Most professionals who participated in the research were from the Southeast Region of Brazil, while the least represented was the North Region. These findings may be influenced by both the number of oral-motor function specialists who work in these regions (according to databases in the *Conselho Federal de Fonoaudiologia*)[17] and their geography. Large urban areas offer greater and better opportunities to improve training and the use of state-of-the-art therapeutic instruments.

To understand myofunctional therapy more in depth, this study also aimed to find the profile of professionals who referred patients to SLH therapists. Teamwork is essential in the process of oral-motor function diagnosis and treatment and extremely important to successful therapies[18]. Most referrals to SLH therapists in this research came from dentists, followed by otorhinolaryngologists – which is similar to the profile of patients referred for SLH care in another study[19]. Nevertheless, many patients went to SLH clinics on their own initiative, raising in SLH therapists (in this case, particularly those who work with oral-motor function) questions on how much information and publicization of their specialty still need to reach other health professionals[20].

Visual support instruments can be used during orofacial exercises in myofunctional therapy to help patients perceive the process[6]. Of the 28 participating SLH therapists, 23 (82.14%) used mirrors, while five (17.85%) used both EB and mirrors. The two instruments work on the principle of activating mirror neurons, which are related to motor function control. These neurons are stimulated by the person's observation and purpose in the movement; hence, they are related to the process of learning by imitation[21]. In health, particularly in motor rehabilitation, mirror neurons help in therapy[22]. There is a great interest of SLH therapists who use mirrors – 20 (89.95%) in this study – in learning more about EB and improving their technical basis for using instruments associated with myofunctional therapy.

All SLH therapists who reported using EB do so with equipment manufactured by MIOTEC®, which widely spreads SEMG research nationwide[23-26]. International studies on this topic use other brands, such as MyoTrac®[27] and VitalStim® Plus[28], which provide EB and neuromuscular electrical stimulation. This is a different technique from EB, as it stimulates skeletal muscles with electrical impulses[29].

Most SLH therapists who use EB have done so at some point in all age groups, as well as in mastication and swallowing functions and facial mimics. The most reported pathologies in which EB is regularly or occasionally used were dysphagia and facial palsy. In general, the literature on EB reports a recent use with adults and older people[27,29,30], associated with neurological cases such as facial palsy[31], dysphagia[29], temporomandibular disorder[7], and orofacial pain[32]. The indication and use of EB reported in this study by Brazilian SLH therapists agree with what has been recently researched and practiced internationally.

There was no significant difference between MG and EBG regarding the number of sessions and moments when they used the instruments. On the other hand, the patients' perception was significantly associated with the use of either instrument (Table 3). In EBG, there was a consensus among patients on the positive support of EB, whereas, in MG, only half the patients reported a greater interaction thanks to the mirror. A recent study on EB[8] used a questionnaire on the patients' perception of swallowing with and without the support of EB. When asked what was good about the strategy, they reported the visual support to follow performance and progress, presenting them a goal to reach. Information in the literature, reinforced by data in this study, indicates that patients identify EB as an instrument that potentializes the objective of the therapy. This may or may not happen with the mirror, as it only shows the movement of structures in the stomatognathic system, while EB shows to patients the muscle dynamics in a graph[3].

There was no significant association in the indication of weekly home myofunctional exercises. However, the indication to do them seven times a week was unanimous in EBG and recommended by most in MG. As for how often a day they should do the exercises, there was no consensus. Half EBG indicated once a day, and the other half, three times a day, whereas most of the MG indicated three times a day. This issue is also greatly discussed in the literature, as some studies found instructions for home exercises three times a day for more than three days a week[33].

This research is rather important because it presents the profile of SLH therapists who use EB and mirrors. The desire of professionals who use mirrors to learn about EB stands out and may point to the need for strategies to teach the use of SEMG and EB in undergraduate courses.

CONCLUSION

Most professionals who participated in this research used mirrors, rather than EB. Their mean age was 40 years; most specializations were in oral-motor function, with titles granted by the Brazilian Federal Speech-Language-Hearing Council; most worked in outpatient centers, and received patients referred by dentists and otorhinolaryngologists.

Many SLH therapists who use EB treat patients from various age groups. Similarly, all of them treat facial mimics, dysphagia, and facial palsy.

In the comparison of MG and EBG, the patients' perception was significantly associated with the use of either instrument. In EBG, there was a consensus among patients on the positive effects of EB, while in MG only half identified the mirror as positive. Myofunctional exercises were unanimously recommended seven times a week in EBG, which most of those in MG also did.

This study has important contributions to the literature on the topic. Nevertheless, further research on complementary therapeutic procedures, both EB and mirrors, in the field of oral-motor function are needed.

REFERENCES

1. Bianchini E. Bases da terapia de motricidade orofacial. In: Associação Brasileira de Motricidade Orofacial – ABRAMO, editor. Terapia Fonoaudiológica em Motricidade Orofacial. 1. Ed.: Pulso Editorial, 2018. Cap 2, p.31-41.
2. Caetano AFR, Ferreira FRM. Neurônios espelho: reflexos de uma reflexão. Filos. Hist. Biol. 2018;13(2):147-68.
3. Rahal A, Silva A, Berretin-Felix G. Eletromiografia de superfície e biofeedback eletromiográfico. In: Pernambuco LA, da Silva HJ, de Souza LBR, Magalhães HV, Cavalcanti RVA, editors. Atualidades em Motricidade Orofacial. 1. Ed.: Revinter, 2011. Cap 5, p.49-58.
4. Kwong E, Ng KK, Leung MT, Zheng YP. Application of ultrasound biofeedback to the learning of the Mendelsohn maneuver in non-dysphagic adults: a pilot study. Dysphagia. 2021;36(4):650-8.
5. Bernardes D. Biofeedback eletromiográfico em Motricidade Orofacial – In: da Silva HJ, Tessitore A, Motta AR, da Cunha DA, Berretin-Felix G, Marchesan IQ, editors. Tratado de Motricidade Orofacial. 1. Ed.: Pulso Editorial, 2019. Cap 63, p.835-43.
6. Freitas GS, Mittuti CT, Furkim AM, Busanello-Stella AR, Stefani FM, Arone MMAS et al. Electromyography biofeedback in the treatment of neurogenic orofacial disorders: systematic review of literature. Audiol Commun Res. 2016;21:e1671.
7. Barbosa MA, Tahara AK, Ferreira IC, Intelangelo L, Barbosa AC. Effects of 8 weeks of masticatory muscles focused endurance exercises on women with oro-facial pain and temporomandibular disorders: a placebo randomised controlled trial. J Oral Rehabil. 2019;46(10):885-94.
8. Archer SK, Smith CH, Newham DJ. Surface electromyographic biofeedback and the Effortful Swallow Exercise for stroke-related dysphagia and in healthy ageing. Dysphagia. 2021;36(2):281-92.
9. Freitas ACM, Bezerra LAP, de Oliveira PCA, Freitas LM, da Silva SR, de Medeiros Cirne GN et al. Avaliação da eficácia da terapia de espelho na Síndrome de Pusher e da heminegligência em pacientes pós-acidente vascular encefálico. Fisioter Bras. 2017;18(3):362-8.
10. Thomas DB, Oenning NSX, Goulart BNG. Essential aspects in the design of data collection instruments in primary health research. Rev. CEFAC. 2018;20(5):657-64.
11. Da Costa FP, De Lima DP, Mendonça K, Mourão LF. Professional qualification of Brazilian speech-language pathologists and its impacts on the Blue Dye Test (BDT). CoDAS. 2021;33(5):1-7.
12. Benedicto NM, Martinez EZ, Jorge TM. Use of images of patients in social networks: how do speech-language therapists perceive and act? CoDAS. 2019;31(2):1-6.
13. Faleiros F, Käppler C, Pontes FAR, Silva SSC, de Goes FSN, Cucick CD. Use of virtual questionnaire and dissemination as a data collection strategy in scientific studies. Texto Contexto & Enferm. 2016;25(4):1-6.
14. Tomaz-Morais J, de Lima JAS, Luckwu-Lucena B, Limeira RRT, Silva SM, Alves GAS et al. Clinical intervention studies of orofacial motricity: an analysis of the methodological quality of Brazilian studies. Rev. CEFAC. 2018;20(3):388-99.
15. De Matos AS, Berretin-Felix G, Bandeira RN, de Lima JAS, Almeida LNA, Alves GAS. Laser therapy applied to orofacial motricity: perception of members of the Brazilian Orofacial Motricity Association – ABRAMO. Rev. CEFAC. 2018;20(1):61-8.

16. Correia PRB, Coêlho JF, Freire MLJ, Almeida LNA, Pernambuco LR, Alves GAS. Photobiomodulation in speech-language-hearing therapy: a profile of professional practice and the level of information of Brazilian speech-language-hearing therapists. Rev. CEFAC. 2021;23(3):1-14.
17. CFFa: Conselho Federal de Fonoaudiologia. Consulta por especialistas por especialidade/ região [homepage on the internet]. 2021 [accessed 2021 Jun 20]. Available at: https:// www.fonoaudiologia.org.br/cffa/index.php/ consulta-especialistaspor-especialidaderegiao/
18. Silva TR, Canto GL. Dentistry-speech integration: the importance of interdisciplinary teams formation. Rev. CEFAC. 2014;16(2):598-603.
19. Barros PML, Oliveira PNP. Perfil dos pacientes atendidos no setor de fonoaudiologia de um serviço público de Recife - PE. Rev. CEFAC. 2010;12(1):128-33.
20. Cardoso MC, Ferreira CP, da Silva CP, Medeiros GM, Pacheco G, Vargas RM. Utilização das redes sociais em projeto de extensão universitária em saúde durante a pandemia de Covid-19. Expressa Extensão. 2021;26(1):551-8.
21. Ferreira VRT, Cecconello WW, Machado MR, Neurônios-espelho como possível base neurológica das habilidades sociais. Psicol. Rev. 2017;23(1):147-59.
22. Costa VDS, Silveira JCCD, Clementino TCA, Borges LRDDM, Melo LPD. Effects of mirror therapy on the motor and functional recovery of post-stroke paretic upper limbs: a Systematic Review. Fisioter e Pesqui. 2016;23(4):431-8.
23. Amarante EL, Lima JS, Bandeira RN, Moura APA, Pessoa LSF, Pernambuco LA et al. Masseter muscle surface electromyography in college students with a high degree of anxiety and temporomandibular disorder. Rev. CEFAC. 2018;20(1):44-52.
24. Silva AP, Carvalho ARR, Sassi FC, Silva MAA. The taping method effects on the trapezius muscle in healthy adults. CoDAS. 2019;31(5):1-8.
25. Santos VAD, Vieira ACDC, Silva HJD. Electrical activity of the masseter and supra hyoid muscles during swallowing of patients with multiple sclerosis. CoDAS. 2019;31(6):1-8.
26. Moura APA, Lima JS, Amarante EL, Almeida LNA, Pessoa LSF, Pernambuco LA et al. Orofacial myofunctional changes and electromyographic activity of the orbicularis oris muscle in trombonists. Rev. CEFAC. 2021;23(1):1-12.
27. Tang Y, Lin X, Lin XJ, Zheng W, Zheng ZK et al. Therapeutic efficacy of neuromuscular electrical stimulation and electromyographic biofeedback on Alzheimer's disease patients with dysphagia. Medicine. 2017;96(36):1-5.
28. Park JS, Hwang NK, Kim HH, Lee G, Jung YJ. Effect of neuromuscular electrical stimulation combined with effortful swallowing using electromyographic biofeedback on oropharyngeal swallowing function in stroke patients with dysphagia: a pilot study. Medicine. 2019;98(44):1-6.
29. Pinheiro DLDSA, Alves GÂDS, Fausto FMM, Pessoa LSDF, Silva LAD, Pereira SMDF et al. Efeitos da eletroestimulação associada ao treino mastigatório em pessoas com síndrome de down. CoDAS. 2018;30(e):e20170074.
30. Rodrigues EHDS, Coriolano MDGWDS, Lins CCDSA. Use of biofeedback combined with conventional therapy in the swallowing rehabilitation of older adults: an integrative literature review. Rev. CEFAC. 2020;22(5):1-9.
31. Dalla Toffola E, Tinelli C, Lozza A, Bejor M, Pavese C, Degli Agosti I et al. Choosing the best rehabilitation treatment for Bell's palsy. Eur J Phys Rehabil Med. 2012;48(4):635-42.
32. Criado L, de La Fuente A, Heredia M, Montero J, Albaladejo A, Criado JM. Electromyographic biofeedback training for reducing muscle pain and tension on masseter and temporal muscles: a pilot study. J Clin Exp Dent. 2016;8(5):571-6.
33. Torres GMX, César CP. Physiology of exercise in orofacial motricity: knowledge about the issue. Rev. CEFAC. 2019;21(1):1-11.