The Transition from Nonoral to Oral Feeding in Children

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In this single-subject study, an evaluation was completed to determine the effect of occupational therapy intervention on the oral intake of 3 children who had their nutritional needs met by nonoral methods prior to the administration of an oral feeding program. Treatment consisted of a gradual increase of food presentation with the application of behavioral management methods and the presentation of developmentally appropriate play activities. Oral intake was measured during baseline and intervention phases to establish the effect of intervention. An analysis indicated an increase in oral intake in the intervention phase in 2 of the 3 children. The results, that occupational therapy intervention can increase the oral intake of children in transition from nonoral to oral feeding, might be strengthened through the replication of this study on larger populations.

Infants who are deprived of oral feedings for prolonged periods can experience great difficulty in reestablishing oral feeding when they have sufficiently recovered from their underlying medical problems (Geertsma, Hyams, Pelletier, & Reiter, 1985).

Various gastrointestinal disorders and medical conditions can necessitate the use of total parenteral nutrition (TPN) or oral-gastric, nasogastric, gastrostomy, or enterostomy tubes as a means of providing adequate caloric intake and nutrients. These nonoral methods of feeding are often used during infancy and early childhood when certain oral feeding experiences should take place for optimal oral motor function. Illingworth and Lister (1964) and Handen, Mandel, and Russo (1986) suggested that there are critical periods in infancy in which normal nutritive feeding patterns develop. For example, tongue mobility improves with the presentation of pureed foods at 4 to 6 months of age, thereby preparing a child for future chewing. Medical conditions such as gastroesophageal reflux, oral-facial congenital anomalies, and short-bowel syndrome may prevent oral experiences during these important periods. This often affects the way a child will accept and handle food once it is presented orally (Blackman & Nelson, 1985, 1987).

Occupational therapists providing intervention in pediatrics are faced with a growing number of children who have experienced nonoral methods of feeding and who have difficulty making the transition to oral feeding (Morris & Klein, 1987). Common characteristics of this population are hypersensitivity, resistance to food presentation, and delayed oral motor skills (Blackman & Nelson, 1987). These areas are of particular concern to occupational therapists due to their effect on feeding skill development, parent–infant interaction, psychosocial development, and general behavior. The significance of the behavioral problems in the form of food refusal and resistance often lead to frustration on the part of both parents and professionals, resulting in behavioral mismanagement and unsuccessful attempts to reestablish oral feedings (Chan, 1981; Denton, 1986; Stroh, Robinson, & Stroh, 1986).

The complexity of this type of feeding problem requires occupational therapy assessment of oral motor structures and function, developmental status, feeding behavior, play behavior, parent–child interaction, and home–hospital environmental factors that may influence the feeding activity. Collaboration among various professionals, including pediatric gastroenterologists and dietitians, as well as the family is necessary in the design and implementation of an individualized intensive feeding program. Recognition that physiological, anatomical, social, and behavioral factors all contribute to successful oral feeding is crucial (Lipsitt, Crook, & Booth, 1985; Satter, 1986).

The individuality of feeding problems makes it difficult for one to evaluate the effectiveness of an interven-
tion program by traditional experimental designs. The single-subject research design permits individual analysis of change. The primary advantage of a single-system evaluation strategy is the ability to identify characteristics relevant to the client’s performance. The primary goal is to demonstrate the effectiveness of a particular intervention strategy on a small number of subjects (Ottenbacher, 1986).

We used the single-subject research design in the present study to evaluate the effect of occupational therapy intervention in the form of behavioral management and play facilitation on the oral intake of children who had previously received nonoral forms of nutritional intake.

Literature Review

Although literature on the feeding process as related to the developmentally disabled population is readily available, literature on the process of initiating or reinstituting oral feeding following a prolonged period of TPN or gastrostomy tube intake is limited. For example, Stroh et al. (1986) described the results of a feeding program using a behavioral approach with 3 children from a residential psychiatric facility. The children had socioemotional problems and a history of food refusal. The program consisted of food presentation at regular intervals in a quiet room with a familiar child-care worker. Emphasis was placed on the consistent presentation of food in a calm, relaxed manner without undue attention being given to negative behaviors such as crying, hand pushing, or screaming. Eventual acceptance of food occurred for all 3 children within a 3-week period. The treatment was monitored daily by a physician and discussed with the parents on an ongoing basis. When possible, the parents were encouraged to become fully involved in the feeding activity once the eating conflict had resolved. Although these children had not experienced hyperalimentation, their negative behaviors toward food (i.e., inconsistent or inappropriate oral motor function) were similar to those of our sample.

Handen et al. (1986) also tried a program of behavioral management and gradual introduction of oral feeding over a period of 2 years with 7 chronically ill children ranging in age from 1 to 6 years. Each child demonstrated food aversion and was dependent on a gastrostomy tube or TPN for his or her primary source of caloric intake. The behavioral management consisted of the giving of positive reinforcers, such as social play or a favorite toy, for appropriate eating and the limiting of access to reinforcers at nonmealtimes. A gradual increase in the eating requirement was established. All 7 children established consistent oral intake during the 2-year implementation of the feeding program. Other literature that focuses on behavioral aspects of feeding and supports the use of behavioral management techniques includes the works of Lipsitt et al. (1985); Palmer, Thompson, and Linscheid (1975); and Satter (1986).

Other approaches to the management of oral feeding problems include the use of sensory stimulation and play activity, but references to the significance of behavioral management are still made. Zissermann (1986) described the transition from tube to oral feeding in an infant with omphalocele. Occupational therapy intervention was initiated when the child was 29 days old and initially consisted of oral and olfactory stimulation, formula introduction with gradation in nipple size, and behavioral-state management. Tube feedings were gradually decreased as oral intake increased. By the age of 2 months, the infant had been weaned from the transpyloric tube and was taking adequate amounts of formula orally. The feeding program was completed with the parents’ education on appropriate oral stimulation and methods of recording intake.

Denton (1986) suggested the use of a play history and informal observations of play between the primary caretaker and the child who fails to thrive as a means of establishing the effect of caretaker–infant interaction on the feeding process. In this occupational therapy protocol, play was also recommended as a motivational activity and reward for improved eating behavior. As an occupational performance and legitimate tool of occupational therapy, play facilitation is applicable to all areas of pediatrics (Kent, 1979).

Vogel (1986) reported physical and behavioral causes for oral motor difficulties in the tube-fed infant based on a literature review and clinical experience. Physical causes of dysfunction include oral hypersensitivity, laryngeal incompetence, nasal regurgitation, pharyngeal incoordination, irritation caused by nasogastric tube feedings, or a combination of these factors. The main behavioral cause of dysfunction is conditioned dysphagia, which DiScipio, Kaslon, and Ruben (1978) described as a learned disorder in which a child responds negatively to oral activity due to previous repeated trauma in the mouth or throat, as from nasogastric tube replacement or bronchoscopy procedures. Conditioned avoidance to swallowing develops as a protective response. Vogel suggested that occupational therapists consider both physiologic and behavioral reasons for feeding dysfunction. She suggested that intervention be initiated with positive oral experiences at tube-feeding times with a gradual increase in oral foods. She also recommended graded tactile play activities for decreasing oral hypersensitivity and conditioned dysphagia.

Blackman and Nelson (1985, 1987) identified treatment principles and techniques for reinstituting oral feeding with the orally deprived child. Ten children with gastrostomy tubes were selected for an oral feeding program that provided a gradual introduction to feeding during specific treatment stages. The goal of treatment was to diminish resistive behaviors to feeding and establish
consistent oral intake. Five children were managed successfully as outpatients and 4 as inpatients. Oral feedings were discontinued for 1 child who experienced aspiration.

The treatment methods described by Blackman and Nelson (1985, 1987) were adapted and applied to the feeding program described in the present study. These methods were (a) initial multidisciplinary evaluation of nutritional, medical, and developmental needs; (b) family readiness assessment; (c) establishment of participation criteria; and (d) goal setting for four major treatment stages—preparation, compliance, cooperation, and skill mastery. The preparation stage involves team consultation regarding the child’s and family’s needs. Medical, dietary, and occupational therapy assessments are also done. In the compliance stage, tolerance to the feeding situation emerges following a period of resistance. Consistent positive reinforcers are introduced and negative behaviors are ignored. The cooperation stage is characterized by the child’s increased participation in the feeding and increased oral intake volume tolerance. The skill mastery, or parent involvement, stage is the period of transition from therapist to parent as the primary feeder.

**Method**

An AB single-subject research design was used to evaluate the effectiveness of occupational therapy in increasing the oral intake of 3 children. The intervention involved behavioral management and play facilitation.

Referrals to occupational therapy were received from a pediatric gastroenterologist and pediatric pulmonary specialist. Each child had a history of unsuccessful oral feeding attempts made by his or her parents and, in some cases, by an occupational therapist. Each child was determined by his or her physician to be medically stable, and physiological reasons for food refusal had been ruled out.

Baseline measurements were collected during the first week of occupational therapy. During this time, we presented food in a nonthreatening manner only in conjunction with play activities such as feeding dolls and puppets, water play, and presentation of play foods. The focus was to establish rapport with the child through developmental-age-appropriate play activities. Sessions were held three times daily for 1 hr each.

The length of the intervention phase varied for each subject due to third-party payer limitations, the child’s tolerance of the hospital setting, staffing limitations, and goal attainment. Oral intake data were collected during each mealtime (i.e., three times daily) and plotted as a daily total during the intervention phase. Solids included purees; junior baby foods; and soft, textured table foods. The solids were premeasured in 30-ml (1-oz) cups. Liquids were premeasured in the same cups or larger marked cups or bottles. If supplements were added, they were also measured by teaspoon and documented. Spillage, spitting, and emesis were estimated and subtracted from the total oral intake. The dietitian made daily caloric conversions. The nurse, nutritionist, and physician calculated and monitored gastrostomy tube and TPN feeding reductions.

**Subjects**

The criteria for subject selection were medical stability, long-term use (defined as use in excess of 1 month) of nonoral means of nutritional intake, lack of significant cognitive developmental delays that would hinder awareness of reinforcements, family readiness, and a history of unsuccessful previous attempts to feed orally. Additionally, a determination that poor feeding was unrelated to medical factors such as esophagitis or gastroesophageal reflux was established in each case by the pediatric gastroenterologist.

Subject 1 was a boy born at term age. His primary diagnosis was Goldenhar syndrome, which included marked facial asymmetry and dysplasia of the facial bones. He was hospitalized for 3½ months after birth, at which time he was fed by a nasogastric tube. When he was discharged home, attempted oral feeding was unsuccessful, resulting in failure to thrive. A gastrostomy tube was placed before the subject’s first birthday. At 4 years of age, the subject was referred to occupational therapy for a feeding program to increase oral intake. Until this point he had only accepted small amounts of liquid by cup, although several attempts by professionals and parents had been made to introduce oral feedings. Developmental testing with the Gesell Preschool Test (Knoblock & Passaminick, 1980) indicated mild delays in cognitive and motor areas. During the feeding program, the subject’s behavior ranged from refusals and pushing food away to cooperation.

Subject 2 was a girl born at 36 weeks gestational age. Her primary diagnosis at birth was gastrochisis, resulting in short-bowel syndrome. At 5 months of age, a catheter was placed for TPN. She subsequently had numerous catheter-related septic episodes. At the age of 22 months, the subject continued to have the catheter as well as a gastrostomy tube. Intermittent home programs given by occupational therapists to introduce oral feedings were unsuccessful. During rehospitalization at 22 months of age, the subject was referred to the occupational therapy feeding intervention program to increase oral intake. At that time, the child was taking less than 1 oz of pureed food by mouth at any mealtime, as reported by her parents. The Bayley Scales of Infant Development (Bayley, 1969) indicated age-appropriate mental and motor functioning. As the feeding program progressed, her behavior fluctuated from being playful and cooperative to pushing away, scratching, crying, whining, and gagging.

Subject 3 was a girl born at 36 weeks gestational age.
Her medical history included gastrointestinal dysfunction with food intolerance, cystic fibrosis, respiratory distress, and reflux. Early nasogastric and intravenous feedings were initiated, followed by the placement of a TPN catheter and gastrostomy tube. Occupational therapy program recommendations for the foster home had been given prior to the intensive program, resulting in the acceptance of tastes of foods and small amounts of liquids. At 18 months of age, the subject was referred to occupational therapy for a feeding program to increase oral intake. At that time, she was refusing all spoon and nipple feeding attempts by nursing and was being sustained by TPN along with 70 ml of glucose water by the gastrostomy tube each day. The Bayley Scales of Infant Development indicated mild motor delays. The children were treated during hospitalization by two occupational therapists and one occupational therapy assistant. Sessions were held two to three times daily at regularly scheduled mealtimes in a quiet treatment room in the occupational therapy department.

The initial feeding evaluation assessed oral and body muscle tone, oral reflexes, biting, chewing and swallowing abilities, sensory responsivity to tactile experiences, play skills, and parent-infant interaction. Social and feeding histories were also taken from one or both parents. A formal developmental assessment was done with the Bayley Scales of Infant Development or the Gesell Preschool Test, depending on the child's age. In addition to these tests, clinical observations were made of space management, material management, and social play skills.

The occupational therapists and the parents met prior to treatment initiation to establish parental priorities, discuss guidelines of the program, and assess if the parents were willing and able to participate in this type of intervention. Information from this meeting was shared with the physician to determine if the intervention should be initiated.

Treatment consisted of behavioral management and play facilitation. Behavioral management procedures included positive reinforcement for desired behaviors and shaping, which is the process of acknowledging and rewarding approximations of the desired response (Lewis, 1982). Positive reinforcers were used in the form of play activity, because this was both developmentally appropriate and acknowledged as a legitimate tool of occupational therapy (Reilly, 1974). Play activities included music tapes and singing, doll and puppet feeding, water play, and plastic food and utensil play. Desired responses such as feeding a doll or initiating a taste of food were reinforced with a preferred toy of any type or praise. As desired responses increased, reinforcements gradually decreased to every other bite, then every few bites, with continued diminishment. Negative behaviors ranged from head turning to hand slapping and screaming. The therapists handled such behaviors by ignoring them or by verbalizing a firm no in extreme cases. Occasional gentle restraint of the child's hands was needed to reduce the potential for self-injury and to establish a therapist-controlled situation. Negative behaviors were extinguished by ignoring them. Expectations of food completion or of a desired response remained even when negative behaviors increased.

The initial foods presented in all three cases were puréed due to the children's lack of refined oral motor skills, gagging with textures, and inexperience with solids. Textures progressed to junior and then soft table foods as oral skills and tolerance for the feeding situation increased. Liquids consisted mainly of formula, but high-calorie drinks such as nectars were also used as tolerated. Ongoing consultation with the dietitian and nutritionist provided information on caloric needs and high-calorie food requirements. Daily reports were given to the nutritionist and primary nurse to make adjustments, as necessary.

The occupational therapy team met at least once daily to discuss program objectives, quantity and quality of oral intake, effective behavioral management, and the families' needs. Food quantities and behaviors were documented after each meal on a chart and in narrative progress notes. Only 1 child was admitted to the feeding program at a time due to the amount of time involved in the intervention planning, implementation, and documentation.

Initial family involvement did not include direct feeding for several reasons. We believed that the frustration and emotional stress involved with previous feeding attempts might conflict with the new programming. All of the parents agreed not to feed their child for a few days; some even expressed relief at this suggestion. During this period, the parents made routine visits at nonmealtimes and were encouraged to engage in enjoyable play activities with their child. An occupational therapist made daily contact during visitation or by phone to update the parents on the feeding progress. A written record of daily intake was also available for the parents to review on the hospital unit.

Direct parental involvement was initiated by the third stage of intervention. Positive behavioral changes were expected by this time. The parents observed feeding sessions in a one-way viewing situation while the occupational therapist fed the child. Following at least two observations in this manner, the parents were asked to observe in the same room, then to feed their child while the occupational therapist observed and provided guidance.

The program ended with the parents taking complete responsibility for mealtimes without the therapist's...
observing them. A consultation session followed these mealtimes. Every effort was made not to discharge the child until the parents felt comfortable with the feeding situation. The treatment team members consulted with each other and with the family prior to discharge to make follow-up plans and to give home-program guidelines. All of the children continued to see the gastroenterologist and nutritionist in an outpatient pediatric gastrointestinal clinic.

Results
Data on total oral intake (liquids and pureed food) were collected from 13 to 26 consecutive days for each child and graphed for baseline and intervention phases. A visual analysis of the acceleration lines indicates a noticeable increase of oral intake during the intervention phase in 2 of the 3 subjects. Subject 1 had an increase in oral intake that consisted primarily of high-calorie liquids (see Figure 1). When it was observed that acceptance of liquids was greater than that of pureed foods, liquids were offered more frequently, resulting in noticeable increases in intake, such as on Day 18. Subject 1 was able to discontinue gastrostomy tube feedings by Day 26 because his caloric needs were being met by liquid intake. On discharge, he was taking formula from a training cup and yogurt by spoon while sitting in a chair at a small table, with some resistive behaviors persisting when his mother was involved. Gastrostomy tube placement was maintained at discharge, although all needed calories were being taken orally. Follow-up intervention was indicated to establish intake of age-appropriate foods and to increase oral feedings to meet caloric needs.

By visual analysis, Subject 2 did not increase her oral intake substantially, but between Days 23 and 25 there was a positive trend (see Figure 2). On discharge, she was taking baby foods, formula, and nectars by spoon and cup while sitting independently in a high chair. Her nutritional needs were still completed by gastrostomy tube feedings by her discharge date.

Subject 3 had only 13 days of intervention due to a short hospitalization but demonstrated a remarkable change in intake of both liquids and pureed food (see Figure 3). On discharge, she was accepting purees and rice cereal by spoon and liquids by bottle while being held and fed in her foster mother's lap. A TPN catheter remained in place but was not used, and gastrostomy tube placement was maintained at discharge, although all needed calories were being taken orally.
feedings continued to be given following each meal to complete her caloric needs.

The binomial test of statistical significance indicated a significant change in oral intake between phases for Subjects 1 and 3 (p < .05). Most of the data points in the intervention period for Subject 2 fell below the celeration line, thus indicating no statistically significant change in the increase of oral intake.

Discussion

The results of this single-subject research study are affected by several factors. Time restraints and third-party reimbursement can necessitate initiating treatment prior to an adequate baseline measurement. In the present study, the baseline data were collected during a week of rapport building with the occupational therapists in play situations, which children's overall acceptance of food may have influenced. Another study limitation is that fewer than the recommended eight data points were collected in the baseline period. This may result in a less accurate celeration line for the baseline period (Kazdin, 1982).

The study results were also limited during the intervention phase by negative behaviors and decreased oral intake, which resulted when medically necessary but often invasive medical procedures were carried out (e.g., bronchoscopy). Ideally, any such adverse procedures should be completed before the intervention phase of the feeding program to prevent their influencing the subjects' feeding behaviors and quantity of oral intake. Other factors that may have contributed to the subjects' behavior included inappropriate staff involvement (e.g., food presentation at nonmealtimes) and minor illnesses.

The main issues contributing to the development of an inpatient intensive feeding program were (a) extreme stress experienced by parents over their failed efforts; (b) failed attempts by occupational therapists, other professionals, and parents to effect change through home programs; (c) difficulty of parents to bring their children for treatment daily due to travel distances, economics, work schedules, and transportation; (d) the need for consistent medical monitoring of a child's response to being weaned from tube feedings; (e) the availability of team involvement or consultation that included the parents, physician, dietitian, nurse, occupational therapist, nutritionist, social worker, and, at times, the psychologist and chaplain; and (f) treatment time limitations when dealing with third-party payers.

An intensive inpatient feeding program of this kind should be considered only after all other intervention strategies have been exhausted or are ineffective and medical reasons for food refusal ruled out. With the current focus in pediatrics on family-centered treatment approaches, occupational therapists need to explore more effective options for family involvement during the process of reinstating or initiating oral feeding for children.

Intensive outpatient and at-home feeding programs must be considered due to the increasing costs of hospitalization as well as the possible traumatic effects of a prolonged hospital stay on the child. An ideal setting for an outpatient intensive feeding program would be a nonacute but clinical environment close to important medical personnel and services as well as convenient for the family. Furthermore, occupational therapists must be willing and knowledgeable in providing families and other health care professionals with early and ongoing information, education, and training regarding preventative interventions for the normalization of oral sensorimotor experiences and responses, which would minimize the problems associated with oral deprivation.

Intensive occupational therapy feeding programs such as the one discussed in the present study do not completely solve the child's feeding problems. They provide a beginning, however, for reduced family stress, more appropriate oral motor skills, and positive behaviors toward the feeding activity. This type of program also provides parents or caregivers with opportunities for improved confidence in their parenting skills as the transition takes place between professionals and parents as primary feeders. Although oral intake was the dependent variable and main area of concern, other positive changes were made during intervention. Social behaviors such as smiling, vocalization, and play interaction noticeably increased as the program progressed. Parent-infant interaction also improved in some instances as the pressure surrounding the feeding activity decreased.

Recommendations for future studies or programs in this area are the establishment of an objective behavioral scale with interrater reliability, more formal play assessments at the beginning of intervention and before discharge, and postdevelopmental assessments. Follow-up studies are also indicated to assess the long-term effects of intervention. We also strongly recommend family inclusion in team conferences throughout the program.

This preliminary study suggests that pediatric occupational therapists in an acute care setting, using therapeutic play and consistent behavioral management, can be instrumental in increasing oral intake of children who have been fed by nonoral means for prolonged periods.

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References


