Nonspeech Oral Motor Exercises: An Update on the Controversy

American Speech-Language-Hearing Association Convention

New Orleans, LA November 20, 2009

MGH INSTITUTE OF HEALTH PROFESSIONS
A graduate school founded by Massachusetts General Hospital

Gregory L. Lof, Ph.D., CCC-SLP

Department Chair/Associate Professor
Department of Communication Sciences and Disorders Boston, MA 02129-4557
glof@mghihp.edu http://www.mghihp.edu

Introduction to the Controversy

Nonspeech Oral Motor Exercises Defined

- *Any technique that does not require the child to produce a speech sound but is used to influence the development of speaking abilities* (Lof & Watson, 2008).
- *A collection of nonspeech methods and procedures that claim to influence tongue, lip, and jaw resting postures, increase strength, improve muscle tone, facilitate range of motion, and develop muscle control* (Ruscello, 2008).
- *Oral-motor exercises (OMEs) are nonspeech activities that involve sensory stimulation to or actions of the lips, jaw, tongue, soft palate, larynx, and respiratory muscles which are intended to influence the physiologic underpinnings of the oropharyngeal mechanism and thus improve its functions. They include active muscle exercise, muscle stretching, passive exercise, and sensory stimulation (*McCauley, Strand, Lof, et al., 2009).

Do SLPs use NSOME? What Kind?

- 85% of SLPs in the USA use NSOME to change speech sound productions (Lof & Watson, 2008); 85% of Canadian SLPs use NSOME (Hodge et al. 005); 71.5% of SLPs in the UK use them (Joffe & Pring, 2008); 79% of Kentucky SLPs use NSOME (Cima et al., 2009).
- **Most frequently used exercises** (in rank order): Blowing; Tongue push-ups; Pucker-smile; Tongue wags; Big smile; Tongue-to-nose-to-chin; Cheek puffing; Blowing kisses; Tongue curling.
- **Reported benefits** (in rank order): Tongue elevation; Awareness of articulators; Tongue strength; Lip strength; Lateral tongue movements; Jaw stabilization; Lip/tongue protrusion; Drooling control; VP competence; Sucking ability.
- **These exercises are used for children with** (in rank order): Dysarthria; Apraxia of apeech (CAS); Structural anomalies; Down syndrome; Enrollment in early intervention; "Late talker" diagnosis; Phonological impairment; Hearing impairment; Functional misarticulations.
- **The above data came from Lof & Watson (2008).**

Evidence-Based Practice

- **Defined:** The conscientious, explicit, and unbiased use of current best research results in making decisions about the care of individual clients (Sackett et al., 1996). Treatment decisions should be administered in practice only when there is a justified (evidence-based) expectation of benefit.
- **Dollaghan (2004; 2007)** reminds clinicians that when using the EBP paradigm, valid and reliable evidence needs to be given more credence than intuition, anecdote and expert authority. Evidence must come from works that are independent and peer-reviewed.
- **Instead of "Clinician's Experience,"** we need "practice-based evidence." That is, using clinical data that have been reliably and validly gathered using scientifically sound methodologies.

Logical Reasons to Question Using NSOME

- **Clinical experience cautions:** Finn, Bothe, and Bramlett (2005) provided criteria for distinguishing science from pseudoscience: It is a pseudoscience when: ①Disconfirming evidence is ignored and practice continues even though the evidence is clear; ②The only "evidence" is anecdotal, supported with statements from personal experience; ③Inadequate evidence is accepted; ④Printed materials are not peer reviewed; ⑤Grandiose outcomes are proclaimed.
- **Many claims are made about NSOME effectiveness** in catalogs selling therapy materials, non-peer reviewed publications, CEU events, etc. But evidence of effectiveness is not provided.
- **Some claims of effectiveness are outrageous** and are actually illogical when carefully examined.

Theoretical Reasons to Question Using NSOME

Part-Whole Training and Transfer

- **Basic questions:** ①Does training on a smaller portion of the articulatory gesture transfer over to the whole gesture? ②Is it more efficient and better for learning by first training just part of the movement and not the whole movement?
- Tasks that comprise highly organized or integrated movements (such as speaking) will not be enhanced by learning the constituent parts of the movement alone; training on just the parts of these well-organized behaviors can actually diminish learning. Highly organized tasks require learning the information processing demands, as well as learning time-sharing and other inter-component skills (Kleim & Jones, 2008; Weightman & Lintern, 1985).
- "*Fractionating a behavior that is composed of interrelated parts is not likely to provide relevant information for the appropriate development of neural substrates*" (Forrest, 2002).
- Some clinician-researchers believe that it can be more effective to "Train the Whole" (Ingram & Ingram, 2001) and to use "Whole-Word Phonology and Templates" (Velleman & Vihman, 2002*)* rather than breaking up the gesture into small parts.

Strengthening the Articulatory Structures

- **Basic questions**: ①Is strength necessary for speaking? If so, how much? ②Are the articulators actually strengthened by using NSOME? ③How do SLPs objectively document weakness of articulators and objectively document supposed increases in strength after NSOME? ④Do children with speech sound disorders have weak articulators?
- **Articulatory strength needs are VERY low** for speech and the speaking strength needs do not come anywhere close to maximum strength abilities of the articulators. For example, lip muscle force for speaking is only about 10-20% of the maximal capabilities for lip force, and the jaw uses only about 11-15% of the available amount of force that can be produced (see also Bunton & Weismer, 1994).
- *"…only a fraction of maximum tongue force is used in speech production, and such strength tasks are not representative of the tongue's role during typical speaking. As a result, caution should be taken when directly associating tongue strength to speech…"* **(**Wenke, Goozee, Murdoch, & LaPointe, 2006).
- **Agility** and fine articulatory movements, rather than strong articulators, are required for the ballistic movements of speaking. NSOME encourage gross and exaggerated ranges of motion, not small, coordinated movements that are required for talking.
- **NSOME may not actually increase articulator strength**. To strengthen muscle, the exercise must be done with multiple repetitions, against resistance, until failure…and then done again and again. Most NSOME do not follow this basic strength training paradigm so there are probably no actual strength gains occurring due to these exercises.
- **Articulators can be strengthened** (e.g., the tongue for oral phase of swallowing or the VP complex) but these strengthened articulators will not help with the production of speech. Clark et al. (2009) and Robbins et al. (2005) have demonstrated ways to increase oral strength.
- **Measurements of strength are usually highly subjective** (e.g., feeling the force of the tongue pushing against a tongue depressor or against the cheek or just "observing" weakness), so clinicians cannot initially verify that strength is actually

diminished and then they cannot report increased strength following NSOME.

- **Only objective measures** (e.g., tongue force transducers, Iowa Oral Performance Instrument [IOPI]) can corroborate statements of strength needs and improvement. Without such objective measurements, testimonials of articulator strength gains must be considered suspect.
- *"To assess tongue strength, clinicians commonly hold a tongue depressor beyond the lips and the patient pushes the tongue against the depressor. Strength is rated perceptually, often with a 3-5 point equal-appearing interval scale or with binary judgments of "normal" or "weak"* (Solomon & Monson, 2004).
- **Preschool children with speech sound disorders may actually have STRONGER tongues** than their typically developing peers (Sudbery et al.; 2006).

Relevancy of NSOME to Speech

- **Relevancy is the only way to get changes in the neural system**; the context in which a skill is learned is crucial. In order to obtain transfer from one skill to another, the learned skills must be relevant to the other skills.
- ***"…muscle fibers are selectively recruited to perform specific tasks**, so static non-speech tasks do not account for the precise and coordinated activity needed during speech"* (Hodge & Wellman, 1999).
- **For sensory motor stimulation to improve articulation**, the stimulation must be done with relevant behaviors, with a defined end goal, using integration of skills. *"The PURPOSE of a motor behavior has a profound influence on the manner in which the relevant neural topography is marshaled and controlled"* (Weismer, 2006).
- **Most NSOME dis-integrate the highly integrated task of speaking** (e.g., practicing tongue elevation to the alveolar ridge with the desire that this isolated task will improve production of the lingual-alveolar sound /s/). For example, a motor task (e.g., shooting a free throw using a basketball) must be learned in the context of the actual performance goal. By analogy, no one would teach a ballplayer to *pretend* to hold a ball and then *pretend* to throw it toward a non-existent hoop with the eventual hope of improving free throwing ability. Breaking down basketball shooting or the speaking task into smaller, unrelated chunks that are irrelevant to the actual performance is not effective.
- Another non-speaking example would be the illogical finger pounding on a tabletop to simulate playing on a piano. Learning and improving piano playing must be practiced on a piano, not on a tabletop. Likewise, learning and improving speaking ability must be practiced in the context of speaking. To improve speaking, children must practice speaking, rather than using tasks that only superficially appear to be like speaking.
- Because isolated movements of the tongue, lips and other articulators are not the actual gestures used for the production of any sounds in English, their value for improving production of speech sounds is doubtful. That is, no speech sound requires the tongue tip to be elevated toward the nose; no sound is produced by puffing out the cheeks; no sound is produced in the same way as blowing is produced. Oral movements that are irrelevant to speech movements will not be effective as speech therapy techniques.

Task Specificity

- **The same structures used for speaking and other "mouth tasks"** (e.g., feeding, swallowing, sucking, breathing, etc.) function in different ways depending on the task and each task is mediated by different parts of the brain. The organization of movements within the nervous system is not the same for speech and nonspeech gestures. Although identical structures are used, these structures function differently for speech and for nonspeech activities.
- **Weismer (2006):** The control of motor behavior is task (speaking) specific, not effector (muscle or organ) specific. There is strong evidence against the "shared control" for speech and nonspeech. *"Motor control processes are tied to the unique goals, sources of information (e.g., feedback), and characteristics of varying motor acts, even when those share the same effectors and some neural tissue."*
- **Some examples of task specificity:** Babbling and early nonspeech oral behaviors are not related (e.g., Moore & Ruark, 1996); Patients can have dysphagia with and without speech problems (i.e., "double dissociations"; Ziegler, 2003); It is well documented that the VP mechanism can be strengthened, however, reduction of speech nasality does not occur (e.g., Kuehn & Moon, 1994); Breathing for speech is different than breathing at rest or during other activities (e.g., Moore,

Caulfield, & Green, 2001). See Weismer (2006) for summary of 11 studies that show that speech and nonspeech are different for a wide variety of structures, including facial muscles, jaw motion, jaw operating space, jaw coordination, lingual movement, lip motions, leavator veli palatini, and mandibular control.

- **Research has shown** that non-speech movements activated different parts of the brain than do speech movements (Bonilha et al., 2006; Ludlow et al., 2008; Schulz et al., 1999; Yee et al., 2007). This shows that the neural basis of motor control is different for speech and non-speech oral movements.
- **Bunton (2008) and Wilson, Green, Yunusova, and Moore (2008)** provide excellent examples and concepts dealing with the importance of task specificity.

Warm-Up/Awareness/Metamouth

- **Warm-up has a physiological purpose** during muscle exercise: to increase blood circulation so muscle viscosity drops, thus allowing for smoother and more elastic muscle contractions (Safran, Seaber, & Garrett, 1989).
- **Warm-up of muscles** may be appropriate (Pollock et al., 1998) when a person is about to initiate an exercise regimen that will maximally tax the system (e.g., distance running or weight training). However, muscle warm-up is not required for tasks that are below the maximum (e.g., walking or lifting a spoon-to-mouth). Because speaking does not require anywhere near the oral muscular maximum, warm-up is not necessary.
- If clinicians are not using the term warm-up to identify a physiological task to "wake up the mouth," then perhaps they believe that they are providing some form of "metamouth" knowledge about the articulators' movement and placement.
- **Awareness and its role in therapy** is always questioned. It is well known that young children have difficulty with various metaphonological awareness tasks (Kamhi & Catts, 2005). For articulation awareness, Klein, Lederer and Cortese (1991) reported that children age 5 and 6 years had very little consciousness of how speech sounds were made; 7 year olds were not very proficient with this either. According to Koegel, Keogel, and Ingham (1986), some children older than 7 years were successful during a metalinguistic speech intervention program, but only when they have the *"…cognitive maturity required to understand the concept of a sound…"*
- **It appears that young children cannot take advantage of the non-speech mouth-cues** provided during NSOME that can be transferred to speaking tasks. More research is needed to determine the minimum cognitive, linguistic, and motor abilities of children that are necessary for such "meta" skills.

Disorders that SLPs Often Use NSOME

Childhood Apraxia of Speech (CAS)

- **Children with CAS have adequate oral structure movements for nonspeech activities** but not for volitional speech (Caruso & Strand, 1999), so this would preclude the use of NSOME because non-speech is not the problem.
- **There is no muscle weakness for children with CAS**, so there is no need to do strengthening exercises. If there is weakness, then the correct diagnosis is dysarthria, not apraxia.
- *"The focus of intervention for the child diagnosed with CAS is on improving the planning, sequencing, and coordination of muscle movements for speech.* ***Isolated exercises designed to "strengthen" the oral muscles will not help. CAS is a disorder of speech coordination, not strength."*** (ASHA Technical Report on Childhood Apraxia of Speech, 2007).

Cleft Lip/Palate

- The VP mechanism can be strengthened through exercise (many studies have demonstrated this since the 1960s), but added strength will not improve speech productions.
- *"Blowing exercises, sucking, swallowing, gagging, and cheek puffing have been suggested as useful in improving or strengthening velopharyngeal closure and speech. However, multiview videofluoroscopy has shown that velopharyngeal movements of these nonspeech functions differ from velopharyngeal movements for speech in the same speaker. Improving velopharyngeal motion for these tasks do not result in improved resonance or speech. These procedures simply do not work and the premises and rationales behind them are scientifically unsound."* (Goldening-Kushner, 2001).

- **Ruscello (2008)** evaluates the use of NSOME and craniofacial anomalies in his article.

NSOME for Non-Motor Speech Disorders

- Some may believe that motor exercises can help children with motor production speech problems, such as functional misarticulators (phonetic/ articulatory problems) or children with structural problems; however the evidence does not support this.
- It makes no sense that motor exercises could help improve the speech of children who have non-motor problems such as language/phonemic /phonological problems like children in Early Intervention diagnosed as late talkers.

NSOME for Children with Dysarthria

- Following guidance from adults with acquired dysarthria, *"…strengthening exercises are probably only appropriate for a small number of patients"* (Duffy; 2005).
- *"…weakness is not directly related to intelligibility..." for patients with ALS"* (Duffy; 2005).
- Based on the adult acquired dysarthria literature, it appears that NSOME are not recommended as a technique that can improve speech productions.

Evidence Against the Use of NSOME

Evidence-Based Systematic Review: Effects of Nonspeech Oral Motor Exercises on Speech (McCauley et al., 2009). Purpose was to conduct evidence-based systematic review on NSOME. Only 8 peer-reviewed articles met rigorous criteria for inclusion. *"Insufficient evidence to support or refute the used of OMEs to produce effects on speech was found…"*

There are a few studies evaluating the effectiveness of NSOME that are not in peer-reviewed journals**;** most of these studies were reported at ASHA Conventions. Of the 11 studies available, 10 showed that NSOME were NOT effective as a treatment approach. See Lass and Pannbacker (2008) and Ruscello (2008) for a review of these and other studies.

Combining Treatment Approaches

- Most SLPs use a combination of treatment approaches so it is difficult to "tease apart" which approach is providing therapeutic benefit. Additionally, whenever intervention approaches are combined, it is unknown if and how they actually work in conjunction with each other to enhance performance.
- There is much evidence that the NSOME portion of combined treatments is irrelevant to speech improvements.
- NSOME probably do not harm the child when used in combination with traditional approaches (however, Hayes et al. found that some children may be negatively affected by a combination approach).
- It seems reasonable that if there is no speech improvement using combined approaches, then clinicians should eliminate the approach that is not effective (i.e., NSOME) so as to not waste valuable therapy time with an ineffectual technique.

In Conclusion

- **Potential reasons why NSOME continue to be used (Lof, 2009):** ①The procedures can be followed in a step-by-step "cookbook" fashion; ② The exercises are tangible with the appearance that something therapeutic is being done;③ There is a lack of understanding the theoretical literature addressing the dissimilarities of speech-nonspeech movements; ④ The techniques can be easily written out to produce; ⑤ There are a wide variety of techniques and tools available for purchase that are attractively packaged; ⑥ Many practicing clinicians do not read peer-reviewed articles but instead rely on unscientific writings; ⑦ SLPs attend non-peer reviewed activities that encourage their use; ⑧ Parents and therapists on multidisciplinary teams encourage using NSOME; ⑨Frequently other clinicians persuade their colleagues to use these techniques.
- **If clinicians want speech to improve**, they must work on speech, and not on things that LOOK like they are working on speech.
- **Phonetic placement cues** that have been used in traditional speech therapy are NOT the same as NSOME.
- **NSOME is a procedure not a goal.** The goal of speech therapy is NOT to produce a tongue wag, to

have strong articulators, to puff out the cheeks, etc. Rather, the goal is to produce intelligible speech.

- **We have been burned before**. In the 1990s many SLPs inappropriately embraced Facilitated Communication (FC) as a treatment approach because they thought they observed that it worked. Once it was tested using scientific methodology, it was found to not work. Pseudoscientific methodologies can persuade clinicians to provide the wrong treatment.
- **Speech is special** and unlike other motor movements.
- **Following the guidelines of Evidence-Based Practice**, evidence needs to guide treatment decisions. Parents need to be informed that NSOME have not been shown to be effective and their use must be considered experimental.

Relevant Articles Addressing NSOME

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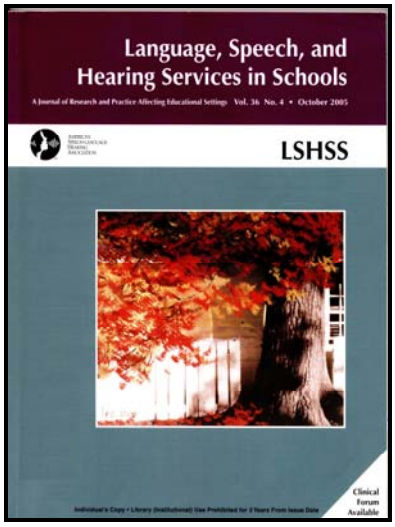
- Introduction to controversies about the use of nonspeech oral motor exercises. *G. Lof*
- Task specificity in early oral motor development. *E. Wilson, J. Green, Y. Yunusova & C. Moore*
- Speech versus nonspeech: Different tasks, different neural organization. *K. Bunton.*
- The role of strength training in speech sound disorders. *H. Clark*
- Treatment of childhood apraxia of speech: Clinical decision making in the use of nonspeech oral motor exercise. *R. McCauley & E. Strand*
- An examination of nonspeech oral motor exercise for children with velopharyngeal inadequacy. *D. Ruscello*
- A comparison of oral motor and production training for children with speech sound disorders. *K. Forrest &, J. Iuzzini*
- Establishing a basic speech repertoire without using NSOME: Means, motive, and opportunities. *B. Davis & S. Velleman*
- What works: Evidence-based intervention for children with speech sound disorders. *A. Tyler*
- A meme's-eye view of nonspeech oral motor exercises. *A. Kamhi*
- What we know about nonspeech oral motor exercises. *M. Watson & G. Lof*



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- The use of nonspeech oral motor treatments for developmental speech sound production disorders: Interventions and interactions. *T. Powell*
- Nonspeech oral motor treatment issues related to children with developmental speech sound disorders. *D. Ruscello*
- A nationwide survey of nonspeech oral motor exercise use: Implications for evidence-based practice. *G. Lof & M. Watson*
- The application of evidence-based practice to nonspeech oral motor treatments. *N. Lass & M. Pannbacker*
- An integrated evaluation of nonspeech oral motor treatments. *T. Powell*

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