




# Feeding Problems in Autism Spectrum Disorder: Home and Community-based Solutions

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## Learning Objectives

1. List and describe at least two treatments for food selectivity.
2. List at least three behavioral procedures commonly included in treatments for food refusal.
3. Explain an intervention for teaching a child to chew.



## What do I want to accomplish today?

- Provide practical information that can be used to develop interventions.
- Let you know that the empirical evidence for a behavioral approach to treating feeding problems is large, and growing.
- Explain how our interventions can be transferred to the community.



## Myths and misconceptions

- My child will just outgrow his feeding problem
- Selective eating is normal
- Reinforcement is damaging
- My child just does not like particular foods
- My child cannot **learn** to eat new foods **because** of sensory issues.



## Feeding problems in ASD in just one slide

- Children with ASD more selective than children w/o special needs
- Numerous case studies document nutrient deficits
- Few studies found differences in *nutritional status*
  - Studies do not account for use of vitamins or supplement
  - Some studies show more overweight, but some more underweight
- Severity of feeding problem more related to medical history than severity of autism
- No feeding problems unique to autism, thus no interventions specific to autism



## How are taste preferences developed?

There are three ways in which preferences to new foods are developed

1. Repeated taste exposure – food must be ingested, size of bite does not matter
2. Flavor-flavor conditioning – form of associative learning, new and familiar foods paired
3. Flavor-nutrient conditioning - form of associative learning, flavor associated with post-ingestive effects of the food.

Children *learn* food preferences, food preferences are only acquired through learning



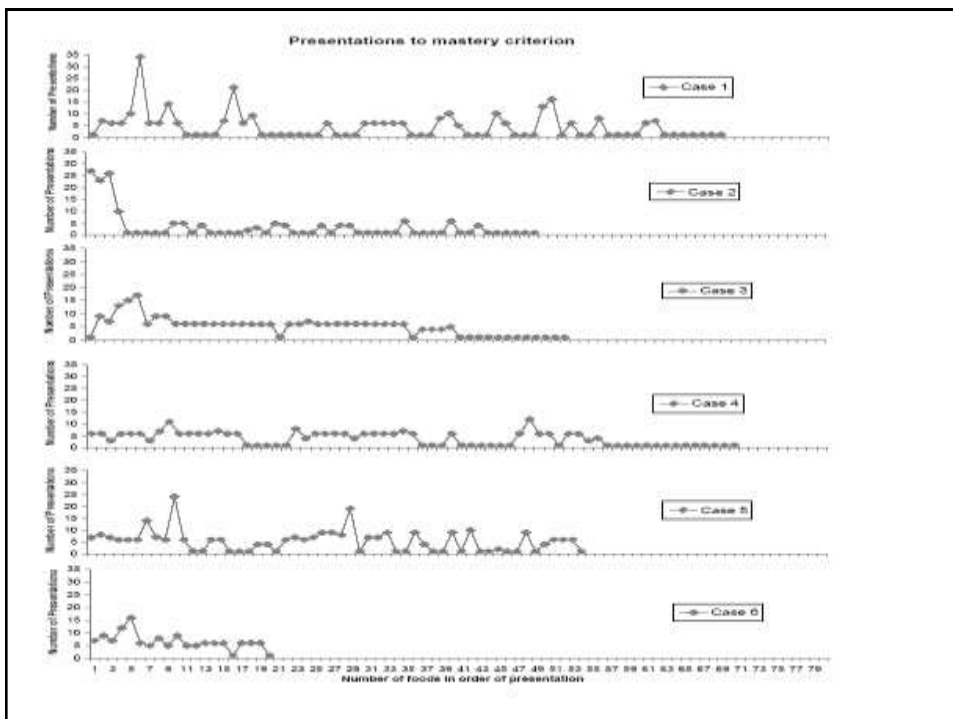
## What do we know about repeated exposure?

- Adults *tasted* unfamiliar juices either 0, 5, 10, or 20 times, higher preference related to # of tastes
- Preschoolers *tasted* new cheese & fruits, more tastes led to higher liking
- Dozens of studies over 30 years have shown this
- However, **tasting is required**, anything short of ingestion does not count.
- **More exposure** required with age, infants often require one taste, adults up to 20
- In children without feeding problems, 5-20 tastes



## What else should you know about repeated exposure?

- The size of the taste does not seem to matter, can be the size of a grain of rice
- A taste is one taste at one meal, eating 5 tastes at one meal counts as 1 taste
- Initially, child **probably** will not like the food...this is normal...*liking comes later*
- Parents quit to early...average 1.5 tastes
- This gets better over time...





## How has flavor-flavor conditioning been used to increase diet variety?

- Used with college students
  - selected familiar sauces (e.g. soy sauce, spaghetti sauce)
  - Familiar sauce paired with new food
  - Preference for new foods increased
- Used with children
  - Offered dips (sour cream-onion, catsup, chocolate syrup)
  - Dips increased eating of fried green pea chip
- Used with boy with ASD
  - vegetables covered in catsup, increased veg consumption



## Just what have we seen...

- Mustard on watermelon
- Syrup on eggs
- Catsup on everything
- Meat between two cheese crackers
- You can put sugar on vegetables...don't worry about the sugar, you can fade it out later



## Is there a role for flavor – nutrient learning?

- Eating foods with fat make you feel satiated, leading to preferences of calorie dense foods.
- Minimal research that can be applied
- The accidental butter finding



Take Home Point:  
To increase diet variety, your  
intervention must necessarily include  
one of these three forms of learning



## What we have found about children with selectivity

- Most children with selectivity are normal wt and have no growth problems
- They typically ate a wider variety when younger
- They refuse foods without tasting them, thus the appearance of food is most important to them
- Despite their ability to grow normally, their caregivers are often concerned about growth
- Caregivers often express concerns about their children not eating, to the point of worrying their children are “starving” or nutritionally deficient



## An intervention using taste exposure

- Taste exposure is the most common method of developing food preferences
- Repeated tastes are required with more tastes across the course of development
- The tastes can be small, but must occur repeatedly over time...and the tastes must actually involve consumption
- The goal of this intervention is to ensure foods are tasted often enough to develop preferences





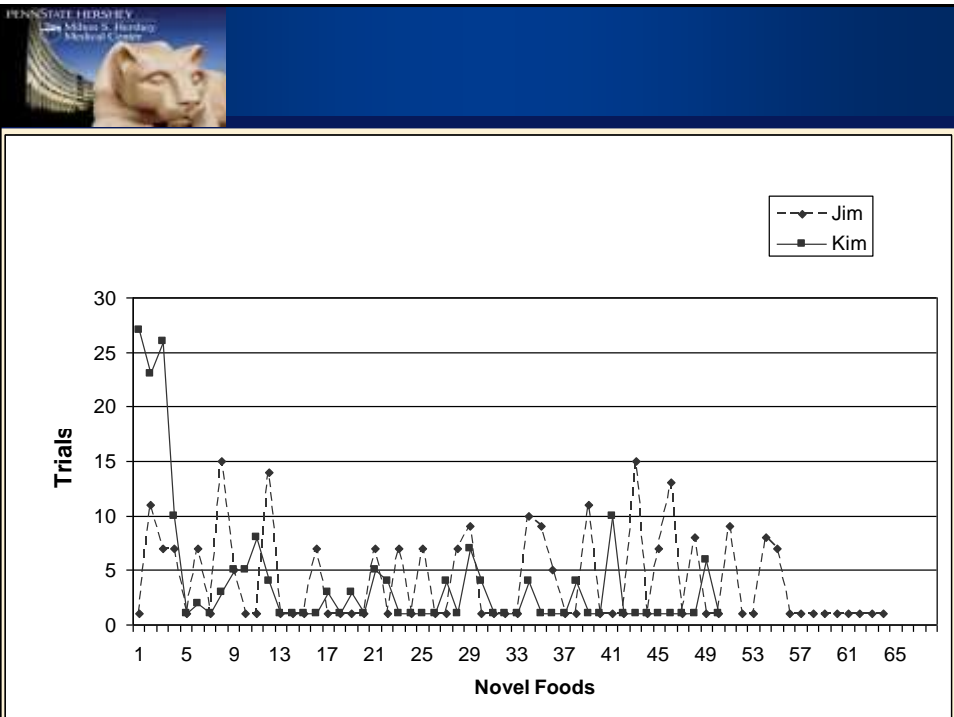
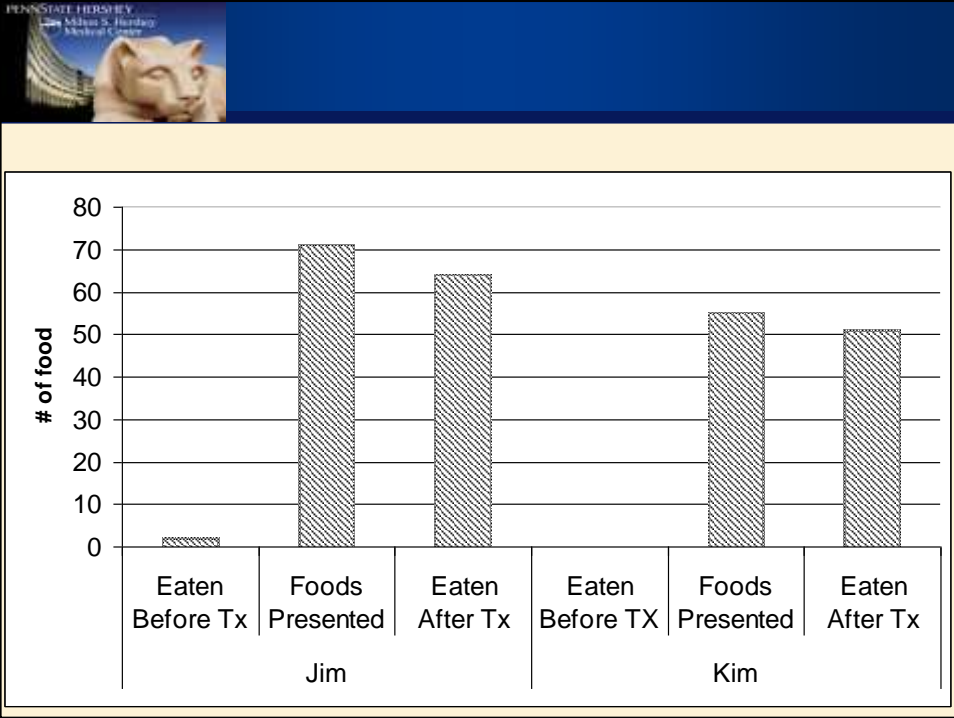
## Repeated taste exposure & exit criterion

- Involves repeatedly having the child taste novel foods. The taste is as small as a grain of rice and the taste is presented until tasted, then the session is terminated.
- These novel foods are later presented to the child in a structured meal plan.
- To date, we have published 3 articles demonstrating the successful use of this intervention



## The intervention

- Participants
  - Jim – 3.5 y.o. boy with ASD, most calories from drinking milk, but he ate hot dogs and grilled cheese
  - Kim – 5 y.o. girl with ASD, totally dependent on G-tube feeds, had eaten nothing for 6 mos prior to treatment.
- Procedure
  - Taste sessions consisted of pea-sized bites of food
  - Bite size increased based upon child compliance
  - Probe meals conducted periodically across the day



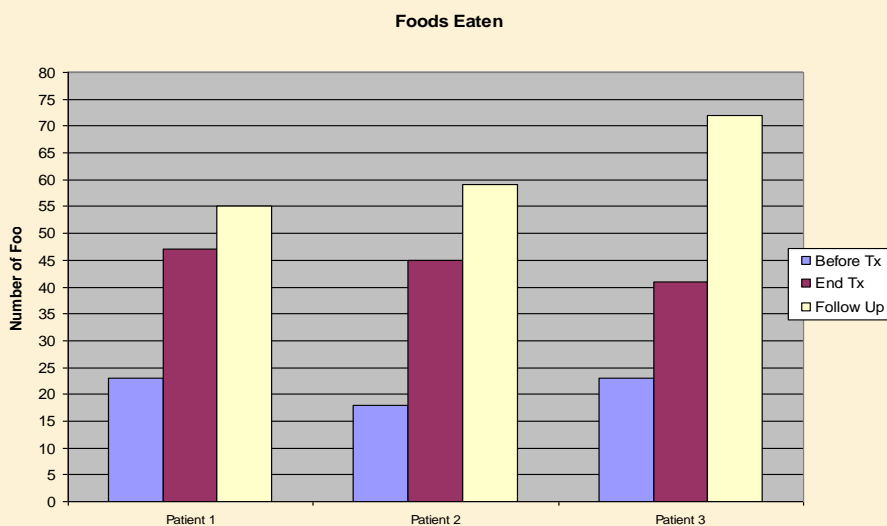


## Further modification of this intervention

- The duration of tx for the initial study was 3 weeks.
- The goal was to determine whether the study could be conducted in a briefer time frame with similar results.
- Participants
  - 5 y.o. boy with anxiety
  - 9 y.o. boy with ADHD
  - 4 y.o. boy with ASD

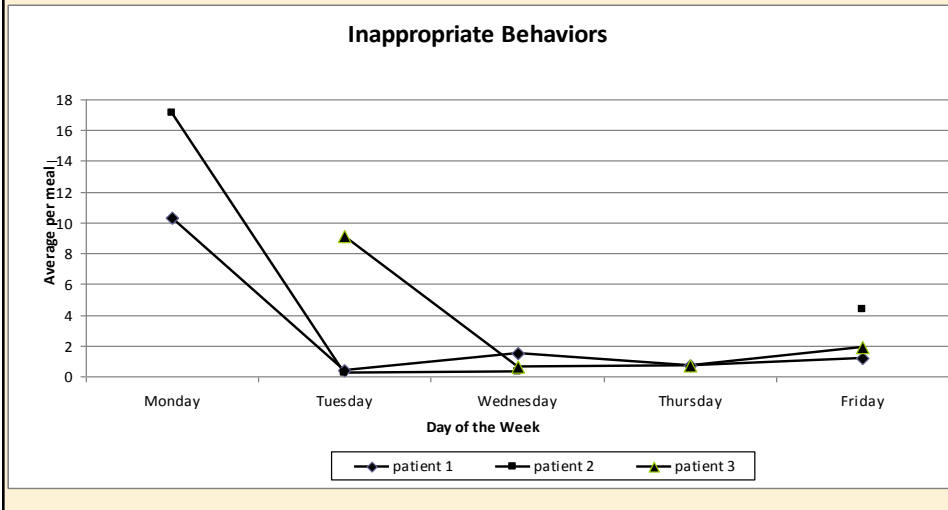


## “Jump-start” Exit Criterion





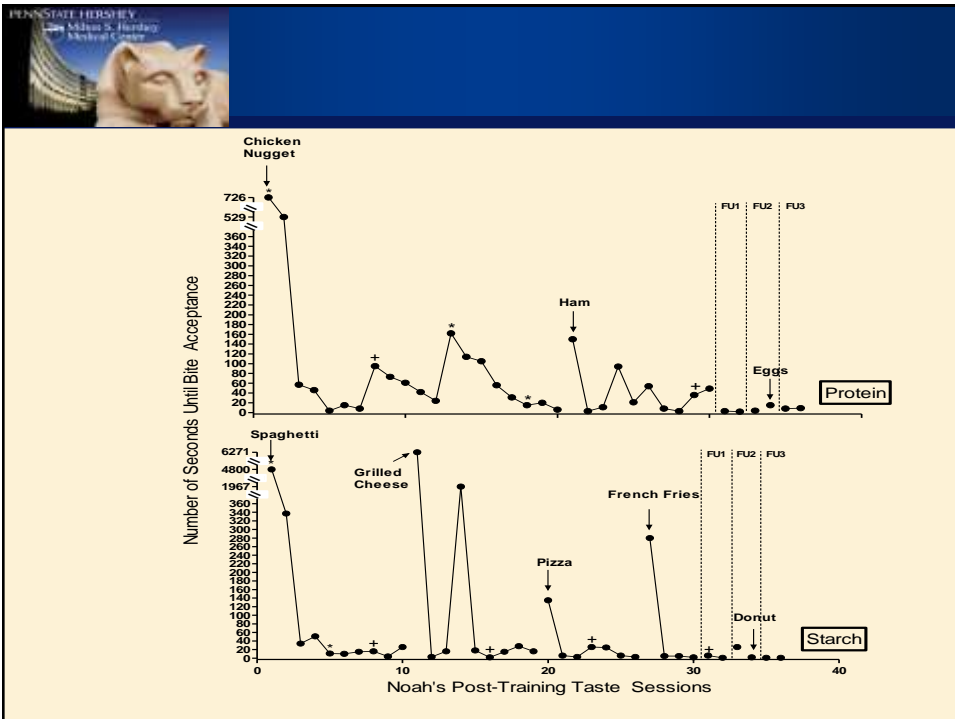
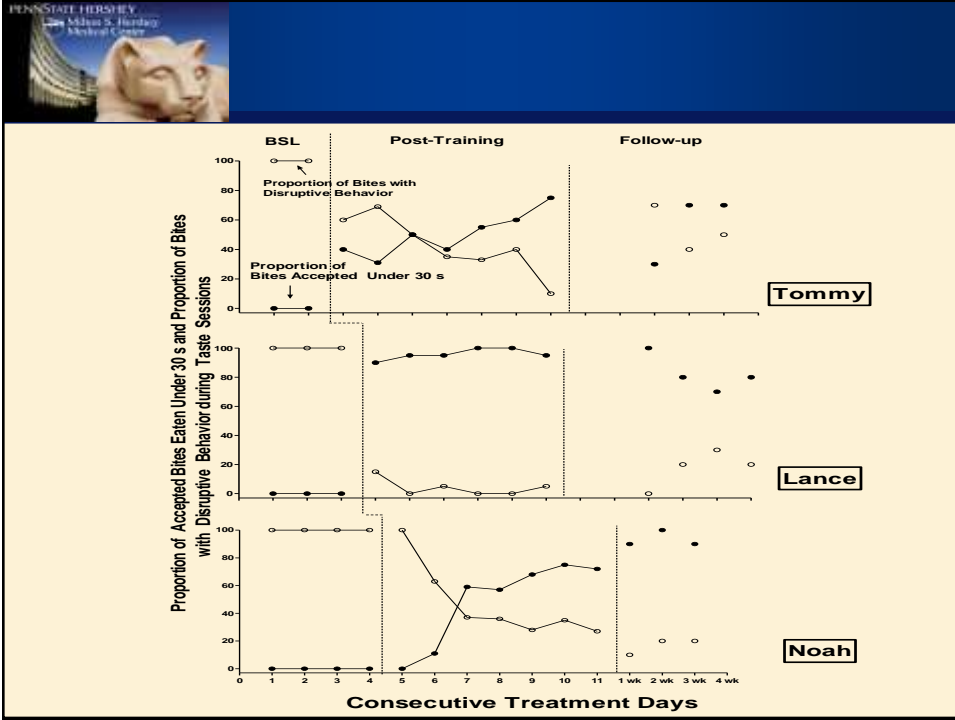
## The burst ends quickly...



## Can we train parents to do this at home?

### • Participants

- 3 Mother-Child Dyads
  - Tommy-age 4 years
  - Tommy's mother-age 33 years
  - Lance-age 8 years
  - Lance's mother-age 41 years
  - Noah-age 5 years
  - Noah's mother-age 40 years
- All children had ASD diagnoses
- All parent training occurred at home
- Intervention last 3 weeks, 3-5 afternoons per week







Table 6. Number of foods reported eaten prior to treatment and at one month follow-up.

Participant	Prior to Treatment	Following Treatment	1-Month Follow-up
<u>Tommy</u>	<u>1</u>	<u>20</u>	<u>26</u>
<u>Lance</u>	<u>11</u>	<u>34</u>	<u>51</u>
<u>Noah</u>	<u>12</u>	<u>25</u>	<u>39</u>



## Should you consider taste sessions?

- Taste sessions can be done away from family meals
- Present a tiny taste of a new food using an edible or tangible reward, such as toys or videos
- Often shaping is used, just touching the food to the child's lips may be done first
- Taste sessions are often conducted instead of snacks for a specific time period
- Taste session may be part of discrete trial program



## What is the downside of exit criterion?

- While we try to make the intervention easy by requiring only a rice-sized taste, this is still an extinction-based intervention.
- The use of extinction can result in a range of inappropriate behaviors making it difficult to implement.
- This intervention has been shown to be successful, but can be intrusive and may not be appropriate for community settings.



## What is often recommended?

- “Just give your child the family meal, he will eat when he is hungry”
- Probably true in most cases, but is this feasible for most families?
- This advice can lead to more inappropriate behavior than exit criterion since the response effort is so much higher.



## Plate A – Plate B: A compromise

- The typical pediatric advice requires the child to change their diet almost completely.
- This intervention lowers the response effort by requiring only tasting.
- The child is offered novel foods, often the size of a grain of rice or pea and contingent upon tasting, is provided a bite of familiar food and a preferred drink.
- While tasting is required to gain access to familiar foods, only tiny tastes are required.
- At any particular meal, nothing is required, but access to familiar foods is contingent on tasting.



## An Overview of Plate A – Plate B

- Present 6 10" meals/day, use a timer.
- Offer one plate containing pea-sized bites of novel food, one plate containing large bites or pieces of preferred foods, and a drink
- The child gets a bite of preferred food and a drink only after eating a bite of new food
- Give water between meals
- Systematically increase bite size
- Goal is to repeatedly expose child to new foods





## Modifications to Plate A – Plate B

- Extinction has been included so the child is required to taste a bite of novel food at each meal.
- Other modifications include:
  - Reducing response effort by requiring one taste then offering a plate of familiar foods.
  - Increasing the number of bites of familiar food offered after each taste.
  - A token economy targeting either: appropriate behavior, a specific number of bites



## Monkey see, monkey do The role of modeling

- It is true that children imitate their parents, siblings, and peers' behaviors.
- Hendy used modeling to introduce novel fruits at preschools.
  - She used teachers and peers as models with success, but peer models were best.
- We used incidental modeling to increase consumption of fruits and vegetables in elementary schools
- We found modeling increased bites of novel foods eaten when added to Plate A Plate B.



## Plate A – Plate B – Plate C

- Appetite manipulation is not appropriate for all children or families.
- Plate A – Plate B is used with the child's *favorite* foods on Plate B.
- Plate C, containing familiar foods, not necessarily favorites, but familiar, is offered at the end of the regular session.
- This has been used with children with diabetes.



## Why does Plate A – Plate B work?

- The response effort is minimal.
- The child gets hungry.
- Modeling may also increase acceptance.

The appetite manipulation is critical, if the child is allowed to eat whatever he wishes, the intervention will not work.



## Just a little more about selectivity...

- While the interventions we just reviewed have been shown to be effective, there are numerous other intervention that will work...
- They must result in tasting over time.
- While seen to be a mild feeding problem, it is perhaps the most persistent



## SUPPLEMENTS ARE NOT ALWAYS HELPFUL!

- While supplements, often found in the form of high-calorie beverages, are nutritionally-balanced, they can be problematic.
- Because they are so calorie-dense, children often do not want to eat other foods.
- These beverages, high in fat and low in fiber, can also result in constipation.
- Supplements do not provide a mechanism for the introduction or consumption of solid foods. They provide nutrition, but do not teach a skill. For most children, a multi-vitamin is a better alternative.



## Milk does a body good, but only in moderation

- We see many children who drink 40 to 100 ounces of milk per day.
- Because the calcium in milk can block iron absorption, many children who drink excessive amounts of milk develop anemia.
- Like formula, milk is high in fat and low in fiber, often leading to constipation.
- Many children, even preschoolers, drink milk from a baby bottle across the day, allowing the milk to continuously lay on the child's teeth causing dental problems.



## What is food refusal?

- Child refuses to eat enough to sustain growth
- Often accompanied by refusing to eat, turning away from the food, crying, and various other inappropriate mealtime behavior
- Most children w/ food refusal have at least one medical condition, most often GERD
- Often children dependent upon tube feedings or oral supplements
- Problems with appetite are common.



## How do we treat food refusal?

1. Hunger induction
2. Escape extinction for refusal
3. A structured meal and snack schedule
4. Positive reinforcement for acceptance
5. Gradually increasing response effort
6. Extinction of inappropriate behavior

Every published tx of true food refusal involve either #1 or #2



## What is hunger induction?

- Many children dependent upon tube feeds or who drink large amounts of supplement may not have a large appetite.
- Children who are underweight or malnourished may not understand hunger.
- We reduce or eliminate tube feeds/supplements to increase hunger.
- This is not accomplished in 1-2 days, but more typically in 1-2 weeks.



## What is escape extinction?

- Some children not motivated to eat or with conditioned aversions to eating are dependent upon tube feeds, supplements, or are failing to thrive.
- Escape extinction typically entails presenting a small bite of food and waiting for the child to accept the bite, thus teaching the child that avoiding eating by refusing, crying, turning away, or other inappropriate behaviors is not possible.



## Is escape extinction necessary?

- If you look at the literature, most successful treatments of food refusal involve some form of escape extinction.
- Typically, most studies have been conducted in inpatient or day treatment settings, rarely in school or home settings.
- Some children will not require escape extinction, interventions without EE take time and consistency



## Why do we use structured meal and snack routines?

- You want the eating to become a habit for the child, a schedule can help do this.
- A schedule helps develop a hunger-satiety cycle, which is not present in many children
- Many children with GERD or motility problems do better with 5-6 oral feeds per day rather than 3 meals
- Grazing across the day can just take the edge off the child's hunger and not allow the child to learn to accept a larger volume



## Using positive reinforcement with feeding

- Why?: because food is not a primary reinforcer for many of our children
- It is a consequence, not a distraction
- Schedules of reinforcement
- Remember: the ultimate goal is to develop natural reinforcers, e.g. food
- The reinforcer is nothing but a tool



## Reinforcement vs. bribery

- Bribery = getting someone to do something that is illegal, immoral, or unethical.
- Does rewarding eating a particular food decrease the preference for that food? (overjustification effect)
- No, our research and that of many others has failed to find evidence of the overjustification effect...we, in fact, found that repeated exposure to a food increases the probability that the food will be eaten
- What did Lucy Cooke find?



## Increasing response effort

- Special educators are familiar with gradually increasing response effort...
- Gradually increasing response effort by gradually increasing texture, volume, or variety
- This often decreases the intensity and frequency of inappropriate behaviors.
- There are multiple examples of gradually increasing response effort that we will discuss





## Planned ignoring and more

- Ignoring whining, crying, or tantrums is hard
  - *what you say can reinforce these behaviors*
- Pressuring your child to eat does not help
  - *this can punish eating*
- Contingent praise for eating can help
  - *more is not better*



## Treating food and liquid refusal in an adolescent with Asperger's disorder

- Participant was a 16-year-old male dx'ed with Asperger's disorder.
- 9 yr. history of G-tube feedings, rec'd 2000 kcal/day
- Prior to tx, ht of 10 yr old, wt of 9 yr old
- Drank only water, ate 3 foods
- Selective by type, texture, color, brand. Also used only specific dishes & utensils.
- Failed community based therapy



## Multi-component treatment

- Stimulus fading for both solids & liquids
  - Bites started at pea-sized, drinks started at ¼ oz.
  - Bite size & drink size increased based on progress
- Complete elimination of tube feeds on 1<sup>st</sup> day of tx
- Token economy for solids
  - Participant rated foods; easy, somewhat difficult, difficult
  - Tokens earned for eating bites of food, more tokens for eating foods rated more difficult
  - Tokens exchanged for access to preferred activities
  - The length of time between meals depended upon child's intake, e.g. more bites = longer break
- Exit criterion for liquids
  - Participant had to finish the drinks presented (except water)
  - Volume of drink systematically increased



## Outcomes

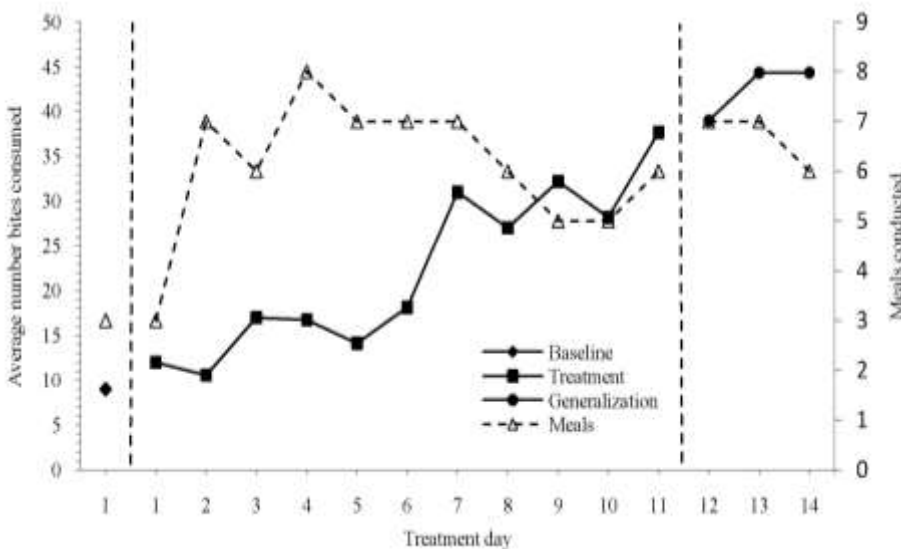
- Child remained off G-tube, gained over 1 lb during tx
- Tx lasted 14 days
- Child's milk consumption increased from 0 to 31 oz/day
- Child eating 78 new foods and 13 new drinks
- At 1-month f/u, added 27 more foods and 2 new drinks
- Inappropriate behaviors were minimal, first day only 8 behaviors for entire day, no other day more than 2 behaviors
- Token economy eliminated prior to end of tx, not needed at home
- Tx generalized to home, school, and public settings.



## Number of bites consumed

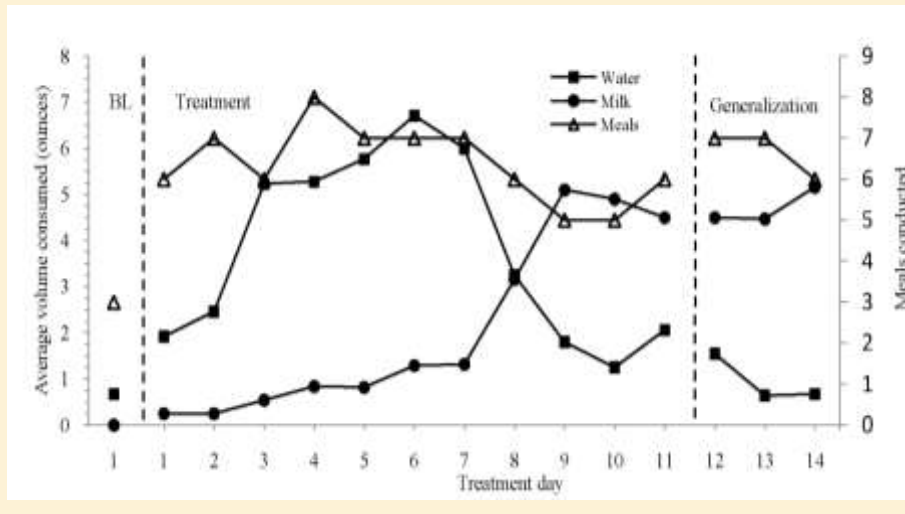


## Average # of bites/day





## Liquid intake per day



## Treatment of food refusal using a reinforcement-based intervention

- Participant was a 9 y.o. boy with ID and no hx of eating or drinking
- Failed a non-behavioral inpatient program which used restraint and jaw control
- Failed years of outpatient therapy
- History of prematurity, pulmonary issues, GER, and constipation. Receives pulmonary medications and medications for constipation.



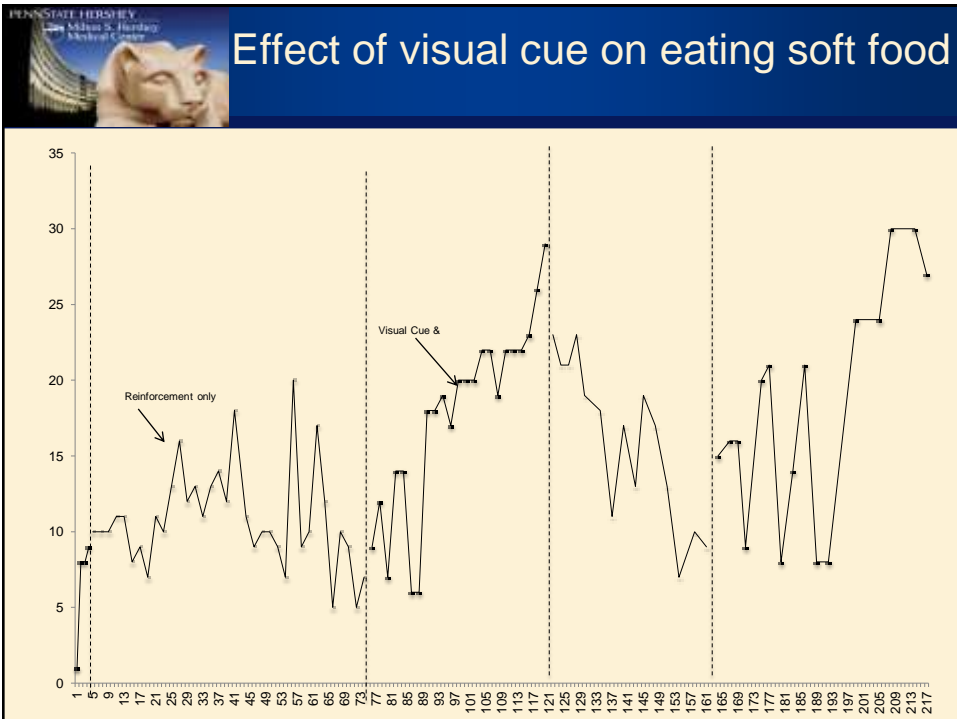
## Overall treatment scheme

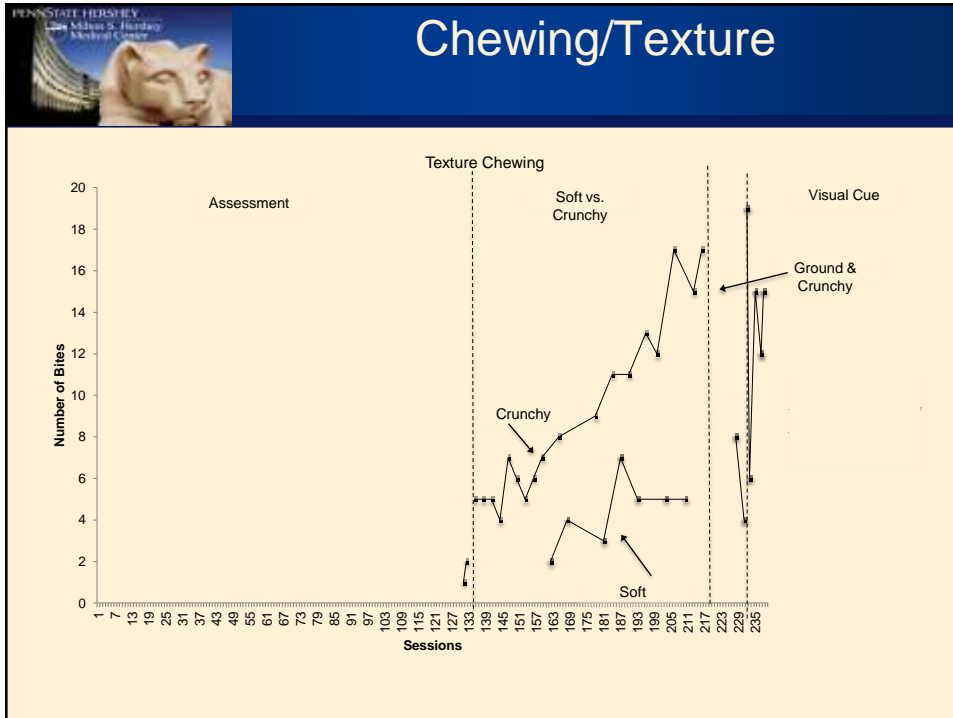
- Family requested no restraint, no extinction
- Also requested focus on self feeding
- Family agreed to contingent reinforcement, reduction in tube feeds as his intake increased
- All sessions were 10 minutes
- Three types of sessions:
  - Drinking
  - Smooth food
  - Textured food



## Components of the intervention

- Reinforcement
  - Praise for multiple behaviors
  - Contingent access to videos, iPad
  - Different schedules of reinforcement
- Visual Cue
- Fading: bite size, drink amount, texture
- Shaping: lip closure, tongue lateralization, chewing





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## Why do some children do not chew?

- Most children who do not chew have oral motor delays
- Some have no oral motor problems, but have had medical problems that have prevented the transition to textured foods.
- Still other children have just refused to transition from the bottle or lower texture foods.
- We also see many who chew dry, crisp foods but not other foods, this is not a chewing problem, but rather a form of food selectivity



## A 4-step plan for chewing

1. Teach drinking from an open cup
2. Shape chewing by reinforcing a single bite
3. Systematically fade up the texture
4. Shape tongue lateralization as needed
  - You can use modeling for each step, but it is not necessary
  - It can be used instead of meal or at separate sessions



## Another approach to chewing

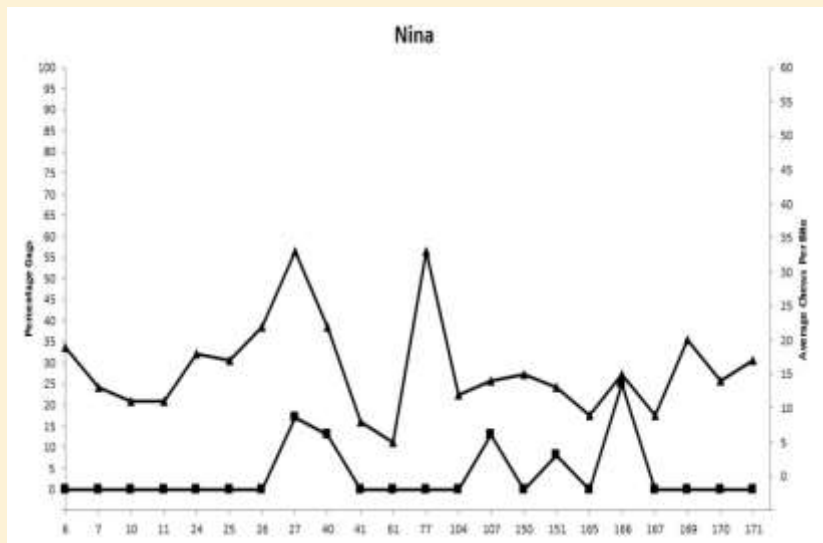
- Some children may not need extensive training with chewing.
- Some children may avoid chewing and texture due to conditioned aversions
- 28 mo old child with hx of GER and FTT
  - Ate only pureed foods for parents
  - Occasionally sucked on cheese puffs for grandparents
  - Resisted all attempts to present textured food





## Bite size fading

- BL/Probes – 4 table foods, 1.5 cm size pieces
- TX – plan changed on two dimensions: bite size and number of bites
  - rice-sized bite → pea-sized bite → 1.5 cm bite
  - 1 bite → 2 bites → 4 bites → 8 bites → 12 bites → 16 bites
- In 12 days of tx moved from pureed foods to small bites of a range of table foods from all foods groups
- In follow-up she continues to improve and eat more table foods.





## Our newest treatment for chewing, integrating home and clinic

- Used with a boy who did not chew and ate only smooth textures
- The goal of treatment was to teach rotary chewing
- Therapist worked with him for one day, then six half days.
- Parents implemented treatment between appointments, progress monitored using Skype
- Was eating table food within two months



## Adipsia: Refusal to drink

- While children with food refusal may refuse both food and drink, there are some children who only refuse liquids.
- Adipsia is usually associated with organic disease, but has been identified in some children with special needs.
- Most treatments have used stimulus fading

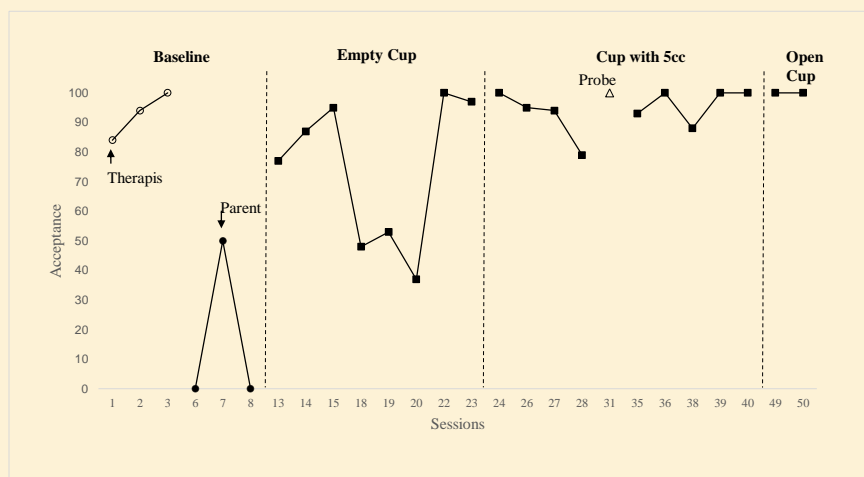


## Parent-led tx of adipsia

- 28 month old boy presented with adipsia
  - Previously drank from a single sippy cup
  - Cup broke, refused to drink any liquids
  - Previously ate a narrow range of table foods
  - Parents fed yogurt, stage 2 baby food by spoon
  - Child stopped eating all table food except for cheese balls
- Treatment consisted to two parts:
  - Parent-led fading procedure to introduce cup drinking
  - Therapist-led Plate A Plate B to introduce table foods

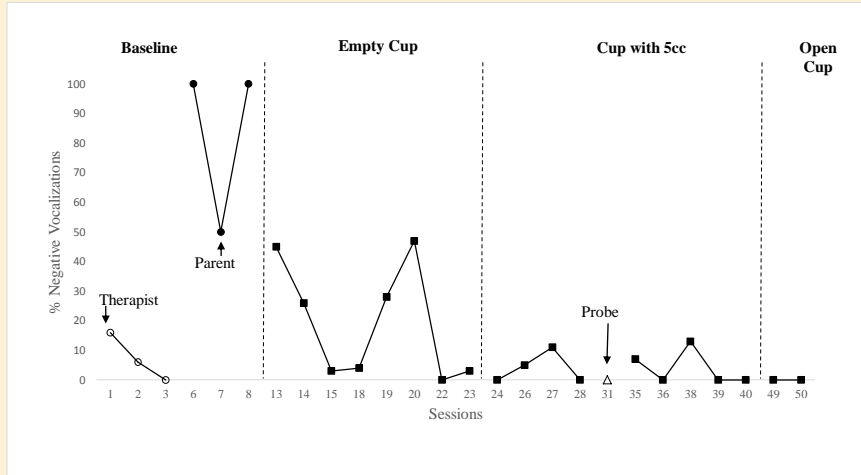


## Parent-led fading for cup drinking

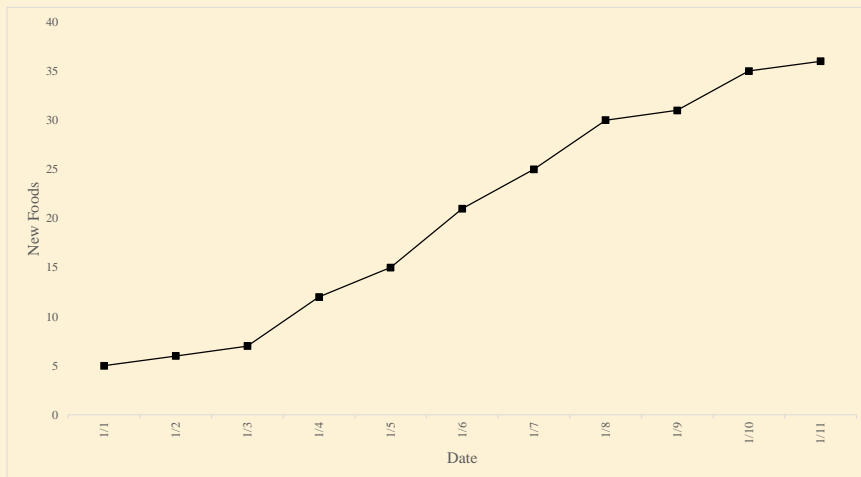




## Crying goes away quickly



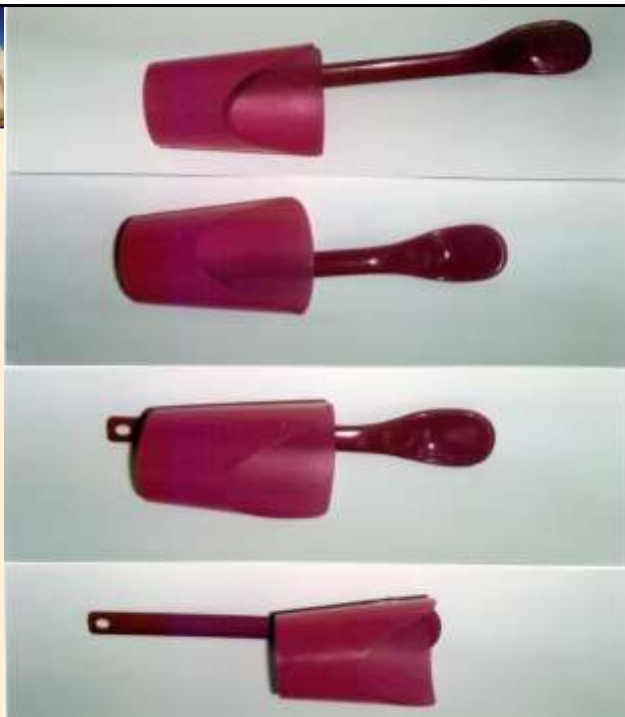
## Increase in number of foods eaten





## Stevie: an example of fading for treating adipsia

- Admitted at 30 mo w/ FTT, adipsia, constipation
- Hx included GER, severe MR
- 100% NG tube fed due to dehydration
- 28 tx days, 138 tx sessions
- Used spoon to cup fading to increase liquid intake
- 100% p.o. at D/C





## Addressing feeding problems in the community

- Feeding problems have typically been treated in outpatient, day treatment, and inpatient settings
- While it may not be appropriate to treat all problems outside of clinical settings, many can be if the treatment involves a small, but sustained effort over time.



## The Autism MEAL Plan

- Sharp, Burrell, & Jaquess, 2013
- Used parent-training curriculum to manage feeding problems in ASD
- 10 families received 8 sessions
- Compared to 9 waitlist controls:
  - Improvement in # of foods eaten
  - Lower parenting stress
  - Improvement in BAMBIC score



## The Autism MEAL Plan: overview of sessions.

- 1 Introduction
- 2 Structuring meals and monitoring behavior
- 3 Ways to increase appropriate behavior
- 4 Effective communication
- 5 Ways to decrease inappropriate behavior during meals
- 6 Methods of introducing foods
- 7 Teaching self-feeding skills
- 8 Monitoring and maintaining progress



## Behavioral Parent Training to Address Feeding Problems in ASD

- Johnson et al., 2015
- 14 families received 9 sessions
- Followed for 16 weeks
- Improvements in parenting stress, BAMBIC score
- Nutritional status was the same pre- and post-tx, however, no problems prior to tx.



## Program Goals

### INCREASE 3 WEIGHT MANAGEMENT BEHAVIORS:

**FVFIRST** -- eat fruit & vegetables first during meals

**HDRINK** -- choose low-fat, low-sugar healthy drinks

**EXERCISE** -- exercise many steps daily

### INCREASE PREFERENCES FOR THESE BEHAVIORS

### IMPROVE WEIGHT STATUS



## Food and Exercise Choices







## Small and Delayed Rewards



## Small Daily Expectations





## Incidental Peer Modeling



## Participants

**382 1<sup>st</sup> – 4<sup>th</sup> grade children from small town in PA;**

**211 boys, 171 girls**

**120 (35%) at risk for overweight**

### **2 GROUPS:**

**Intervention (LIONS) -- “Good Health Behaviors”**

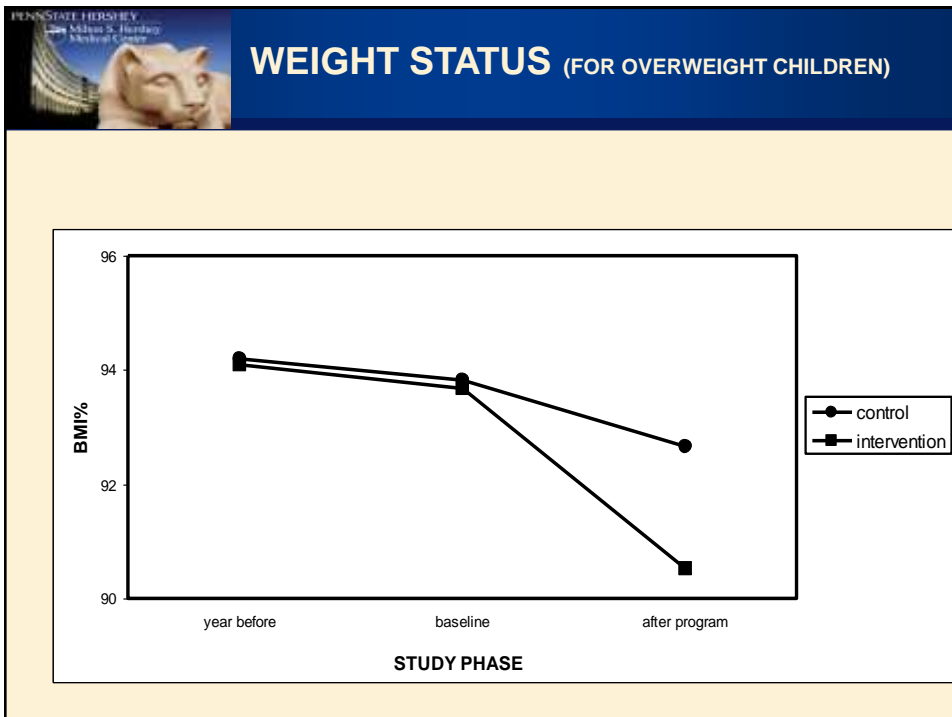
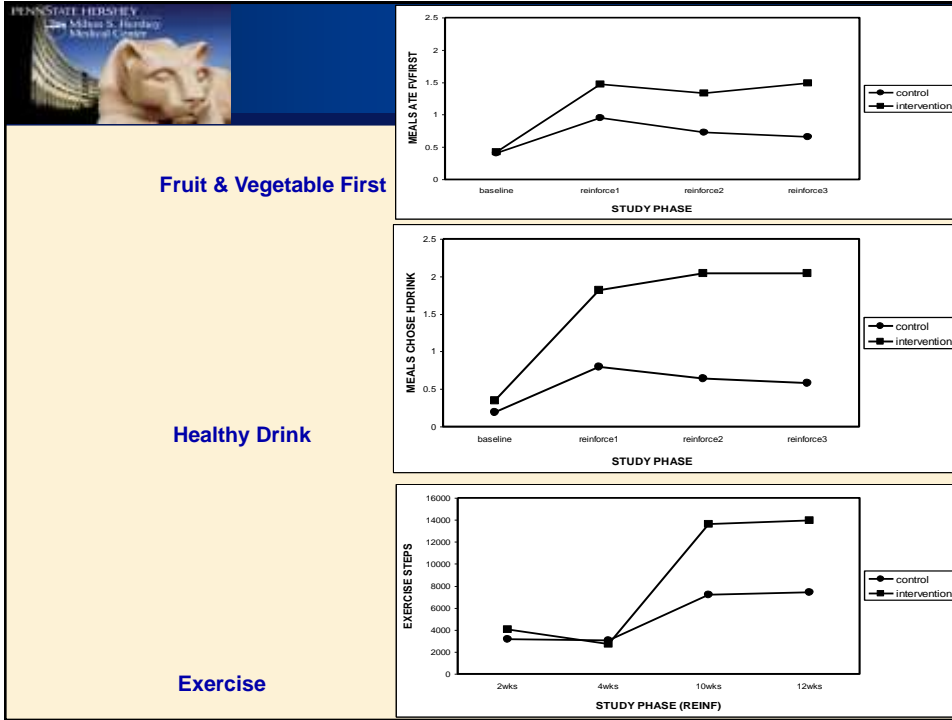
**Control (TIGERS) -- “Good Citizenship Behaviors”**

### **STUDY PHASES:**

**baseline (1 month)**

**reinforcement (3 months)**

**follow-up (2 weeks) (6 months)**





## Possible future applications

- The KCP is currently being utilized in autism support classrooms and a special education school
- We think it would work well in preschools
- This type of public health intervention may be more time and cost effective in addressing common feeding problems



## Eve's story

- Eve was 6 yr old who was placed in foster care.
- She engaged in self injury, aggression, and stereotypic behavior.
- She drank from a bottle and ate only a few snack foods.
- She has been seen on four OP visits. Her foster parents have been requiring her to taste a bite of new food to get cookies and snack food.
- She is eating over 30 foods from all food groups.



## A banana in a bag

- Eve was evaluated by an IU-based “feeding team”
- They advocated giving a banana in a bag
- They also advocated never requiring her to taste anything and abandon the use of reinforcement
- No evidence, no outcomes, no problem



## Sensory issues in Autism regarding taste

- Problems with sensory modulation and processing have been identified in numerous studies.
- Recent study showed # of feeding problems in children with ASD related to taste/smell sensitivity but not sensation seeking or underresponsiveness.
- Sensitivity to taste are the same in persons with and without ASD, however, persons with ASD are more likely to misidentify tastes.
- There is just as much variability among children with ASD as other children, thus there are no general rules governing taste, e.g. like strong flavors, like crunchy foods, etc.



## Possible sensory interventions

- Deep touch or pressure
- Sensory stories, mealtime stories
- Dimming lights, playing soft music
- **Modifying textures, taste, or smell**
- No evidence the 1<sup>st</sup> three can increase diet variety, 4<sup>th</sup> suggestion often incorporated into behavioral interventions



## What has been published?

- Piazza and colleagues (2012)
  - compared sensory and behavioral therapies for tx of pediatric feeding problems
  - Behavioral tx more effect than sensory tx
- Suarez (2015)
  - Used a multi-component tx for food selectivity
  - Used escape extinction so not clear what, if any role played by sensory component



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[researchgate.net/profile/Keith\\_Williams7](https://researchgate.net/profile/Keith_Williams7)