Treatment of speech sound disorders in children: Nonspeech oral exercises

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ABSTRACT

Background: Children with speech disorders need to receive effective services to improve their speech intelligibility. A variety of treatments are available, and one of the most commonly used techniques is oral-motor training, which includes nonspeech oral exercises.

Methods: This paper conducted a review of the literature on using nonspeech oral exercises to treat children with speech sound disorders.

Results: Despite the popularity of this treatment, the nonspeech oral techniques lack supporting evidence in existing literature. Also, the justification of the proposed rationales for this treatment is being questioned. Many other speech-based approaches that are supported by research are available for speech-language pathologists. Some have suggested that any oral training and activity should be performed in the context of speech. The appropriate role of nonspeech oral exercises is that they should be ultimately practiced within the context of speech.

Conclusion: Generally, oral training that does not involve speech production should be considered carefully with respect to a client’s speech needs. Thus, further research is needed to examine the clinical value of using nonspeech oral exercises to treat speech sound disorders in children.

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1. Introduction

The goal of speech intervention is to maximize a child’s communication skills by improving speech intelligibility [1]. To achieve age-appropriate skills or a child’s potential level, speech-language pathologists (SLPs) apply different therapeutic approaches when treating children with speech sound disorders. These children have difficulty with speech sound production due to deficits at the linguistic or and motoric levels of speech production [2]. One of the most commonly used techniques is oral motor training, which includes nonspeech oral exercises. About 67%–85% of SLPs use such exercises to treat speech sound disorders [3–5]. However, the application of nonspeech oral exercises as an intervention for speech difficulty continues to be controversial [6–8]. By focusing on children with speech sound disorders who have a normal developmental profile (e.g., with respect to intelligence, emotions, behavior, and social skills), this paper reviewed the uses of nonspeech oral exercises for treating developmental speech sound disorders. These speech difficulties occur during the normal period of speech–sound acquisition in the age range before 9 years old. This pediatric population with speech sound disorders usually comprises the highest number of cases seen by SLPs [1].

2. Defining nonspeech oral motor exercises

Typically, oral motor training has been incorporated into many treatment protocols. Speech sound errors are the result of difficulty with speech motor skills (i.e., difficulty with the mechanism for producing speech) and/or linguistic knowledge (i.e., difficulty with phonological rules) [9]. Clinicians may include oral motor training in treatment plans in which the motor component of speech production is involved, and such training may be conducted with or without speech sound production. Nonspeech oral exercises may be defined broadly as any nonspeech activity that is used to train orofacial structures to improve sensory integration, motor coordination, and muscular strength [10,11]. This definition highlights the term nonspeech, which suggests that training does not demand speech sound production. Examples of these exercises are shown in Table 1.

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Table 1
Examples of nonspeech oral activities.

| Jaw stability and strength exercises (e.g., biting small rubber or plastic objects) |
| Lip exercises (e.g., closure, rounding, protruding) |
| Tongue exercises (e.g., elevation, spreading, retraction, wagging, pressing) |
| Sucking thickened fluids with straws |
| Chewing objects made of rubber |
| Blowing (e.g., horns, bubbles, balls) |
| Oral massage |
| Oral brushing |
| Icing of orofacial muscles |
| Cheek puffing |
| Whistle blowing |

Several rationales support the application of nonspeech oral exercises. For example, the first key rationale is to strengthen the weak oral muscles (jaw, lip, and tongue) that are associated directly with speech sound production. This rationale is a common claim [3], and it is assumed to be easily diagnosed by many SLPs [12]. The second key rationale relates to decomposing complex behavior (speech) into smaller components (nonspeech oral gestures) to facilitate learning. The structure of practice underlying nonspeech oral exercises is known as part-whole training, which is assumed to reduce the cognitive loads and unneeded practice that in turn facilitates learning [13]. The third key rationale for using nonspeech oral exercises relates to the notion that speech emerges from other oral motor behaviors such as chewing [10]. It is assumed that a successful training program needs to follow a normal pattern of development by enhancing the precursor skills (nonspeech oral movements), which in turn improves the basic oromotor control skills needed for speech tasks [14]. About 60% of SLPs use nonspeech oral exercises because they assume that speech develops from early nonspeech oral behaviors [3]. The last key rationale for using nonspeech oral exercises is that they prepare articulatory muscles for speech training [10]. About 65% of SLPs have reported using these exercises as a warm-up activity [3].

Nevertheless, these rationales for using nonspeech oral exercises have been challenged, for example, with respect to the strengthening of weak oral muscles, concerns have been raised related to subjective judgments of muscle strength. Tongue strength commonly is assessed by applying an opposing force with a tongue depressor. This subjective determination of muscle strength is not a valid means for making clinical decisions about whether to strengthen an assumed weak muscle, and subsequently to measure potential gain. Also, a strong oral muscle may be unnecessary due to the low amount of strength that is required for normal speech tasks [10,15]. With respect to the part-to-whole training rationale, the speech motor literature does not support the superiority of either “whole” or “parts” training of the multiple movements involved in the production of a target speech sound [13]. Furthermore, with respect to the emergence of speech from other oral motor behaviors, the divergence between speech and early primitive behaviors (e.g., chewing) has been documented at a very early age [16], which suggests that nonspeech oral motor behaviors are not precursors for speech. For example, the mandibular coordination of 15-month-old infants during speech (babbling and spontaneous speech) is distinct from nonspeech behaviors (chewing and sucking) [17]. Also, muscle warming-up may not be required for normal speech because only a low force of oral muscles is used [3]; for example, only 20% of the inter-labial force is used for the production of labial sounds such as /b/ [18].

3. Research report on nonspeech oral exercises

The application of nonspeech oral exercises to treat children with speech difficulties has been reviewed in several studies that highlight the lack of efficacy data to support the use of these exercises e.g. [6,11,19–22]. Forrest and Luzzini [23] compared nonspeech oral intervention to traditional intervention for children with speech sound disorders (ages 3;3 to 6;3 years). The nonspeech oral exercises included warm-up, facial stimulation, and tongue strengthening, whereas the traditional therapy included training of target sounds in words. Their findings showed that the difference in the outcomes of the two approaches was significant. The traditional intervention resulted in a 30% increase in the accuracy of target sound production compared to only a 3% increase for the nonspeech oral exercises. In another study, Lass and Pannbacker [19] evaluated the quality of the level of evidence provided in studies (from 1981 to 2006) that focused on the use of nonspeech oral intervention. Their research located 45 studies/reports, of which 20 were published in peer-reviewed journals. Overall, the reviewed studies reported no evidence to support the use of nonspeech oral exercises to treat speech sound disorders in children. For example, Guisti-Braislin and Cascella [24] found that four first-grade children with speech sound disorders, who had a normal oral mechanism, achieved a mild (not significant) gain following nonspeech oral motor therapy. Polmanteer and Fields [25] examined the effectiveness of NS-OMEs for treating SSD in preschoolers. Although they reported positive outcomes, this study had many flaws, such as an unequal severity distribution in which children who received speech therapy were more severely impaired than those who received nonspeech therapy. Other studies that reported the effectiveness of using nonspeech oral exercises focused solely on voice quality or nonspeech behaviors, rather than speech sound production [26,27].

In addition, Lass and Pannbacker [19] reported that the evidence for using a combined treatment approach (nonspeech oral exercises and traditional therapies) is limited. The level of evidence in the 25 reports that provide evidence for treating speech sound disorders using a combined treatment approach was not strong, since it was based on expert opinions (e.g., textbooks, manuals of commercially available programs). Even though these reports showed limited effectiveness, it is unclear whether the gain is related to the nonspeech oral exercises or to the traditional speech therapy. Also, it is common for SLPs to report positive outcomes following the application of nonspeech oral exercises; however, many of them tend to use nonspeech oral training with other traditional speech approaches. About 93% of SLPs use a combination of approaches [3], which makes it difficult to determine whether the speech gain is due to nonspeech training or the other speech therapy [28]. Furthermore, the findings concerning using nonspeech oral exercises to improve nonspeech behaviors may not be considered to be clear evidence for treating speech sound disorders with nonspeech oral exercises because the aim of using nonspeech oral exercises is to improve nonspeech behaviors (e.g., feeding, oral pressure, and nonspeech oral movements), rather than to treat speech sound disorders [19].

Furthermore, Williams, Stephens, and Connery [29] claimed that conclusive supporting evidence for nonspeech oral exercises is simply not available at this time and suggested that such training should not be disregarded because it is popular among SLPs. While this is true to some extent, the selection of the best available treatment depends on three factors: clinical experience, a client’s characteristics, and research. Among these three factors, high-quality research is the most important [28]. Clearly, research supporting the use of nonspeech oral exercises is lacking, but many other research-supported approaches are available to SLPs [15]. For example, Gierut [1] conducted a review of the treatment efficacy for functional phonological disorder. The search included 64 efficacy studies published from 1980 to 1995, which reported positive
outcomes for treating speech sound disorders. None of the 64 studies included nonspeech oral exercises. Moreover, Baker and McLeod [30] evaluated the level of evidence provided in 120 publications on the treatment of children with speech sound disorders using speech-based approaches. Similar to the studies that Gierut [1] reviewed, these studies did not use nonspeech oral exercises, and about 45% of the studies reported a strong evidence level for speech-based approaches to treat speech sound disorders [30]. Thus, the scientific evidence supported using a speech-based approach.

4. Role for nonspeech oral exercises

Parents, children, and SLPs have little time in the clinic, so session time should be used wisely by selecting therapeutic techniques that are effective and efficient. The assumption is that by working on nonspeech oral exercises before teaching speech sound production, the intervention time period can be reduced and positive outcomes increased [31]. However, this assumption is not true with respect to the findings of the current literature, which suggests that speech-based interventions, without using nonspeech oral exercises, yield positive outcomes [21], whereas nonspeech oral interventions lack sufficient evidence to support their effectiveness [19,22]. Thus, a question is raised regarding the appropriateness of using valuable session time on techniques that do not induce real changes in speech. When an intervention concerns speech sound disorders in a pediatric population with a normal developmental profile, SLPs should not list one of their short-term goals as achieving nonspeech tasks because the supporting evidence is still lacking. As indicated previously, with respect to this population, many other therapeutic techniques have been proven to be effective training for speech sound disorders. For example, speech motor approaches may be used to treat sounds in increasingly complex speech contexts (e.g., isolation, syllables, and phrases) through repetitive drills that focus on articulator placement and movement during speech production [9].

In brief, the appropriate role of nonspeech oral exercises in treating developmental speech sound disorders is that they should be practiced within the context of speech, since training tasks should be similar to target behaviors [32]. However, nonspeech oral exercises may be used with such a population as an activity to clarify instructions regarding specific sound production, such as blowing bubbles to demonstrate lip rounding [33] or to make the beginning of a session attractive to a child [15]. Also, if used as a speech treatment, nonspeech oral exercises should be regarded as exploratory rather than evidenced-based techniques [22].

5. Conclusion

This paper conducted a review of the literature on using nonspeech oral exercises to treat speech sound disorders in children who have a normal developmental profile. It found that these nonspeech oral techniques lack supporting research, and that their theoretical justification is being questioned as irrelevant to speech that is distinct from nonspeech behaviors. Oral motor training should be performed in the context of speech. Speech-language pathologists are encouraged to base their assessment on evidenced-based research, their client's needs and wishes, and their own clinical experience supported by theory [26]. Further research is needed to identify the clinical value of using nonspeech oral exercises to treat speech sound disorders in children.

Declarations of interest

None.
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