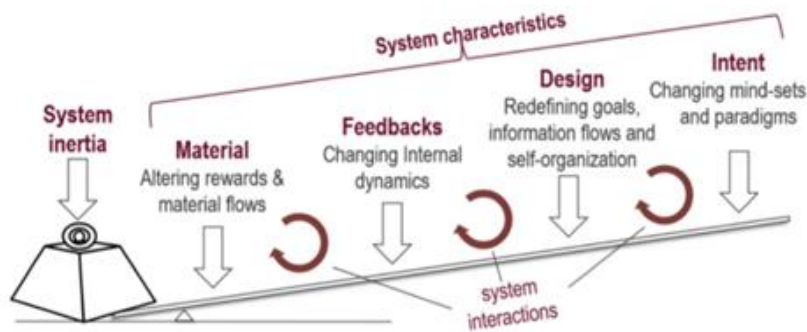


Contextual factors associated with young children's development of food preferences

WHERE ARE THE LEVERAGE POINTS?



Susan L. Johnson, PhD
Professor of Pediatrics



Are food preferences born or made?

Both...

- Taste signals & genetic predispositions— responses are inborn and reflexive
- Exposure & experience lead to acceptance and to regulation
- Environmental factors
 - Access and availability
 - Culture
- Child- and family-level characteristics
 - Temperament
 - SES
 - Parent eating behaviors
 - Parent feeding practices



The up and down sides of young children's emerging self-regulation

Children grow, develop, gain motor control & ability to self-feed

Concurrently, the desire for autonomy grows

Food refusal can increase over time

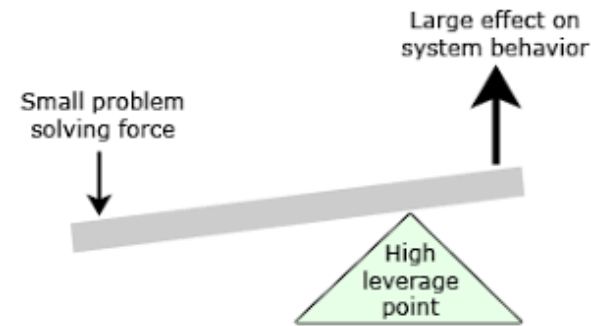
Parental confusion:

- Satiety? Dislike of food? Independence? Illness? Teething?

Neophobia and/or picky eating emerges

Feeding is not much fun...and takes place many times each day

Summary: Exposure works



Child traits

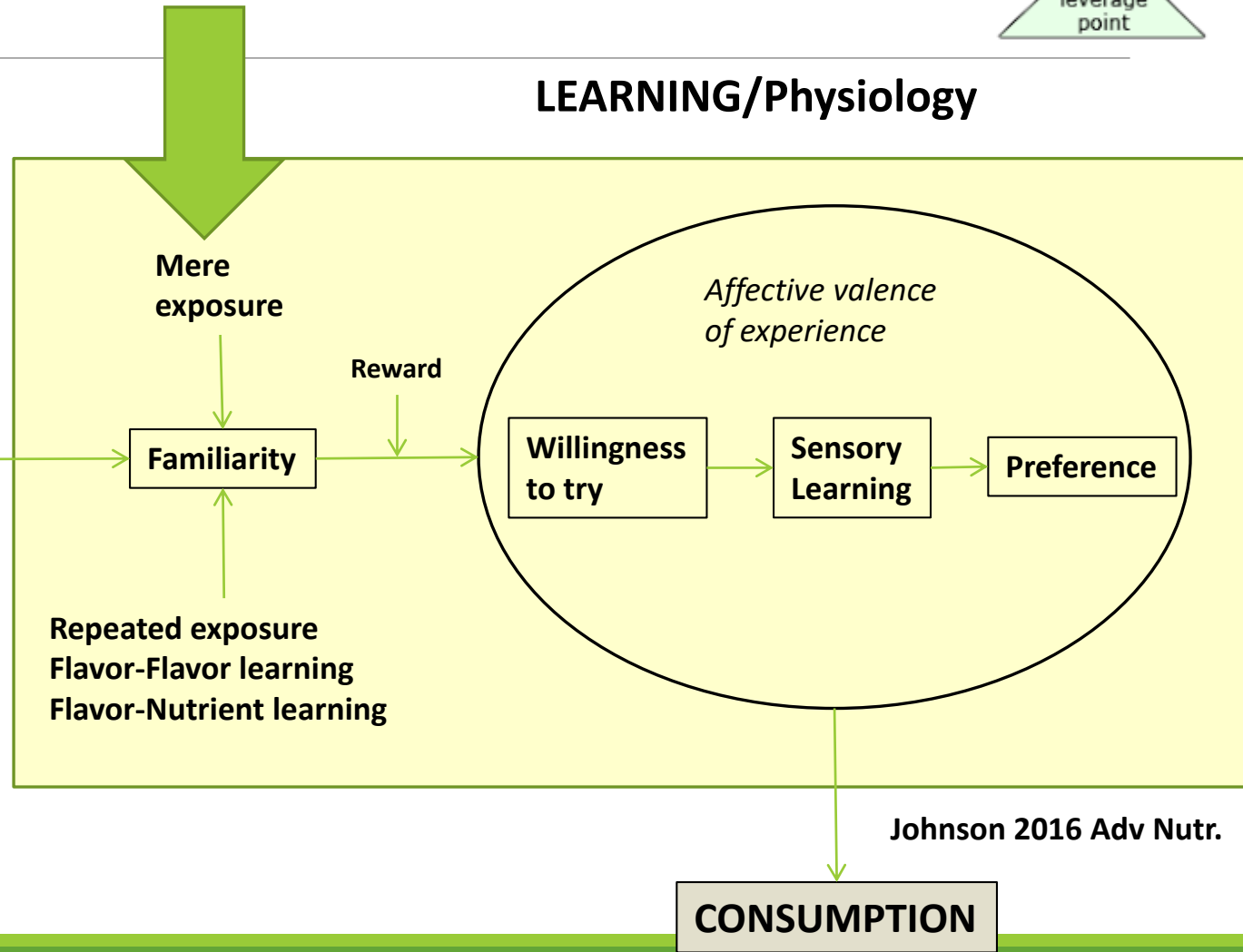
- Neophobia
- Sensory sensitivities
- Age
- Temperament
- Genes



Environmental inputs

- Early learning experiences
- Parent neophobia
- Parent diet
- Home environment
- Vegetable availability
- SES factors
- Parenting practices
- Culture/cuisine rules

LEARNING/Physiology



Johnson 2016 Adv Nutr.

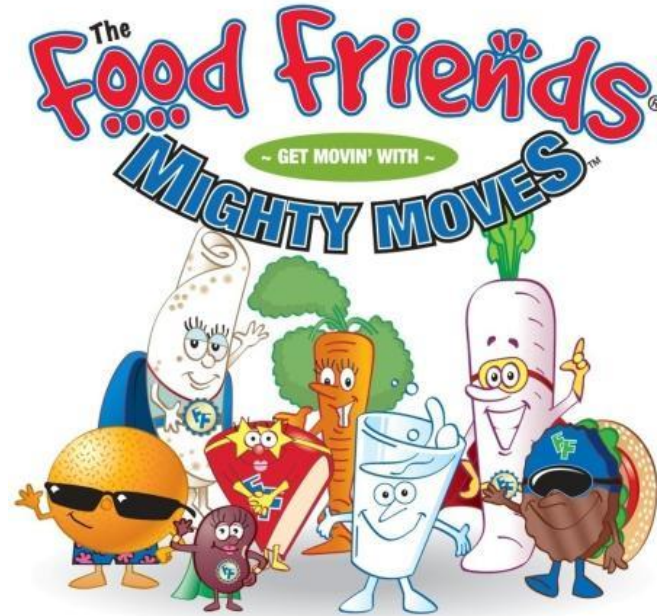


We know that
repeated
exposure
works....

IN THE SHORT TERM BUT
WHAT HAPPENS OVER TIME?



Fun With New Foods Intervention



Program Goal:
Enhance Children's Willingness to Try
and Consume New Foods
Longitudinal from Preschool – 1st grade



Grant #2010-85215-20648

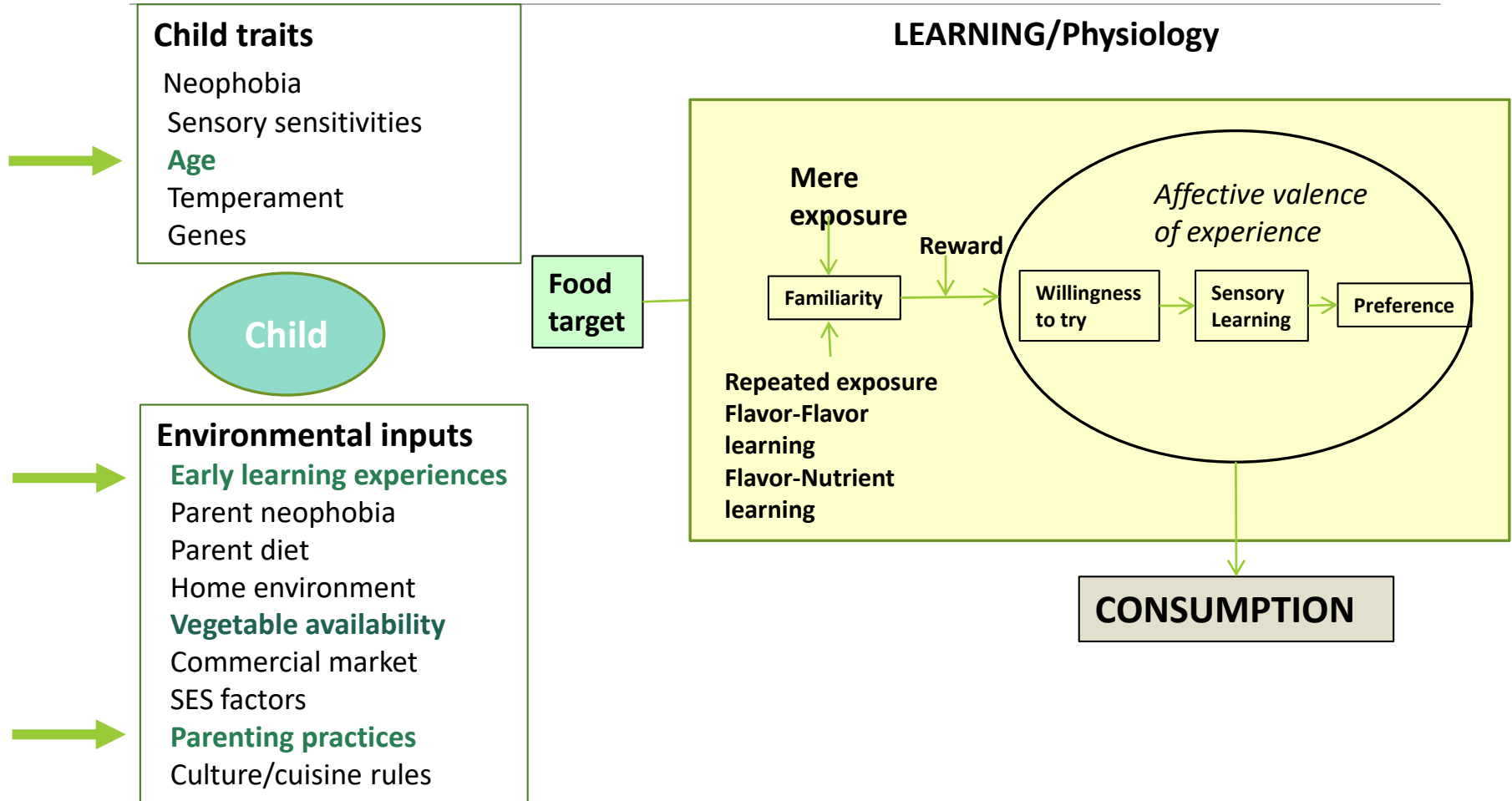


Fun With New Foods Intervention

- Intervention produced faster effects for liking
- Over time, all children became more positive
- Intervention group consumed more of target food post-intervention & also at 2-y follow up (~2/3 serving)
- Especially true for children who *liked* the target food

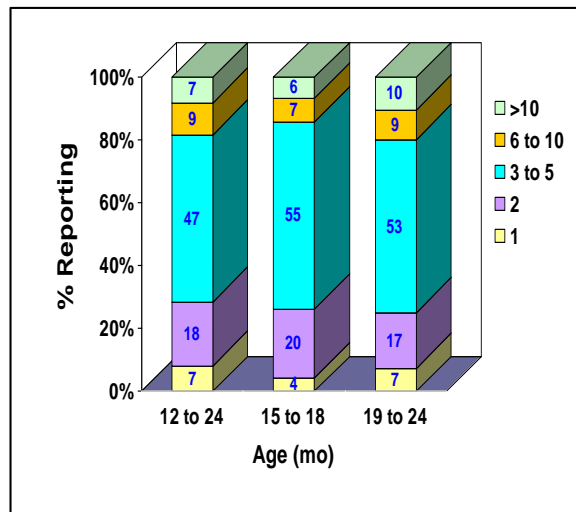


Shifting focus: Moms and infants/toddlers



What about caregivers?

Most stop by 3–5 tries



Skinner et al., 2002 JADA.

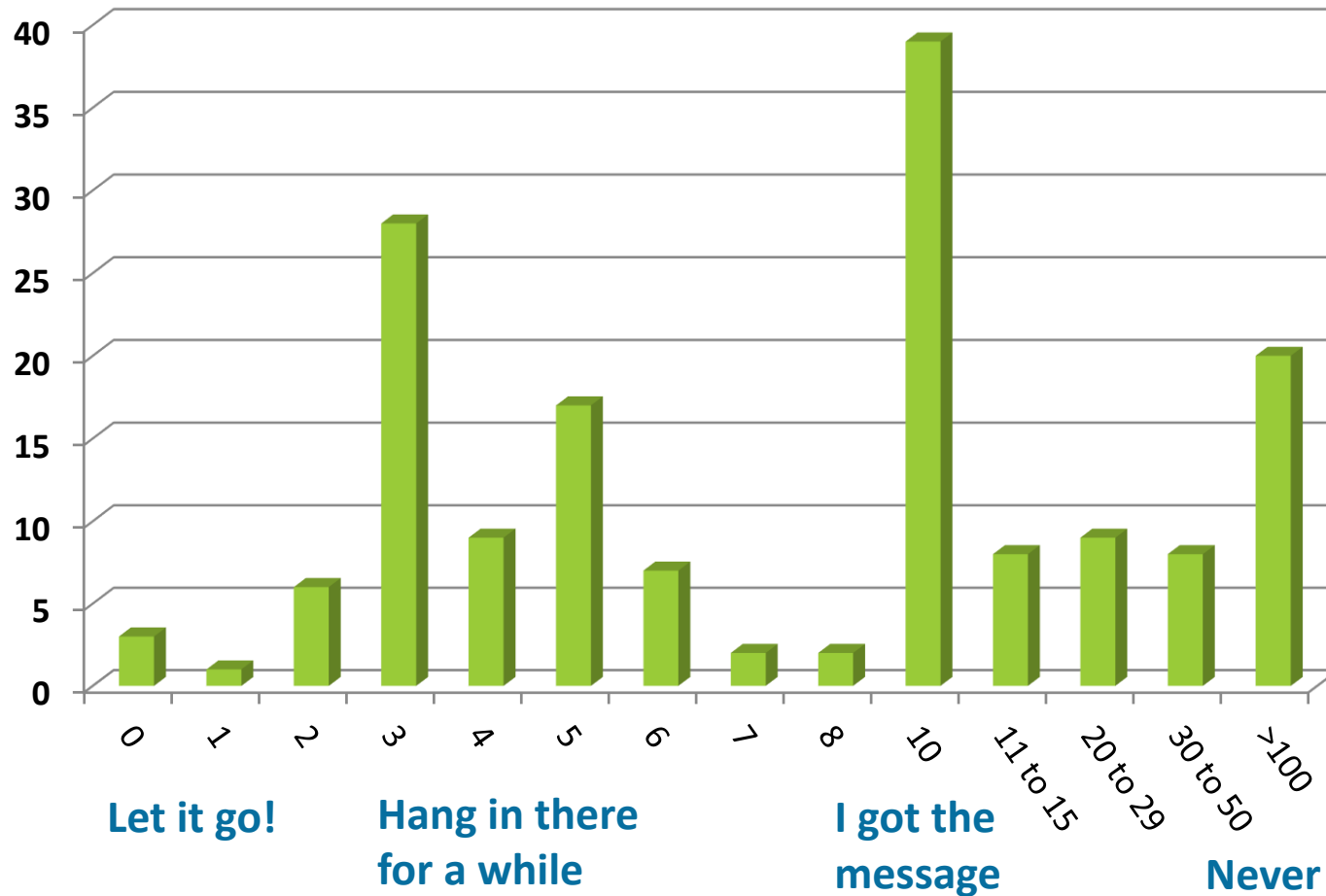
How do caregivers make decisions related to feeding persistence?

What is the experience of rejection like for the caregiver?

Do moms discern differences in infant response when foods taste different?

What are infant behaviors that predict caregiver intention to re-offer (*or not*) rejected foods?

Persistence Project Survey (2018): Number of times parents will reoffer a rejected food



The Good Tastes Study



- Observed maternal-infant interactions in response to bitter tastes (**dark green vegetable**)
- Does adding sugar or salt alter infant responses?
- Do moms see differences in how children respond to different versions of the same vegetable?
- Is maternal intention to re-offer a food associated with her child's behavior in response to tasting the food?

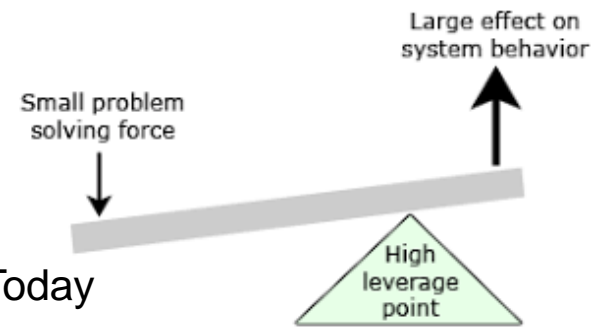
Searching for Godot... or unsweetened infant/toddler dark green vegetable



Moding et al. (2018) AJCN

Summary

Moding et al. (2018) AJCN
Moding et al. (2019) Nutrition Today

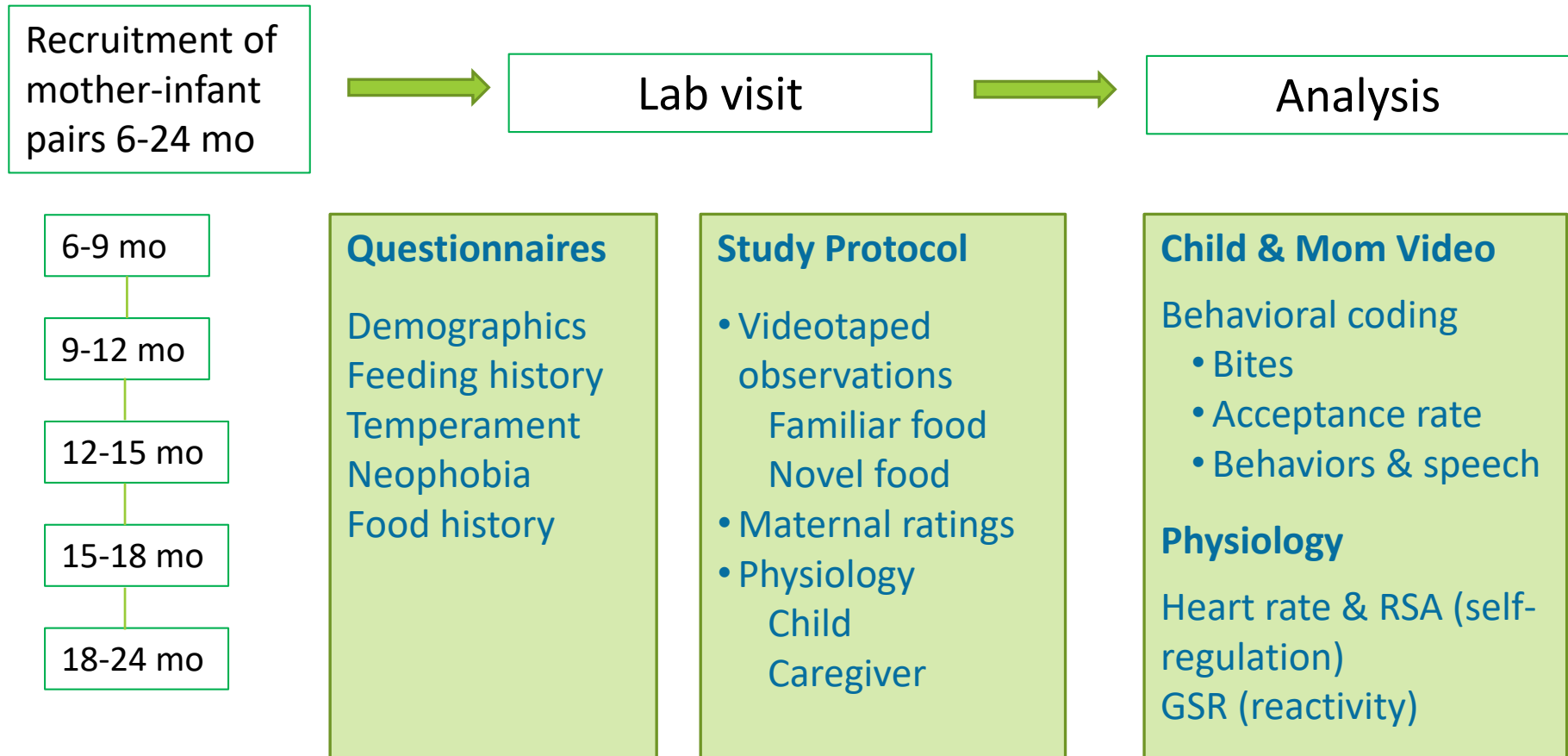


- Insufficient variety of green (n=0) and single vegetables
- Vegetable or fruit?
 - Fruits 1st ingredient
 - Vegetable + fruit products contain more sugars
- 50% ITFs containing vegetables packaged in pouches (and contain more kcal & sugars)
- Infants are eating what they are being offered: the Top 5

¹⁶Siege-Riz et al. (2010)



Good Tastes Study Flow



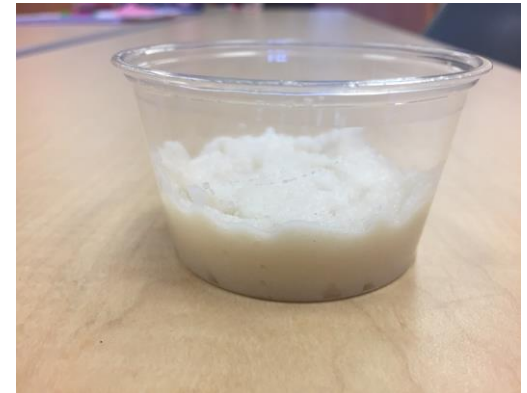
The Good Tastes Study



- Infants/toddlers and caregivers
($n = 106$)



- 1 rice cereal control
- 4 bitter green vegetable purées (kale)
- Order randomized



Good Tastes Study: Behavioral Coding

Food Acceptance: Behavioral Coding

- **Infant Behaviors**
 - e.g.: crying/fussing, prevention, leaning, reaching
- **Degree of Acceptance**
 - 0 (*Refusal*) – 3 (*Anticipation*- mouth open with spoon at a distance)

Facial Action Coding⁷



Child & Caregiver Characteristics

106 dyads (56 boys); typically developing children

Child Age (mo)	6 - 8	9 - 11	12 - 14	15 - 17	18 - 24
<i>n</i>	26	21	20	20	19

Mother demographics:

91% College or post-graduate degree

50% Middle income or higher

97% White

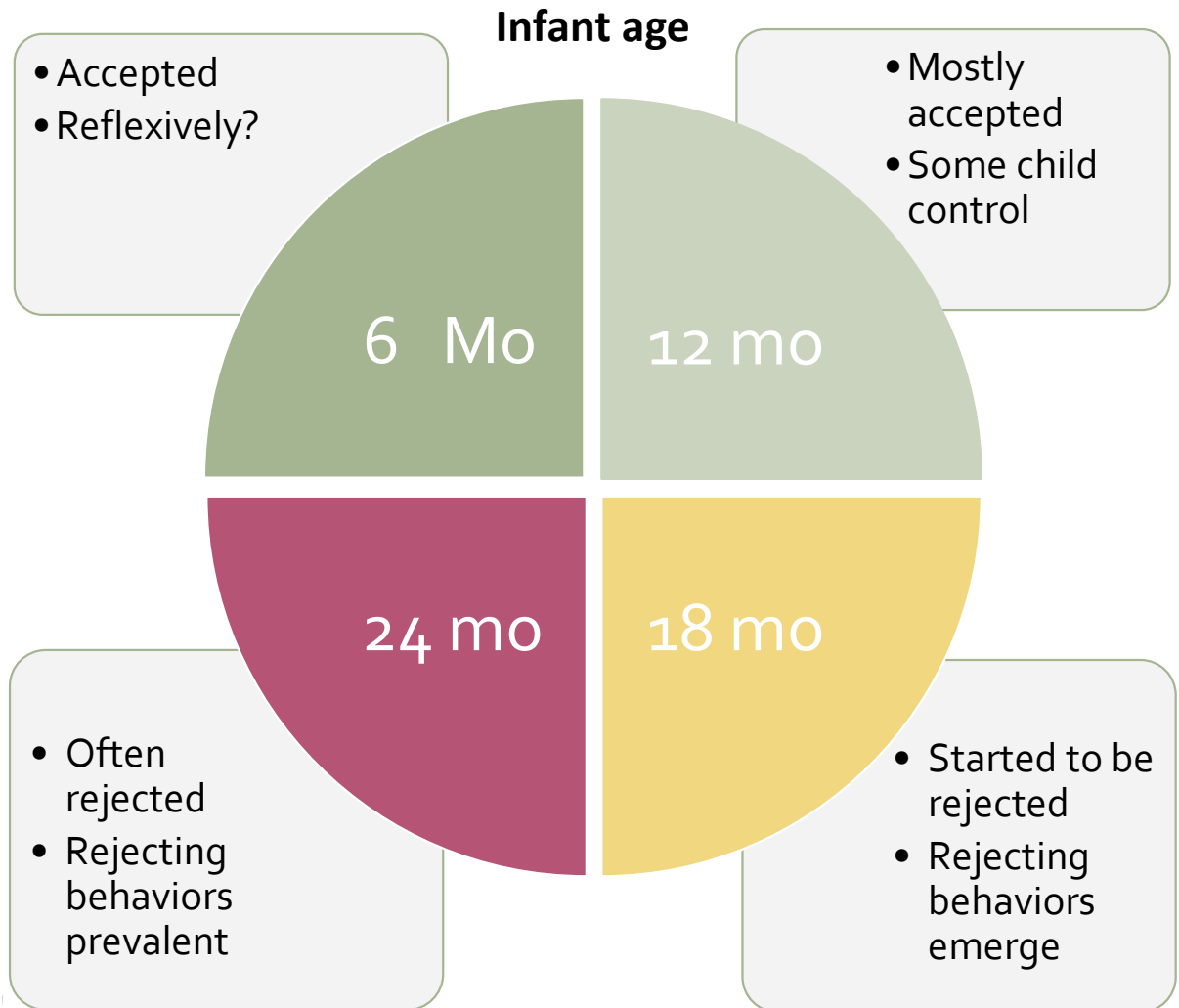
Children liked it best as plain kale-- Sugar or salt didn't help

- Higher rate of acceptance of familiar food ($p < .01$)
- First version was less preferred than the control
- Largest effects were for age: infants ate more bites than toddlers
- No effects of breastfeeding history or recency
- No differences in maternal ratings of child liking (salted version $p = .069$)



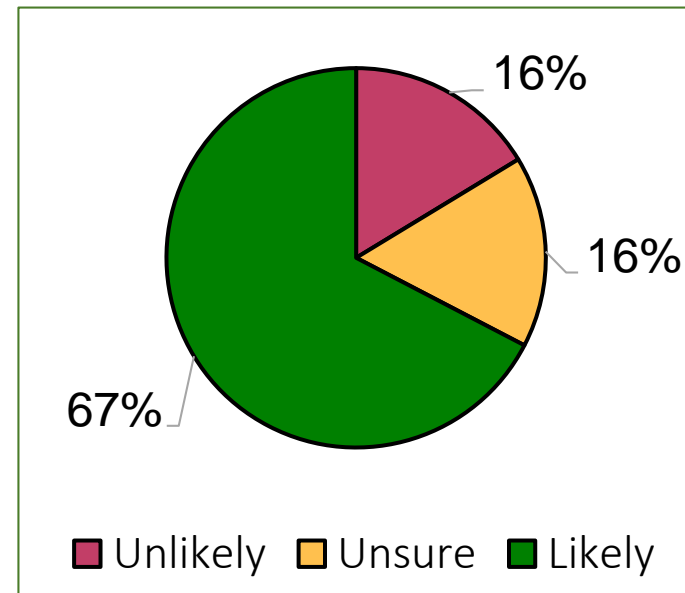
Changes in acceptance and child behavior from infancy to toddlerhood

Responses to a dark green vegetable



Getting kids to eat, and kids liking the food, is what counts for moms

- Maternal ratings of child liking and intention to reoffer kale correlated ($r=.63$, $p=.000$)
- Child liking and intention to re-offer:
 - negatively associated w/ avoidant behavior, crying, or expelling kale
 - positively associated w/ successful bites & rate of acceptance



Intention to re-offer

Results of interviews w/ mothers

What do moms know about repeated exposure and what are their priorities for children's eating?

- **Moms know about repeated exposure...but not how professionals think of it**
 - If child rejects a food, they often “take a break” or fix a different way
 - Tastes buds change
 - One & done → Never give up
- **Mothers' priorities**
 - Want feeding to be a happy experience (and it's not that fun, really)
 - Getting kids to eat enough
 - Good nutrition



How mothers feel when their child rejects a food

acceptance ambivalent amused angry annoyance anxious concerned
conflicted confused curious disappointed discouraged
frustrated grumpy guilt indifferent
irritated optimism sadness surprised
understanding worried

Things to consider about how to help mothers translate repeated exposure theory into use at home

- What does it mean to be “responsive” when the child does not like the food?
 - Ignoring? Distracting? Removing the offending stimulus? Move on to a better liked food?
- Is it effective to “take a break?” For different child temperaments?
- Do tastes (buds) change?
- When an infant grimaces or gapes, they will still take more bites. Is it ok to continue to offer food when children display these responses?
- How important is it that the child likes a new food?
- Is there a critical window for early flavor exposure?

The Good Tastes Study Research Team



University of Colorado
Anschutz Medical Campus



PennState

Kameron Moding

Abigail Flesher

Katie Davis

Haley Lucitt

Joey Campaign

John Hayes (Co-I)

Alyssa Bakke

And many more student interns!



Our Mission:

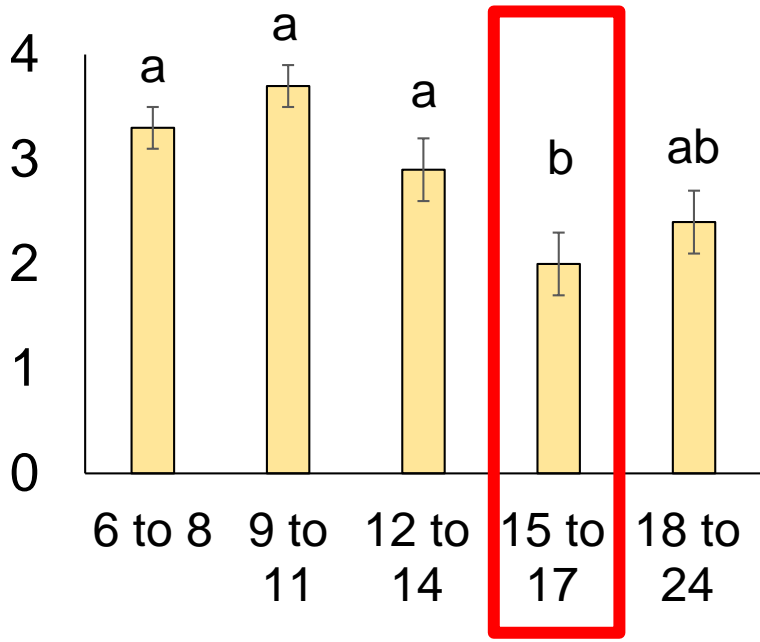
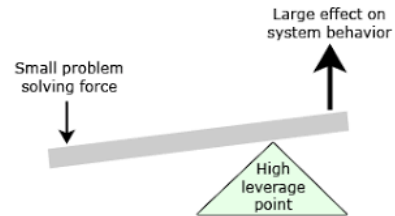
To understand
what makes
children eat
the way they
do...

...And how can
we help families
do better?

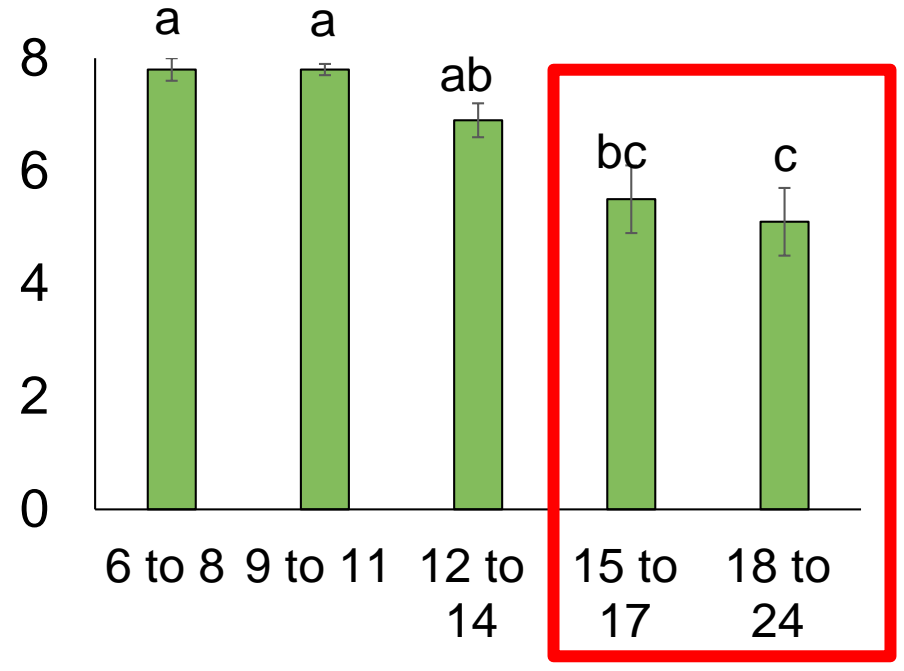


Questions?

Good Tastes: Younger children accept more bites



Child Age (mo)
Familiar food

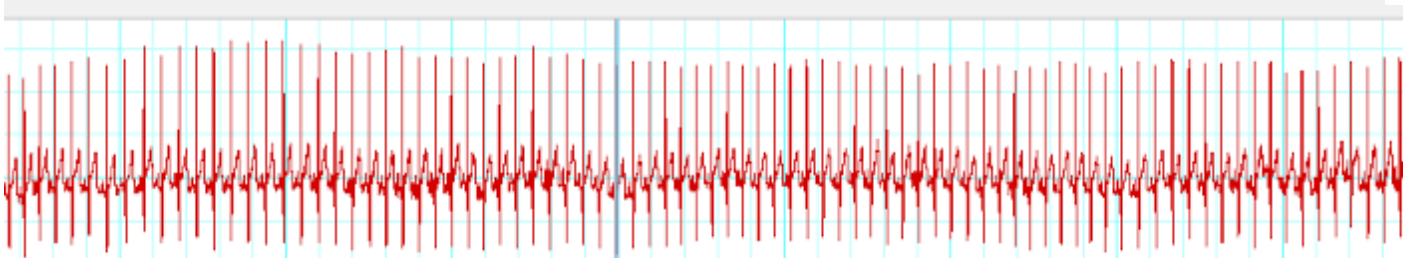


Child Age (mo)
Kale

Are there physiological responses to basic tastes?



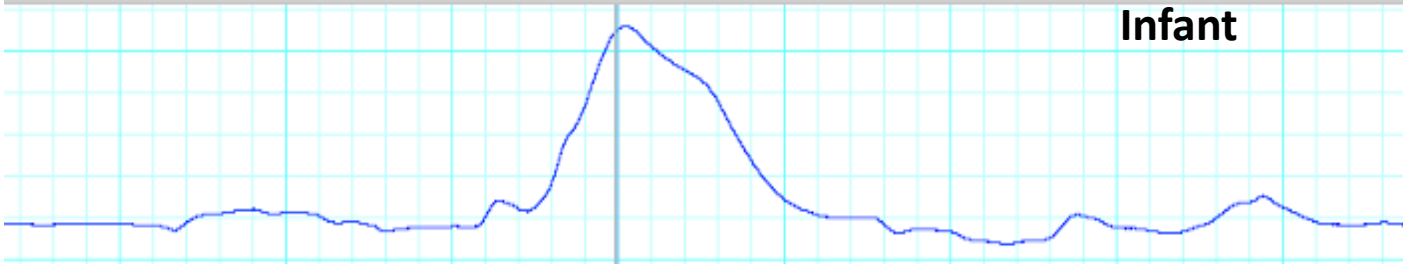
Heart rate



No Sampling
Bio Amp 1

Infant

Skin conductance



No Sampling
GSR Amp 1

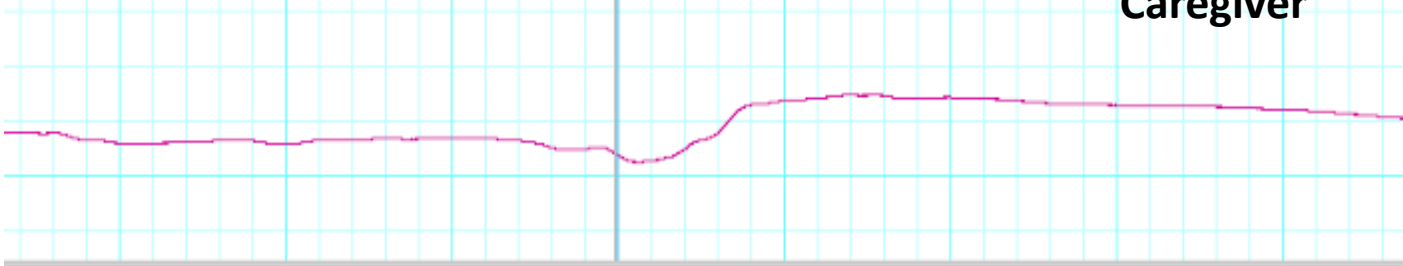
Heart rate



No Sampling
Bio Amp 2

Caregiver

Skin conductance



No Sampling
GSR Amp 2