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Original Article

Nonspeech Oral Motor Exercises: Use and Knowledge of Speech-Language Pathologists Working with People with Speech Sound Disorders

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ABSTRACT

Previous studies, conducted in different countries (e.g. Australia, Canada, India, Republic of Ireland, USA, UK), have shown that speech-language pathologists (SLPs) use nonspeech oral motor exercises (NSOMEs) to treat speech sound disorders (SSDs), bringing attention to the substantial debate regarding the clinical effectiveness of NSOMEs. The aim of the present study was to investigate and characterize the use of NSOMEs by Portuguese SLPs in the intervention of SSDs, and to analyze the evidence that supports it. To do so, SLPs who provide therapy to children with SSDs were invited to complete an online questionnaire, based on a previous survey conducted in India by Thomas and Kaipa (2015). A total of 184 participants responded to the survey; 93.5% reported knowing about NSOMEs, 78.5% used NSOMEs in their intervention for SSDs, and 80.2% considered them effective in treating SSDs (89% indicated that their knowledge about NSOMEs was acquired through graduate and post-graduate courses; 98.5% reported that they used NSOMEs to improve the motor function of the articulators). This study offers an overview of Portuguese speech-language pathologists' reported use of NSOMEs as part of the intervention of speech sound disorders in children. Many of the participants in this study reported that they did use NSOMEs in SSD treatments, regardless of the lack of evidence to support their use in this context. Furthermore, the results show that the percentage of SLPs in Portugal using NSOMEs is similar to those found in the USA, UK, Canada, and India, but different from those in Australia and Ireland.

Keywords:
Speech Sound Disorders; Speech-Language Pathology; Evidence-based practice; Nonspeech Oral Motor Exercises

Ejercicios motores orofaciales no verbales: uso y conocimiento de los fonoaudiólogos que trabajan con personas con trastornos de los sonidos del habla

RESUMEN

Estudios realizados previamente en otros países (por ejemplo, Australia, Canadá, India, República de Irlanda, EE.UU., Reino Unido) han demostrado que los fonoaudiólogos utilizan ejercicios motores orofaciales no verbales (EMONV) para tratar los trastornos del los sonidos del habla (TSH), atrayendo atención hacia el debate sustancial que existe respecto a la eficacia clínica de estos ejercicios. En este contexto, el presente estudio tuvo como objetivo investigar y caracterizar el uso de los EMONV por fonoaudiólogos portugueses que realizan intervenciones en TSH y evaluar el conocimiento que lo respalda. Para ello, se invitó a fonoaudiólogos que trabajan con niños con TSH a completar un cuestionario basado en Thomas y Kaipa (2015). Un total de 184 participantes respondió a la encuesta; 93,5% informó contar con conocimientos sobre los EMONV, 78.5% utiliza EMONV para el tratamiento de TSH y 80,2% los considera efectivos en el tratamiento del TSH (89% indicó que su conocimiento sobre EMONV se adquirió a través de cursos de pregrado y posgrado; 98,5% informó que utiliza los EMONV para mejorar las funciones motoras de los articuladores). Este estudio ofrece una descripción general del uso de los EMONV por parte de los fonoaudiólogos portugueses en la intervención en niños con TSH. Muchos de los participantes en este estudio informaron que utilizan EMONV en el tratamiento de TSH, independientemente de la falta de evidencia para respaldar su uso en este contexto. Estos hallazgos muestran que el porcentaje de fonoaudiólogos en Portugal que utilizan EMONV es similar a los encontrados en los EE.UU., Reino Unido, Canadá e India, pero diferente de los de Australia e Irlanda.

Palabras clave:
Trastornos de los sonidos del habla; Fonoaudiología; Práctica Basada en Evidencia; Ejercicios motores orofaciales no verbales

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INTRODUCTION

Speech sound disorders (SSDs) are a very frequent communication impairment in preschool and school children, compared to other communication disorders (Azmat et al., 2014; Ceron et al., 2017; Law et al., 2000; McKinnon et al., 2007, 2007; McLeod & Harrison, 2009; Oliveira et al., 2015). Given their prevalence, different approaches have been proposed for their intervention (e.g., Baker & McLeod, 2011; Wren et al., 2018), which can be divided into phonological (approaches that focus on the reorganization of the phonological system) and articulatory (approaches that target the motor skills necessary for speech sound production; Dodd & Bradford (2000). Motor-based approaches include motor learning principles in speech therapy (Maas et al., 2008). Nonspeech oral motor exercises (NSOMEs) are based on oral motor activities that involve the manipulation or stimulation of the oral structures (e.g., lips, tongue, jaw, soft palate) in nonspeech mode (e.g., Ruscello, 2008). Speech-language pathologists (SLPs) usually refer using these exercises in combination with other techniques (e.g., auditory discrimination; Kamhi, 2008) for intervening in children with articulatory-based SSD (Hodge et al., 2005; Joffe & Pring, 2008; Kamal, 2021; Lee & Moore, 2015; Lof & Watson, 2008; Ruscello, 2008; Ygual-Fernández & Cervera-Mérida, 2016).

The effectiveness of the intervention in preschool children with SSD has been analyzed by systematic reviews (e.g., Baker & McLeod, 2011; Wren et al., 2018), while some have particularly focused on the efficacy of nonspeech oral motor exercises (NSOMEs; e.g., Lass & Pannbacker, 2008; Lee & Gibbon, 2015; McCauley et al., 2009; Ruscello, 2010). These reviews have shown that only a few studies have explored the efficacy of NSOMEs in children with SSDs (e.g. Lee & Gibbon, 2015). For instance, in the review conducted by Lee & Gibbon (2015), only three studies of interventions using NSOMEs were included. Furthermore, some methodological limitations were found, suggesting that further well-designed research is needed to answer the question of whether NSOMEs are effective in the treatment of SSDs in children.

To date, despite the popularity of NSOMEs, there is considerable literature questioning the effectiveness of this intervention in SSD (Hodge et al., 2005; Lass & Pannbacker, 2008; Lee & Gibbon, 2015; Rumbach et al., 2018; Ygual-Fernández & Cervera-Mérida, 2016).

An important aspect to note is that it is difficult to find unanimity regarding the type of exercises that are considered to be part of NSOMEs since the use of different types of exercises in different studies has contributed to the discrepancy in the results (Vashdi et al., 2020). Lof (2008) uses NSOMEs to refer to every therapy technique that does not require the production of speech but is used to influence speech. Kent (2015) used the term "nonspeech oral movements" to refer to the motor acts executed by some of the muscles of speech to achieve a specific movement goal that is, per se, not sufficient to have a phonetic character. The author also discusses the distinctions of overlapping tasks such as speechlike, quasispeech/paraspeech, and nonword repetition. Susanibar et al. (2016) also refer to these tasks, differentiating them and adapting the terms to Spanish. Bahr & Rosenfeld-Johnson (2010) propose the term "oral placement therapy" to describe oral motor exercises that are directly related to speech and used essentially with the purpose of improving speech (this is an updated form of the term Phonetic Placement Therapy). Consequently, there has been some confusion regarding what constitutes NSOMEs and what constitutes oral placement therapy (Bahr & Rosenfeld-Johnson, 2010).

Despite the lack of evidence of the efficacy of NSOMEs for the treatment of SSD in preschool children, a number of SLPs commonly use them, particularly for the intervention of children with articulatory-based SSDs (Hodge et al., 2005; Joffe & Pring, 2008; Kamal, 2021; Lee & Moore, 2015; Lof & Watson, 2008; Ruscello, 2008; Ygual-Fernández & Cervera-Mérida, 2016). However, it is important that SLPs base their clinical decisions on current scientific evidence (Boswell, 2005; Lass & Pannbacker, 2008; Lee & Gibbon, 2015; McCauley et al., 2009), carrying out interventions for speech with an established efficacy in the literature, especially when the goal of intervention is to achieve functional speech (Alhaidary, 2021; Forrest & Iuzzini, 2008; Lass & Pannbacker, 2008; G. Lof, 2008; McCauley et al., 2009; Powell, 2008; Ygual-Fernández & Cervera-Mérida, 2016).

In a survey about the use of NSOMEs by SLPs conducted in the United Kingdom (UK), the majority (71.5%) of the SLPs reported having used NSOMEs, and 72.4% stated that there was evidence-based research to support their use (Joffe & Pring, 2008). However, this research did not study the SLPs' rationales for using NSOMEs, like the study by Thomas & Kaipa (2015) did. Similarly, in a study conducted in India by Thomas & Kaipa (2015), most of the participants (91%) reported using or having used NSOMEs as a speech therapy technique. The authors found that 84% of SLPs considered the strengthening of the articulators to be the main reason for the effectiveness of NSOMEs. Moreover, a study conducted in Canada by Hodge et al. (2005) showed that SLPs considered the improvement of the articulators' strength as one of the most important benefits of NSOME. In the USA, Lof & Watson (2008) surveyed a sample of 537 SLPs,

showing that a majority (85%) reported using NSOMEs in SSD interventions. Also, Brumbaugh & Smit (2013), in a USA-based study with a sample of 489 SLPs, found that 67% reported using NSOMEs in SSD interventions. Finally, a study carried out in the Republic of Ireland by Lee & Moore (2015) stated that 22/39 (56%) of the SLPs reported using NSOMEs.

The studies indicate that the articulators' strength is one of the reasons that SLPs express to justify the use of NSOMEs. However, the arguments against the use of NSOME claim that these exercises are not useful to improve muscle strength (e.g., Bunton & Weismer, 1994). Furthermore, studies have shown that a high level of muscle strength is not required for speech production (for example, the tongue and lips use only 10% to 30% of their maximum force during speech, and the jaw uses 2% of its strength (DePaul & Kent, 2000; Forrest & Iuzzini, 2008; Wenke et al., 2006). Lof & Watson (2008) propose other reasons against the use of NSOMEs (additional to the unnecessary training of the articulators' strength), such as: the transference of a part (oral nonspeech movements) to a whole (speech) is not advantageous; the awareness of articulators is not significant for speech; the neural organization for speech and nonspeech tasks are different; and there is a lack of empirical evidence supporting the use of NSOMEs.

In this context, the main goal of this study was to analyze and characterize: (1) the use of NSOMEs by Portuguese SLPs working with SSDs and the type of NSOMEs they use; (2) the reasons why Portuguese SLPs use or do not use NSOMEs for SSD; (2) the application of NSOMEs in other communication disorders; (4) the intervention programs more frequently used by Portuguese SLPs working with SSDs.

This research also aimed to answer the following questions: (1) What is the percentage of Portuguese SLPs using NSOMEs in the intervention of SSD, and the reasons for using them?; (2) What is the percentage of Portuguese SLPs that consider NSOMEs to be effective?; (3) What are the types of NSOMEs used by Portuguese SLPs?; (4) what is the percentage of SLPs not using NSOMEs and the reasons for not using them?; (5) What are the types of communication disorders for which NSOMEs are used by Portuguese SLPs?; (6) What are the most frequent intervention programs used by Portuguese SLPs in SSD treatment? To answer these questions, Portuguese SLPs with clinical experience in SSDs were asked to complete an online questionnaire, adapted from a previous survey conducted in India by (Thomas & Kaipa, 2015).

METHODS

Portuguese SLPs with experience in the treatment of SSDs were asked to complete an online questionnaire, adapted from a previous survey conducted in India by Thomas & Kaipa (2015). The authors of the survey were contacted in order to obtain authorization to use the questionnaire (see appendix). Subsequently, the questionnaire was translated into Portuguese by a bilingual SLP, and submitted to an expert panel consisting of four SLPs with expertise in SSDs and oral motor therapy, who suggested some changes at this stage. The translated questionnaire bore some similarities as well as differences with the original, and was adapted to suit the cultural needs of Portuguese SLPs and clients.

A new question was added, related to the area of the country where participants worked. Additionally, the expert panel considered the fifth item (type of master's degree, e.g. audiology, speech-language pathology, hearing) of the Thomas & Kaipa (2015) questionnaire not applicable to the Portuguese context, since this differentiation does not exist in Portugal, and consequently this question was removed. Furthermore, the item regarding specialties was not included, since there are no specialization programs in Portugal for Speech-Language Pathology. It should be noted that audiology does not exist as a specialization in Portugal, but as an independent profession. The "length of clinical experience" and the "nature of the work setting" items were maintained just as in the original questionnaire. The expert panel also suggested that an item asking about "highest educational degree" should be included. The "Type of speech disorders seen" in SLP's caseload was maintained. A question was added to determine whether the SLPs who answered the questionnaire had knowledge about NSOMEs. If the answer was yes, they were able to continue the survey; if they answered no, the survey would end for those participants. Finally, a question was added to determine which SLPs would continue to section II (if they used NSOMEs) and which would skip to section III (the ones who didn't use NSOMEs): "Do you use NSOMEs currently in your clinical practice with speech sound disorders?".

Sections II and III were identical to those in the Thomas & Kaipa (2015) questionnaire. Section IV was not part of the original questionnaire and it was added to gather more information about the types of approaches Portuguese SLPs use with SSDs. This was similar to the final section of Lof & Watson's survey (2008), but only indicated which programs were used by the SLPs, without using a Likert-type scale. The options were selected according to Oliveira et al. (2015), and included: Minimal Pairs, Maximal

Oppositions, Traditional Approach, Cycles, Metaphon, Phonological Awareness Approach, PROMPT, Parents and Children Together-PACT, Core Vocabulary, and an option for other approaches.

Following the analysis performed by the experts, a final version of the questionnaire was created. The final version was then pre-tested on 5 randomly selected SLPs to analyze possible problems, showing no need for additional modifications. The survey was then converted into an online version. The Portuguese Association of SLPs was contacted and asked to cooperate and distribute the online questionnaire on their website and social network. The questionnaire was also available through Facebook.

Participants

A total of 184 SLPs participated in this study. The majority of SLPs were female (94.6%; n = 174), reflecting the gender distribution of the profession in Portugal (Batista, 2011). The SLPs predominantly practiced in the North of Portugal (59.8%; n = 110). The experience of the SLPs ranged from 1 to 35 years (with a higher percentage found in the 0 to 5 years range, of 39.1%). The majority of the participants (60.3%) had a college degree as their highest level of qualification. Regarding work settings, 79.9% of the participants worked in private practice, and 48.9% in an educational context. The information related to the participants is presented in Table 1. Our research was conducted with the formal approval of the Ethics Committee of Fernando Pessoa University (5 March 2018). Written informed consent was collected from all participants before any data collection was carried out.

Materials

The Portuguese questionnaire consisted of four sections with a total of 26 items (multiple-choice and yes/no questions) and took about 10 minutes to complete. Some of the questions allowed the participants to select multiple answers, whilst others allowed selecting only one option.

The four main sections of the questionnaire were:

1) Section I (9 items): This section requested sociodemographic and professional data (e.g. gender, professional experience). In the final part of section I, the participants were asked about their knowledge of NSOMEs (ending their participation if they had no knowledge about the subject). Participants also had the option of indicating their belief with regards to the efficacy of NSOMEs in interventions, and whether they use NSOMEs or not. Their response directed them to sections II or III of the questionnaire, respectively.
2) Section II (11 items): this section solicited information about the use of NSOMEs (e.g. type, frequency, and reasons supporting the use of NSOME in therapy).
3) Section III (5 items): This section requested information from the participants who responded they did not use NSOMEs in clinical practice (e.g. reasons for not using NSOMEs in SSD intervention).
4) Section IV (1 item): This section required the participants to indicate the intervention programs used in their clinical practice in the treatment of SSDs, to understand what other programs of interventions were used besides NSOMEs.

Procedures

The questionnaire was created using Google Forms and distributed online through the Fernando Pessoa University and the Portuguese Association of Speech-Language Pathologists. The questionnaire was available online from 6 February 2018 to 6 April 2018.

The SLPs were eligible to participate if they were currently practicing in Portugal and had experience with SSDs. There were no other inclusion or exclusion criteria. A total of 189 questionnaires were received, however, five were excluded since the participants did not fulfill the eligibility criteria (working with SSDs).

Data analysis

The data collected was analyzed through the Statistical Package for Social Sciences (SPSS), version 25, using descriptive statistics to display the frequency of nominal and ordinal variables. Inferential statistical analyses were also made. The associations between variables were analyzed using Spearman's and chi-square tests. A significance level (α) of 0.05 was established.

Table 1. Sociodemographic characterization of the participants.

Sociodemographic characterization of the participants	N	%
Gender		
Male	10	5.4
Female	174	94.6
Area of the Country		
North	110	59.8
Center	51	27.7

South	12	6.5
Autonomous region of the Azores	6	3.3
Autonomous region of the Madeira	5	2.7
Years of Experience		
0 – 5	72	39.1
6 – 10	70	38.1
11 – 15	21	11.4
16 – 20	15	8.1
+ 21	6	3.3
Highest Level of Education		
Bachelor	1	0.5
Graduate	111	60.3
Masters	47	25.5
PhD	7	3.8
Other	18	9.8
Work Settings		
Early intervention	48	26.1
Educative context	90	48.9
Universities	5	2.7
Hospitals	30	16.3
Private practice	147	79.9
Health Centers	5	2.7
Other institutions	44	23.9
Other	13	6.5

RESULTS

Section I: Knowledge about NSOMEs

Knowledge about NSOMEs: After completing the personal data, the participants were asked about their knowledge of NSOMEs as an speech-language therapy technique. The participants' responses can be consulted in Table 2 (see appendix). Those who expressed having no knowledge of NSOMEs ended their participation at this point. Twelve SLPs (6.5%) stated having no experience with NSOMEs, while 172 (93.5%) reported they had some knowledge and continued answering the questionnaire (sections II, III and IV).

Opinions regarding the efficacy of NSOME: 80.2% (n = 138) of the participants reported that they considered NSOMEs to be effective, as opposed to 19.8% (n = 34), who did not consider NSOMEs to be effective for SSD interventions.

Use of NSOMEs for the intervention of SSDs in clinical practice: The participants were divided into two different sections of the questionnaire according to their responses: Section II – For SLPs that use NSOMEs with SSDs (78.5%; n = 135); Section III – For SLPs that do not use NSOMEs with SSDs (21.5%; n = 37).

Section II: SLPs who use NSOMEs in their interventions for SSDs

Knowledge about NSOMEs: 89.6% of the participants (n = 121) answered that their knowledge about NSOMEs was acquired through their "college degree and/or postgraduate courses"; 55.6% (n = 75) through "conferences, workshops, seminars"; 38.5% (n = 52) through "books and research articles"; and 20.7% (n = 28) through colleagues.

Length of time using NSOMEs: Regarding the length of time that NSOMEs had been used as a technique in SSD interventions, 48.1% (n=65) reported having used them for less than 5 years, 34.1% (n = 46) indicated that they had been using NSOMEs for 6–10 years, 7.4% (n = 10) for 11–15 years, 8.2% (n = 11) for 16–20 years and 2.2% (n = 3) had been using them for more than 21 years.

Conditions for which NSOMEs were used: The majority of the participants (98.5%) reported using NSOMEs to improve the motor functions of the articulators, and 38.5% to improve sensory deficits. A low percentage (2.8%) indicated that they used NSOMEs for other conditions (e.g. improving the speed and amplitude of the articulators; articulatory training; oral proprioception).

Types of NSOMEs used: Most of the NSOMEs used were vertical tongue movements (91.9%) and blowing (91.1%). Lateral tongue movements, alternating lip puckering and/or smiling and lip puckering were used by most participants (79.3%, 79.3%, and 78.5%, respectively). Other oral movements mentioned were smiling, lateral tongue sweeps, mandibular movements, suction, puffing of the cheeks, among other exercises.

Types of materials used for NSOMEs: The most frequently used materials for NSOMEs were straws (84.1%), balloons (74.1%), blowing whistles (56.3%), paper strips (54.1%), and cotton balls (53.3%). Some participants (25%) indicated other materials, such as spatulas, bubble gum, chocolate, polystyrene balls, whistles, wind ramps, food with different textures, orthodontic elastics, gloves, swabs, oral tubes, facial massagers, pencils, and jelly.

Frequency of use of NSOMEs: Regarding the use of NSOMEs in the treatment of SSDs, 40.7% of the participants indicated that they used them frequently, 34.1% used them occasionally, and only 6.7% used them rarely.

Reasons for believing that NSOMEs are effective: Most of the participants (83.7%) reported believing in the efficacy of NSOMEs because they helped to strengthen the articulators. Almost half the participants (45.2%) indicated that they used NSOMEs because of their clinical experience.

Experience with the use of NSOMEs for SSDs: Concerning the participants' experience with NSOMEs and SSDs, 71.9% reported being satisfied with the results, while 18.5% claimed inconsistent results. Only a small percentage of participants (0.7%) stated that NSOMEs did not appear to be beneficial.

Use of NSOMEs in the future: Most participants (91.9%) reported that they would continue to use NSOMEs in the future along with other speech therapy techniques. A small number of participants (8.1%) mentioned that they intend to continue using NSOMEs for a long time.

Types of communication disorders for which NSOMEs are used besides SSDs: Many participants reported using NSOMEs for motor speech sound disorders (83.7%), swallowing disorders (62.2%), resonance disorders (34.8%), voice disorders (25.2%), fluency disorders (17.8%), language developmental disorder (12.6%), adult language disorders (5.2%), written language disorders (2.2%), and others (sensory disorders and mouth breathing syndrome (1.4%).

Section III: SLPs who expressed not using NSOMEs for SSDs

Rationale for not using NSOMEs: The main reasons reported by the participants for not using NSOMEs were personal experience of finding no evidence of results (56.8%) and a lack of research supporting the use of NSOMEs (56.8%).

Awareness of research discouraging the use of NSOMEs: More than half of the participants (59.5%) reported that they were aware of literature discouraging the use of NSOMEs as a speech therapy technique.

Would SLPs consider the use of NSOMEs if there was scientific evidence to support their use: All participants responded that they would consider using NSOMEs in their practices under this condition.

Use of NSOMEs in the future: Most participants (97.3%) stated that evidence-based practice is an important factor for the decision of using NSOMEs in the future, while 51.4% reported that a successful intervention is sufficient to include NSOMEs in their clinical practices.

Possibility of using NSOMEs in combination with other speech therapy techniques: 83.8% of the participants would consider doing this, while 16.2% would not consider combining NSOMEs with other techniques.

Section IV: Intervention programs used with SSDs

This section was completed by all the participants (n = 184), following sections II and III. Most participants referred using "Minimal Pairs Intervention" (89%), followed by "Phonological Awareness Intervention" (84.9%), as intervention programs for SSDs. The methods less frequently used by the respondents were "PROMPT", "Parents and Children Together" and "Core Vocabulary" (each with 14%).

Relationship between clinical experience and the use of NSOMEs: The relationship between clinical experience and the number of years using NSOMEs was analyzed, and the results of Spearman's coefficient revealed a significant relation ($r_s = 0.888$, $p < 0.01$) between the years of clinical experience as an SLP and the use of NSOMEs.

The authors were also interested in whether there was an association between SLPs considering NSOMEs to be effective and the frequency of their use. The results of a Chi-square test revealed a significant association between the two variables ($p = 0.037$). The authors also found a direct association between the frequency of use of NSOMEs and the SLPs' awareness of studies that didn´t recommend this intervention technique ($p = 0.020$).

DISCUSSION

The present study focused on the use of NSOMEs by 184 Portuguese SLPs who provide therapy for SSDs. A similar study conducted in the Republic of Ireland (Lee & Moore, 2014) had the participation of 39 SLPs, and in India (Thomas & Kaipa, 2015) 127 SLPs participated. A larger sample (537 SLPs) was achieved in a study conducted in the USA (Lof & Watson, 2008). A more recent study carried out in Australia had the participation of 124 SLPs (Rumbach et al., 2018). Considering the number of SLPs currently employed in Portugal (2800 SLPs in 2018, according to ACSS) and in each of those countries, this study presents a satisfactory sample.

In total, 78.5% of the SLPs reported using NSOMEs for the treatment of SSDs, and only 21.5% stated not to use them. These results replicate those found in other studies in the USA (85%; Lof & Watson, 2008), Canada (85%; Hodge et al., 2005), UK (81%; Mackenzie et al., 2010), Jordan (74%; Kamal, 2021), and

India (91%; Thomas & Kaipa, 2015). However, these results are different from findings obtained in Australia (Mcleod & Baker, 2014; Rumbach et al., 2018) where the majority of SLPs reported not using NSOMEs when working with SSDs. They also differ from the results Lee & Moore (2014) found in the Republic of Ireland, where only 56% of the SLPs reported using NSOMEs. Furthermore, Brumbaugh & Smit (2013) acknowledged a weakening tendency in the use of NSOMEs among USA SLPs working with children, comparing the results with Lof & Watson (2008).

Regarding the high percentage of SLPs using NSOMEs, Thomas & Kaipa (2015) presented some possible reasons for this decision among SLPs in India. One is that NSOMEs are relatively easy to teach, when compared to other activities. They also suggested that professionals in India could be influenced by western countries that frequently use oral motor-based interventions. Additionally, there is the idea that NSOMEs can cross generations of SLPs through cultural transmission. Some authors (e.g. Ygual-Fernández & Cervera-Mérida, 2016) claim that one of the reasons for the popularity of NSOMEs, is that these exercises are easily implemented and applied in all clinical cases, following the same steps, and do not require an up-to-date evidence-based theoretical frame. In Portugal, the high percentage of SLPs using NSOMEs to treat SSDs may have to do with the influence of other countries and their histories of oral motor-based interventions, and also the influence of other SLPs, despite the lack of evidence supporting the efficacy of NSOMEs for SSD.

Concerning the SLPs' opinions about the efficacy of NSOMEs in the intervention of SSD, 80.2% answered that they considered them effective. This finding contrasts with what is found in the current literature, which shows a lack of evidence of NSOMEs efficacy (Lass & Pannbacker, 2008; Lee & Gibbon, 2015; McCauley et al., 2009).

SLPs that use NSOMEs

Within the group of participants that reported using NSOMEs in the intervention of SSD, the 89 percent indicated that they learned about NSOMEs through their college education and/or postgraduate courses. This could mean that Portuguese universities are promoting NSOMEs as an evidence-based practice. Rumbach et al. (2016) observed that SLP students required more knowledge about the clinical intervention using NSOMEs, suggesting that evidence-based training on the use of NSOMEs would be favorable for SLP students, as well as for clinical instructors. On the other hand, 20.7% of the respondents learned about NSOMEs through colleagues, which is consistent with the previously mentioned reasons for the popularity of these exercises (e.g. Thomas & Kaipa, 2015).

The reasons why SLPs continue to use a procedure that is not supported by evidence may include a trust in unreliable sources (Kamhi, 2004), such as non-scientific papers, or the influence of a colleague. Dollaghan (2004) stated that said evidence should come from peer-reviewed studies, and that clinical experience, although important and valuable, can also be subjective and incorrect.

Regarding the reasons why NSOMEs are used, 98.5% of the Portuguese SLPs indicated using them to improve the motor functions of the articulators. This finding is in line with the results shown by Thomas & Kaipa (2015) and Hodge et al. (2005) where muscle strength was the most frequent reason reported by SLPs. In turn, in the study by Lee & Moore (2014) all SLPs claimed that they doubted that muscle movements for nonspeech oral tasks would carry over to muscle movements for speech sounds production. Indeed, studies have shown that high muscular strength is not required for speech production (DePaul & Kent, 2000; Forrest & Iuzzini, 2008; Wenke et al., 2006). Susanibar et al. (2016b) describe speech as an extremely complex function, integrating various components that cannot be equated to a motor act, indicating that the oral-facial strength necessary for speech production varies between 10 and 25%.

In the same line, when asked about the reasons for believing that NSOMEs are effective, most participants (83.7%) affirmed that NSOMEs help strengthen the articulators, and 45.2% answered that this belief is based on clinical experience. Similarly, Thomas & Kaipa (2015) found that 84% of the SLPs considered articulator strength to be the main reason supporting the effectiveness of NSOME, and the study conducted in Canada by Hodge et al. (2005) also showed articulator strength as one of the most important benefits reported by SLPs. The fact that the perception of SLPs is similar among these papers is worthy of further study. This may be related to a lack of clarity regarding what type of exercises constitute NSOMEs. As previously mentioned, there is some confusion between NSOMEs, nonspeech oral movements, and OPT (Bahr & Rosenfeld-Johnson, 2010; Kent, 2015; Lof, 2008). Other studies have argued over what type of oral-motor exercises are included in SLPs' clinical practice (e.g. Rumbach et al., 2018), which makes it important to analyze, specifically, what are the differences and variables that could explain the different perceptions among SLPs.

Regarding the percentage of SLPs that considered clinical experience as a valid argument to use NSOMEs, it is important to

note that subjective observations should not be used in lieu of evidence-based practice to assess the efficacy of clinical procedures (Finn et al., 2005). As found by Muttiah et al. (2011), both clinicians and researchers have complementary roles regarding clinical decisions and professional collaboration. It appears that the gap between researchers and clinicians regarding the use of NSOMEs comes from the fact that most researchers strongly recommend against using them, considering the lack of sufficient evidence. Nevertheless, most practitioners continue to use NSOMEs in their therapy (Kamhi, 2008). No information has been found to justify the difference between these two groups (e.g. Vashdi et al., 2020). A recent study found that SLPs considered it difficult to apply research findings to their clinical practice, due to limited time and other restrictions (Fulcher-Rood et al., 2020). It is important to note that an evidence-based practice involves the integration of clinical knowledge, the highest level of evidence, the patients' values, and the context of practice (Susanibar et al., 2016a).

Concerning the types of NSOMEs used by the Portuguese SLPs in this study, it was found that most use vertical tongue movements (91.9%) and blowing (91.1%). Other NSOMEs, such as lateral lip movements, alternate lip puckering and/or smiling, and isolated lip puckering are also used frequently. It is noteworthy that none of these exercises include movements that are related to speech sounds (and this is the major difference between NSOMEs and Oral Placement Therapy). In this regard, Golding-Kushner (2001) stated that some of these exercises (e.g. blowing and sucking) do not work for speech, and that the rationales used to justify them were scientifically unreliable. Some of the reasons deemed unreliable by those authors are: (1) speech is simply a motor act; (2) a specific ability in one structure will be transferred to speech (because all elements share the same neuromotor principles); and (3) speech can be decomposed in less complex segments (Susanibar et al., 2016a). In conclusion, despite the scientific evidence refuting these assumptions (e.g. (Bonilha et al., 2006; G. Lof, 2003, 2008, 2009; G. L. Lof & Watson, 2008; Maas, 2017; Muttiah et al., 2011), NSOMEs remain popular among the clinical practices of SLPs. Nonetheless, it is worth mentioning that although most studies strongly recommend against the use of NSOMEs for children with SSD, a more recent study (Vashdi et al., 2020) showed a relation between NSOMEs and speech sound production that seems to oppose the conclusions of the rest of the literature.

Regarding the types of communication disorders for which NSOMEs are used, our participants reported motor speech disorders and swallowing disorders as the most frequent. While for dysarthria the literature is insufficient to support the use of NSOMEs (e.g. Duffy, 2012; Kent, 2015; Mackenzie et al., 2010), there is some evidence that this type of intervention, without speech exercises, elicited significant articulatory improvements in children with feeding disorders (Kollia et al., 2019).

SLPs that do not use NSOMEs

For the SLPs that reported not using NSOMEs, the main reasons were related to personal experience (absence of results) and the lack of research supporting their use. Knowledge about the literature that discourages the use of NSOMEs as a speech therapy technique was reported by 59.5% of the SLPs. The fact that these participants reported the lack of evidence supporting NSOMEs is a positive result, since it means that some Portuguese SLPs are aware of important information (e.g. Lee & Gibbon, 2015; McCauley et al., 2009).

SSD intervention programs

Besides NSOMEs, Minimal Pairs Intervention and Phonological Awareness Intervention were the approaches most used by Portuguese SLPs. In contrast, Lousada et al. (2013, 2014) observed that, in Portugal, the most common approach used by SLPs working with children with any SSD subgroup was traditional articulation therapy, while phonological interventions were rarely used. However, a recent study by Oliveira et al. (2015) highlighted that the most frequently used interventions were phonological awareness (97%), auditory discrimination (92%), meaningful minimal contrast therapy (75%), and parent-based work (58%). Similarly, Mcleod & Baker (2014), in a sample of 231 Australian SLPs, observed eight intervention approaches most frequently used: auditory discrimination, minimal pairs, cued articulation, phonological awareness, traditional articulation therapy, auditory bombardment, Nuffield Centre Dyspraxia Programme, and core vocabulary.

This study emphasizes the need to include specific content in the undergraduate and post-graduate curricula of Speech-Language Pathology programs, regarding current evidence for different techniques used in the intervention of SSDs.

Association between clinical experience and the use of NSOMEs

This study also showed a significant correlation between the length of clinical experience and the use of NSOMEs, meaning that SLPs with more years of clinical experience had an increased tendency to use NSOMEs in their interventions for SSD. This result differs from the study by Thomas & Kaipa (2015), in which the participants' use of NSOMEs diminished as their clinical

experience increased. Brumbaugh & Smit (2013) also observed that recently graduated SLPs shared a similar degree of knowledge with their more experienced colleagues about SSD interventions. Although some may argue that SLPs with more clinical experience are more likely to realize that NSOMEs do not produce benefits in patients with SSD (e.g. Thomas & Kaipa, 2015), it also may be argued that the same SLPs have different knowledge, perceptions, and experiences than their recently graduated colleagues, and this might include beliefs about the efficacy of NSOMEs. An important aspect to focus on is understanding and studying the clinical experiences of these SLPs, since evidence-based practice refers not only to the highest-quality research, but it also incorporates clinical expertise and the client's preferences into the process (American Speech Language-Hearing Association [ASHA], 2004).

Another relevant finding of this study is that the more the SLPs read about NSOMEs, the less they used them in their clinical practice. Thome et al. (2020) suggest that the use of evidence-based practices improves the clinical experience of SLPs, helping them provide better interventions to their clients.

The methodology used in this study may have contributed to a sampling bias, since SLPs with an interest in this topic may have been more willing to participate in the study, and also because of the lack of consensus regarding the exercises and tasks that are included in NSOMEs (see Kent, 2015; Lof, 2008, 2009). Due to the small sample size and unequal distribution among areas of the country, the opinions in the present study may not be representative of all Portuguese SLPs that work with SSDs, as responses from all the districts were not equally represented. A future study should consider a better distribution of Portuguese SLPs, in order to better understand their practices.

CONCLUSION

This study focused primarily on examining and characterizing the types of NSOMEs used by Portuguese SLPs, as well as the frequency of use, when providing intervention for SSDs in children, and their rationales for using -or not- these exercises.

The majority of the SLPs who completed the survey reported using NSOMEs for SSD intervention, which is similar to the results reported in studies carried out in other countries (e.g. USA, Canada, and India). These results are not in line with the currently available evidence regarding the efficacy of NSOMEs. Additionally, the majority of the SLPs stated that NSOMEs help to strengthen the articulators, with many of them stating that this belief was based on clinical experience. However, the current literature does not support this argument.

There is a need for greater awareness amongst SLPs with regards to the up-to-date evidence supporting different techniques for the intervention of SSDs in children. Thus, these results are worthy of further exploration.

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APPENDIX

Appendix 1. Adaptação portuguesa do questionário "*The Use of Non-speech Oral-motor Exercices in India Questionnaire*" (Thomas & Kaipa, 2015).

Na sua prática profissional, atende crianças com Perturbação dos Sons da Fala?

- Sim
- Não

(se responde não) O seu questionário terminou aqui. Obrigada pela sua colaboração!

Parte I
Caracterização Sócioprofissional

1. Indique o sexo.
- Masculino
- Feminino
- Não quero indicar

2. [1]Indique em que região de Portugal exerce funções como Terapeuta da Fala.
- Norte
- Centro
- Sul
- Região Autónoma dos Açores
- Região Autónoma da Madeira

3. Indique a sua formação académica mais elevada.
- Bacharelato
- Licenciatura
- Mestrado
- Doutoramento
- Outro _____

4. Indique há quantos anos exerce funções como Terapeuta da Fala. _____

5. Indique em que contexto(s)/área(s) exerce funções como Terapeuta da Fala.
- ☐ Intervenção Precoce
- ☐ Contexto Educativo
- ☐ Universitário
- ☐ Hospitalar
- ☐ Prática privada
- ☐ Centro de Saúde
- ☐ IPSS
- ☐ Outro _____

[1] Esta questão não faz parte do questionário original de Thomas & Kaipa (2015).

6. Escolha, num máximo de três, as perturbações que mais observa na sua prática profissional.

- ☐ Perturbação Motora da Fala
- ☐ Perturbações da Voz
- ☐ Perturbações da Fluência
- ☐ Perturbação do Desenvolvimento da Linguagem
- ☐ Perturbações da Linguagem Escrita
- ☐ Perturbação da Linguagem em Adultos
- ☐ Perturbações de Ressonância
- ☐ Disfagia/Dificuldades na alimentação
- ☐ Outro _____

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1. Tem conhecimento sobre os exercícios orofaciais não-verbais na Terapia da Fala?

- Sim
- Não- Termina questionário

2. Acha que as exercícios orofaciais não-verbais são eficazes no tratamento das Perturbações dos Sons da Fala?

- Sim
- Não

3. Usa exercícios orofaciais não-verbais na sua prática clínica com Perturbações dos Sons da Fala?

- Sim – Avançar para a parte 2 do questionário
- Não – Avançar para a parte 3 do questionário

Parte II

Para Terapeutas da Fala que usam exercícios orofaciais não-verbais na intervenção com Perturbações dos Sons da Fala

Atenção: Lembre-se que todas as questões que se seguem estão relacionadas com a sua prática com Perturbações dos Sons da Fala.

1. Como adquiriu conhecimento acerca dos Exercícios Orofaciais Não-verbais? (Selecione a(s) opção(ões) que melhor se adequam).

- ☐ Durante a licenciatura/pós-graduações.
- ☐ Com colegas.
- ☐ Em conferências, *workshops*, seminários. (Aprendizagem continua).
- ☐ Através de livros da especialidade e de artigos científicos.

2. Há quanto tempo usa exercícios orofaciais não-verbais na intervenção com Perturbações dos Sons da Fala? _____

3. Para que objetivo utiliza com maior frequência os exercícios orofaciais não-verbais? (Selecione a(s) opção(ões) que melhor se adequam à sua prática profissional).

- ☐ Para melhorar aspetos motores dos articuladores (como por exemplo, força e tonicidade).
- ☐ Para intervir com questões sensoriais das estruturas orais.
- ☐ Para intervir com problemas de alimentação.

- ☐ Para controlo da baba.
- ☐ Outro _____

4. Indique que tipo de exercícios orofaciais não-verbais usa para intervir nas Perturbações dos Sons da Fala. (Selecione a(s) opção(ções) que melhor se adequam à sua prática profissional)

- ☐ Protusão labial
- ☐ Lateralização labial
- ☐ Alternância entre estiramento e protusão labial
- ☐ Estiramento labial
- ☐ Lateralização lingual
- ☐ Supraversão e infraversão lingual
- ☐ Sopro
- ☐ Sucção
- ☐ Insuflação das bochechas
- ☐ Outro _____

5. Indique que tipo de materiais utiliza para auxiliar na realização das exercícios orofaciais não-verbais nas Perturbações dos Sons da Fala. (Selecione a(s) opção(ões) que melhor se adequam à sua prática profissional.)

- ☐ Palhinhas
- ☐ Bolas de algodão
- ☐ Tiras de papel
- ☐ Balões
- ☐ Apitos
- ☐ Outro _____

6. Indique com que frequência utiliza exercícios orofaciais não-verbais para intervir nas Perturbações dos Sons da Fala.

- o Quase sempre (uso em mais de 75% das sessões)
- o Frequentemente (uso em 50% a 75% das sessões)
- o Ocasionalmente (uso em 25% a 50% das sessões)
- o Raramente (uso em 10% a 25% das sessões)
- o Quase nunca (uso em menos de 10% das sessões)

7. Escolha a opção que melhor descreve o uso que faz dos exercícios orofaciais não-verbais para intervir nos Perturbações dos Sons da Fala.

- o Uso exercícios orofaciais não-verbais em conjunto com outras técnicas de terapia da fala para alcançar um objetivo específico.
- o Uso somente exercícios orofaciais não-verbais numa sessão para alcançar um objetivo específico.

8. Escolha o que é aplicável em relação aos exercícios orofaciais não-verbais para intervir nas Perturbações dos Sons da Fala.

- o Estou satisfeito com os resultados dos exercícios orofaciais não-verbais.
- o Obtive resultados imprecisos usando exercícios orofaciais não-verbais nas minhas sessões terapêuticas.
- o Tenho observado uma melhoria mínima nos utentes em que uso exercícios orofaciais não-verbais.
- o Exercícios orofaciais não-verbais não me parecem benéficos na terapia da fala.

9. Se considera que os exercícios orofaciais não-verbais são eficazes no tratamento das Perturbações dos Sons da Fala, selecione a(s) opção(ões) que melhor se aplica(m).

- ☐ A fala desenvolve-se através de tarefas não-verbais, por isso o uso de exercícios orofaciais não-verbais melhoram a fala.
- ☐ Os exercícios orofaciais não-verbais ajudam a desenvolver a força muscular dos articuladores, melhorando assim a inteligibilidade da fala.
- ☐ Li artigos científicos/capítulos de livros sobre a eficácia dos exercícios orofaciais não-verbais.
- ☐ Sei pela minha experiência clínica que exercícios orofaciais não-verbais são eficazes.
- ☐ Melhora os problemas sensoriais da região oro-facial.
- ☐ Outro. _____

10. O que pensa sobre o uso de exercícios orofaciais não-verbais em futuras sessões terapêuticas.

- o Continuarei a usar somente exercícios orofaciais não-verbais.
- o Planeio usar exercícios orofaciais não-verbais juntamente com outras técnicas terapêuticas.
- o Posso usá-los por algum tempo e interromper se existirem melhores técnicas disponíveis.
- o Não planeio usar exercícios orofaciais não-verbais nas minhas futuras sessões terapêuticas.

11. Para além das Perturbações dos Sons da Fala, indique, em que tipo de perturbação(ões) utiliza exercícios orofaciais não-verbais.

- ☐ Perturbação Motora da Fala
- ☐ Perturbações da Voz
- ☐ Perturbações da Fluência
- ☐ Perturbação do Desenvolvimento da Linguagem
- ☐ Perturbações da Linguagem Escrita
- ☐ Perturbação da Linguagem em Adultos
- ☐ Perturbações de Ressonância
- ☐ Disfagia/Dificuldades na alimentação
- ☐ Outro _____

(avançar para a parte IV)

Parte III

Para Terapeutas da Fala que NÃO usam exercícios orofaciais não-verbais na intervenção com Perturbações dos Sons da Fala

Atenção: Lembre-se que todas as questões que se seguem estão relacionadas com a sua prática com Perturbações dos Sons da Fala.

1. Indique qual(ais) é/são a(s) razão(ões) para não usar exercícios orofaciais não-verbais. Selecione a(s) opção(ões) que melhor se adequam à sua realidade.

- ☐ Com base na minha experiência clínica, não estou convencido sobre a evidência do uso de exercícios orofaciais não-verbais.
- ☐ Assisti a eventos de formação contínua sobre exercícios orofaciais não-verbais e não me pareceram úteis.
- ☐ Não li literatura que suporte o uso exercícios orofaciais não-verbais.
- ☐ Aprendi com os meus colegas que exercícios orofaciais não-verbais não são benéficos.
- ☐ Outro _____

2. Tem conhecimento de estudos que não recomendam o uso de exercícios orofaciais não-verbais na intervenção na Fala?
- Sim
- Não

3. Consideraria usar exercícios orofaciais não-verbais se existisse evidência científica adequada que comprovasse a sua eficácia na intervenção nas Perturbações dos Sons da Fala?
- Sim
- Não

4. Consideraria usar exercícios orofaciais não-verbais juntamente com outras técnicas terapêuticas no futuro?
- Sim
- Não

5. O que é que o faria considerar a utilização de exercícios orofaciais não-verbais no futuro?
- ☐ Pratica baseada na evidência sobre exercícios orofaciais não-verbais.
- ☐ Sucesso pessoal ao usar exercícios orofaciais não-verbais com os meus utentes.
- ☐ Um aumento do número de Terapeutas da Fala a usar exercícios orofaciais não-verbais.
- ☐ Nunca considerarei o uso de exercícios orofaciais não-verbais no futuro.
- ☐ Outro _____

(avançar para a parte IV)

(para todos responderem)

Parte IV [2]

Uso de Programas de Intervenção nas Perturbações dos Sons da Fala

Abaixo estão listados abordagens de intervenção nas Perturbações dos Sons da Fala, selecione qual(ais) usa na sua prática profissional.

- ☐ Pares mínimos (Weiner, 1981)
- ☐ Oposições máximas (Gierut, 1990)
- ☐ Abordagem tradicional – Van Riper (Van Riper & Emerick, 1984)
- ☐ Abordagem dos Ciclos (Hodson & Paden, 1991)
- ☐ Metaphon (Howell & Dean, 1991)
- ☐ Abordagem de Consciência Fonológica (Gillon & McNeill, 2007)
- ☐ PROMPT (Hayden, 1970)
- ☐ Parents and Children Together - PACT (Bowen & Cupples, 1998)
- ☐ Core Vocabulary (Dodd & Paden, 1991)
- ☐ Outro _____

O seu questionário terminou aqui. Obrigada pela sua colaboração!

[2] Esta parte do questionário não faz parte do questionário original de Thomas & Kaipa (2015).

Appendix 2. Table 2. Participant's responses.

Findings	Response (%)
Section I: Knowledge about NSOMEs	
No Knowledge about NSOMEs	6.5
Knowledge about NSOMEs	93.5
Opinions regarding NSOME efficacy for SSDS	
Effective	80.2
Non effective	19.8
Use of NSOMEs for SSDs in clinical practice	
SLPs that use NSOMEs with SSDs	78.5
SLPs that did not use NSOMEs with SSDs	21.5
Section II: SLPs that used NSOMEs with SSDs	
Knowledge about NSOMEs	
College degree and/or postgraduate courses	89.6
Colleagues	20.7
Conferences, workshops, seminars	55.6
Books and research articles	38.5
Length of time using NSOMEs	
0-5 years	48.1
6-10 years	34.1
11-15 years	7.4
16-20 years	8.2
>21 years	2.2
Conditions for which NSOMEs were used	
To improve the motor functions of the articulators	98.5
Treating feeding problems	44.4
To improve oral-sensory issues	38.5
To control drooling	33.3
Other conditions	2.8
Types of NSOMEs used	
Vertical tongue movements	91.9
Blowing	91.1
Lateral tongue movements	79.3
Alternating lip puckering/smiling	79.3
Lip puckering	78.5
Puffing of cheeks	77.0
Sucking	63.0
Smiling	62.2
Lateral lip movements	57.8
Others	7.7
Types of materials used for NSOMEs	
Straws	84.1
Balloons	74.1
Blowing whistlers	56.3
Paper strips	54.1
Cotton balls	53.3
Others	25.0
Frequency of NSOMEs use	
Almost every time (>75% of the session)	17.8
Frequently (50-75% of the sessions)	40.7
Occasionally (25-50% of the sessions)	34.1
Rarely (10-25% of the session)	6.7

Almost never (0-10% of the session)	0.7
Reasons for believing that NSOMEs are effective	
NSOMES helps developing muscle strength, thus improving speech intelligibility	83.7
Personal experience	45.2
Read research articles/textbooks about the efficacy of NSOMEs	26.7
Speech develops from non-speech tasks, so NSOMEs improves speech	25.9
Improves sensory problems of the oral facial region	23.7
Others	3.5
Experience with NSOMEs with SSDs	
Satisfied with the results	71.9
Inconsistent results	18.5
Minimal results	8.9
Doesn't appear beneficial	0.7
Use of NSOMEs in the future	
Continue to use only NSOMEs for a long time	0
Use along with other speech therapy techniques	91.9
Use for a while and discontinue if better treatment techniques are available	8.1
Not planning to use NSOMEs in future	0
Types of communication disorders for which NSOMEs were used besides SSDs	
Motor speech sound disorders	83.7
Swallowing disorders	62.2
Resonance disorders	34.8
Voice disorders	25.2
Fluency disorders	17.8
Language developmental disorder	12.6
Adult language disorders	5.2
Written language disorders	2.2
Others	1.4
Section III: SLPs that did not use NSOMEs with SSDs	
Rationale for not using NSOMEs	
Not convinced based on personal experience	56.8
No literature that supports the use	56.8
Not beneficial as learned from lectures	24.3
Not beneficial as learned from colleagues	8.1
Others	24.3
Awareness of research discouraging the use of NSOMEs	
Yes	59.5
No	40.5
Consider using NSOMEs in their practices if there were scientific evidence that supported their use	
Yes	100
No	0
Use of NSOMEs in the future	
Practice based evidence of NSOMEs	97,3
Personal clinical success on using NSOMEs	51.4
An increase in number of SLPs using NSOMEs	0
I will never consider using NSOMEs	0
Other	2.7
Consider the possibility of using NSOMEs associated with other speech therapy technique	
Yes	83.8
No	16.2
Section IV: intervention programmes used with SSDs	
Minimal pairs intervention	89
Phonological awareness approach	84.9

Maximal oppositions	30.2
Traditional approach	47.7
Cycles approach	9.9
Metaphon	13.4
PROMPT	14
Parents and Children Together	14
Core vocabulary	14
Others	2.4