### Supplemental Table 1. Evidence for Behavioral, Parent-Directed and Educational, and Physiological Interventions

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<tr>
<th>Author/Year</th>
<th>Study Objectives</th>
<th>Level/Design/Participants</th>
<th>Intervention and Outcome Measures</th>
<th>Results</th>
<th>Study Limitations</th>
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</table>
| **Behavioral Interventions**

To assess the efficacy of a behavioral intervention in eliminating the need for enteral tube feeding in infants who no longer had a medical indication for this intervention but were resistant to oral feeding

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<tr>
<td>I</td>
<td>RCT</td>
<td>N = 64 children age 4–36 mo who were tube fed and had resistance to feeding, behavioral, or nutritional interventions randomly allocated into 2 groups (32 per group)—behavioral or nutritional intervention group</td>
</tr>
</tbody>
</table>

**Intervention**  
Behavior (extinction/flooding) + nutritional intervention for 7 wk

**Outcome Measures**  
- Discontinuation of enterostomy tube feeding  
- Infant Feeding Behavior rater checklist, Infant Feeding Behavior parent checklist

At the 8-wk visit, 47% of patients in behavioral therapy were no longer dependent on tube feed. Participants in the behavioral group ingested a greater proportion of their daily energy requirements orally compared with the nutritional group at each of the following visits.

**Study Limitations**  
Limited generalizability; intervention would not be appropriate for children with uncoordinated swallowing.  
Not a blind study

Greer, Gulotta, Masler, & Laud (2008)  
To investigate the effects of an intensive interdisciplinary feeding program on caregiver stress and child outcomes of children with feeding disorders across three categories

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<tr>
<td>III</td>
<td>One-group pre- and postdischarge</td>
<td>N = 121 children in 3 categories (tube-dependent, liquid-dependent, or food-selective groups)</td>
</tr>
</tbody>
</table>

**Intervention**  
Inpatient (behavior therapy 3 hr/day and oral–motor therapy 1 hr/day, 7 days/wk) and day treatment program (behavior therapy 3 hr/day and oral–motor therapy 1 hr/day, 5 days/wk)  
Oral–motor therapy: nutritive and nonnutritive oral–motor exercises

**Outcome Measures**  
Caregiver stress level, child mealtime behaviors, weight, and calories

Caregiver stress, child mealtime behaviors, weight, and caloric intake improved significantly after treatment in the intensive feeding program regardless of category placement.

**Study Limitations**  
Not randomized, discrepant sample size across the groups  
No association between caregiver stress level and child program outcome  
No long-term follow-up. The caregiver outcomes were measured at discharge. The decrease in caregiver stress could not be interpreted as a result of treatment effects.

**Parent-Directed and Educational Interventions**

Fraser, Wallis, & St. John (2004)  
To evaluate the effectiveness of a single-session, group, early intervention, multidisciplinary, education program designed to improve children's problem eating and mealtime behaviors

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<tr>
<td>III</td>
<td>One-group, pretest–posttest</td>
<td>Convenience sample of 106 parents of children ages 2–10 yr who attended a food program conducted in community health venues</td>
</tr>
</tbody>
</table>

**Intervention**  
2.5-hr education program that covers the main content areas of childhood nutrition and behavioral management strategies

**Outcome Measures**  
Children's Eating and Mealtime Behaviour Inventory

Significant improvement (with large effect size) was found in children's problem eating and mealtime behaviors after parent education program.

**Study Limitations**  
13% of the studied sample were age 6 yr and older.  
Maturation effect  
Lack of control group

Pridham et al. (2005)  
To examine the effect of a method of supporting development on premature infant and maternal feeding competencies

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| I     | RCT    | GP provided by a project nurse  
Weekly home visits for the 1st month, then weekly, biweekly, or |

(Continued)
### Supplemental Table 1. Evidence for Behavioral, Parent-Directed and Educational, and Physiological Interventions (cont.)

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<tr>
<td><strong>Physiological Interventions</strong></td>
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<td>Boiron, Da Nobrega, Roux, Henrot, &amp; Saliba (2007)</td>
<td>To compare the effects of oral stimulation with those of oral support on NNS and feeding parameters in preterm infants</td>
<td>Level I RCT</td>
<td>12 min of oral stimulation 1x/day 30 min before gavage for ≤14 consecutive days. Oral support was administered 2x/day for a maximum of 10 min.</td>
<td>Oral stimulation delivered during gavage significantly enhanced the NNS parameters (NNS pressure and sucking activity). Oral support applied alone or combined with oral stimulation during the transition period improved NNS pressure and feeding parameters and reduced transition time.</td>
<td>Small sample size</td>
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<tr>
<td>Einarsson-Backes, Deitz, Price, Glass, &amp; Hays (1994)</td>
<td>To determine the effectiveness of oral support for feeding efficiency in preterm infants who were identified by the medical term as poor feeders</td>
<td>Level III One group</td>
<td>Infants were fed twice, once with oral support and once without. The order of occurrence of these two conditions was randomly selected without replacement to ensure an equal number of both conditions.</td>
<td>A statistically significant difference in volume intake occurred between the oral support condition and the no-oral-support condition.</td>
<td>The relatively short data collection periods (2 min) did not allow the examination of the effect of providing oral support over an entire feeding session. Small sample Limited number of data points used</td>
</tr>
<tr>
<td>Hake-Brooks &amp; Anderson (2008)</td>
<td>To determine the effects of kangaroo care (KC) on breastfeeding status in mother–preterm infant</td>
<td>Level I RCT</td>
<td>KC dyads breastfed significantly longer. More KC dyads breastfed</td>
<td>Breastfeeding duration and exclusivity during follow-up were based entirely on self-report by the mothers.</td>
<td>(Continued)</td>
</tr>
</tbody>
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<tr>
<td>Pinelli &amp; Symington (2005)</td>
<td>To determine whether NNS in preterm infants influences physiological stability and nutrition</td>
<td>Level I Systematic review 21 studies, 15 of which were RCTs All studies used experimental or quasi-experimental designs in which NNS in preterm infants was compared with no provision of NNS</td>
<td><strong>Intervention</strong> NNS</td>
<td><strong>Outcome Measures</strong> Weight gain, energy intake, heart rate, oxygen saturation, length of stay, intestinal transit time, age at full oral feed, other clinical outcomes</td>
<td>NNS was found to decrease the length of hospital stay in preterm infants significantly. The review did not reveal a consistent benefit of NNS with respect to other major clinical variables (weight gain, energy intake, heart rate, oxygen saturation, intestinal transit time, age at full oral feeds, behavioral state). The review identified other positive clinical outcomes of NNS: transition from tube to bottle feeds and better bottle-feeding performance. No negative outcomes were reported in any of the studies.</td>
</tr>
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**Note.** Behavioral interventions are defined as treatment strategies that are based on operant learning principles. Seven studies were categorized as research on behavioral interventions, including 2 Level I, 4 Level III, and 1 Level IV articles. Intervention strategies that addressed children’s feeding problems by providing primary caregivers with information and recommendations regarding how to facilitate appropriate feeding behaviors were reviewed in the category of parent-directed and educational interventions. Six studies were categorized as research on parent-directed or educational interventions, including 4 Level I studies and 2 Level III studies. Interventions that concentrated on improving children’s biological development, including physical and sensory functions to support infant feeding, were categorized as physiological interventions. Twenty-one studies were categorized as research on physiological interventions, including 12 Level I studies, 3 Level II studies, 4 Level III studies, and 2 Level IV studies. IPAB = infant positive affect and behavior; IRNAB = infant regulation of negative affect and behavior; MPAB = maternal positive affect and behavior; MRNAB = maternal regulation of negative affect and behavior; NNS = nonnutritive sucking; RCT = randomized controlled trial.

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### Supplemental Table 2. Evidence for Behavioral, Parent-Directed and Educational, and Physiological Interventions

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| Benoit, Wang, & Zlotkin (2000) | To assess the efficacy of a behavioral intervention in eliminating the need for enteral tube feeding in infants who no longer had a medical indication for this intervention but were resistant to oral feeding | Level I RCT | Behavioral intervention for 7 wk  
**Outcome Measures**  
• Discontinuation of entero-stomy tube feeding  
• Infant Feeding Behavior rater checklist, Infant Feeding Behavior parent checklist  
• Infants’ weight and length | At the 8-wk visit, 47% of patients in behavioral therapy were no longer dependent on tube feed. Participants in the behavioral group ingested a greater proportion of their daily energy requirements orally compared with the nutritional group at each of the following visits. | Limited generalizability; intervention would not be appropriate for children with uncoordinated swallowing. Not a blind study. |
| Byars et al. (2003) | To describe multicomponent feeding program outcomes with children who have Nissen fundoplication and feeding gastrostomy | Level III One group, pre- and posttreatment, and follow-up comparison | Short-term intensive biobehavioral treatment  
**Outcome Measures**  
• Behavioral Pediatric Feeding Assessment Scale  
• Classification system for complex feeding disorder  
• Caloric intake (oral and G-tube), weight and height | Successful in improving oral intake and weaning from gastrostomy tube feeding in children with Nissen fundoplication and feeding gastrostomy. The $M$ percent ideal body weight for height was not compromised during intensive treatment. | Small sample size limits the generalizability. Lack of posttreatment measures of behavioral feeding resistance. |
| Greer, Gulotta, Masler, & Laud (2008) | To investigate the effects of an intensive interdisciplinary feeding program on caregiver stress and child outcomes of children with feeding disorders across three categories (tube-dependent, liquid-dependent, or food-selective groups) | Level III One-group pre- and postdischarge | Inpatient (behavior therapy 3 hr/day and oral–motor therapy 1 hr/day, 7 days/wk) and day treatment program (behavior therapy 3 hr/day and oral–motor therapy 1 hr/day, 5 days/wk).  
Oral–motor therapy: nutritive and nonnutritive oral–motor exercises  
**Outcome Measures**  
• Caregiver stress level  
• Child mealtime behaviors  
• Weight and calories | Caregiver stress, child mealtime behaviors, weight, and caloric intake improved significantly after treatment in the intensive feeding program regardless of category placement. | Not randomized, discrepant sample size across the groups.  
No association between caregiver stress level and child program outcome.  
No long-term follow-up.  
Caregiver outcomes were measured at discharge. Decrease in caregiver stress could not be interpreted as a result of treatment effects. |
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| Kerwin (1999)                   | To identify treatment studies for severe pediatric feeding problems               | Level I Systematic Review                         | **Interventions** Psychosocial or behavioral intervention  
**Outcome Measures** Measure of eating or caloric ingestion | Effective interventions for children with severe feeding problems are contingency management treatments that include positive reinforcement of appropriate feeding responses and ignoring or guiding inappropriate responses. Promising interventions include positive reinforcement for acceptance, not removing the spoon for refusal, and swallow-induction training. | The studies had various methodological limitations. Additional research is needed using either psychological placebo or established treatment as control conditions. |
| Laud, Girolami, Boscoe, & Gulotta (2009) | To evaluate treatment outcomes of an interdisciplinary feeding program           | Level III One group, nonrandomized                | **Intervention** Inpatient (behavior therapy 3 hr/day and oral–motor therapy 1 hr/day × 7 days/wk) and day treatment program (behavior therapy 3 hr/day and oral–motor therapy 1 hr/day × 5 days/wk). Oral–motor therapy: nutritive and non-nutritive oral–motor exercises  
**Outcome Measures**  
- Participant feeding behaviors: Acceptance, refusal behaviors, negative vocalizations, grams consumed.  
- Caregiver assessment measures: Children's Eating Behavior Inventory (CEBI), caregiver satisfaction scores  
- Follow-up: Questionnaires on volume, variety, texture, meal-time refusal behavior and caregiver satisfaction | Acceptance, refusal behaviors and grams consumed increased significantly; negative vocalizations significantly decreased from admission to discharge. A significant decrease in the total eating problem score (CEBI) from admission to discharge was found. At follow-up, the majority of the sample reported their children eating a greater variety of foods while engaging in less refusal. | Sample was not representative of most children with ASD. Efficacy of various treatment modalities in a less intensive outpatient setting for children with ASD should be evaluated. Follow-up data were assessed at only one point in time for each participant. |
| Wilder, Normand, & Atwell (2005) | To examine the use of noncontingent reinforcement to decrease self-injury and increase bite acceptance in a child who exhibited food refusal. | Level IV Single-subject design                    | **Intervention** Noncontingent reinforcement 2×/wk (10 min) for approximately 6 wk  
**Outcome Measures**  
- Self-injury  
- Bite acceptance | Results of the intervention showed a decrease in self-injury and an increase in bite acceptance. | Limited generalizability due to single-subject design. |
### Author/Year

**Williams, Riegel, Gibbons, & Field (2007)**

**Study Objectives**

To describe a day treatment program that was developed as a more cost-effective alternative to inpatient treatment of severe feeding programs

**Level/Design/Participants**

Level III

One group

*N* = 46 children ages 16–133 mo (*M* = 37 mo) with severe feeding problems with G-tubes

**Intervention and Outcome Measures**

**Intervention**

Intensive behavioral therapy in a day treatment program (contingency contacting, representation, swallow induction, thermal stimulation, exit criterion, texture fading, response cost for refusal, differential reinforcement of other behavior, token economy, graduated guidance for self feeding, prompts for self feeding)

**Outcome Measures**

Oral intake and the need for tube feed at discharge, 12-, and 24-mo follow-up (successful = complete elimination of all tube feeding, partially successful = dependence on tube feedings for 50% or less of calories; unsuccessful = dependence on tube feedings for more than 50% of caloric needs)

**Results**

67% of children were successfully weaned from their feeding tube during the course of treatment. 30% were partially successful, and 1 participant was not successful.

At 1-yr follow up, 63% remained successful, 28% were partially successful, and 9% unsuccessful.

At 2-yr follow up, 74% were successful, 17% were partially successful, and 9% were unsuccessful.

**Study Limitations**

Study was limited to examining the efficacy of intensive therapy and comparing the direct costs of feeding therapy and tube feeding. It did not compare the utilization of medical services for children who were tube fed but did not receive intensive therapy with that of children who receive intensive therapy.

Did not measure psychosocial or other benefits of oral feeding for children or their families.

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### Parent-Directed and Educational Interventions

**Black, Dubowitz, Hutcheson, Berenson-Hovan, & Starr (1995)**

**Study Objectives**

To evaluate the efficacy of a home-based intervention on the growth and development of children with nonorganic failure to thrive

**Level/Design/Participants**

Level I

RCT

*N* = 130 children, *M* age = 12.7 ± 6.4 mo

Intervention group *n* = 64

Control group *n* = 66

**Intervention**

*Intervention group*: Clinic and home visit for 1 yr. Home visits were done by trained lay person.

*Control group*: Clinic only.

**Outcome Measures**

- Growth
- Language development
- Parent–child behavior during feeding

**Results**

Children’s weight for age, weight for height, and height for age improved significantly, regardless of intervention status.

Children in the home intervention group had better receptive language over time than the clinic-only group.

Significant improvements in children’s interaction competence and parents’ becoming more controlling during feeding regardless of intervention status, suggesting that intervention was not effective in altering maternal behavior.

**Study Limitations**

Intervention needs to combine with education and special service components.

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**Chatoor, Hirsch, & Persinger (1997)**

**Study Objectives**

Describe a developmental treatment model for infantile anorexia

**Level/Design/Participants**

Level III

*N* = 40

**Intervention**

3 feeding sessions under supervision, follow-up phone call and visits

**Results**

17 mothers reported that they had relaxed over their children’s food intake.

**Study Limitations**

Subjective assessment measures limited to only provide description. Limited generalizability.

(Continued)
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| Fraser, Wallis, & St. John (2004) | To evaluate the effectiveness of a single-session group, early intervention, multidisciplinary, education program designed to improve children’s problem eating and mealtime behaviors | Intervention group n = 20 toddlers with infantile anorexia  
Control group n = 20 toddlers without infantile anorexia  
Followed 6 mo to 2 yr postintervention | Intervention 2.5-hr education program that covers the main content areas of childhood nutrition and behavioral management strategies  
Outcome Measures  
- Feeding scale to assess mother-infant interaction  
- Weight and height  
- Interview with mothers | Infants with anorexia increased their body weight 7% significantly. | Significant improvement (with large effect size) in children’s problem eating and mealtime behaviors after parent education program  
13% of the studied sample were age 6 yr and older.  
Maturation effect.  
Lack of control group. |
| Garcia Coll et al. (1996)    | To assess the impact of an individualized behavioral feeding intervention with mothers on postnatal growth patterns in full-term infants (FT) and those who were intrauterine growth retarded (IUGR) | Level I  
RCT  
N = 61 infants  
Intervention group n = 27 IUGR  
Comparison group n = 34 FT  
Sample size was sufficient to detect medium to large effects with an alpha of 0.05. | Intervention Videotape of feeding interaction with feedback given to mother immediately following the feeding interaction in the context of viewing the selected video segments with the mother.  
Outcome Measures  
- Anthropometric measurements (weight, head circumference, length, skin fold thickness)  
- Formula intake | Individualized behavioral feeding intervention can accelerate early growth in IUGR bottle-fed infants in the short term during the period of intervention (birth to 1 mo). On most parameters of physical growth, there is no lasting catch-up growth over the first 18 mo in IUGR infants. | Results cannot be generalized beyond bottle-fed infants.  
Unknown whether beneficial effects might have continued if the intervention had continued beyond the neonatal period. |
| Pinelli, Atkinson, & Saigal (2001) | To determine whether supplementary structured breastfeeding counseling (SSBC) for both parents compared with conventional hospital breastfeeding support (CHBS) improves the duration of breastfeeding in very low birthweight infants up to 1 yr old | Level I  
RCT with longitudinal follow-up of infants at term and age 1, 3, 6, 12 mo  
Parents of infants with birthweight <1,500 g, who planned to breastfeed  
N = 128  
Intervention group n = 64 SSBC couples  
Control group n = 64 CHBS couples | Intervention SSBC: Viewing a video on breastfeeding for preterm infants; individual counseling by the research lactation consultant; weekly personal contact in the hospital, and frequent postdischarge contact through the infants’ first year  
CHBS: Standard breastfeeding support from regular staff members during the period of hospitalization in the NICU.  
Outcome Measures | No statistically significant difference in duration of breastfeeding between the two groups. | Participants in both re were highly motivated and committed to breastfeed. |
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| Pridham et al. (2005)       | To examine the effect of a method of supporting development on premature infant and maternal feeding competencies | Level I RCT 42 mother–infant pairs randomly assigned to either guided participation (GP) or standard care (SC) group | Intervention  
**GP** provided by a project nurse. Weekly home visits for the 1st month, then weekly, bimonthly, or monthly for the 1st postterm yr. Phone calls between visits to answer questions  
**Outcome Measures**  
- Child feeding skills for infant feeding skills  
- MPAB, MRNAB, IPAB, and IRNAB for maternal and infant feeding interaction competencies  
- Centers for Epidemiological Studies–Depression Scale for mothers' symptoms of depression | **Results**  
GP significantly and positively contributed to MRNAB at 4 mo and to IRNAB at 1 and 8 mo.  
**Negative effect of symptoms of depression on MRNAB at 8 mo** | **Study's low power limits confidence in the adequacy of the study's assessment of GP effectiveness.**  
**Small sample size.** |
| Barlow, Finan, Lee, & Chu (2008) | To evaluate the effects of a new motorized pacifier to transition tube to oral feed | Level II Two group, pre- and posttest  
* N = 31 tube-fed preterm infants  
* Intervention group n = 20  
* Control group n = 11 | Intervention  
**Intervention group:** 3-min epochs of patterned oral somatosensory stimulation during gavage feeds 3–4×/day  
**Control group:** Regular pacifiers  
**Outcome Measures**  
Physical parameters of NNS and oral feed | The patterned orocutaneous stimulus was highly effective in accelerating the development of NNS: minute rates for total oral compressions, bursts, NNS cycles, suck cycles per bursts.  
**Greater success occurred in oral feeding than in the control group.** | **Small sample size.**  
Did not investigate swallowing. |
| Bier et al. (1996)           | To evaluate the effects of maternal–infant SSC vs standard contact (SC) on low-birthweight infants' physiological profile and duration of breastfeeding | Level I RCT Intervention study with cohort followed up for 6 mo after discharge  
* N = 50 infants with birthweight <1,500 g randomized to 2 groups | Intervention  
**SSC group:** Infants were clothed in diaper and held upright between mother's breasts; both mother and infant were covered with a blanket.  
**SC group:** Infants were clothed, wrapped in blankets, and held cradled in mothers' arms.  
**Outcome Measures**  
- Physiological data  
- Duration of BF | Infants in SSC group had higher oxygen saturation.  
90% of mothers in SSC group continued BF for the duration of the infants' hospitalization, and 50% in the SSC group (vs 11% in the SC) continued breast-feeding through 1 mo after discharge. | **Small sample size.** |

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| Boiron, Da Nobrega, Roux, Henrot, & Saliba (2007) | To compare the effects of oral stimulation with those of oral support on NNS and feeding parameters in preterm infants | Level I RCT<br>
* N = 43 preterm infants <34 wk gestational age randomly allocated into one of the 3 experimental groups: stimulation + support (*n* = 9), stimulation (*n* = 11), and support (*n* = 12) or control group (*n* = 11) | Oral stimulation delivered during gavage significantly enhanced the NNS parameters (NNS pressure and sucking activity).<br>Oral support applied alone or combined with oral stimulation during the transition period improved NNS pressure and feeding parameters, and reduced the transition time. | Small sample size                                                                                           |
| Bragelien, Rokke, & Markestad (2007)    | To study the effect of stimulation of sucking and swallowing on weaning from nasogastic (NG) feeding and length of hospital stay in premature infants | Level I RCT with blinded evaluation<br>
* N = 36 preterm infants (<36 wk GA) on NG feedings<br>Intervention and control group ns = 18 | Infants received stimulation based on Vojta’s technique of initiating reflex activity of striate and smooth muscle for 15 min once a day. | There were no group differences in infants when NG feedings were discontinued or when infants were discharged home. | Small sample size resulting in limited statistical power.<br>Treatment was given only once daily. |
| Einarsson-Backes, Deitz, Price, Glass, & Hays (1993) | To determine the effectiveness of oral support on feeding efficiency in preterm infants who were identified by the medical term as poor feeders. | Level III One group<br>
* Participants<br>
* N = 13 premature infants between 34 and 40 wk GA who were selected from a group of infants at children's hospital and medical center in Seattle | Infants were fed twice, once with oral support and once without. The order of occurrence of these two conditions was randomly selected without replacement to ensure an equal number of both conditions. | A statistically significant difference in volume intake occurred between the oral support condition and the no-oral-support condition. | The relatively short data collection periods (2 min) did not allow the examination of the effect of providing oral support over an entire feeding session. Small sample size. Limited number of data points. |
| Fucile, Gisel, & Lau (2002)             | To assess whether an oral stimulation program, before the introduction of oral feeding, enhances the oral feeding performance of preterm infants born between 26 and 29 wk GA. | Level I Two-group RCT<br>
* N = 32 preterm infants receiving full-tube feeding | Independent oral feeding was attained significantly earlier in experimental group. Overall intake and rate of milk transfer were significantly greater over time in the experimental group than the control groups (*p* = .0002 and .046, respectively). | Although there are general guidelines for the management of oral feedings, there is no specific protocol for initiating and advancing oral feedings at the participating institution. |
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<tr>
<td>Fucile, Gisel, &amp; Lau (2005)</td>
<td>To assess the effect of an oral stimulation program on the maturation of sucking skills of preterm infants</td>
<td>Level I Two-group RCT $N = 32$ preterm infants at 28 wk GA</td>
<td>Intervention: A daily 15-min oral stimulation program for 10 days before the start of oral feeding.</td>
<td>The experimental group achieved full oral feeding 7 days sooner than the control group and demonstrated greater overall intake, rate of milk transfer, and amplitude of the expression component of sucking.</td>
<td>Small sample size. Development of additional interventions aimed at facilitating the development of other skills involved in oral feeding, such as enhancing the suction component, behavioral state, and respiratory control, may be of great importance in order to develop more efficacious feeding intervention strategies.</td>
</tr>
<tr>
<td>Gaebler &amp; Hanzlik (1996)</td>
<td>To examine the effects of stroking and a perioral and intraoral pre-feeding stimulation program on healthy, growing, preterm infants</td>
<td>Level II Two-group, pretest–posttest Two groups of 9 randomly assigned, medically stable, preterm infants, born at 30–34 wk gestation, were selected. Intervention group $n = 9$ Control group $n = 9$</td>
<td>Intervention: Intervention group: 5-min stroking protocol in addition to a perioral and intraoral stimulation program. Control group: 5-min stroking protocol before feeding.</td>
<td>Compared with control group, the experimental group had increased number of nipple feeds, greater weight gain, fewer days of hospital stay, and higher scores on the Revised Neonatal Oral Motor Assessment nutritive suck scale</td>
<td>Findings cannot be generalized to preterm infant populations who are at greater medical risk.</td>
</tr>
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<td>Gisel et al. (2003)</td>
<td>To examine whether pulmonary function would improve following 1 yr of intervention with optimal positioning for feeding, control of</td>
<td>Level IV Descriptive studies that include analysis of outcomes (case series)</td>
<td>Intervention: Positioning the child for each meal in the position that was shown to minimize eliminate aspiration, as 2 of 3 girls showed improvement in respiratory functions</td>
<td>Generalization is limited due to the sample size and study design.</td>
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<td>Hake-Brooks &amp; Anderson (2008)</td>
<td>To determine the effects of kangaroo care (KC) on breastfeeding status in mother–preterm infant dyads from postpartum through 18 mo</td>
<td>Level I RCT</td>
<td>Intervention group: Mothers were encouraged to experience KC with their infants as soon as possible after birth and for as long as possible each time Control group: Received standard nursery care</td>
<td>KC dyads breastfed significantly longer. More KC dyads breastfed at full exclusivity at discharge and at 1.5, 3, and 6 mo.</td>
<td>Breastfeeding duration and exclusivity during follow-up were based entirely on self-report by the mothers. Mothers from control group may not get same level of attention as KC group.</td>
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<tr>
<td>Jadcherla et al. (2009)</td>
<td>To determine pharyngeoesophageal motility correlates in neonates with dysphagia and the impact of multidisciplinary feeding strategy</td>
<td>Level III One group pre-post</td>
<td>Intervention Multidisciplinary feeding strategy includes postural adaptation, sensorimotor adaptation, hunger manipulation, and operant conditioning methods.</td>
<td>75% of infants (15/20) showed success feeding with occupational therapy intervention (NNS, positioning, oral feeding)</td>
<td>Potential confounder variables not controlled. Videofluoroscopic swallow study is limited because of the ethical issue.</td>
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<tr>
<td>Lamm, De Felice, &amp; Cargan (2005)</td>
<td>To investigate and isolate the specific regional mechanical functions of the tongue during swallowing—“Tactile stimulation on the tongue”</td>
<td>Level III One group</td>
<td>Intervention • A tactile stimulus to the posterior tongue. • Sequential tactile stimuli to varied locations on the lingual surface.</td>
<td>Tactile stimulation to the posterior tongue can induce swallow.</td>
<td>Additional research is needed to facilitate parental compliance and decrease drift from training procedures in the home environment, because parent training is a critical component for maintaining the patients’ oral feeding gains in generalized settings. A biopsychosocial evaluation should be conducted to evaluate the patient and parents to determine social and...</td>
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<td>Larnert &amp; Ekberg (1995)</td>
<td>To investigate whether trunk and neck positioning influenced oral and pharyngeal swallow</td>
<td>Level IV Single-subject design</td>
<td>Intervention Two different sitting positions: upright and 30° backward with neck flexed</td>
<td>In the reclined position with the neck flexed, aspiration decreased in all 5 children, oral leak diminished in 2 children, and retention improved in 1 child.</td>
<td>Small sample size. Lack of objective outcome measures (e.g., the amount of bolus was not assessed).</td>
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<tr>
<td>Moore, Anderson, &amp; Bergman (2009)</td>
<td>To assess the effects of early SSC on breastfeeding, behavior, and physiological adaptation in healthy mother–newborn dyads</td>
<td>Level I Systematic review</td>
<td>Interventions include birth SSC, very early SSC, early SSC</td>
<td>A statistically significant positive effect on the success of the first breastfeeding, breastfeeding status Day 3 postbirth, breastfeeding 1 to 4 mo postbirth, breastfeeding duration was found for mothers and their healthy full-term or late preterm newborn infants (34–37 wk GA) who have early SSC starting less than 24 hr after birth</td>
<td>Limitations in design, outcome variability, and long-term outcomes.</td>
</tr>
<tr>
<td>Munakata et al. (2008)</td>
<td>To assess whether black pepper oil (BPO) stimulation facilitates oral intake in pediatric patients receiving long-term enteral nutrition.</td>
<td>Level III Single-group design</td>
<td>Intervention The effects of scenting with BPO for 1 min immediately before every meal were evaluated.</td>
<td>Eight patients completed 3-mo BPO intervention; 5 showed a distinct increase in oral intake. The increase was accompanied by desirable effects, such as facilitated appetite, reduced drooling, and distinct swallowing movements. BPO intervention was not effective in the other 3 patients.</td>
<td>Low evidence level. Case study.</td>
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<tr>
<td>Pinelli &amp; Symington (2005)</td>
<td>To determine whether NNS in preterm infants influences physiologic stability and nutrition</td>
<td>Level I Systematic review</td>
<td>Intervention NNS</td>
<td>NNS was found to decrease the length of hospital stay in premature infants significantly. The review did not reveal a consistent benefit of NNS with respect to other major clinical variables (weight gain, energy intake, heart rate, oxygen saturation, length of stay, intestinal transit time, age at full oral feed, other clinical outcomes</td>
<td>8 of 15 studies were crossover design. The washout time for NNS is unknown. Only 6 of 15 studies were clearly blinded.</td>
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## Supplemental Table 2. Evidence for Behavioral, Parent-Directed and Educational, and Physiological Interventions (cont.)

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| **Poore, Zimmerman, Barlow, Wang, & Gu (2008)** | To determine whether Ntrainer-patterned orocutaneous therapy affects preterm infants’ NNS and/or oral feeding success. | Level II Two-group, pretest-posttest  
*N* = 31 preterm infants with minimal NNS output and delayed transition to oral feeds at 34 wk  
Intervention group *n* = 21  
Control group *n* = 10 | Intervention  
NTrainer treatment provided to 21 infants 4x per day during scheduled gavage feeds  
**Outcome Measures**  
NNS nipple compression waveforms and percentage of oral feeding | Treated infants manifest a disproportionate increase in suck pattern stability and percent oral feeding beyond that attributed to maturational effects alone  
Small sample size.  
This study was conducted on healthy preterm infants. The results cannot be generalized to preterm infants with greater medical complications (i.e., IVH 3–4) | |
| **Reid (2004)** | To identify feeding interventions recommended for infants with cleft conditions | Level I Systematic review  
*N* = 55 Level I–IV articles published 1955–2002 | **Interventions**  
Early feeding and nutrition education as well as assisted feeding methods for infants with isolated cleft conditions  
**Outcome Measures**  
Feeding method, mothers’ reported ease and pleasure of feeding and estimate of infant contentment  
*M* energy, protein intakes, growth, time to feed, weight gain, failure to thrive | There are currently no completed systematic reviews relevant to this body of literature (Level I evidence). Two well-designed RCTs (Level I evidence) were found. These were considered to provide the strongest evidence for feeding intervention techniques. These articles described a combination of interventions, including early feeding and nutrition education as well as assisted feeding methods for infants with isolated cleft conditions.  
Three examples of Level III evidence were also found.  
Fifty (91%) of 55 articles reviewed were non-data-driven reports of expert opinion (Level IV).  
High proportion of studies are Level V, expert opinion (50/55). | |
| **Rocha, Moreira, Pimenta, Ramos, & Lucena (2007)** | To assess whether sensory–motor stimulation and NNS gavage feeding enhances the oral feeding performance of preterm infants born 26–32 wk GA | Level I Double-blind, two-group RCT  
*N* = 98 very low birthweight infants randomized into an experimental and control group | **Intervention**  
**Experimental group:**  
Sensory–motor–oral stimulation and NNS  
**Control group:** Sham stimulation program  
**Outcome Measure**  
Length of hospital stay | Independent oral feeding was attained significantly earlier in the experimental group than the control group. There was significant difference in length of hospital stay between the two groups.  
Study did not describe “sham stimulation” for the control group.  
Study was not designed to compare whether this intervention was of more benefit than NNS alone. Further studies are needed to verify this question. | |
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<td>Simpson, Schanler, &amp; Lau (2002)</td>
<td>To determine whether transition from tube to all-oral feeding can be accelerated by the early introduction of oral feeding in preterm infants</td>
<td>Level I RCT N = 29 infants (&lt;30 wk GA) randomly assigned to intervention and control groups</td>
<td>Intervention: Oral feeding initiated 48 hr after full tube feed; the feeding progression followed a structured protocol</td>
<td>Infants in the experimental group were introduced to oral feeding significantly earlier than the control group and attained all-oral feeding significantly earlier as well.</td>
<td>Small sample size.</td>
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<td>White-Traut et al. (2002)</td>
<td>To determine whether an auditory, tactile, visual, and vestibular intervention increases the proportion of alert behavioral states, thereby improving their feeding progression</td>
<td>Level I RCT N = 37 preterm infants (12 infants born at 23–26 wk gestation with normal head ultrasounds and 25 CNS-injured infants born at 23–31 wk)</td>
<td>Intervention: Standard of nursing care, plus an auditory, tactile, visual, and vestibular intervention (ATVV). ATVV intervention provides infant-directed talk via a soothing female voice (auditory stimulation) as the researcher massages the infant for 10 min (tactile stimulation), followed by 5 min horizontal rocking (vestibular stimulation). Throughout the 15-min period, the researcher attempts to engage in eye contact with the infant (visual stimulation).</td>
<td>Study group demonstrated increased alertness during the first 5 min of intervention, significantly correlated to length of stay. The proportion of nipple intake increased significantly faster for study group.</td>
<td>Small sample size. High rate of attrition due to hospital discharge. A significantly greater proportion of females were randomized to the study group.</td>
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**Note.** Behavioral interventions are defined as treatment strategies that are based on operant learning principles. Seven studies were categorized as research on behavioral interventions, including 2 Level I, 4 Level III, and 1 Level IV articles. Intervention strategies developed that address children’s feeding problems by providing primary caregivers with information and recommendations regarding how to facilitate appropriate feeding behaviors were reviewed in the category of parent-directed and educational interventions. Six studies were categorized as research on parent-directed or educational interventions, including 4 Level I studies and 2 Level III studies. Interventions that concentrated on improving children’s biological development, including physical and sensory functions to support infant feeding, were categorized as physiological interventions. Twenty-one studies were categorized as research on physiological interventions, including 12 Level I studies, 3 Level II studies, 4 Level III studies, and 2 Level IV studies. GA = gestational age; IPAB = infant positive affect and behavior; IRNAB = infant regulation of negative affect and behavior; M = mean; MPAB = maternal positive affect and behavior; MRNAB = maternal regulation of negative affect and behavior; NNS = nonnutritive sucking; RCT = randomized controlled trial; SSC = skin-to-skin contact.

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