

FEEDING AND SPEECH RELATIONSHIPS

One of the hottest questions in the field of Communicative Disorders asks whether there is a causal relationship between the motor control used for feeding and that used for speech production. Many scientists and academicians vehemently deny the relationship, and propose that two separate control systems are responsible for a separate development of these two skills. Their support comes primarily from theoretical and laboratory models of neuromotor control. Other scientists and most clinicians support the view that the two systems are closely related or operate in a causal fashion. Their support comes from detailed clinical observations of normal and abnormal development, and from their view and interpretation of theoretical models. Hard, irrefutable data are non-existent to support either view.

Let us look for a moment at developmental similarities in the relationship of oral movement patterns in feeding and speech. A parallel development occurs in the movements and processes considered necessary for speech production and the movements and processes that occur in the development of feeding skills. For example, it is necessary to tighten the cheeks and pull them inward during sucking from the bottle or breast and while moving chewed food from the side to the center of the tongue for swallowing. This creates a central channel for food to pass to the back of the tongue for swallowing. A central grooving of the tongue is also observed during these activities to support the oral stage of the swallow. This activation of the cheek muscles increases as the sucking pads diminish and the infant must rely on internal movements of control for stability and precise skills. A similar pattern is required in speech development. The contraction or inward tightening of the cheeks is necessary to direct the airstream forward and prevent lateral air leakage in the production of fricative consonants (f, v, sh, zh, s, z). In addition, a spreading and slight grooving of the tongue are needed to create an unobstructed channel for the air.

There are many similarities between the movements that an infant would experience during feeding and those that are combined with sound at a slightly later time. It is interesting that infants do not usually develop the movements in their sound play before they appear in feeding. Generally the movements occur in babbling at roughly the same time as they are being refined in feeding or several months later. For example, the elevation of the front of the tongue emerges slowly during feeding as the infant shifts from the early suckle pattern to the up-down tongue action of the suck. This begins around 6-7 months. The elevated pattern also emerges in the swallow at this age, alternating with the earlier simple protrusion of the tongue. By 9 months the baby shows many instances

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in which tongue movement is separate from jaw movement resulting in independent tongue tip elevation.

The infant's sound production follows a similar sequence, usually lagging behind the feeding patterns by several weeks or months. Infants commonly increase vocal play and the variety of sounds just after they are introduced to lumpy junior and soft mashed table foods. The first consonants produced are generally those requiring sustained or intermittent contact of the lips. It is interesting that the sequence "ma-ma" occurs in almost every known language as the baby's symbol for the mother. This refinement of lip contact is also the first feeding movement that reaches a skilled level during nursing and early spoon feeding. By the time the infant reaches 6-9 months when babbling emerges and reaches its heights, precise lip movements are used to eliminate the loss of liquid during bottle or breast feeding, to remove food from the spoon, and to prepare the lower lip for cleaning by the teeth. The same level of skill has not developed for tongue movement. A backward-forward movement of the tongue predominates in feeding until the infant is 6-9 months. There is a gradual shift during this period toward tongue tip elevation. The emergence of consonants produced by elevating the front of the tongue (t, d, n) occurs for most babies after they have already produced lip sounds (m, b, p). Initially the jaw and tongue move together in saying "da-da" or "nah-nah-nah". The independent upward movement of the tongue will not be seen for many months. Sounds produced with the elevation of the back of the tongue develop around the same time period. It may be necessary for the infant to perceive separate movements of the front and back of the tongue during feeding for this distinction to occur in sound production. Sounds requiring greater sophistication and a finer level of motor control (f, v, s, z, sh, zh, ch, j, th, r, and l) occur much later in the exploration of sound. These require movement patterns that are similar to those refined during the chewing process.

These similarities do not prove that feeding skills are pre-requisite to talking. If this were the case, a child who is fed by tube would have no possibility of speaking. We know this is not true. Many children require tube feedings because of medical problems that are not associated with neurological disorders. Although there may be a delay in speech and language development, these children do talk. Other children with disorders of pharyngeal and esophageal control develop spontaneous speech. Does this imply that there is no relationship between the two skills? Do they, indeed, follow separate paths of development?

These observations of children with normal oral-motor control abilities must be balanced with observations of feeding and speech development in children with known oral control problems. Clinical experience supports the view that when a child experiences difficulty with oral control in feeding, there will be similar oral control problems in sound production and speech. For example, the child with lip retraction during feeding will probably show the same lip retraction pattern during speech. Moreover, improvements in jaw, tongue, and lip movements in feeding frequently lead to improved acquisition of speech sounds containing similar movements.

How may one view these seemingly conflicting observations? The human central nervous system shows a high degree of efficiency and redundancy. The development of a common system to support the initial stages of feeding and early speech development would fit this operational model. As the infant develops a need for a set of repeatable movements to symbolize ideas, movements that are familiar and refined through feeding are initially selected. The infant has rehearsed the basic movement components of early speech for a year prior to the need for similar articulatory speech movements. This preliminary learning could provide the basis for the speech motor control system. It is clear that the coordination patterns used in feeding are not adequate for sophisticated speech production. At some point the requirements for speech motor control increase beyond those required for feeding. A divergence into two separate control systems may emerge at this point.

Feeding, per se, may not be the magical element that is required for preparation of the initial sensorimotor coordination. This statement is supported by the children who have never eaten food orally, yet speak. In most instances, these children have engaged in sensory play and exploration with the mouth. Because they have not experienced major motor difficulties, they are free to use the hands and mouth to discover the sensory variations in their world. The tongue, lips, cheeks, and jaw are engaged in the process of sensorimotor differentiation that sets the stage for speech. Thus, the key element may be the opportunity which the child has to develop sensorimotor control and differentiation within the mouth. If this has been present and specific oral motor control problems do not interfere with development and learning, the patterns needed for speech should be there. This is essentially what is observed in tube-fed children with gastrointestinal, respiratory, or cardiac problems, and those experiencing aspiration related to pharyngeal or esophageal mechanisms.

For the normal child feeding provides a frequent, oft-repeated stage for the learning of sensorimotor control and differentiation. If the elements usually associated with feeding can be incorporated frequently into the child's learning, speech movements will be possible without the physical act of eating.

Another interesting question has been raised by several children who do not follow either of the patterns that have been described. A number of children make major changes in their coordination during feeding without evidence of change in their sound production and sound play. A smaller group appears to develop changes in speech sounds without a similar advancement in feeding. Any theory must explain the exceptions as well as the underlying rule. A two-system control mechanism could be supported by these few clinical examples. All learning is a function of the connections and interconnections that are made in the brain as new experiences are added. It is possible that the transference of movement patterns from feeding into speech production does not occur automatically, but relies on the child's awareness of the potential connection. If feeding is worked on without any exploration or modeling of similar speech sounds, some children experience the "aha" phenomenon that allows them to utilize a potential pathway to speech. A child who experiences swallowing difficulties or sensory deviations in integrating the multiple sensations involved in eating solid foods, may find it easier to develop higher level coordination patterns during speech which may bypass control areas that are difficult.

These conflicting views provide many implications for feeding programs. Since there is a strong possibility that feeding and speech control systems are related, it is important to include work on oral-motor feeding

patterns with any child who shows delays or deficits in feeding or non-feeding oral movements. Yet, we cannot be assured that simply working on feeding will resolve the child's difficulties with speech motor control for articulation. The connections and interconnections of learning must be built into the program. Work on oral movement patterns through sensory exploration and the facilitation of sound play is an essential part of the treatment program for any child who is not taking food orally. Sounds for babbling and speech are often possible for a tube-fed child long before the system can support the coordination required for oral feeding. Since choking and aspiration are not usually a part of oral exploration and vocalization, the child can approach the learning of oral patterns with greater freedom. There also appears to be a reverse interconnection between feeding and sound production in the tube-fed child whose program includes an active exploration of movement for sound play. While most infants develop the feeding patterns first and may generalize their use to sound production, the tube fed child is likely to learn the primary patterns through stimulation of sound production and then generalize their use to the manipulation of food and liquids. All of these possibilities can be incorporated into the design of a feeding program.

These concepts offer many implications for feeding programs. They should never be silent. They should offer the child multiple opportunities to experience the sensorimotor patterns used in both feeding and sound production, and should provide a constant model of their interconnectedness. Parents and therapists can make funny sounds while eating, can create a model of exploration of sound when food is in the mouth, and can reinforce desired sound patterns with food requiring similar movements.