Taste preferences in young children

Annemarie Olsen
Assistant professor, PhD

SPECIAL VERSION FOR OPEN ACCESS.

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INFANTS
Why are preferences interesting and important?

• A major determinant of food intake!

• Most preferences are learned – and can be modified.

• Preferences established already before 2 years of age continue into adulthood\(^1\).

\(^1\)Nicklaus et al., Food Qual Pref, 2004
A few concepts before we start

• **Preference**
  When one food or compound is selected over another
  Not always corresponding with high liking of a particular substance

• **Acceptance**
  Def: *Taking willingly something that is offered*
  Often defined as food eaten (with enjoyment)

• **Liking**
  Evaluated pleasantness
Prenatal preference learning

Conditions for learning to take place:
- Development of the senses
- Presence of dietary aroma compounds in amniotic fluid
Who knows what they are thinking down there...
Innate preferences

(Mela, 2001).
Pre- and post-natal flavour learning

How do we know that newborns like sweet taste?

(Rosenstein and Oster 1988).
Pre- and post-natal flavour learning

How do we know that newborns dislike sour (left) and bitter (right) taste?

(Rosenstein and Oster 1988).
Pre- and post-natal flavour learning

• How can fetuses and infants learn preferences for certain flavours and odours?

• **Pre-natal:** Fetuses can get acquainted with flavours and odours from their mother’s diets through the amniotic fluid.

• **Post-natal:** Infants can get acquainted with flavours and odours directly from their mother’s milk or nearby surroundings.
Pre- and post-natal flavour learning

• Hypothesis:

“Under the natural condition of breast-feeding, infants become familiar with the flavors consumed by their mothers, and such experiences may impact on later food and flavor acceptability and choice.”

(Mennella & Beauchamp, 1996).
Concentration-time profiles for volatiles in mother’s milk

Large variations within and between lactating mothers

CV\%, \(d\)-carvone:
Within subject 51.9 ± 38.8%
Between subjects 84.1%

Pre- and post-natal flavour learning

Breastfeeding and Bottle feeding – are the transmission of flavours comparable?

- Characterization and comparison of human breast milk and formula milk suggested that infants exposed to breast milk experience a higher diversity of flavors than formula-fed infants. (Hausner et al. 2009).

- Suggestion: “...the limited flavor experience of formula-fed infants may impede their acceptance of new foods or may foster the neophobic response”. (Birch, 2005).
Long-term effect of early exposure

Taste test of ketchup w/without vanillin (supra threshold concentration)
2/3 bottle-fed preferred ketchup w vanillin
2/3 breast-fed preferred normal ketchup not added vanillin

n = 133
12-59 yrs
Exhibition in Frankfurt
TODDLERS AND UP
**Pickiness**

- When a child refuses to eat known foods

- In children associated with:
  - Lower vegetable intake
  - Lower dietary variety

- Neophobia ≠ Pickiness
Neophobia og food

• Neophobia (~ phobia for the new)
  - Rejection of new/different food
  - Seen in adults in varying levels

• Peaks around 2-3 years for most children

• Among children associated with:
  - Lower vegetable intake
  - Lower dietary variety
  - Higher intake of saturated fat
Neophobia over the life span

Dovey et al. 2008
Hunger and food preferences

*Food deprivation* will induce an animal to eat.

Foods eaten during food deprivation increases later preference for that food.

We do not deprive humans of food, but taking advantage of a naturally occurring state of hunger might be an advantage.

(Capaldi, 2001)
Strategies to change children’s acceptance

• Repeated exposures
  - Simple and effective

• Flavour-flavour learning
  (pairing known, liked flavor with novel food)
  - “Ketchup effect”
  - Effective in children with high neophobia

• Flavour-nutrient learning
  (pairing energy with novel food)
  - Perhaps effective
  Very time consuming
Mere exposure principle

- “... repeated exposure of the individual to a stimulus object enhances his attitude toward it.

- By "mere" exposure is meant a condition making the stimulus accessible to the individual's perception.”

(Zajonc, 1968).
What constitutes "an exposure" (food context)?

An exposure can be represented by e.g.:

1) A small taste
   (which may or may not be swallowed).

2) A full feeding/serving/meal

(Birch et al. 1998).
Change of preference – Mere exposure

- A food related example: Mashed fruits in infants.

Change of preference – Mere exposure
Acceptance learning, weaning babies (5-7 months)
Mere exposure to tofu in 4-5-year-old children

(Sullivan and Birch 1990).
Exposure styles

- To obtain significant positive changes in preference, experience with the food must include *experience in the modality that is relevant for the judgments* one apply to investigate changes.

- **Examples:**
  Visual exposure enhanced visual preference, and taste exposure enhanced taste preference.

  (Birch et al. 1987).
Required number of exposures

8-15 exposures seem to be the “magic” numbers.

The frequency of exposures should be determined upon what would be considered “suitable” for the target food in focus.

As an example, pasta sauce is consumed less frequently than cereals etc.
Number of exposures and age

- Infants: New (palatable foods) 1 to 2 exposures
- Children/toddlers: up to 8-15 exposures to ‘less tasty foods’ (often vegetables)
- Adults: 15-20 exposures (e.g. coffee, red wine)

- Exposure number depends on sensory attributes of the particular food
- To obtain significant positive changes it must include experience with the relevant modality
What do people do in practice?

In a large sample (n=3,022) of children it was found that 25 % of caregivers only offered a new food once or twice before deciding that their child disliked it.

The majority offered a food 3-5 times, and only few caregivers offered a new food 6 times or more, (Carruth et al., 2004).

It seems current practice is not good enough to increase liking through mere exposure...
Challenge of exposure hypothesis

“The overall relationship between exposure and affect may be nonmonotonic, with high as well as low degrees of exposure associated with negative affect, and intermediate degrees with positive affect”

(Maddi, 1968).
Challenge of exposure hypothesis

- Frequent exposures may lead to *boredom*!

- With levels of consumption perceived to be too frequent, negative effects might be seen with repeated exposures.

- However, staple foods, for example, are more resistant to boredom than other foods.”

(Zandstra et al., 2000).
What influence children’s acceptance of (novel) foods?

• **Role models**
  - Idols (‘Popeye’), parents, other adults,

• **Peer effects**
  - Friends largely influence children’s willingness to taste and eat a food
    - Often peers have larger influence than adults (depending on child’s age)
What influence children’s acceptance of (novel) foods?

• **Reward**
  - May be used, if the reward is something else than food (e.g. a sticker).

• **Availability and Accessibility**
  - Limited access to unhealthy food
  - Easy access to healthy foods (e.g. fruits and vegetables in ready-to-eat forms).
Influence of serving style of snack vegetables

- 138 children aged 9-11 years (3rd to 5th grade)
- Systematic variation in:

**Size**
- Small vs Ordinary

**Shape**
- Whole/chunk vs Stick vs Slice vs Figure
Visual stimuli

• 2 x 4 design = 8 presentations
Results

Liking evaluations assessed on 100 mm VAS scale (n = 138, mean SEM). Anchors were “not at all” and “extremely good”. Colors designate 4 statistically significant different groupings.
Summing up on children’s preferences

• Few preferences are innate.

• Preferences are primarily learned, and can be influenced by many parameters (social, food, habits etc).

• Preferences show long-term stability, but are plastic!
Thank you for listening 😊

Annemarie Olsen, PhD.

Mail: ano@life.ku.dk