Assessment and Treatment of Feeding Problems in Children with Autism Spectrum Disorders

William Sharp, Ph.D.
Instructor of Pediatrics
Emory University / Pediatric Psychology and Feeding Disorders Program
The Marcus Autism Center

Workshop Overview

I. Feeding Difficulties in ASD
   - Pediatric Feeding Disorders
   - Historical Link with ASD
   - Topography & Prevalence
   - Comprehensive Literature Review
   - Clinical & Research Implications
II. Assessment of Feeding Concerns
   - Methodological considerations (“The Assessment Problem”)
   - Assessment Methods
     - Standardized Questionnaires
     - Estimates of nutrient intake
     - Mealtime observation
III. Treatment Approaches
   - Levels of intervention
   - Multidisciplinary Collaboration
     - Nutritional counseling
     - Behavioral Intervention
       - Antecedent Changes
       - Consequence-Based Procedures

Learning Objectives

1. Participants will be able to identify mealtime difficulties commonly associated with autism.
2. Participants will be able to list key components of assessment methods for identifying behavioral and nutritional concerns.
3. Participants will recognize key factors to indicate appropriate levels of intervention for longstanding feeding concerns.

Pediatric Feeding Disorders

- No human activity has greater biological and social significance than eating
  - Required for survival
  - Important role in socialization
- Develops seemingly automatically most children
  - The type and amount of food children eat changes significantly over the first 3 years. In general:
    - By 4-6 months, semisolid foods (baby cereal, pureed food) are added to a child’s diet
    - By 8 months of age, children begin to show interest in feeding themselves (reaching for the spoon)
    - Between 12 and 24 months, children begin to eat the same things as the rest of their family and begin to develop preferences for certain foods
    - At 18 months, toddlers learn to feed themselves with a spoon
    - By 24 months they begin to learn the social skills around eating

- Common problem for children and source of stress for caregivers:
  - Up to 40% of children experience some mealtime problems (Manikam & Peman, 2000; Mayes & Volkmar, 1993)
  - Issues include:
    - “Picky” eating patterns
    - Strong food preferences – insist on eating the same foods
    - Behaviors aimed at ending meals prematurely (e.g., whining, crying, pushing food away)
    - Fluctuating hunger
    - Reluctance to self-feed

- Between 3% and 10% of children develop chronic feeding issues exceeding ordinary developmental variation (Kerwin, 1999).
- Pediatric Feeding Disorder: Failure to eat a sufficient quantity and/or variety of food resulting in chronic malnutrition, poor weight gain and/or weight loss diagnosed before age six years in the absence of an active organic complaint (American Psychiatric Association, 2002).
Potential Outcomes

- Growth retardation
- Malnutrition
- Developmental and psychological deficits
- Poor academic achievement
- Social difficulties
- Invasive medical procedures (e.g., placement of a feeding tube)
- Death

(Benoit 1993; Chatoor 2002; Finney 1988)

Feeding - Problem Description

- Broad Categories-
  - Food Refusal
    - Partial vs. Total Food Refusal
  - Food Selectivity
    - Texture, Type, Presentation
  - Skill Deficit
    - Chewing, tongue lateralization
  - Organic vs. Non-Organic
    - Cases typically include more than one causal factor and involve a wide range of topographies

Feeding - Problem Description

- Medical Issues (Babbitt et al., 1994; Sanders et al., 1993)
  - 1) metabolic abnormalities or defects in absorption that accompany conditions such as cystic fibrosis, mitochondrial disease, short bowel syndrome or lactose intolerance
  - 2) gastrointestinal issues involving persistent emesis and/or diarrhea (e.g., gastroesophageal reflux, gastroenteritis, dysmotility)
  - 3) structural or anatomical defects (e.g., bronchopulmonary dysplasia, malrotated intestine, micrognathia)
  - 4) oral motor deficits (dysphagia)
  - 5) hypersensitivity to food tastes, smells and textures

Feeding - Problem Description

- Developmental Issues (Ledford & Gast, 2006)
  - 33% - 80% of children w/ developmental disabilities (autism, mental retardation, cerebral palsy)
- Environmental Issues
  - Disrupted family functioning and maladaptive patterns of reinforcement (Babbitt et al., 1994)
  - Lack of structure conducive to eating (e.g., unrestrained access to food; irregular mealtimes), exposure to developmentally inappropriate textures, and/or parental modeling of inappropriate eating habit
  - Negative and positive reinforcement

Chain of feeding behaviors

<table>
<thead>
<tr>
<th>Step</th>
<th>Disruption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparing/Securing Food</td>
<td>famine, poverty, neglect</td>
</tr>
<tr>
<td>Bringing food to Mouth (Self or Non-self)</td>
<td>head turns, batting at spoon, agressions, crying, screaming, elopement</td>
</tr>
<tr>
<td>Accepting</td>
<td>teeth clenching, head turning, lip pursing</td>
</tr>
<tr>
<td>Processing (e.g., Hold in Mouth, Chew, Move to Back of Mouth)</td>
<td>expulsion, tongue retraction</td>
</tr>
<tr>
<td>Swallowing/Digestion</td>
<td>packing, gagging, vomiting</td>
</tr>
</tbody>
</table>

Behavioral Elements- 2 factor model

Function: Past research suggest that many of these behaviors are escape maintained (Piazza et al. 2003)

Classical Conditioning

<table>
<thead>
<tr>
<th>US</th>
<th>UR</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS</td>
<td>CR</td>
</tr>
</tbody>
</table>

Reflux/Pain | Escape/Avoidance
Food        | Escape/Avoidance
Operant Conditioning

- Once medical issues is resolve, problem behaviors continue due to operant conditioning

<table>
<thead>
<tr>
<th>Environment</th>
<th>Add</th>
<th>Remove</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase</td>
<td>Positive Reinforcement</td>
<td>Negative Reinforcement</td>
</tr>
<tr>
<td>Decrease</td>
<td>Positive Punishment</td>
<td>Negative Punishment</td>
</tr>
</tbody>
</table>

- Family system also disrupted and learning process also involves caregivers

Learning Process - Child

Child displays refusal behaviors in response to a bite presentation

- Parent removes the feeding demand

- Refusal behaviors are reinforced

- Child stops crying, screaming, aggressing etc.

- Parents behavior is also reinforced

Learning Process - Parent

Child displays refusal behaviors in response to a bite presentation

- Parent removes the feeding demand

- Refusal behaviors are reinforced

- Parents behavior is also reinforced

- Child stops crying, screaming, aggressing etc.

ASD & Feeding

Historical Background

- Feeding problems historically link with autism spectrum disorders (ASD)
  - Leo Kanner (Kanner, 1943)
  - Included in past diagnostic indicators of autism (Ritvo & Freeman, 1978)
  - Anecdotal reports/case studies documenting food selectivity, food refusal, and strong emotional responses to non-preferred food (Cornish, 1998; Ahearn et al., 2001)

- Lack of clinical attention and research focus in this area may be related to:
  - Concentration on core features of ASD
  - Reliance on anthropometric data (weight, height) to guide referrals for assessment/treatment
  - Health not viewed as immediately at risk (Ledford & Gast, 2006) b/c not underweight
  - Greater need for micronutrient analysis

Topography & Prevalence

- Recent studies suggest feeding difficulties may be endemic in the ASD population
  - 46% and 89% of children with ASD display significant feeding problems (Ledford & Gast, 2006)
  - Often no identifiable organic precursor
  - Food selectivity (i.e., eating only certain foods) is the most common mealtime issue associated with ASD
    - Strong preferences for carbohydrate-based diets (Williams, Gibbons, & Schreck, 2005)
    - Preference against fruits and vegetables (Ahearn et al., 2001; Cornish, 1998; 2002)
Comprehensive Literature Review

- **Goal:** Systematically review the literature regarding feeding difficulties associated with autism spectrum disorders (ASD), focusing on methodology, participants, and outcomes
- **Method:**
  - MedLine, PsychINFO, and PubMed databases
  - Search parameters included combinations of key words regarding:
    - Target population - autism, autistic, autism spectrum disorders, pervasive developmental disorder (PDD), Asperger’s
    - Mealtime related variables - diet, dietary intake, eating, feeding, food selectivity, nutrition, mealtime behaviors, pediatric feeding disorder
    - Evaluation methodology - assessment, mealtime observation, food frequency

Inclusion Criteria:
- Descriptive studies regarding feeding behaviors/patterns and/or dietary intake among children with ASD
- Published in an English language peer reviewed journal between January 1970 and June 2011
- Evaluated feeding through a standardized or replicable manner
- Dependent variable(s) was a measure of nutritional status, dietary intake, or feeding behavior
- Participants were children (birth to 18 years of age) with ASD
- Excused single-subject and group intervention studies designed to modify eating behavior were not included

Data collected from articles included:
- Study descriptors
  - Journal, year of publication, procedure, design, presence of a comparison group, type of ASD diagnostic indicator, setting and feeding measure
- Demographics, Procedures and Design
  - Sample size, diagnostic breakdown, gender, age, measures
- Results
  - Percentages – Feeding concerns and/or nutritional deficits
  - P values or effect size estimates (e.g., d)
- Two independent coders
- Inter-rater reliability to be calculated on 100% of the data

Table 1: Literature Summary by Journal and Year of Publication

<table>
<thead>
<tr>
<th>Journal Title</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Journal of Autism and Developmental Disorders</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>Autism</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Journal of Developmental and Physical Disabilities</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Journal of Human Nutrition and Dietetics</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Biological Psychiatry</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Autism Health Care</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Journal of Developmental Disabilities</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Journal of the American Academy of Orthopaedic Medicine</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Journal of Pediatrics</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Nutrition Science</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Pediatrics</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Physical &amp; Occupational Therapy</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Research in Autism Spectrum Disorders</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Topics in Clinical Nutrition</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>100</td>
</tr>
</tbody>
</table>

Results

- 27 studies indentified*
- Notable Omissions
  - Bowers (2002): “A review of audits to dietary services indicated 46% of the sample were referred for concerns related to food selectivity; the remaining 54% were referred for guidance on dietary manipulation”.
  - Schreck & Williams (2006): This is a more detailed description of the sample presented by Schreck, Williams, & Smith (2004)

* 2 recent additions not reflected in the data presented
Summery of Outcomes

- 23 studies (92%) measured food selectivity
  - All but one reported atypical feeding concerns in a majority of the participants
  - All comparison studies indicated ASD children experienced significantly more feeding concerns (p < .05)
  - Prevalence?
    - Multiple methods of assessment: single items, group differences, mealtime observation, review of food diaries
- 12 studies (48%) investigated nutritional status
  - 5 studies (42%) reported vitamin/mineral deficiencies
  - Lockner, Crowe, & Skipper (2008) – Children with ASD were significantly more likely to be taking vitamin/mineral supplements
  - Highlights importance of controlling for vitamin/mineral supplements

Clinical and Research Implications

- Definitive conclusions regarding the topography, etiology, impact and treatment of feeding problems in ASD are limited
  - Lack of standardized measures
  - Inconsistent methodology
- Strong need to establish clinical and research standards in this area
- Atypical eating patterns and ASD may be linked with a number of negative outcomes, including:
  - Nutrient inadequacy (Bandini et al., 2010)
  - Decreased bone density (Hediger et al., 2007)
  - Social impact: parent stress (Greer et al., 2007); modifying family routine
  - May also inform the use of dietary manipulations (e.g., GFCF diet)

Assessment of Feeding Problems

- Assessment of feeding problems associated with ASD should ideally seek to capture (Luken's & Lenshied, 2008):
  - General feeding concerns (e.g., enjoyment of eating; independence during meals)
  - Mealtime difficulties purportedly unique to this population:
    - Severe food selectivity
    - Ritualistic behavior surrounding eating
    - Strong emotional responses in response to non-preferred food
  - Relationship between selective eating habits and possible nutritional inadequacies
  - Potential for widespread dissemination and replication (which required standardization in questions, procedures and/or format)
Lack of adequate assessment methodology in feeding problems in this population (Matson & Fostad, 2009).

Three possible candidates:
- Standardized questionnaires
- Estimates of nutrient intake
- Structured mealtime behavior observations

### Behavioral Pediatric Feeding Assessment Scale (BPFAS; Crist & Napier-Phillips, 2001)

<table>
<thead>
<tr>
<th>Description</th>
<th>Standardization Sample</th>
<th>Psychometric Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Sample</td>
<td>n = 95</td>
<td>Cronbach's alpha = .79</td>
</tr>
<tr>
<td>Non-clinical sample</td>
<td>n = 46</td>
<td>Test-retest reliability = .73</td>
</tr>
<tr>
<td>Clinical sample</td>
<td>n = 49</td>
<td>Internal consistency = .82</td>
</tr>
</tbody>
</table>

#### Psychometric Properties
- **Internal consistency**: .82 for the entire scale (range .79 to .90 across subscales)
- **Test-retest reliability**: .73 (range .68 to .80 across subscales)
- **Cronbach’s alpha**: .79 for the entire scale

### Children’s Eating Behavior Inventory-Revised (CEBI-R; Archer et al., 1991)

<table>
<thead>
<tr>
<th>Description</th>
<th>Standardization Sample</th>
<th>Psychometric Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Sample</td>
<td>n = 316</td>
<td>Internal consistency = .85</td>
</tr>
<tr>
<td>Subgroups</td>
<td>1. Non-clinical (n = 206)</td>
<td>Subscale reliability = .74</td>
</tr>
<tr>
<td></td>
<td>2. Clinical (n = 110)</td>
<td>Subscale reliability = .75</td>
</tr>
</tbody>
</table>

#### Psychometric Properties
- **Internal consistency**: .85 for the entire scale (range .79 to .89 across subscales)
- **Subscale reliability**: .74 to .79 (range .69 to .85 across subscales)
- **Subscale reliability**: .74 to .85 (range .70 to .84 across subscales)
- **Subscale reliability**: .75 to .85 (range .70 to .84 across subscales)
- **Subscale reliability**: .75 to .85 (range .70 to .84 across subscales)
### Brief Autism Mealtime Behavior Inventory (BAMBI; Lukens & Linshied, 2008)

<table>
<thead>
<tr>
<th>Description</th>
<th>Standardization Sample</th>
<th>Psychometric Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Sample = 108</td>
<td>Test: Group A (n = 58), Group B (n = 50)</td>
<td>Reliability: .87 for the total score. .68 for the non-social factor. .58 for the food refusal factor.</td>
</tr>
<tr>
<td>Yield:</td>
<td>Test: Group A (n = 58), Group B (n = 50)</td>
<td>Validity: BAMBI total scores correlated significantly with BPFAS.</td>
</tr>
<tr>
<td>Date:</td>
<td>Test: Group A (n = 58), Group B (n = 50)</td>
<td>In addition to an overall score, three factors can be isolated for further analysis.</td>
</tr>
<tr>
<td>Cons:</td>
<td>Test: Group A (n = 58), Group B (n = 50)</td>
<td>Factor scores can be measured in weight or volume units.</td>
</tr>
</tbody>
</table>

#### Standardized Assessments: Pros/Cons

- **Pros:**
  - Quick access to information
  - Time
  - Scoring
  - Yields important data regarding parent perception of problem

- **Cons:**
  - No link with behavioral data
  - No cut-off scores for clinical interpretation
  - Screening measure?

#### Estimates of Nutrient Intake

- **2 General Categories (see Buzzard, 1998, Posner et al., 1992, and/or Willet, 1998 for a review):**
  1. Identify specific foods and quantities consumed within a certain period of time
  2. 24 hour recall
  3. Caregiver to record all foods consumed for one or more days, including the quantity of intake measured in weight or volume
  4. Food Diary
  5. In-depth interview conducted by a trained dietary observer

#### Estimates of Nutrient Intake

- **3 Sections**
  1. Food list - What foods are consumed?
  2. Frequency/preference section - How often the food is consumed?
  3. Likert scale (e.g., often, sometimes, never)
  4. Dichotomous yes/no responding to assess whether age appropriate portions are consumed

#### Estimates of Nutrient Intake

- **At Least Every Meal**
  1. My child closed his/her mouth tightly when food is presented.
  2. My child expels (spits out) food that he/she has eaten.
  3. My child is aggressive during mealtimes (hitting, kicking, scratching others).
  4. My child shows rejection of food presented by caregivers (e.g., pushing/throwing utensils, utensils off score for clinical interpretation)
  5. My child shows restricted food preferences (e.g., my child is only willing to eat a certain food or foods)

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Food Preference Inventory

Directions: Circle how willing your child is to eat each of these foods most times the food is offered. If the child eats other foods not included here, write them in the blanks below.

How willing is your child to eat these foods?
NA - Not eaten by family or not offered due to a restricted diet (e.g., food allergy);
Never - Refuses to eat when presented at meals.
With Prodding - Will eat occasionally or with encouragement from caregivers;
Willing - Eats on a regular basis without difficulty;
Favorite - Actively seeks out this food and requests it frequently.

Food Preference Inventory

<table>
<thead>
<tr>
<th>Food</th>
<th>Willingness to Eat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>NA</td>
</tr>
<tr>
<td>Apple Juice</td>
<td>NA</td>
</tr>
<tr>
<td>Applesauce</td>
<td>NA</td>
</tr>
<tr>
<td>Apricots</td>
<td>NA</td>
</tr>
<tr>
<td>Avocado</td>
<td>NA</td>
</tr>
<tr>
<td>Banana</td>
<td>NA</td>
</tr>
<tr>
<td>Banana Chips</td>
<td>NA</td>
</tr>
</tbody>
</table>

Food Frequency Inventory

<table>
<thead>
<tr>
<th>Food</th>
<th>Frequency</th>
<th>How Often is it Consumed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple Juice</td>
<td>At least 1x per week</td>
<td>At least 1x per week</td>
</tr>
<tr>
<td>Applesauce</td>
<td>At least 1x per week</td>
<td>At least 1x per week</td>
</tr>
<tr>
<td>Apricots</td>
<td>At least 1x per week</td>
<td>At least 1x per week</td>
</tr>
<tr>
<td>Avocado</td>
<td>At least 1x per week</td>
<td>At least 1x per week</td>
</tr>
<tr>
<td>Banana</td>
<td>At least 1x per week</td>
<td>At least 1x per week</td>
</tr>
<tr>
<td>Chips</td>
<td>At least 1x per week</td>
<td>At least 1x per week</td>
</tr>
</tbody>
</table>

Estimates of Nutrient Intake: Pros/Cons

- Food Diary/Recall
  - Pros:
    - Flexibility in the level of analysis (e.g., food group, meal pattern or nutrient intake)
    - Unlimited specificity of food type and amounts due to the open-ended nature
  - Cons:
    - Demand placed on respondents
    - Inappropriateness for assessing long-term dietary habits
    - Need for a trained dietary interviewer (24 hour recall)

Estimates of Nutrient Intake: Pros/Cons

- Food Preference Inventory
  - Pros:
    - General assessment of intake patterns
    - Easy to administer
    - Less time consuming
  - Cons:
    - Sacrifices the collection of more precise of dietary information

Estimates of Nutrient Intake

- Willett (1998):
  - Food frequency/preference method may be best suited for epidemiologic assessment of long-term dietary patterns
  - Recall method should be used if more detailed data regarding nutrient intake is needed

Behavior Observation

- Key Considerations:
  - Naturalistic versus Structured
  - Environment
  - Feeder
  - Foods (type, texture)
  - Presentation format
  - Bolus size

- Few examples in the literature
  - Munk & Repp, 1994
  - Ahearn, Castine, Nault, & Green, 2001
Recent Studies

- Describe studies utilizing behavior observations with varying degrees of structure
  - Study 1: Structured mealtime protocol (Sharp & Jaquess)
  - Study 2: Semi-structured mealtime observations (Aponte)
- Assess the relationship between behavioral observations and third party report questionnaires:
  - Food Preference Inventory
  - Brief Autism Mealtime Behavior Inventory (BAMBI)

Methods

<table>
<thead>
<tr>
<th>Study 1</th>
<th>Study 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description of Participants</strong></td>
<td>Children with an ASD 31 parent-child dyads Recruited at MAC in Atlanta, GA (23M, 8F)</td>
</tr>
<tr>
<td><strong>Measures</strong></td>
<td></td>
</tr>
<tr>
<td>BAMBI, Food Preference Inventory</td>
<td>BAMBI, Food Preference Inventory</td>
</tr>
<tr>
<td><strong>Child Behavior Observations</strong></td>
<td></td>
</tr>
<tr>
<td>Acceptance, Combined Inappropriate Behaviors (CTs)</td>
<td>Acceptance, Combined Inappropriate Behaviors (CTs)</td>
</tr>
<tr>
<td><strong>Parent Feeding Behaviors</strong></td>
<td>Accuracy of protocol implementation</td>
</tr>
</tbody>
</table>

Protocol Considerations

<table>
<thead>
<tr>
<th>Study 1</th>
<th>Study 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Foods</strong></td>
<td>Standardized (researcher provided)</td>
</tr>
<tr>
<td><strong>Texture</strong></td>
<td>Table (½” x ½”) and puree</td>
</tr>
<tr>
<td><strong>Bolus size</strong></td>
<td>2 pea</td>
</tr>
<tr>
<td><strong>Feeder</strong></td>
<td>Parents presented; Child Self-Fed</td>
</tr>
<tr>
<td><strong>Length of Meal/ # of presentations</strong></td>
<td>24 presentations</td>
</tr>
<tr>
<td><strong>Setting</strong></td>
<td>Laboratory</td>
</tr>
<tr>
<td><strong>Persistence with Bites</strong></td>
<td>Standardized with script and bug in the ear</td>
</tr>
</tbody>
</table>
Study 1 – Structured Prompting

- Pre-scooped food placed on plate in front of child
  - 5s delay
  - Verbal Prompt
    - 5s delay
    - Gestural Prompt
      - 5s delay
      - Physical Prompt
        - 20s break from the meal

  - Bite Acceptance
    - Praise

Study 2 – More Naturalistic

- Examiner gives caregiver 1 piece of food on a spoon on a plate
  - Caregiver directed to prompt/feed as usual
    - 30s
    - Examiner prompts caregiver to move on to the next food

Results

High percentage of parent participants indicated concern about their child’s feeding in both studies

- Study 1: 89% reported concerns with feeding
- Study 2: 91% of parents reported some degree of concern with their child’s mealtime behavior

<table>
<thead>
<tr>
<th></th>
<th>Study 1</th>
<th>Study 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accepted Bites</td>
<td>40%</td>
<td>49.1%</td>
</tr>
<tr>
<td>Percent of Session Out of Seat</td>
<td>27.3%</td>
<td>19.4%</td>
</tr>
<tr>
<td>Foods with CT’s*</td>
<td>43.0%</td>
<td>22.7%</td>
</tr>
<tr>
<td>Percent of Session with Negative Vocalizations</td>
<td>3.6%</td>
<td>11.6%</td>
</tr>
</tbody>
</table>

* CT’s = combined inappropriate behaviors (i.e., head turns or disruption of the food presentation)

Food Preference Inventory

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<tr>
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<td>% of foods with CI’s</td>
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</tr>
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<td></td>
<td>r = -.528, p&lt;.005</td>
</tr>
<tr>
<td>Study 2</td>
<td>r = -.832, p&lt;.05</td>
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<tr>
<td></td>
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</tr>
<tr>
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<td>r = -.832, p&lt;.05</td>
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### BAMBI Limited Variety Scale

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<tr>
<th>Limited Variety Scale</th>
<th>Behavior Observation</th>
<th>Study 1</th>
</tr>
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<td>% of Session with Negative Vocalizations</td>
<td>r = .430, p&lt;.05</td>
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### Behavioral Observation: Pros/Cons

- **Pros:**
  - “Gold standard” of assessment, provides objective data regarding actually performance
- **Cons:**
  - Design questions
  - Cost (e.g., time, data collection, emotional response)

### Treatment of Feeding Concerns In ASD
**Levels of Intervention**

- Parent Education/Consultation
  - Spans multiple disciplines
  - Involves guidance and recommendations
  - Educational handouts
- Outpatient Therapy
  - Behavioral psychology
  - Nutrition
  - Oral-motor therapy
- Intensive Feeding Programs
  - Inpatient / Day Treatment
  - Multi-disciplinary

**Treatment Setting**

- Setting:
  - 60.4% - Inpatient or day treatment setting
  - 29.2% - Home/school
  - 10.4% - Outpatient clinics
  - 6.3% - Residential facilities

**Presenting Problem:**

- Most children with tube (69.7%; \(X^2[3, N = 43] = 47.14, p < .0001\)) and bottle dependence (87%; \(X^2[2, N = 15] = 19.2, p < .0001\)) treated at day treatment program.
- No significant difference in treatment setting was detected for patients treated for severe food refusal or selectivity (inpatient/day treatment: \(n = 8\), home/school: \(n = 15\); outpatient: \(n = 5\); residential facility: \(n = 2\)).

**Treatment Elements**

- Escape extinction - 83.3%
  - Non-removal of the spoon (NRS) – 47.9%
  - Physical Guidance (PG) – 20.8%
  - Non-removal of the food (NRF) – 25%
- Differential Reinforcement of an Alternative Behavior (DRA) – 77.1%
  - Accepting a bite
  - Swallowing a bite
- Antecedent Manipulations (AM) – 47.8%
  - Texture, food type, bite size
- Treatment packages - 89.6%
  - EE + DRA
  - EE + DRA + AM

**Medical Outcomes**

**Medical and Nutritional Outcomes**

- Tube reductions were reported in 25 of 43 tube-dependent children (58.1%)
  - Eliminated in 16 cases (64%)
  - Reduced by an average of 57.1% (range: 42% to 60%) in 7 cases
  - 2 unspecified
- Anthropometric parameters were reported in 23 of the 93 cases (24.7%)

**Literature Review**

  - Articles in peer reviewed scientific journals (1970-2010) evaluating treatment of severe food refusal or selectivity were identified.
  - Studies demonstrating strict experimental control were selected and analyzed.
  - Forty-eight single-case research studies reporting outcomes for 96 participants were included in the review
  - Most children presented with complex medical and developmental concerns and were treated at multidisciplinary feeding disorders programs
  - 23.7% diagnosed with ASD
- All studies involved behavioral intervention; no well controlled studies evaluating feeding interventions by other theoretical perspectives or clinical disciplines met inclusion criteria.

---

**Table: Treatment Outcomes**

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Acceptance (Mean) (Standard Deviation)</th>
<th>Acceptance (Frequency)</th>
<th>Acceptance (Participants N)</th>
<th>Mean NAP (Standard Deviation)</th>
<th>Mean NAP (Participants N)</th>
<th>Effect Size (D)</th>
<th>Effect Size (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent Education</td>
<td>2.41 (1.43)</td>
<td>25 (7, 17)</td>
<td>26 (1, 15)</td>
<td>29.85 (2.39)</td>
<td>29.85</td>
<td>2.60</td>
<td></td>
</tr>
<tr>
<td>Outpatient Therapy</td>
<td>3.27 (1.79)</td>
<td>26 (9, 17)</td>
<td>29 (1, 15)</td>
<td>36.04 (2.48)</td>
<td>36.04</td>
<td>2.46</td>
<td></td>
</tr>
<tr>
<td>Intensive Feeding</td>
<td>3.63 (1.39)</td>
<td>24 (8, 16)</td>
<td>29 (1, 15)</td>
<td>36.25 (1.24)</td>
<td>36.25</td>
<td>2.90</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3.02 (1.73)</td>
<td>24 (9, 16)</td>
<td>29 (1, 15)</td>
<td>31.71 (2.62)</td>
<td>31.71</td>
<td>2.46</td>
<td></td>
</tr>
</tbody>
</table>

Note: NAP = Nonoverlap of All Pairs; PND, NAP and Effect Size Values by Dependent Variable.
Laud, Girolami, Boscoe, & Gulotta (2009) and Sharp, Jaquess, Morton, & Miles (2011) documented outcomes for children with ASD admitted for treatment at intensive, interdisciplinary feeding program. Key points:
- With relatively few interdisciplinary feeding programs spread out geographically, developing and evaluating alternative treatment avenues will help assure appropriate access to care.
- Need to establish evidence base for other disciplines providing feeding therapy (e.g., medical, occupational therapy, speech therapy, dietetics).

Matching the demand with the child’s behavioral presentation:
- If something is too aversive, you won’t be able to motivate
- Treatment designed on individual level
- Use demand fading
  - Start with attainable demand to promote contact with the contingency.
  - Start with empty spoon → preferred → non-preferred.
  - As many steps as necessary to make progress
  - Decision rule: Stay at a level until consistent progress is observed (e.g., 3 meals with > 80% acceptance and clean mouth, < 20% with crying or disruptions)

May include:
- Recommendations regarding mealtime structure/routine
- Guidance regarding food preparation/presentation
- Education regarding developmental considerations

Establish meals and snacks on a regular schedule
- 3 meals with 1 to 2 snacks
- Meal length should be about 30 minutes
- Meals should take place at a table with age-appropriate seating
- Limit grazing and access to food between meals
- Eat as a family!

Provide attention and praise for appropriate mealtime behaviors—
  - Accepting bites, swallowing, eating properly with a spoon, trying a new food, or staying seated throughout the meal
- Ignore minor behavior problems—
  - Whining, negative statements regarding food, messy eating (if age appropriate)

Guidance regarding food preparation/presentation:
- Food texture:
  - For young toddlers or children with poor oral motor skills, harder foods should be pureed, mashed or cut into small pieces
- Bite size and meal quantity:
  - Present smaller bites and quantities when introducing new food
- Mealtime variety:
  - Present foods from all food groups (breads/grains, vegetables, fruit, milk/dairy, meat/protein)
  - Begin with previously accepted foods
  - Use preferred foods as motivators (“Grand-ma’s rule”)
    - Primarily in cases in which the child accepts new or non-preferred food

Education regarding developmental considerations
- Oral motor skills – Age and texture?
- Self-feeding skills – Messy eating?
- Pickiness and appetite fluctuations – Selectivity?
Activity: What would it take for you to . . .

- Eat your favorite vegetable
- Eat your least favorite vegetable
- Eat sushi / sashimi
- Eat chocolate-covered crickets
- Eat live grasshoppers
- Eat live worms
- Eat live spiders!!!

Treatment – Antecedent Changes

- Bite Size
  - Decrease demand
- Food Texture
  - Taste Exposure
- Mealtime Variety
  - Select items previously accepted or similar
- Blending Foods
  - Ratio preferred to non-preferred
- Bite Placement/Presentation
  - Flipped spoon

Treatment – Tangibles

- Noncontingent Access to Preferred Items (NCA)
  - Allow child to play throughout the session
- Differential Reinforcement:
  - To increase a behavior: reinforce it
    - Praise / attention
    - Brief toy play
    - Brief break (escape)
  - Go in small steps for complex behavior
- End on a good note:
  - Consistent cut-off: average level of prior success
  - Resist temptation to push for “one more bite”

Treatment - Reinforcement Removal

- Extinction Procedures
  - selective ignoring (especially verbal)
  - Change in feeder attitude is “attention”
- Escape (Caution)
  - Acceptance
    - Non-removal of the food
    - Non-removal of the spoon
- Expelling: re-presentation (size of a pea)
- Packing / pocketing
- Redistribution
- Help food

Issue: Extinction burst

Inpatient and Day Treatment Programs

- Most support for behavioral intervention has occurred in this treatment setting.
- Typically involves multidisciplinary approach
  - Nutritionist
  - OT/Speech
  - Psychologist
  - Nursing
  - Social Work
- Trained therapist implement treatment (initially)
  - 4 meals daily, 6 to 8 week admissions
  - When to refer?

References
