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# Efficacy of Non-speech Oral Motor Exercises for Developmental Speech Sound Disorders

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EFFICACY OF NON-SPEECH ORAL MOTOR EXERCISES FOR  
DEVELOPMENTAL SPEECH SOUND DISORDERS

by

Allison Schuette

B.S., Southern Illinois University, 2010

A Research Paper  
Submitted in Partial Fulfillment of the Requirements  
for the  
Master of Science Degree

Rehabilitation Institute  
in the Graduate School  
Southern Illinois University Carbondale  
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RESEARCH PAPER APPROVAL

EFFICACY OF NON-SPEECH ORAL MOTOR EXERCISES FOR  
DEVELOPMENTAL SPEECH SOUND PRODUCTION

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A Research Paper  
Submitted in Partial Fulfillment of the Requirements for  
the  
Master of Science Degree  
in the field of Communication Disorders & Sciences

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This literature review will describe the research associated with the effects of non-speech oral motor exercises (NSOMEs) on speech sound production in children with developmental speech disorders. Much of the available literature discusses the effects of non-speech oral motor exercises on speech and swallowing. The discussion of swallowing is out of the scope of this literature review. Instead, this discussion will concentrate on the efficacy of non-speech oral motor exercises for speech sound production. Additionally, it should be noted that some investigators refer to non-speech oral motor exercises as oral motor, oral-motor, oromotor, or oro-motor exercises. In order to avoid confusion, the acronym NSOMEs will be consistently used in this paper. The underlying goal of this literature review is to provide the reader with a critical analysis of NSOMEs. Furthermore, this paper will discuss what NSOMEs are, who uses them, why they are used, and whether or not they are evidenced based in the field of speech-language pathology (SLP).

### **Non-speech Oral Motor Exercises (NSOMEs)**

Speech-language pathologists (SLPs) working with children with speech sound disorders may choose from a number of phonetic or phonemic treatment approaches (Bauman-Waengler, 2008; Lof & Watson, 2008). SLPs may

choose to use one, or a combination, of both approaches. Regardless of what approach SLPs choose to treat speech sound disorders, it should be validated by scientific evidence (Lof & Watson, 2008).

### **Phonetic and Phonemic Treatment Approaches**

A phonetic treatment approach has been traditionally identified as "traditional" or "motor approach" (Bauman-Waengler, 2008). When SLPs use this type of approach they typically direct the client to position the articulators in a manner in which the sound is considered to be within normal limits (Bauman-Waengler, 2008). Typically, this approach progresses from one error sound to the next and integrates the use of auditory discrimination (Bauman-Waengler, 2008). A phonemic approach typically takes a phonologically based approach to treatment. Fey (1992) listed three basic principles of the phonemic based approach. The first two principles describe how groups of sounds with similar characteristics are targeted along with the use of minimal pair contrasts, in order to ensure that the client is able to differentiate between different phonemic oppositions. The third principle integrates the grouping of sounds and phonemic contrasts and embeds them within a naturalistic communicative context (Fey 1992; Bauman-Waengler, 2008).

NSOMEs have been used to address speech sound disorders and appear to have their origins in the phonetic treatment approach (Lof, 2008). However, some authors contest that NSOMEs diverge from phonetic or phonemic treatments altogether, because they target non-speech motor movements and oral postures with the aim of developing motor patterns as a prerequisite for speech sound production (Strode & Chamberlain, 1997).

### **Specific NSOME Techniques**

NSOMEs are techniques that do not require the child to produce a speech sound with the expectation of influencing the development of speaking abilities (Lof & Watson, 2008). Early speech texts describe NSOMEs as engaging in non-speech activities to improve muscle strength and coordination for the development of correct sound production (Morley, 1966; Ruscello, 2008; Ward, 1931). However, more recent NSOME techniques include a more extensive range of activities than initially theorized (Ruscello, 2008). For example, NSOMEs may include horn blowing, whistle blowing, positioning, side-to-side tongue wagging, cheek puffing, isolated tongue elevation, and pucker-smile alternations (Bahr, 2001; Forrest 2002; Lass & Panbacker, 2008).

## **Categories of Motor Exercises**

Clark (2003) described NSOMEs as a variety of therapeutic activities that can be categorized as (a) active exercise, (b) passive exercise, and (c) sensory stimulation. Historically, these types of therapeutic activities have not had a significant influence in the SLP field (Clark, 2005). Instead, muscle-based treatment approaches have been more widely used by physical and occupational therapists for the rehabilitation of the trunk and limbs (Clark, 2005). The oral, pharyngeal, and laryngeal systems vary from that of the limbs in various ways (Clark, 2005). Due these variations, the application of these types of muscle-based techniques might not generalize to the musculature of the speech mechanism (Clark, 2005).

### **Active exercises.**

As stated by Ruscello, "Active muscle exercise is probably the most commonly used intervention technique, and one that most practitioners of NSOMEs employ for children with developmental speech sound disorders" (Ruscello, 2008, p. 382). Two types of active exercises are strength training and stretching (Ruscello, 2008). The purpose of strength training is to overload the muscles with the goal of targeting and increasing force, endurance, and power at

the physiological level (Ruscello, 2008; Shumway-Cook & Woollcott, 1995; Tomes, Kuehn, & Peterson-Falzone, 2004). Strength training may be used in cases of musculature weakness and it is presumed to be a prerequisite for the introduction of specific motor skill learning activities (Frontera & Lexell 2005; Ruscello, 2008). Stretching exercises are exercises that move the targeted muscle or groups of muscles outside of their typical range of operation (Ruscello, 2008). Stretching exercises are intended to either increase or decrease muscle tone (Ruscello, 2008).

#### **Passive exercises.**

By definition, passive exercises are types of exercises where the child is provided total or almost total assistance in order to complete the exercise (Clark, 2003). Passive exercises are typically employed to treat hypertonicity of the tongue and lips; however, there has not been sufficient evidence that supports their benefits (Clark, 2003).

#### **Sensory stimulation.**

The final category of NSOMEs is comprised of sensory stimulation agents, which are intended to improve or stimulate muscle function (Ruscello, 2008). "Typically, sensory agents include the use of massage, vibration,

temperature (hot/cold), and electrical stimulation” (Ruscello, 2008, p. 383). The use of sensory stimulation NSOMEs are typically used with children who have developmental sound system disorders, and primarily with children with sound system disorders with a known etiology, for example, structural-based disorders and motor speech disorders (Bahr, 2001; Ruscello 2003; Ruscello, 2008; Tomes et al., 2004; Yorkston et al., 2001).

There are a variety of types of NSOMEs, many of which have diverse desired outcomes. NSOMEs are used to treat multiple disorders and they have been widely used in clinical practice.

#### **A Survey on the Use of NSOMEs**

In 2008, Lof & Watson conducted a nationwide survey in order to understand SLPs’ use of NSOMEs for children with speech sound disorders. Specifically, the investigators were interested in identifying the types of NSOMEs that SLPs use, why they use them, and which populations SLPs typically treat using NSOMEs. A total of 2,000 surveys were mailed to a randomly selected group of SLPs who work with children from birth to 11 years of age; 537 (27.5%) SLPs completed and returned the survey (Lof & Watson, 2008).

**SLPs Use of NSOMES**

Lof & Watson (2008) reported that "eighty-five percent of the respondents stated that they used NSOMES to address speech sound production problems; 15% reported that they never used these exercises" (Lof & Watson, 2008, p. 394). The investigators also wanted to know how the respondents learned about this therapy technique. Eighty-seven percent of respondents who said they used NSOMES reported that they had learned this technique by attending continuing education (CE) workshops or in-services that support the use of NSOMES (Lof & Watson, 2008). Lof & Watson (2008) hypothesized that many of the attendees at these types of CE events believe that ASHA's approval of the CE event means that the content is valid and evidence-based. However, the American Speech-Language-Hearing Association (ASHA) CE policy states "approval of continuing education sponsorship does not imply endorsement of course content, specific products, or clinical procedures" (ASHA, 2011, p. 37). Ninety-two percent of the respondents justified their use of NSOMES by their own subjective clinical judgments (Lof & Watson, 2008). It is of great concern that SLPs may only be using their subjective judgments to evaluate the validity of NSOMES, instead of using objective measurements while incorporating the ASHA mandated use of evidence-based

practice (EBP) principles. More information regarding the application of EBP to NSOMES is discussed later in this literature review (i.e., principles of EBP).

The investigators of the nationwide survey wanted to find out what disorder populations SLPs treat using NSOMES. Lof & Watson (2008) listed nine speech disorders on their survey questionnaire, and the respondents were asked to indicate if they used NSOMES usually, sometimes, or never for each disorder. SLPs reported using NSOMES for (1) dysarthria, (2) childhood apraxia of speech (CAS), (3) structural anomalies (e.g., cleft palate), and (4) Down syndrome (Lof & Watson, 2008). SLPs reported using NSOMES less frequently for children in early intervention (regardless of diagnosis) and for children diagnosed as late talkers. Additionally, SLPs reported the use of NSOMES for children with phonological disorders, hearing impairments, and functional misarticulations (Lof & Watson, 2008). Lof & Watson (2008) implied that it is difficult for them to understand why the same intervention technique would have an effect upon disorders so vastly different in nature.

Lof & Watson (2008) wanted to understand what SLPs believe to be the benefits of NSOMES. The survey respondents were asked to rate NSOMES on a scale of

usually, sometimes, or never for 15 proclaimed benefits of such techniques (Lof & Watson, 2008). The investigators combined the categories of usually and sometimes, and revealed the 10 most frequent benefits that SLPs believe to achieve, due to the use of NSOMEs. The results were "(1) improved tongue elevation, (2) awareness of the articulators, (3) tongue strength, (4) lip strength, (5) lateral tongue movements, (6) jaw stabilization, (7) lip and tongue protrusion, (8) drooling control, (9) velopharyngeal competence, and (10) sucking ability" (Lof & Watson, 2008, p. 396).

The results of Lof & Watson's (2008) study provided detailed information about the types of NSOMEs that SLPs use, why they use them, and which populations SLPs typically treat using NSOMEs. Additionally, the authors raised questions about the validity and effectiveness of the use of NSOMEs on diverse disorders. Furthermore, many respondents reported relying on their own subjective judgments to evaluate intervention effectiveness, without considering and analyzing current research literature (Lof & Watson, 2008).

### **The Debate about the Effectiveness of NSOMEs**

Few treatment strategies have generated as much interest and controversy as NSOMEs directed at improving

speech (Powell, 2008; Lof & Watson, 2008). The basis of this debate is that some SLPs promote the use of NSOMEs for articulation therapy or speech sound development; while others insist that there is no evidence to support their use as an effective therapeutic technique (Hodge, Salonka, & Kollias, 2005; Lof & Watson, 2004, 2008). Those who do not promote the use of NSOMEs argue that clinicians have an obligation to use only intervention techniques that have a strong theoretical base and documented empirical evidence (Lof, 2008). On the other hand, proponents of NSOMEs support their use "because it works" based on their clinical judgment (Lof, 2008). There is a multitude of NSOME treatment materials and workshops, as well as SLPs' testimonies supporting the benefits of their use; in contrast, there are EBP reports that warn against the use of these types of treatments (Clark, 2005). Novice and skilled clinicians may experience confusion and frustration when trying to decipher the inconsistent messages circulating throughout the field regarding the use of NSOMEs (Clark, 2005).

#### **Advocates of the Use of NSOMEs**

Supporters of the use of NSOMES claim that the lack of concrete definitions of the terminology associated with oral motor treatment in articles and presentations is what

has caused the significant misunderstanding and confusion in the field of SLP (Bahr, 2008). Bahr (2008) claimed that there has not been an official definition of the term oral motor treatment within the field of SLP (Bahr, 2008). Bahr stated in reference to current NSOME literature "the term oral motor treatment has been narrowly equated with and defined as non-speech oral motor exercise and treatment (NSOME/NSOMT)" (Bahr, 2008, p. 2). Furthermore, Bahr described NSOMEs as only a part of oral motor treatment (Bahr, 2008). However, Bahr (2008) did not provide any further information as to how NSOMEs fit into the realm of oral motor treatment.

### **Opponents of the Use of NSOMES**

The campaign against NSOMEs provides explicit justifications as to why SLPs should not use these types of techniques. Lof & Watson (2010) described the following five specific reasons why NSOMEs do not work, four of which are theoretical justifications and the fifth rationale described current available research.

#### **Transference of part to whole.**

Lof & Watson (2010) discussed the idea of breaking down and training a highly integrated and complex motor movement into isolated motor tasks (Lof & Watson, 2010). Most NSOMEs disintegrate the highly organized task of

speech into compartmentalized movements that are unrelated to the actual production of speech (Lof, 2010). Research has shown that speech tasks consist of highly organized and integrated movements and that practicing specific components of the speech movement typically does not enhance them (Forrest, 2002; Kleim & Jones, 2008; Lof, 2010). Lof (2010) insisted that only practice with actual speech gestures (i.e., speaking) will improve speech.

#### **Strength training.**

Lof & Watson discussed four major concerns in regard to strength training (Lof & Watson, 2010). These concerns were: (a) articulator strength requirements, (b) strength training regimens, (c) documentation issues, and (d) the cause and effect relationship of strength and speech sound disorders (Lof & Watson, 2010). Lof & Watson's (2008) nationwide survey revealed that many SLPs believed strength training to be a documentable benefit of NSOMEs. Conversely, usually strength is not an issue for speaking (Lof & Watson, 2010). Lof & Watson (2010) reviewed past research that described the necessity of articulator strength and research has shown that articulators use only 11-30% of strength they are capable of producing (Bunton & Weismer, 1994; Lof & Watson, 2010; Wenke, Goozee, Murdock, & LaPointe, 2006).

Lof & Watson (2010) discussed issues regarding the child's ability to adhere to strength training procedures. Clark, O'Brien, Calleja, & Corrie (2009) conducted a study which exemplified the demands of a rigorous lingual strength training regimen. Lof & Watson (2010) questioned whether or not a child would be able to follow this type of regimen each day for 9 weeks.

Additionally, Lof & Watson (2010) discussed the notion that documentation and measurement of oral strength is difficult to obtain. A textbook about SLP assessment procedures (Shipley & McAfee, 2009) exemplified this type of observation by recommending that a clinician should document whether or not tongue strength is either "normal" or "reduced" by feeling the opposing force of the client's tongue against a tongue depressor (Lof & Watson, 2010). This type of measurement is subjective in nature. Most clinicians are unable to accurately identify whether strength is or is not adequate, nor can they verify that strength has improved following a NSOME strength-training regimen (Lof & Watson, 2010). Lof & Watson (2010) also questioned the cause and effect relationship between diminished articulator strength and speech sound disorders in children. Children with speech difficulties typically do not have reduced oral strength (Sudberry, Wilson, Broaddus,

& Potter, 2006; Lof & Watson, 2010). Contrastively, some research has shown that children with speech sound disorders may actually have stronger articulators (Sudberry et. al., 2006).

### **Brain Organization**

Next, Lof & Watson (2010) discussed additional reasons why NSOMES are not an effective treatment method. This reasoning has to do with the task specific organization of the brain. According to Weismer (2006) "even though the same structures are used for speaking and non-speech oral tasks, the functions are mediated by different parts of the brain depending on the tasks" (as cited by Lof & Watson, 2010, p.112). Lof & Watson (2010) described an fMRI study, which demonstrated task specificity of speech versus non-speech tasks (Lof & Watson, 2010). Bonilha, Moser, Rorden, Bylis, and Fredriksson (2006) conducted a functional Magnetic Resonance Imaging (fMRI) study in which 18 normal adults produced non-speech movements of biting the lower lip, tongue elevation, tongue protrusion and other motions. Another set of tasks required the participants to produce common syllables. The results revealed that speech and non-speech tasks clearly activate different parts of the brain (Bonilha, Moser, Rorden, Bylis, & Fredriksson, 2006; Lof & Watson, 2010). This study provided evidence, which shows

that the brain is designed to be task-specific and that using NSOMEs may not be an effective therapeutic intervention technique for the elicitation and production of speech sounds.

### **Awareness of Articulators**

Many SLPs reported using NSOMEs in order to increase awareness of the articulators and their movements (Lof & Watson, 2008). Research has shown that children have difficulty making associations between movements for speech and the act of producing speech (Lof & Watson, 2010). Research by Klien, Lederer, & Cortese (1991) did not show a significant relationship between children's ability to describe speech characteristics with articulation performance (Klien, Lederer, & Cortese, 1991; Lof & Watson, 2010). Children may not be able to understand the non-speech mouth cues provided by NSOMEs, thus they may be unable to transfer them to speaking tasks (Lof & Watson, 2010). Teaching children to be aware of their articulators may not be an appropriate intervention technique to elicit speech sounds (Lof & Watson, 2010).

### **Lack of Evidence**

Lof & Watson (2010) reviewed and discussed a systematic review of published articles associated with the use of NSOMEs which was conducted by McCauley, Strand, Lof,

Schooling, & Frymark (2009). The results of this systematic review revealed that there was insufficient evidence to support the use of NSOMEs at the time of the review (McCauley, et al., 2009; Lof & Watson, 2010). Lof & Watson (2010) went on to say that clinicians should be discouraged from using these types of NSOME techniques, even though much of the research which has evaluated the effectiveness have primarily used single subject research designs versus large scale group designs (Lof & Watson, 2010).

The debate surrounding the effectiveness of NSOMEs has been going on for several decades and will likely continue until both sides of the argument begin to work together with the intention of resolving controversial research questions. Proponents of the use of NSOMEs claim there is a significant lack of operational definitions; whereas the opponents believe there is a significant lack of theoretical and empirical research base. Regardless of which side is correct, practicing clinicians need to consider the principles and practices of EBP, which instruct them to evaluate the effectiveness and efficacy of intervention methods (Lof & Watson, 2008).

### **Principles of Evidence-based Practice**

EBP can be described as the process of integrating clinical expertise with the best available current research

in order to make clinical decisions regarding the management of a client's needs (Lass & Pannbacker, 2008). EBP can be thought of as a perspective on clinical decision-making processes (Lass & Pannbacker, 2008). Depending on one's definitions, the principles of EBP may be considered to be old or somewhat of a new concept (Bothe, 2010). Over the past decade the principles of EBP have been adopted by behavioral sciences, health care, and education (Bloom, 2010). EBP has been integrated in to the academic and clinical curriculum of SLP in order to give students and practicing SLPs up-to-date information on treatment and diagnosis (Bloom, 2010). EBP is important in the field of SLP and it is critical for the future success of SLP (Lass & Pannbacker, 2008).

In regard to NSOMEs, the best available research and EBP should be consistently applied and should serve as the foundation for determining whether or not NSOMEs should be used. NSOMEs have been controversial for many years due to limited and weak empirical research evidence (Lass & Pannbacker, 2008). Many times recommendations about NSOMEs are based on opinion and testimonials, which are not considered to be high levels of evidence. The ASHA (2010) Code of Ethics, Principle of Ethics IV, Rule I addresses the distribution of information among professionals:

"Individuals' statements to colleagues about professional services, research results, and products shall adhere to prevailing professional standards and shall contain no misrepresentations" (p.4). SLPs should avoid testimonials and always consider supporting or refuting evidence regarding NSOMEs in order to make sound clinical decisions (Lass & Pannbacker, 2008). It is the opinion of Lass & Pannbacker (2008) that practicing SLPs should not use this mainstream therapeutic technique until empirical research data supports their use. Furthermore, Lass & Pannbacker (2008) implied that until there are well-designed research studies that support the effectiveness of NSOMEs, they should be considered experimental (Lass & Pannbacker, 2008). Previous investigators have suggested that if clinicians should choose to continue using interventions without external evidence, the client should be informed that the treatment is experimental and the clinician should develop a controlled treatment design and carefully assess the effectiveness of the treatment (Duchan, Calculator, Sonnenmeier, Diehl, & Cumley, 2001; Lass & Pannbacker, 2008).

It should be noted that evidence from systematic research is not the only valid resource in SLP clinical decision-making (Dollaghan, 2004). According to ASHA

(2005), EBP criteria also include (a) practitioner expertise, and (b) client's values and preferences as valid resources that should be considered in SLP treatment planning (ASHA, 2005). Therefore, clinicians should incorporate the three components of EBP in order to evaluate the efficacy, effectiveness, and efficiency of any clinical protocol they use: empirical research, clinical expertise, and client-patient values (ASHA, 2005).

### **Call for Future Research**

Despite the debate surrounding the usefulness of NSOMEs in the treatment of speech disorders, few controlled research studies have evaluated their efficacy (Forrest, 2008). Future research should focus on using well-designed single subject and large-scale group experimental studies in order to continue to evaluate the efficacy of NSOMEs. Additionally, it is important for future research to include concrete operational definitions regarding NSOMEs and adequately describe the description of the participation population.

It would be interesting for future researchers to evaluate SLPs attitudes and beliefs about the principles of EBP. This type of information would be useful in determining SLP's perception of their adherence to the ASHA mandated principles of EBP. Lof & Watson (2008) revealed

that eighty-five percent of SLPs who treat children with speech sound disorders typically use an intervention technique that is not supported by empirical data. This type of statistic shows that there may be either a significant misunderstanding of what EBP means or SLPs may not feel obligated to adhere to certain principles of EBP.

It was hypothesized by Lof & Watson (2008) that attendees of CE workshops that promote the use of NSOMES may believe that ASHA approved CE events provide evidence based and reliable information. Future research may be able to prove or disprove their hypothesis. This information may encourage ASHA's CE board to consider empirical research when approving workshops and CE events.

### **Conclusion**

The purpose of this literature review was to discuss what NSOMES are, who uses them, why they are used, and whether or not they are evidenced based in the field of speech-language pathology. NSOMES were defined as any techniques that do not require the child to produce a speech sound with the goal of improving speaking abilities (Lof & Watson 2008). Specific examples of NSOMES were identified as side-to-side tongue wagging, cheek puffing, isolated tongue elevation, pucker-smile alternations, etc. (Bahr, 2001; Forrest 2002; Lass & Panbacker, 2008). Eighty-

five percent of the SLPs who work with children (birth to 11 years of age) that responded to Lof & Watson's (2008) survey reported that they use NSOMEs to address speech sound production difficulties with diverse populations.

The debate surrounding the controversial use of NSOMEs was discussed in detail. The basis of this debate is that some SLPs promote the use of NSOMEs for articulation therapy, or speech sound development, while others insist that there is no evidence to support their use as an effective therapeutic technique (Hodge, Salonka, & Kollias, 2005; Lof & Watson, 2004, 2008,). It is interesting that much of the available information in favor of the use of NSOMEs were not published in peer-reviewed journals. Rather, the information was found in self-published "step-by-step" therapeutic products, poster presentations, and on the Internet (e.g., Marshella, 2008).

This literature review described the principles of EBP and how they can be applied to NSOMEs. Many journals identified NSOMEs as a therapeutic technique that lacks significant supporting empirical evidence. Suggestions for clinicians who choose to continue to the use of NSOMEs for speech sound production were offered.

It is evident that there is a strong need for future research on the efficacy and effectiveness of NSOMEs. It

appears there may also be necessary to evaluate the attitudes and beliefs of SLPs regarding the EBP issues. Future research may include the examination of SLPs beliefs about information that is acquired at an ASHA approved CE event. Given that an ASHA approved CE event does not mean that the content, products, or clinical procedures are not necessarily endorsed by ASHA (ASHA, 2011). It is not a requirement for information at these types of events to be supported by empirical research evidence.

There is an abundance of information available regarding the efficacy and effectiveness of NSOMEs on speech sound production. It is a topic that has been debated for decades and it will likely continue to be controversial until sufficient research is conducted and published.

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