

Environmental and developmental influences on children's food preferences and dietary intake

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Early eating is formative

- New foods more likely to be accepted early (<3 y old)
- Food preferences formed during the first years of life (loosely) predict what's actually eaten
- Dietary patterns track from early to later childhood

Grimm et al., 2014; Birch, 1994
Resnicow et al., 1998
Skinner et al., 2002;
Cooke et al., 2004;
Nicklaus et al., 2004;
Pearson et al., 2011
Mikkila et al., 2004, 2005, 2007



Children's vegetable intakes



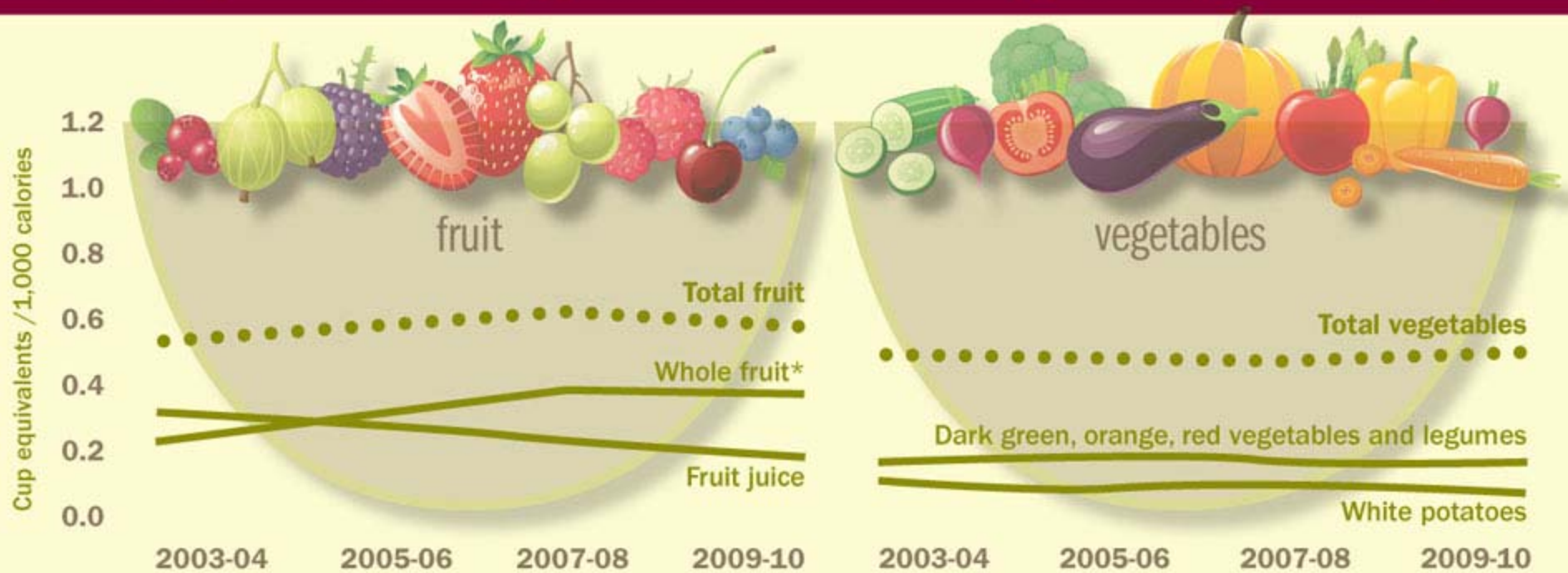
- ↓ Vegetable intakes from infancy to preschool
 - 30% toddlers & preschoolers do not eat any veg/d
 - Vegetable acceptance “falls off in variety” after 1 y
- Dark green vegetables listed in top 5
- In 1 – 3 y vegetable consumption, irrespective of race/ethnicity & which vegetables are examined, is below the DGA

Deming, Reidy, Breifel, Fox, Condon, 2012

Grimm, 2014

Feeding Infant and Toddler Studies FITS, 2006 & 2010

Children, ages 2-18, are eating more fruit but not more vegetables (2003 to 2010)



SOURCE: National Health and Nutrition Examination Survey 2003 to 2010

*All forms of fruit excluding juices

- Whole fruit intake up
- Fruit juice intake down slightly
- Total fruit consumption up slightly
- Vegetable consumption did not change
- Snacking, pizzas, sweet snacks & candy Mexican dishes

Beverage consumption of 1 – 5 y olds

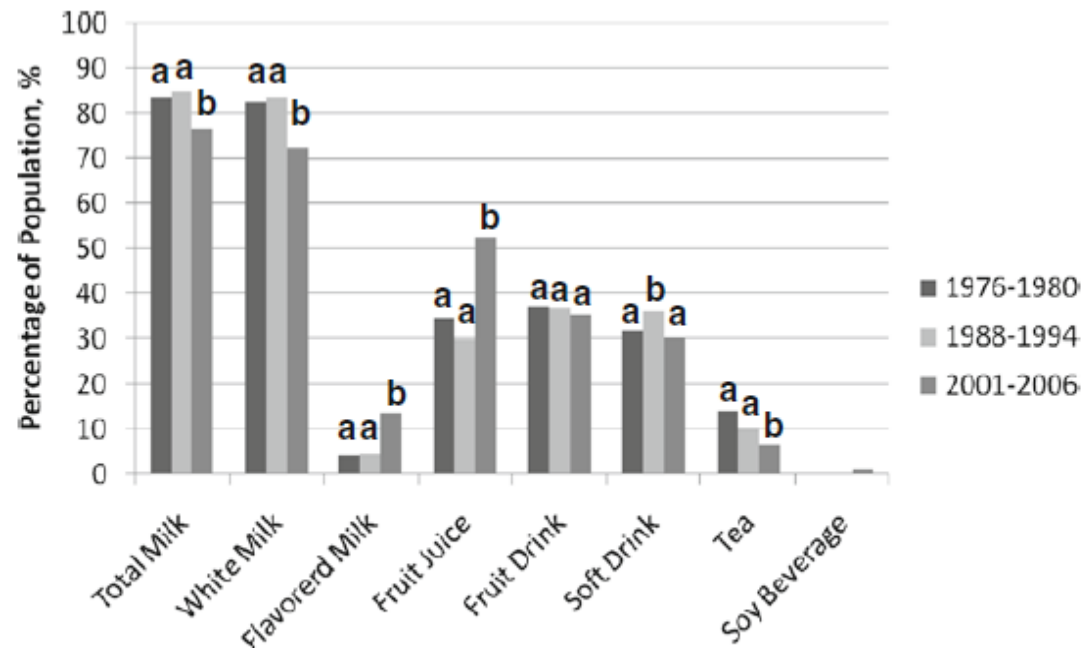


Figure 1 Percentage of children <1–5 years of age consuming different beverages during NHANES 1976–1980, NHANES 1988–1994, and NHANES 2001–2006. NHANES – National Health and Nutrition Examination Survey. Columns with different letters within beverage category are significantly different ($p < 0.01$).

Why children eat the way they do

- Evolution has shaped the type of foods initially preferred or rejected by children. (Steiner et al. 2001)
- That doesn't mean children will only eat sweet or salt but it explains the attraction.
- CHILDREN LEARN. Chemical senses interact with early life experiences. (Mennella, 2007; Pepino & Mennella, 2005)
- Mothers feed their children the foods that they like and enjoy. Mothers want children to enjoy eating.

What makes it worth it to a mother to try to help her child learn to like a food that is initially rejected?

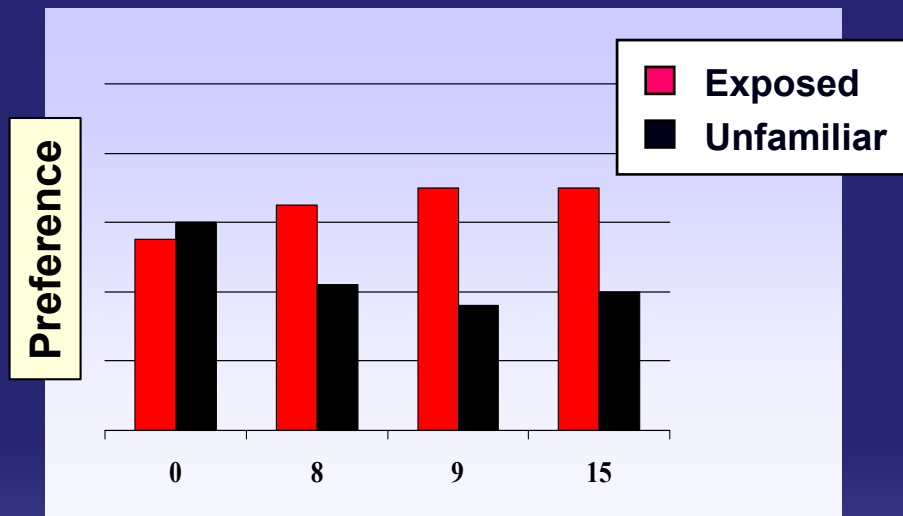


Plethora of dietary choices meets caregiver lack of faith

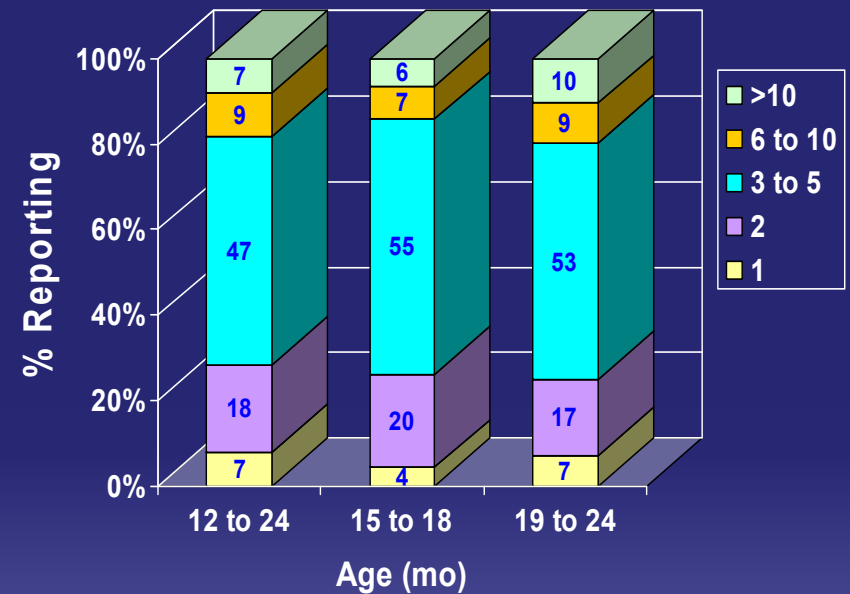
- Children report lower preferences for vegetables compared to high fat / high energy & sweet foods (Wardle)
- Children prefer what they “know” (Birch & Hetherington)
- How do children learn to try new foods? (Johnson)



Preschoolers' preferences aren't intractable but changing them requires persistence



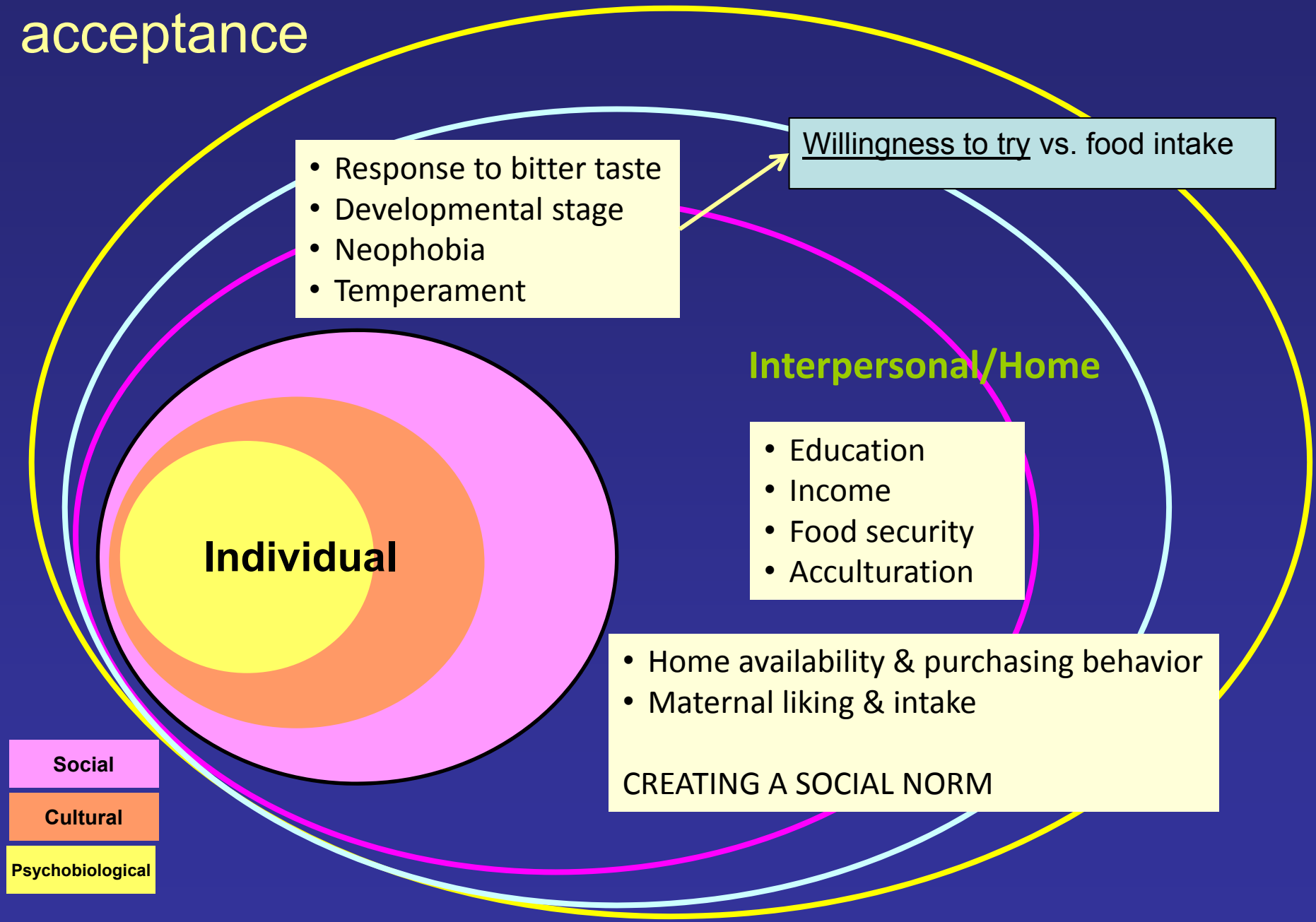
Sullivan, Birch, Dev Psych, 1990
Johnson et al., 2010



Carruth et al, JADA, 2004

- Most mothers reported giving up by 3-5 tries
- Mothers report less willingness to persist if their child is a picky eater (Johnson et al. 2015)

Factors central to young children's food acceptance



Parent beliefs of preschoolers' food preferences

(Russell & Worsley, 2013)

- **Child characteristics**
 - shyness, stubbornness, need for sameness
- Children **inherit food preferences**
- Children just **don't like certain things**
 - texture, strong taste, **color**
- Children's preferences are affected by **social circumstances**
 - peers, parents, child care, marketing

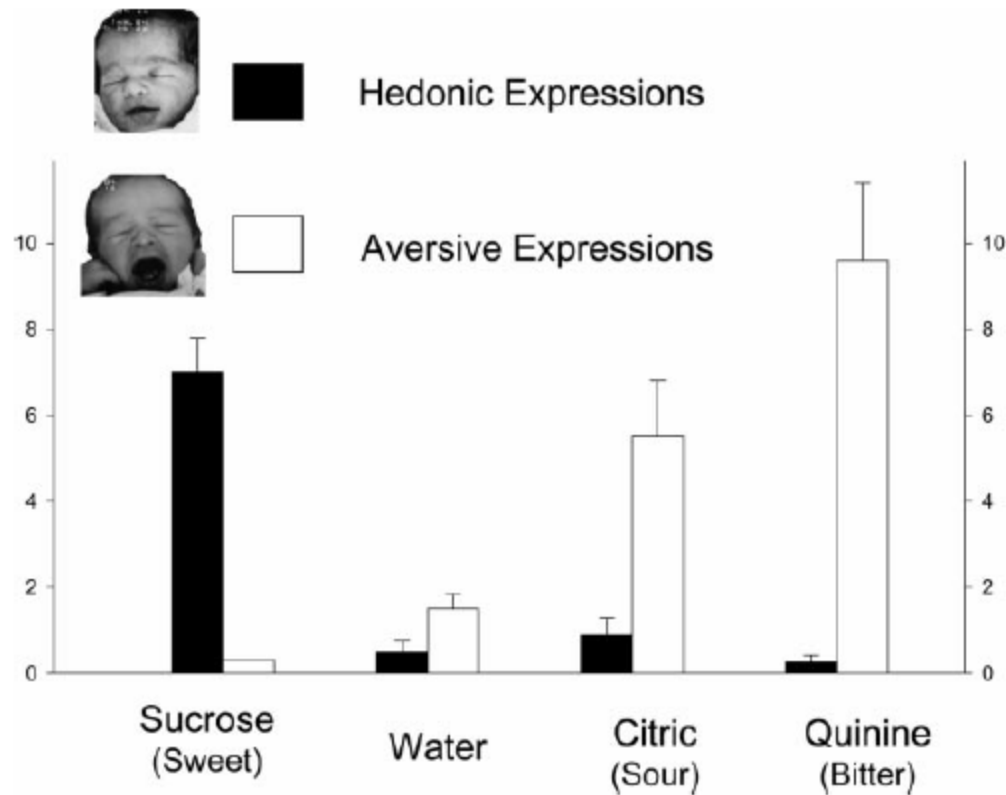


Rejection of bitter is innate

- Infants
 - Facial, suckling & intake responses
 - Conserved across species
 - Protection from toxic agents

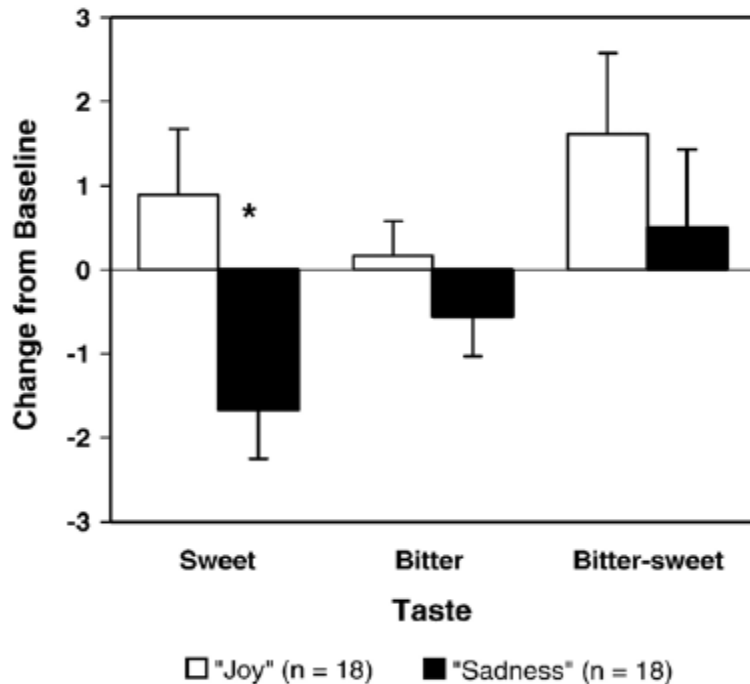


Averaged newborn responses to tastants

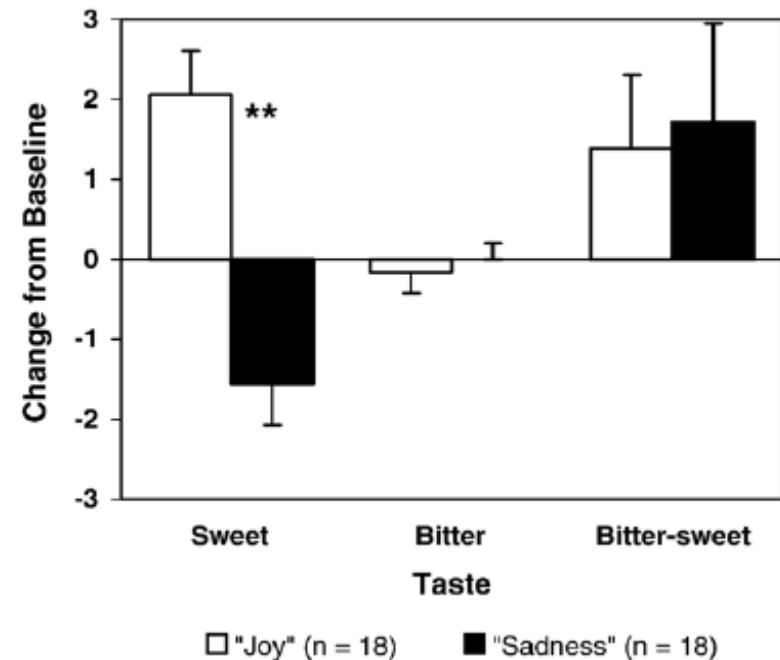


Emotions modulate affective reactions to sweet and bitter taste

Greimel et al. (2006)



Change in Pleasantness



Change in Taste

What if:

- First tastes of bitter (vegetables) are in an emotionally negative environment?
- Or if negative emotions are telegraphed to the child by the caregiver?

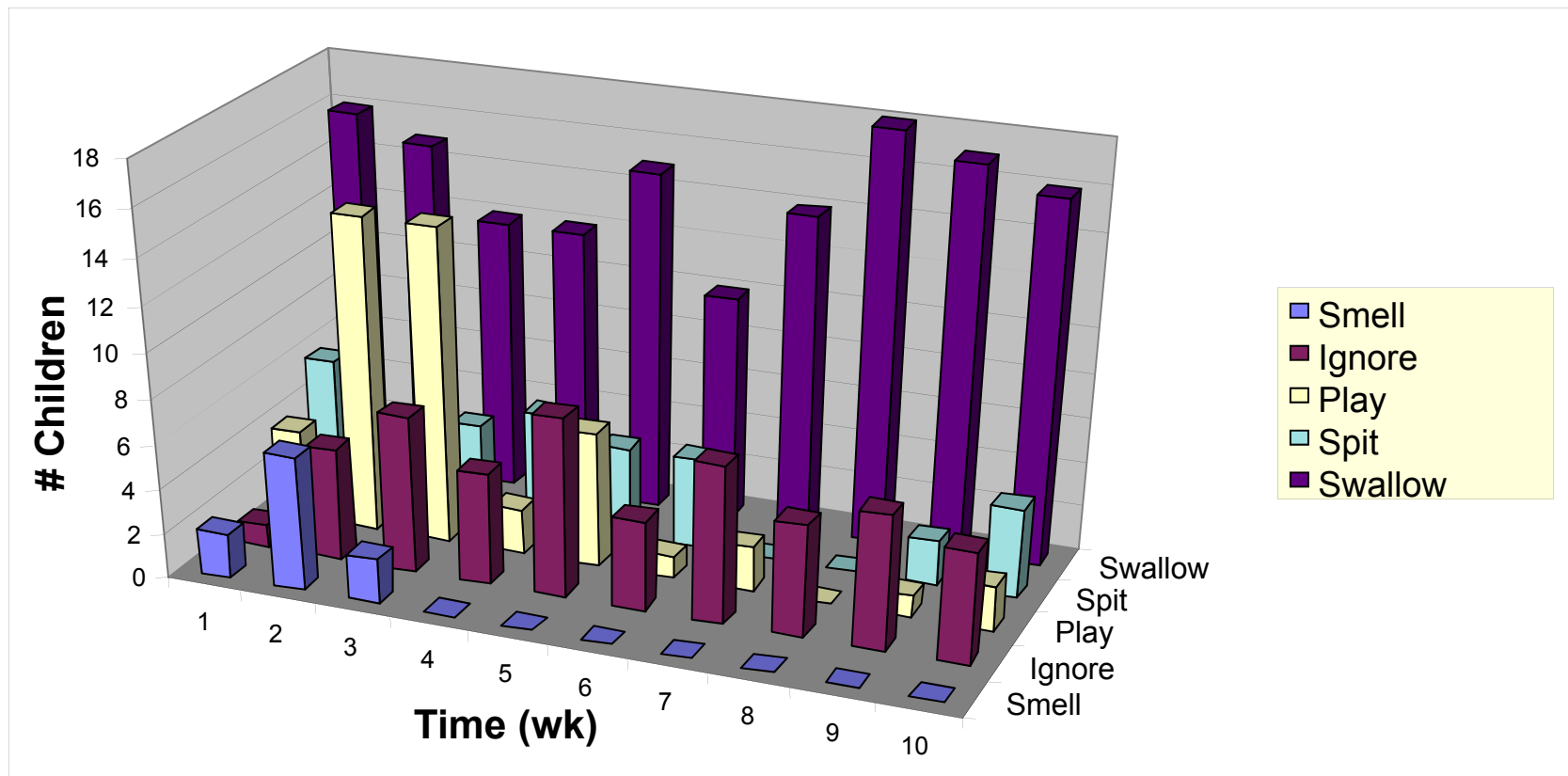
While rejection of bitter is innate...

- Can be modified by repeated exposure
 - In utero—“flavor memories”
 - Via breastfeeding—detection of maternal dietary flavors --“flavor bridge”
 - Early introduction during complementary feeding

Mennella & colleagues
Sullivan & Birch

Positive experiences facilitate acceptance

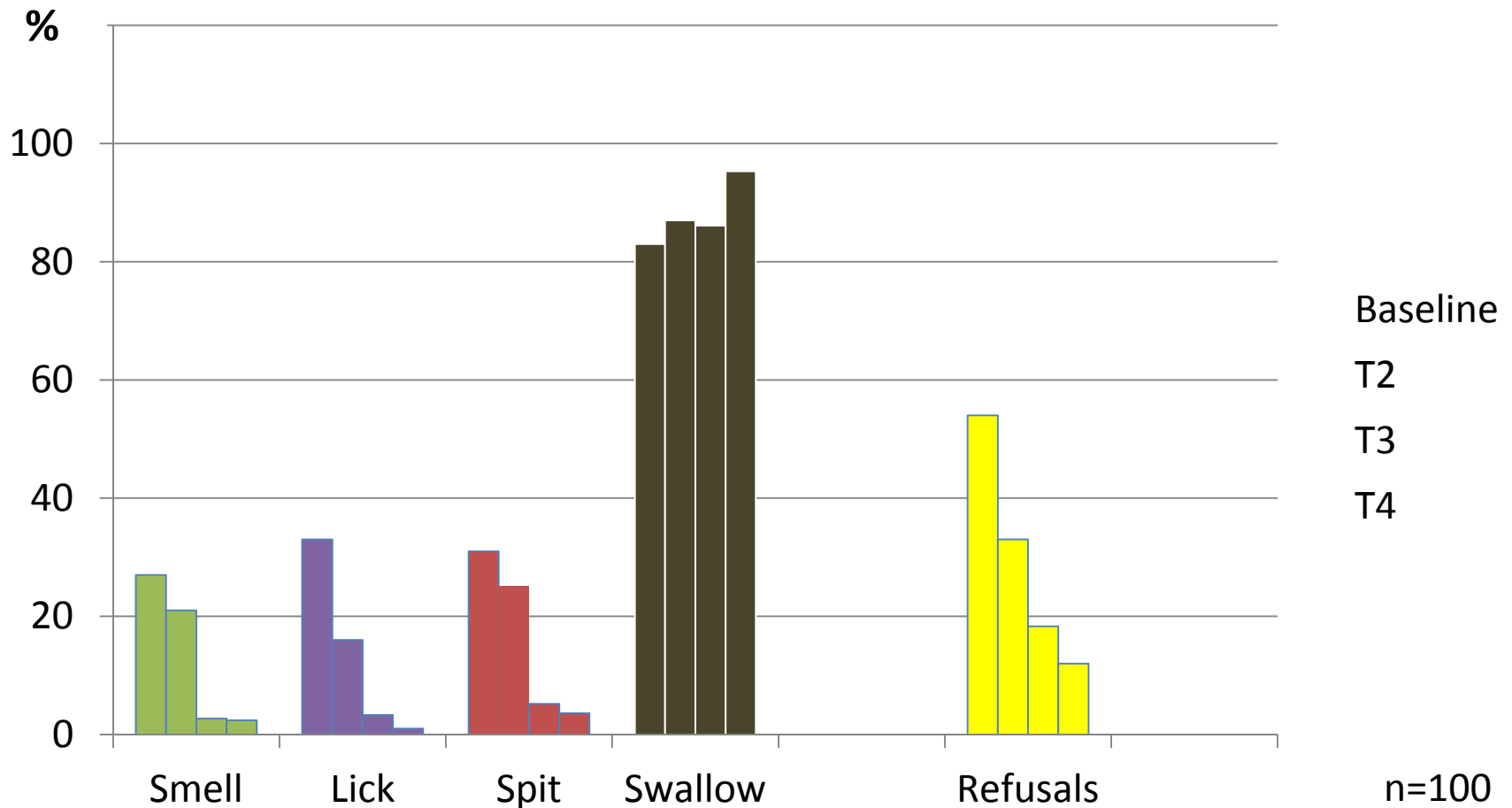
Johnson et al., 2007



Children learn about new foods by gradual experience



Longitudinal shifts in children's sensory behaviors when tasting foods (4 – 6 y)



Johnson, Bellows, et al. 2014

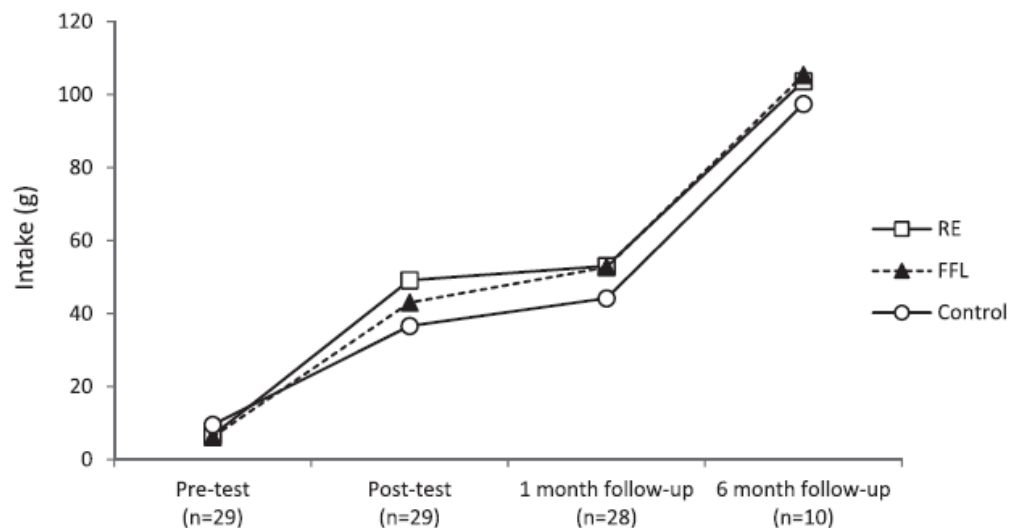


Fig. 2. Mean intake of vegetable purees (g) from pre to post intervention by condition (RE, FFL and control).

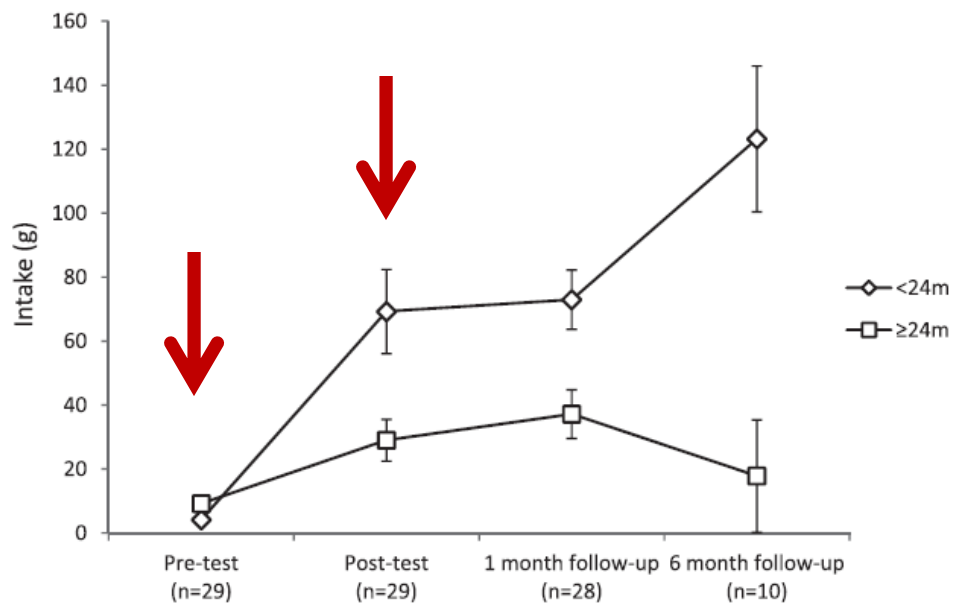


Fig. 3. Mean intake of vegetable purees (g) across the intervention by age group (<24 m and ≥24 m) ± SEM.

Repeated Exposure works in 15 – 56 month olds

- No additional benefit conferred by sweetening

- Biggest response in toddlers <24 m

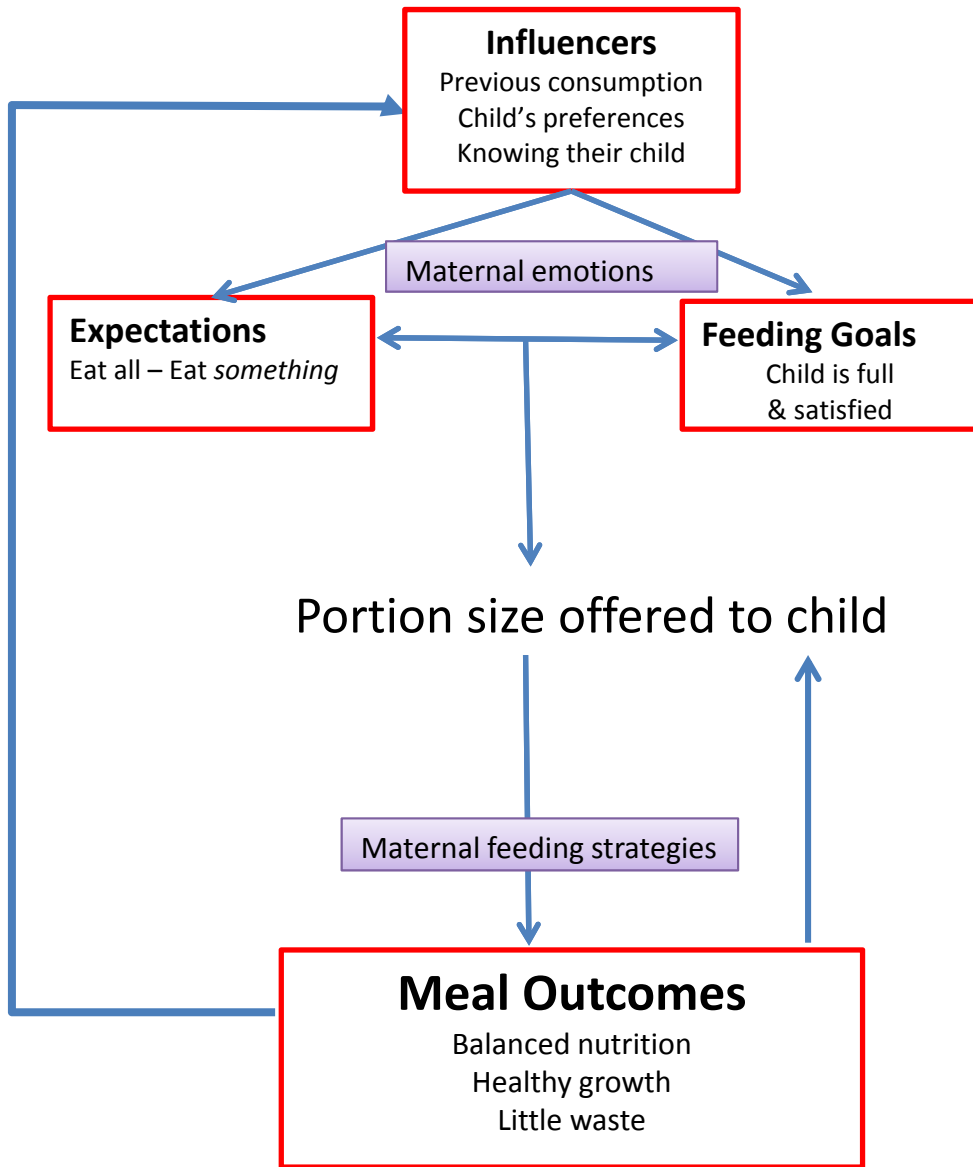
Ahern, et al. 2014

- Age matters, maybe not flavor
- Reactivity?
- What did caregivers observe?

“Good” Eaters & “Picky” Eaters

Getting my child to eat the right amount: Mothers’ considerations

Johnson et al., 2014



Mothers decide what and how much to offer their preschooler based upon the child’s likes and eating characteristics



Portion size effects on children's consumption at dinner

Johnson, Hughes, Cui, Li, Allison, et al. 2014

ENERGY

- Significant and important correlations between amounts parents serve themselves and what they serve their children ($r=0.51$, $p<.0001$)
- Highly predictive relationship between what children are served and what they consume ($r=0.88$. $p<.0001$)



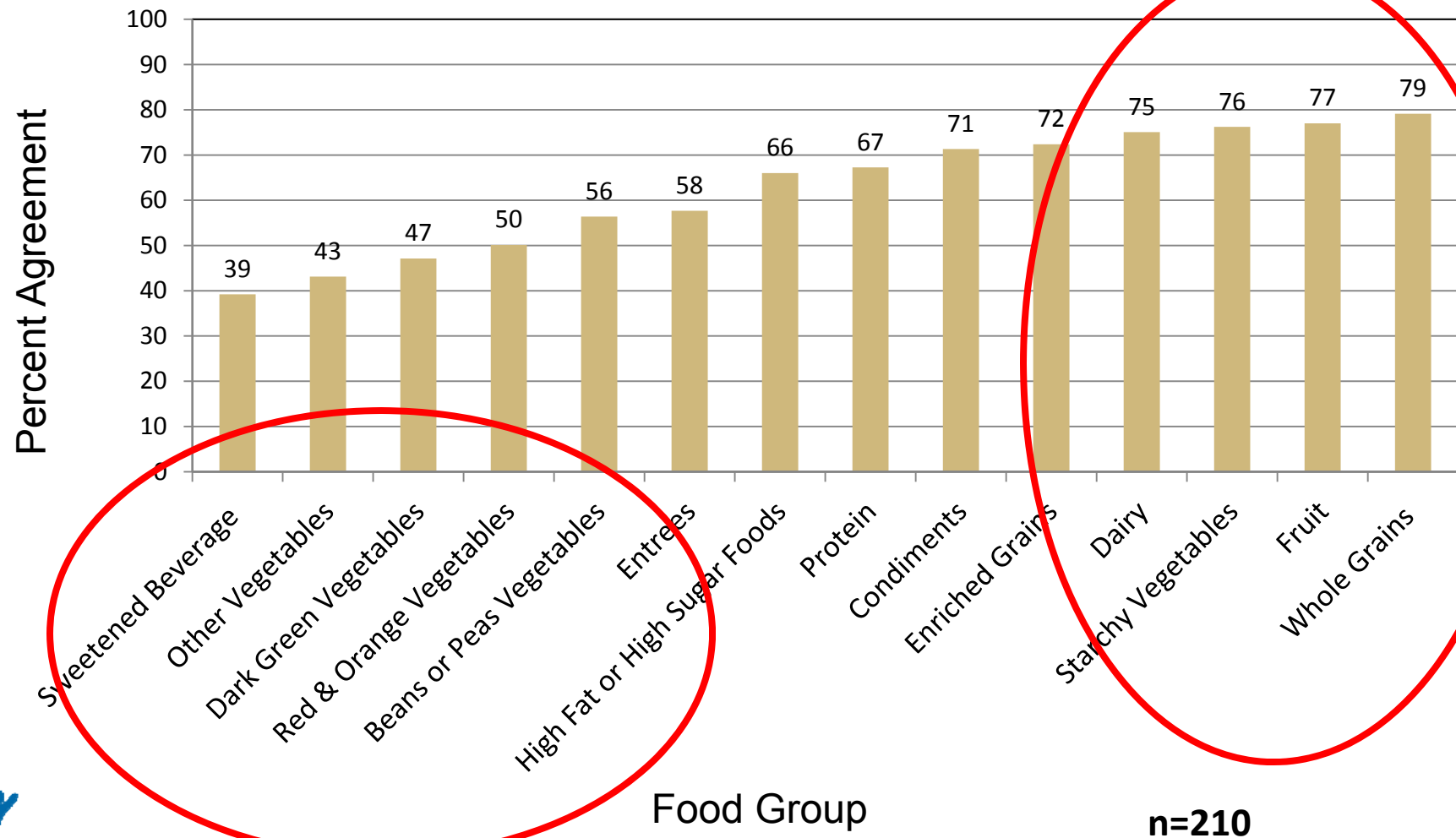
Food neophobia & food preferences

- Early food preferences predict preferences later in childhood
 - Related modestly to child neophobia & maternal preferences (Skinner, 2002)
 - Neophobia related to preferences for all food groups, number of foods tried, variety, healthful food preferences (Russell et al, 2008)



Parent-Child Concordance in Food Preferences (by Food Groups)

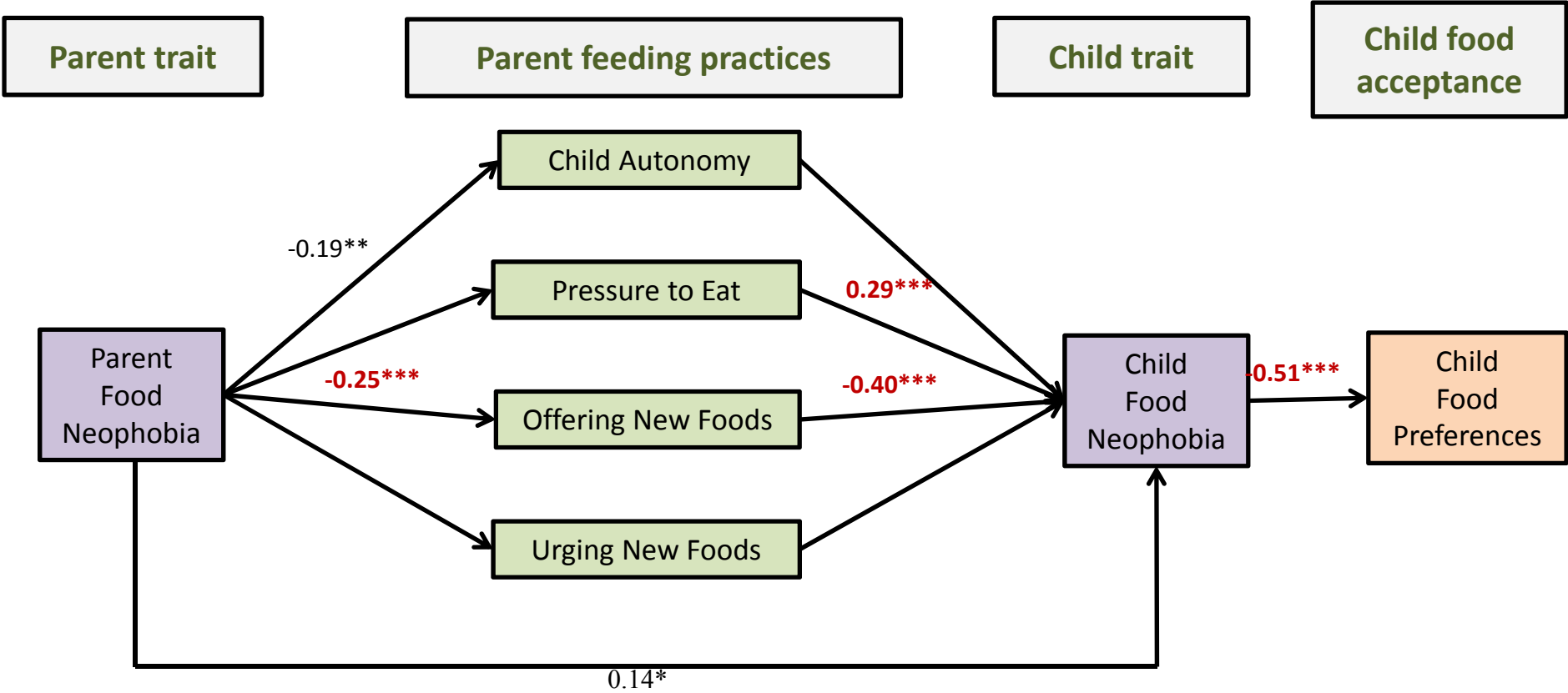
Kaar, Shapiro, Fell & Johnson, 2016



n=210

Development of children's food preferences

Kaar, Shapiro, Fell & Johnson, 2016



p<0.05*, p<0.01** and p<0.001***

R²=.45



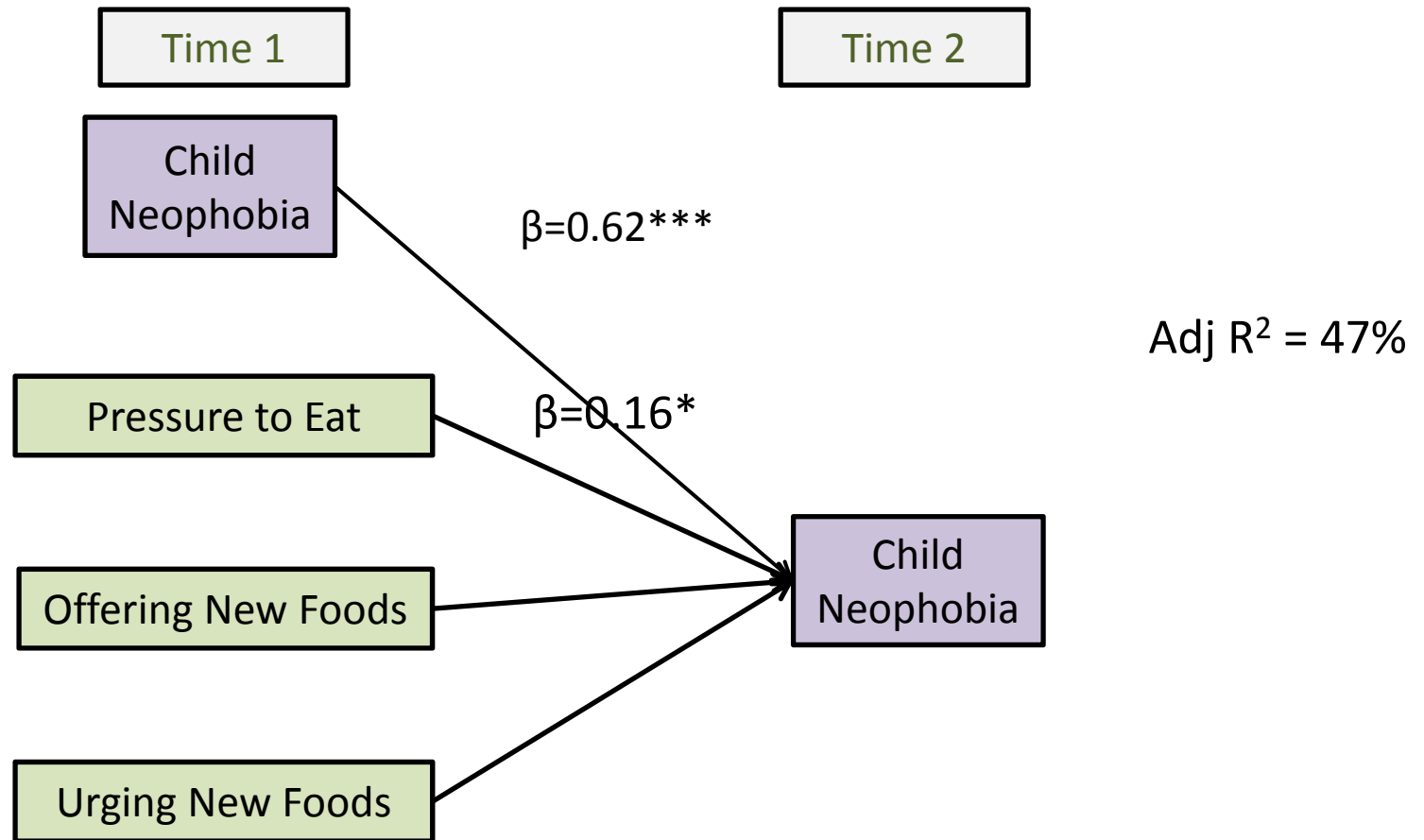
Effective ways to decrease children's food acceptance

- Offering foods as rewards—relates to consumption of poorer quality foods Kiefner-Burmeister et al., 2014
- Pressure to eat Gregory, 2011; Galloway 2006; Fisher 2002
- Permissive feeding style—lowest FV intake Murashima, 2012
- Catering Blissett, 2011





Longitudinal exploration of preschoolers' neophobia



Pressuring may actually contribute to sustaining neophobia

Positive influences on preschoolers' vegetable intake

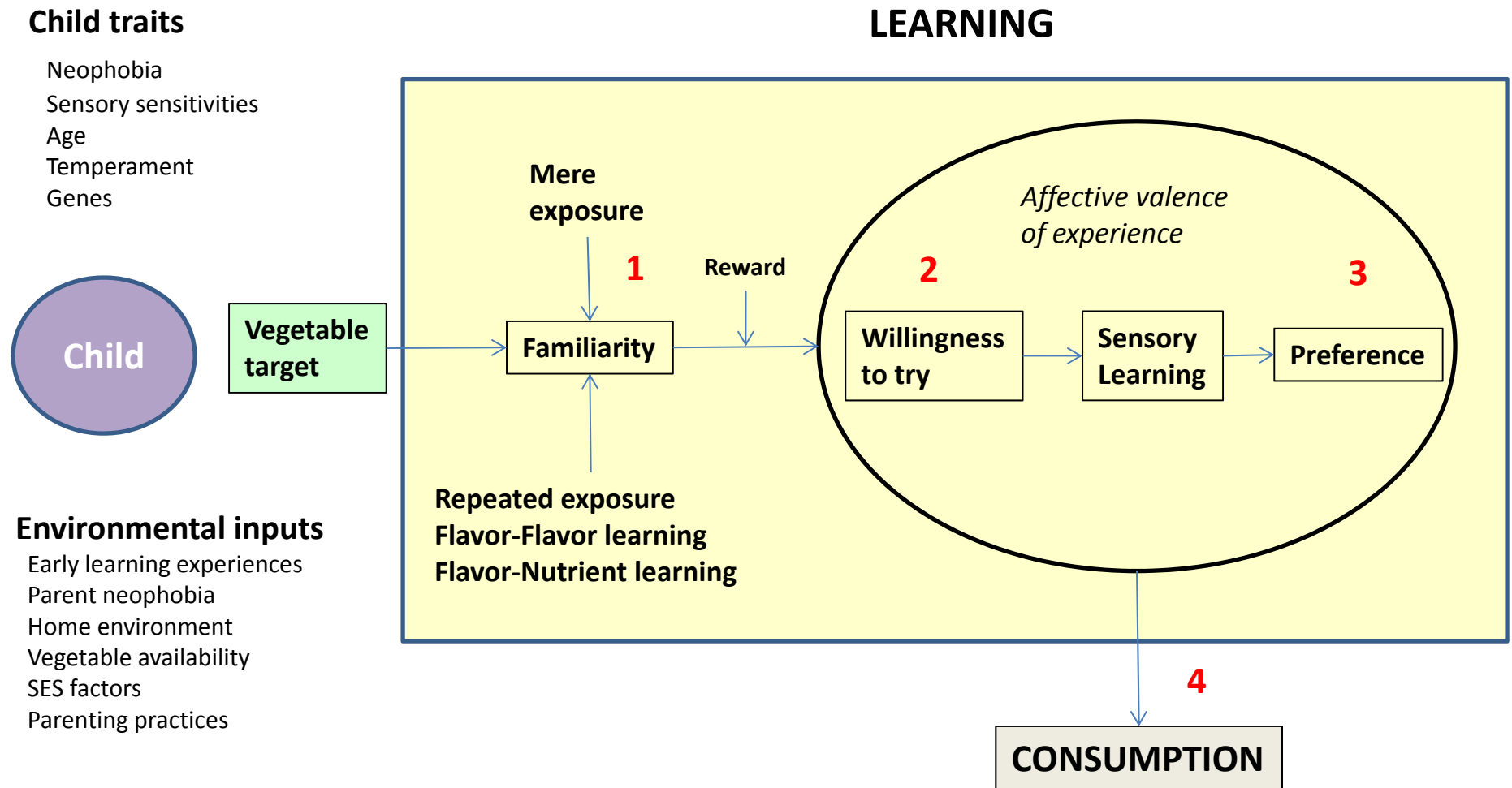
Positive parenting practices

- Encouragement, praise, monitoring
- Child centered feeding practices
- Feeding style of high demand and expectations
- Modeling
- Structure & rules
- Appropriate reward



Vereecken & Maes, 2010
Patrick & Nicklas, 2005
Goldman, 2012
Gregory, 2011
Coulthard, 2009
Baranowski 2013
Wyse, 2011
Pearson, 2009

Model of children's acquisition of vegetable preference and ingestion



Research gaps & opportunities

- Longitudinal research on food preference acquisition from a developmental standpoint to inform tailored interventions.
- Is there a role for appropriate reward in helping children to acquire food preferences?
- How can we help mothers help children learn eat well and accept a variety of foods?
- Studies of positive deviance—who is succeeding? What are the characteristics of healthy home food environments?



Thank You!



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