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

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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 Procedure

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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.

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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

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Pediatric Feeding Disorders

- *Common problem* for children and *source of stress* for caregivers:
  - Up to 40% of children experience some mealtime problems (Manikam & Perman, 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

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Pediatric Feeding Disorders

- 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).

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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 1986)

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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

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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

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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

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Chain of feeding behaviors

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

Behavioral Elements- 2 factor model

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

Classical Conditioning

US → UR

CS → CR

Reflux/Pain → Escape/Avoidance

Food → Escape/Avoidance

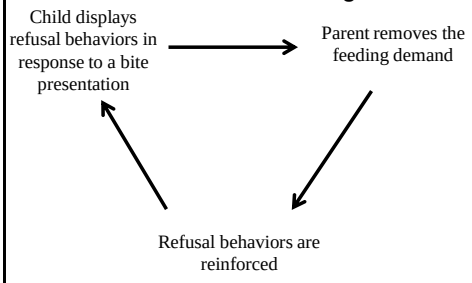
Operant Conditioning

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

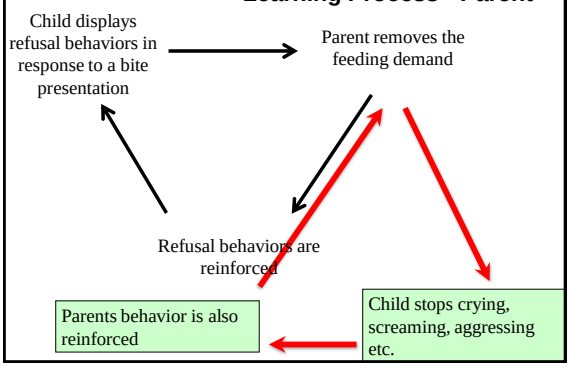
		Environment	
		Add	Remove
Behavior	Increase	Positive Reinforcement	Negative Reinforcement
	Decrease	Positive Punishment	Negative Punishment

- Family system also disrupted and learning process also involves caregivers

Learning Process - Child



Learning Process - Parent



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ASD & Feeding

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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

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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)

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Topography & Prevalence

- Ledford & Gast (2006)
  - Time span: 1994 to 2004
  - 7 descriptive studies identified involving 381 children
  - All identified maladaptive feeding behaviors related to ASD
- Cermak, Curtin, & Bandini (2010)
  - Time span: "Last 25 years"
  - 16 total studies
    - 12 focused on food selectivity
    - 4 focused on nutritional status/diet adequacy
      - (3 examined both)
  - Problems with food selectivity indentified in all 12 studies
  - Outcomes regarding nutritional status inconclusive with "nutrient intakes of children with autism are below, above, or the same as children without autism spectrum disorders"
    - No control for presence of selectivity, dietary restrictions

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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

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Comprehensive Literature Review

- 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

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Comprehensive Literature Review

- 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

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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)

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* 2 recent additions not reflected in the data presented

Table 1: Literature Summary by Journal and Year of Publication

Characteristic		*n*	%
Journal Title			
Journal of Autism and Developmental Disorders		6	20
Autism		2	8
Journal of Developmental and Physical Disabilities		2	8
Journal of Human Nutrition and Dietetics		2	8
Biological Psychiatry		1	4
Children's Health Care		1	4
Focus on Autism and Other Developmental Disabilities		1	4
Journal of the American Dietetic Association		1	4
Journal of Paediatrics and Child Health		1	4
The Journal of Pediatrics		1	4
Nutritional Ecology		1	4
Pediatrics		1	4
Pediatric Nursing		1	4
Physical & Occupational Therapy in Pediatrics		1	4
Research in Autism Spectrum Disorders		1	4
Special Care in Dentistry		1	4
Topics in Clinical Nutrition		1	4
	Total:	25	100%
Year Published			
2010 – Present		4	16
2000 – 2009		16	64
1990 – 1999		3	12
1980 – 1989		2	8

Table 2: Description of Experimental Characteristics by Study

Study	Procedure		Setting			Design		Feeding Measure(s)*				ASD Diagnostic Indicator*					Anthropometric Data*			
	Prospective	Chart Review	Community Wide	Diagnostic Clinic Early Intervention	Other	Descriptive Study	Comparison Study	Standardized Questionnaires	Estimates of Nutritional Intake	Mealtime Observation	Study-Specific Questionnaire	Parent Report	ASD Rating Scale	Clinical Provider	ADOS	Not Specified	Reported (Y/N)	Weight	Height	BMI
Ahearn et al. (2001)	X			X		X				X				X						
Bandini et al. (2010)	X		X				X		X						X		X			X
Cornish (1998)	X		X			X			X					X			X	X	X	
Cornish (2002)	X		X			X			X							X				
Emond et al. (2010)	X		X				X		X		X			X			X	X	X	X
Field et al. (2003)		X			X		X				X					X	X			X
Herndon et al. (2009)	X		X				X		X				X		X					
Ho et al. (1997)	X			X		X			X								X	X	X	X
Johnson et al. (2008)	X			X			X		X		X				X					
Kerwin et al. (2005)	X		X			X					X	X								
Klien & Nowak (1999)		X			X	X					X									
Levy et al. (2007)	X				X	X			X		X		X	X			X	X	X	
Lockner et al. (2008)	X			X			X		X		X									
Luckens & Linshied (2008)	X		X				X	X	X			X					X	X	X	
Martins et al. (2008)	X			X			X	X			X	X	X							
Matson et al. (2009)	X		X				X				X		X							
Nadon et al. (2010)	X		X				X				X			X						
Provost et al. (2010)	X			X			X				X			X						
Raiten & Massaro (1986)	X			X			X		X		X					X				
Schreck et al. (2003)	X		X				X	X	X			X	X				X	X	X	
Whiteley et al. (2000)	X		X			X					X			X						
Williams et al. (2005)		X			X		X		X		X			X			X	X	X	
Williams et al. (2000)	X		X			X					X					X				
Schmitt et al. (2008)	X		X				X		X		X					X	X	X	X	X
Shearer et al. (1982)	X				X		X		X							X				
N	22	3	13	7	5	9	16	3	15	1	16	4	5	9	3	8	10	8	8	5
% of Total Studies	88	12	52	28	20	36	64	12	60	4	64	16	20	36	12	32	40	32	32	20

Table 3: Description of Participants by Study

Study	ASD Group										Comparison Group			
	Sample Size	ASD Diagnostic Breakdown				Age (Months)				Gender			Sample Size	Subtype		
		Reported (Y/N)	Autistic Disorder	PDD - NOS	Asperger Syndrome	Reported (Y/N)	Mean	SD	Range	Reported (Y/N)	Male (%)	Female (%)		Typical Peers	Developmental Disability	Sibling	Other
Ahearn et al. (2001)	30	X	21	9	0	X			45 - 170	X	22 (73%)	8 (27%)					
Bandini et al. (2010)	53					X	80.4	28.8		X	44 (83%)	9 (17%)	53	X			
Cornish (1998)	17					X			42 -117								
Cornish (2002)	37					X			36 - 196	X	31 (84%)	6 (16%)					
Emond et al. (2010)	79					X	6, 15, 24, 38, 54*						12901				X
Field et al. (2003)	26					X			1 - 144				67**		X		
Herndon et al. (2009)	46	X	45	1	0	X	55.9	13.9	33 - 96	X	44 (96%)	2 (4%)	31	X			
Ho et al. (1997)	54					X	160			X	45 (83%)	9 (17%)					
Johnson et al. (2008)	19					X	39.2	8.98	24 - 48				15	X			
Kerwin et al. (2005)	89	X	35	46	8	X	104.5	41.4	36 - 204	X	70 (79%)	19 (21%)					
Klien & Nowak (1999)	43					X	162	70.8	48 - 312	X	39 (91%)	4 (9%)					
Levy et al. (2007)	52					X			44 - 104	X	50 (96%)	2 (4%)					
Lockner et al. (2008)	20					X			36 - 60				20	X			
Luckens & Linshied (2008)	68					X	72.8	29.8	36 - 132	X	56 (82%)	12 (18%)	40	X			
Martins et al. (2008)	41					X	85.2	34.4	36 - 132	X	34 (83%)	7 (17%)	55**	X		X	
Matson et al. (2009)	112	X	72	40	0	X			36 - 192				167**	X	X		
Nadon et al. (2010)	48					X	94.8	30	45.6 - 154.8	X	44 (92%)	4 (8%)	48			X	
Provost et al. (2010)	24					X	51.2	10.6	36 - 70	X	18 (75%)	6 (25%)	24	X			
Raiten & Massaro (1986)	40					X	127	52		X	28 (70%)	12 (30%)	34	X			
Schreck et al. (2003)	138					X	100	29	53 - 152	X	121(88%)	14 (10%)	298	X			
Whiteley et al. (2000)	100	X	79	21	0	X	87		28 - 195	X	81 (81%)	19 (19%)					
Williams et al. (2005)	64					X	61		24 - 149	X	58 (91%)	6 (9%)	114**	X	X		
Williams et al. (2000)	100	X	90	7	0	X			22 - 120								
Schmitt et al. (2008)	20	X	10	3	4	X			84 - 120	X	20 (100%)	0 (0%)	18	X	X		
Shearer et al. (1982)	12	X	12			X	100.8	7.2					12	X	X		
N	1332	8	8	7	2	25	17	12	20	17				13	5	2	1
% of Total Studies		32	32	28	8	100	68	48	80	68				52	20	8	4

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

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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)

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Assessment of Feeding Concerns In ASD

Assessment of Feeding Problems

- Assessment of feeding problems associated with ASD should ideally seek to capture (Lukens & Linshied, 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)

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The Assessment Problem

- 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

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Standardized questionnaires

- Behavioral Pediatric Feeding Assessment Scale (BPFAS; Crist & Napier-Phillips, 2001)
- Children's Eating Behavior Inventory-Revised (CEBI-R; Archer et al., 1991)
- Screening Tool of Feeding Problems (STEP; Kuhn & Matson, 2002)
- Brief Autism Mealtime Behavior Inventory (BAMBI; Lukens & Linscheid, 2008)

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

Description	Standardization Sample	Psychometric Properties
35 item measure developed as a measure of mealtime behavior problems in typically developing children and children presenting to a clinic with feeding difficulties Two main areas assessed in terms of frequency and problem (4 scores total)- 1.) Child behavior (25 items) a. Frequency: Description of child's behavior during meals rated on a five-point Likert scale from never to always b. Problem: parent is also asked whether or not the behavior is a problem by YES/NO responding 2.) Parent feeling/ strategies frequency (10 items) a. Frequency: Description of feeling about or parent strategies during meals rated on a five-point Likert scale from never to always b. Problem: Parent is also asked whether or not the feeling or strategy is a problem through YES/NO responding	Total Sample = 345 Age range: 9 months to 7 years Subgroups- 1.) Normative (n = 96): Non-clinical children recruited during appointments at their physicians office 2.) Clinical/non-medical (n = 95): Children presenting at a Feeding and Nutrition Clinic without contributing medical factors 3.) Clinical/medical (n = 154): Children presenting at a Feeding and Nutrition Clinic with contributing medical factors	Internal Consistency: For all groups, the value for the entire scale was .76 and was .78 for just the combined clinical groups (n = 249) Construct Validity: Estimated marginal means for the normative group was significantly lower than both clinical groups on all measures (p = .001)

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

Description	Standardization Sample	Psychometric Properties
40 item measure intended to assess eating and mealtime problems across a wide variety of children with medical and developmental issues Provides two indices- 1.) Total Eating Problems Score: Measures the frequency of different eating behaviors through a 5-point rating scale 2.) Total Perceived Problems Score: Evaluates whether or not a behavior represents a problem for the family through YES/NO responding	Total Sample = 316 Subgroups- 1.) Non-clinical (n = 206): Typically developing children recruited through community family physician's offices. Mean age: 5.9 years (SD = 3.1) 2.) Clinical (n = 110): Involved children at risk for feeding issues based on their developmental or medical history, including a subsample of children with autism. Mean age: 7.1 years (SD = 3.32)	Test/Retest Reliability: .87 for Total Eating Problems; .84 for the Perceived Problems Score Internal Consistency: Values for different subgroups were at acceptable limits (i.e., above .70) for the exception of the single parent more than one child subgroup at .58 Construct validity: Total eating behavior and perceived problem scores higher for clinical sample (p < .0001)

Revised Children's Eating Behavior Inventory
L. A. Archer

HOW OFTEN DOES THIS HAPPEN?

NEVER 1 SELDOM 2 SOMETIMES 3 OFTEN 4 ALWAYS 5

						Is this a problem for you?
1. My child chews food as expected for his/her age.	1	2	3	4	5	YES NO
2. My child enjoys eating.	1	2	3	4	5	YES NO
3. My child asks for food which he/she shouldn't have.	1	2	3	4	5	YES NO
4. My child feeds him/her self as expected for his/her age.	1	2	3	4	5	YES NO
5. My child gags at mealtimes.	1	2	3	4	5	YES NO
6. I feel confident my child eats enough.	1	2	3	4	5	YES NO
7. My child vomits at mealtimes.	1	2	3	4	5	YES NO
8. My child takes food between meals without asking.	1	2	3	4	5	YES NO
9. My child chokes at mealtimes.	1	2	3	4	5	YES NO
10. My child makes foods for him/her self when not allowed.	1	2	3	4	5	YES NO

Screening Tool of Feeding Problems (STEP; Matson & Kuhn, 2001)

Description	Standardization Sample	Psychometric Properties
23 item measure intended for use in identifying feeding problems among individuals with mental retardation (MR) Yields a total scale score, eight factors, and five individual category of mealtime problems. Categories include: 1.) Aspiration risk (2 items): Items addressing rumination and vomiting 2.) Selectivity (5 items): Items addressing selectivity by food texture, food type, food temperature, setting, and feeder 3.) Feeding skills (8 items): Items addressing ability to chew, swallow, or feed independently, and the necessity for adaptive equipment 4.) Food refusal related behavior problems (3 items): Items associated with meal refusal or termination, such as self-injury, aggression, or spitting out food 5.) Nutrition related behavior problems (5 items): Items such as food stealing, pica, and over or under eating	Total Sample = 570 Mean age: 46 years (range, 10–87 years) Sample represented residents of a developmental center in central Louisiana. MR status breakdown included 1.7% with mild MR, 4.8% with moderate MR, 14.2% with severe MR, 72% with profound MR, and 6.7% with severity of MR unspecified.	Test/Retest Reliability: .72 for the entire scale; averaging .59 for the categories/factors (range .26-.79) Internal consistency: .68 for the entire scale (range .27 to 0.70 for the categories/factors) Cross rater reliability: 71 for the entire scale; averaging .68 for the categories/factors (range .55-.81)

Brief Autism Mealtime Behavior Inventory (BAMBI; Lukens & Linshied, 2008)

Description	Standardization Sample	Psychometric Properties
18 item scale designed to evaluate the feeding problems associated with ASD. In addition to an overall score, three factors can be isolated for further analysis- 1.) Limited variety (8 items): Items assess restricted food preferences (e.g., my child is willing to try new foods, my child prefers the same foods at each meal) 2.) Food refusal (5 items): Items assess rejection of food presented by caregivers (e.g., my child expels food that he/she has eaten, my child closes his/her mouth tightly when food is presented) 3.) Features of autism (5 items): Items assess behavioral characteristics or associated features of autism (e.g., inattention, self-injurious behavior, rigid behavior patterns).	Total Sample = 108 Age range: 3 to 11 years (M = 6.07 years, SD = 2.48) Subgroups- 1.) Autism Group (n = 68): Children with a caregiver-reported diagnosis of Autistic Disorder or Pervasive Developmental Disorder, Not Otherwise Specified 2.) Non-clinical (n = 40): Typically developing children	Internal Consistency: .88. for the total score; .87 for the Limited Variety factor, .76 for the Food Refusal factor, and .63 for the Features of Autism factor Test/Retest Reliability: .87 for the total score Cross rater reliability: .78 for the total score Criterion-related validity: BAMBI total frequency score correlated significantly with BPFAS Construct validity: BAMBI scores significantly higher among children with autism compared to the non-clinical sample

BAMBI

Think about mealtimes with your child over the past 6 months. Rate the following items according to how often each occurs, using the following scale:

Never/Rarely 1 **Seldom 2** **Occasionally 3** **Often 4** **At Almost Every Meal 5**

Circle YES if you think an item is a problem for you or NO if you think it is not a problem.

1.	My child cries or screams during mealtimes.	1	2	3	4	5	YES	NO
2.	My child turns his/her face or body away from food.	1	2	3	4	5	YES	NO
3.	My child remains seated at the table until the meal is finished.	1	2	3	4	5	YES	NO
4.	My child expels (spits out) food that he/she has eaten.	1	2	3	4	5	YES	NO
5.	My child is aggressive during mealtimes (hitting, kicking, scratching others).	1	2	3	4	5	YES	NO
6.	My child displays self-injurious behavior during mealtimes (hitting self, biting self).	1	2	3	4	5	YES	NO
7.	My child is disruptive during mealtimes (pushing/throwing utensils, food).	1	2	3	4	5	YES	NO
8.	My child closes his/her mouth tightly when food is presented.	1	2	3	4	5	YES	NO
9.	My child is flexible about mealtime routines (e.g., times for meals, seating arrangements, place settings).	1	2	3	4	5	YES	NO
10.	My child is willing to try new foods.	1	2	3	4	5	YES	NO

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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?

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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
  - 24 hour recall
    - Caregiver to record all foods consumed for one or more days, including the quantity of intake measured in weight or volume
  - Food Diary
    - In-depth interview conducted by a trained dietary observer

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Estimates of Nutrient Intake

- 2.) Food-frequency/preference method:
- 2 Sections
  - Food list - What foods are consumed?
    - Flexible: A few specific food or nutrients or provide a comprehensive assessment of dietary habits
  - Frequency/Preference section - How often the food is consumed?
    - Likert scale (e.g., often, sometimes, never)
    - Dichotomous yes/no responding to assess whether age appropriate portions are consumed

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THREE DAY FOOD RECORD

Instructions: please record all food/fluid consumed during the next three days. Please be as specific as possible to ensure accuracy of the analysis. Record the amount eaten in either volume (tbsp, cup) or weight (g, oz) measurements. Include brand names and methods of preparation when appropriate.

Note: if an altered texture is being consumed i.e., pureed table food or wet ground, the yield of the "mixture" should be recorded as well as the amount consumed.

For example:

	Food Item:	Yield:	Amount Eaten:
04/13/2000	pureed chicken nuggets (4 nuggets, 1/2 c whole milk)	1 cup	1/3 cup
	carrots, canned		3 tbs.
	red grapes		25 ea.
	Kraft shells and cheese		1/2 cup
	Homemade Mango Shake (1 c mango, 1 1/2 c Wh. Milk)	2 cup	3/4 cup
	Tubefeeding: pediasure		480 cc/ml

	Food/Fluid Item:	Yield:	Amount Eaten:
Date:			

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	Willingness to Eat				
Apple	NA	Never	With Prodding	Willing	Favorite
Apple Juice	NA	Never	With Prodding	Willing	Favorite
Applesauce	NA	Never	With Prodding	Willing	Favorite
Apricots	NA	Never	With Prodding	Willing	Favorite
Avocado	NA	Never	With Prodding	Willing	Favorite
Banana	NA	Never	With Prodding	Willing	Favorite
Banana Chips	NA	Never	With Prodding	Willing	Favorite

Food Frequency Inventory

Food	How Often Is it Consumed?				
Fruits					
Apple	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Apple Juice	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Applesauce	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Apricots	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Avocado	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Banana	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Banana Chips	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Berries	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Cantaloupe	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Cherries	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Cranberry Sauce	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Cranberry Juice	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Fruit Cocktail	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Grapefruit	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Grapefruit Juice	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Grapes	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Grape Juice	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Honeydew	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Kiwi	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Lemonade	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Mango	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Nectarine	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Oranges	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Orange Juice	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Peaches	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Pear	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Pineapple	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Plums	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Prunes	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Prune Juice	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day
Strawberry	Never	At least 1X per month	At least 1X per week	At least 1X per day	Many Xs per day

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)

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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

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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

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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

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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)

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Methods

	Study 1	Study 2
Description of Participants	Children with an ASD 31 parent child dyads Recruited at MAC in Atlanta, GA (23M, 8F)	Children with an ASD 7 parent child dyads Recruited in Binghamton, NY (7M)
Measures	BAMBI Food Preference Inventory Social Responsive Scale (SRS)	BAMBI Food Preference Inventory PDD Behavior Inventory
Child Behavior Observations	Acceptance Combined Inappropriate Behaviors (CI's) Negative Vocalizations Out of Seat	Acceptance Combined Inappropriate Behaviors (CI's) Negative Vocalizations Out of Seat
Parent Feeding Behaviors	Accuracy of protocol implementation	Frequency and duration of food presentations, Verbal behavior (reprimands, coaxing, praise etc).

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Protocol Considerations

	Study 1	Study 2
Foods	Standardized (researcher provided)	Standardized (researcher provided)
Texture	Table (¼" x ¼") and puree	Table (¼" x ¼")
Bolus size	2-pea	1-pea (1 piece)
Feeder	Parents presented; Child Self-Fed	Parents presented; Child Self-Fed
Length of Meal/ # of presentations	24 presentations	About 8 minutes 16 foods (30s each food)
Setting	Laboratory	Laboratory
Persistence with Bites	Standardized with script and bug in the ear	Parent instructed to persist as normal for family

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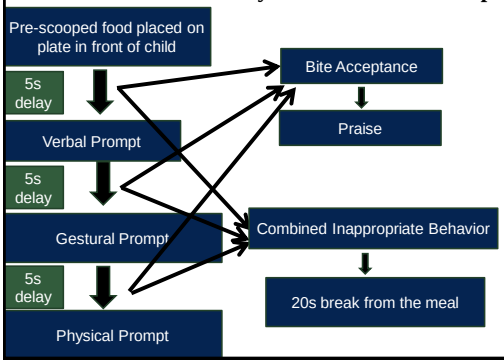
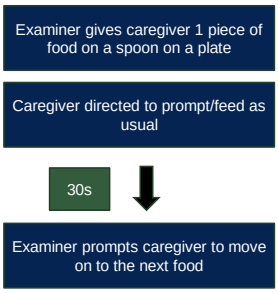
Study 1 – Structured Prompting



Study 2 – More Naturalistic



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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

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	Study 1	Study 2
Accepted Bites	40%	49.1%
Percent of Session Out of Seat	27.3%	19.4%
Foods with CI's*	43.0%	22.7%
Percent of Session with Negative Vocalizations	3.6%	11.6%

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

Food Preference Inventory Foods Never Consumed

	Behavior Observation	
	% of foods Accepted	% of foods with CI's
Study 1	r = -.528, p<.005	r = .419, p<.05
Study 2	r = -.832, p<.05	ns

Food Preference Inventory Foods Never Consumed

	Behavior Observation	
	% of foods Accepted	% of foods with CI's
Study 1	r = -.528, p<.005 ✓	r = .419, p<.05
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Food Preference Inventory
Foods Never Consumed

	Behavior Observation	
	% of foods Accepted	% of foods with CI's
Study 1	r = -.528, p<.005 ✓	r = .419, p<.05
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Food Preference Inventory
Foods Never Consumed

	Behavior Observation	
	% of foods Accepted	% of foods with CI's
Study 1	r = -.528, p<.005 ✓	r = .419, p<.05 ✓
Study 2	r = -.832, p<.05 ✓	ns

Food Preference Inventory
Foods Never Consumed

	Behavior Observation	
	% of foods Accepted	% of foods with CI's
Study 1	r = -.528, p<.005 ✓	r = .419, p<.05 ✓
Study 2	r = -.832, p<.05 ✓	ns ✗

BAMBI
Limited Variety Scale

	Behavior Observation
	% of Session with Negative Vocalizations
Study 1	r = .430, p<.05 ✓
Study 2	ns ✗

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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)

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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

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Literature Review

- Sharp, W, Jaquess, D., Morton, J., & Herzinger, C. (2010). Pediatric Feeding Disorders: A Quantitative Synthesis of Treatment Outcomes. *Clinical Child and Family Psychology Review*. 13(4), 348-365
  - 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.

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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 children treated for food selectivity (inpatient/day treatment: $n = 8$; home/school: $n = 15$; outpatient: $n = 5$; residential facility: $n = 2$).

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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

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Treatment Outcomes

PND, NAP and Effect Size Values by Dependent Variable

Dependent Variable	# Contributing Studies (%)	# Contributing Participants (%)	Mean PND (Standard Deviation) n = 109*	Mean NAP (Standard Deviation) n = 109*	Effect Size (d) n = 106*
Acceptance (Percent)	*n* = 29 (60.4%)	*n* = 54 (56.3%)	87.87 (31.63)	.97 (.09)	2.598
Acceptance (Frequency)	*n* = 6 (12.5%)	*n* = 17 (17.7%)	88.8 (24.8)	.98 (.04)	2.698
Swallowing (Percent)	*n* = 11 (22.9%)	*n* = 22 (22.9%)	81.75 (36.04)	.91 (.20)	1.81
Swallowing (Frequency)	*n* = 2 (4.2%)	*n* = 7 (7.3%)	98.85 (3.27)	.98 (.03)	2.88
Volume	*n* = 6 (12.5%)	*n* = 9 (9.4%)	95.40 (5.5)	.97 (.03)	2.89
Total	*n* = 54	*n* = 109*	87.95 (29.54)	.96 (.12)	2.46

Note. PND = Percent of Nonoverlapping Data; NAP = Nonoverlap of All Pairs; *Data for some participants contributed to more than one dependent variable.

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%)

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Other notes

- 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).

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Treatment - General Concepts

- 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 w/ 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)

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Parent Consultation

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

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Parent Consultation

- Mealtime structure/routine:
- 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!
- Differential Attention
  - 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)

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Parent Consultation

- 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

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Parent Consultation

- Education regarding developmental considerations
  - Oral motor skills – Age and texture?
  - Self-feeding skills – Messy eating?
  - Pickiness and appetite fluctuations – Selectivity?

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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!!!

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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

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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"

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Treatment - Reinforcement Removal

- Extinction Procedures
- Attention:
  - 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
    - Helper food
- Issue: Extinction burst

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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?

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