Fussy eating
Nature or Nurture?

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What is fussy eating?

No definitions available!

- Variable acceptance, eating more on one day than another; eating some foods one day but refusing them on another.
- Not taking in sufficient calories to maintain growth along expected centiles.
- Not accepting a range of foods that would be optimal in a ‘healthy’ diet.
- Rejecting foods of specific texture.
- Refusing new foods or foods that have been eaten before.
These behaviours can be explained in terms of:

- appetite regulation
- innate taste preferences
- learned acceptance of foods
- the neophobic stage
- child temperament
- parental factors
Infants can begin to regulate their intake and energy needs from birth. This regulation is only partial until about six weeks of age, after this infants can take the number of calories that they need to meet growth and energy requirements.

Fomon, (1976)
Nurture

Children gradually learn the energy load of the foods that they eat. They learn how many calories they usually eat at each mealtime. They get hungry for that calorie load at the time that they usually eat it.

Their intake will be better with short frequent meal opportunities. Pressure to eat might well decrease intake.
Nature?

However – young children may regulate their intake from week to week rather than day to day.

Dependent upon
- bowel activity
- growth hormone availability.
Nurture

- Appetite regulation for food is affected by calories from other sources, such as; milk feeds, supplements, tube feeds – even if these are given at night.

- Appetite regulation is also affected by stress – force feeding and stressful mealtimes are the best predictors of faltering growth where there is no medical cause.
Up until 4 or 5 years children’s appetite is determined mainly by their energy and growth needs, after this time they, like adults, begin to modify their eating according to social rules and will learn to :-
Nurture

• Finish what is on the plate.

• Eat when others are eating, even if they are not hungry.

• Comfort eat.

Some children will be more open to external influences to eat more than they need → obesity

(Lumeng JC, Burke LM. Journal of Pediatrics 2006; 149:330-335.)
A ‘fussy’ child will only take small amounts:

- because they are not hungry
- because they are stressed or tired
- because they are being made anxious by the coercive feeding regime

-> growth faltering
Inborn Taste preferences
**Nature**

**Innate taste preferences**

At birth there is a preference for a **sweet taste**

(all other tastes, sour, salt, bitter & umami are neutral or aversive)

*And there seems to be a preference for fat.*
Sweet
Bitter
However

- there are innate differences in bitter taste acceptance

Children an adults can be:-
• bitter supertasters,
• bitter accepters or
• bitter non-tasters

This will affect children’s acceptance of bitter foods

Food acceptance is therefore a **Nature - Nurture** interaction

- We learn to like the foods that we are given – foods that are safe and culturally appropriate

- There are stages of learning in taste acceptance

- There are sensitive periods of acceptance
Learned taste preferences
Developmental timelines

**In utero**
Some weak preferences learned for strong flavours.

**Birth**
Innate preference for a sweet taste
Preference for few tastes, learned from milk diet

**4-6 months**
Window of acceptance for new tastes (solids)
Preference a function of exposure
Preference based on taste and smell

**6-12 months**
Sensitive period for the introduction of solid textures.

**1–2 years**
Preference for food as a ‘gestalt’
Food recognised by appearance.
Beginning of rejection of new foods, and some previously accepted foods

- ready acceptance
- onset of neophobia
- disgust and contamination fears start
Weaning on to solids
4-6 months

• Only needs **small amounts of food** to induce a preference
• **Few exposures** are necessary
• Bitter tastes more difficult
(Parents should be giving the foods **they want their children to eat** when they are toddlers and are eating family meals.)

*Preference is entirely a function of exposure (Except for sweet taste preference)*
Exposure in the 4-6 month period can give quite taste specific preferences.

Peter is 5 months old he was introduced to solid foods at 4 months old. He accepts a mixture of fruit that he is used to having, but shows a disgust response to a new food – broccoli - which has a bitter taste.
At this early stage, preferences for food tastes are learned through exposure. It is the experience not the amount that determines preference.

Few exposures are needed at this age to gain a preference.

Exposure to food is generalised. If many different tastes are given at this age then the infant is more likely to try a new food.
New foods do not have to be given one by one, *a generalised effect is found if many foods are introduced*. At weaning infants were exposed to ‘no variety’ vegetable, ‘variety with daily change’, ‘variety with change every three days’, for 9 days.

Frequency of change rather than number of vegetables predicted new food acceptance. 
Maier et al (2008)

*This generalised effect is long term.*

In an analysis of data provided by parents from the ALSPAC data base, it was found that **early fruit and vegetable consumption - prior to six months** - predicted fruit and vegetable consumption at **7 years**.

Parents were asked to record consumption of home-cooked, raw or ready prepared (baby food jar, tin or packet) fed to their infant by six months.

(Coulthard, Harris, Emmett, 2010.)

Children who ate home-cooked and raw fruit or vegetables at six months were more likely to be eating a higher proportion of fruit and vegetables at 7 years than children given ready prepared fruit and vegetables.

*Early consumption of raw or home cooked fruit and vegetables predicted consumption at 7 years, but consumption of fruit and vegetable from jar, packet or tin did not predict later consumption.*

(The analysis controlled for exposure to fruit and vegetables at a later age point (15 months), and was adjusted to take into account demographic variables.)
<table>
<thead>
<tr>
<th>Frequency 7 years</th>
<th>ready prep veg</th>
<th>ready prep fruit</th>
<th>home ckd veg</th>
<th>home ckd fruit</th>
<th>raw veg</th>
<th>raw veg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salad</td>
<td>ns</td>
<td>ns</td>
<td>0.098</td>
<td>0.094</td>
<td>0.089</td>
<td>0.107</td>
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<tr>
<td>Tomatoes</td>
<td>ns</td>
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<td>0.097</td>
<td>0.111</td>
<td>0.054</td>
<td>0.109</td>
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<td>Peas</td>
<td>-0.026*</td>
<td>ns</td>
<td>0.06</td>
<td>0.057</td>
<td>0.041</td>
<td>0.046</td>
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<tr>
<td>Sweetcorn</td>
<td>ns</td>
<td>ns</td>
<td>0.09</td>
<td>0.074</td>
<td>0.062</td>
<td>0.049</td>
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<tr>
<td>Carrots</td>
<td>ns</td>
<td>-0.028*</td>
<td>0.128</td>
<td>0.086</td>
<td>0.052</td>
<td>0.064</td>
</tr>
<tr>
<td>Other root veg.</td>
<td>ns</td>
<td>ns</td>
<td>0.089</td>
<td>0.054</td>
<td>0.044</td>
<td>0.024</td>
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<tr>
<td>Dk gr. leafy veg.</td>
<td>-0.025*</td>
<td>-0.043*</td>
<td>0.097</td>
<td>0.082</td>
<td>0.055</td>
<td>0.042</td>
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<tr>
<td>Other gr. veg.</td>
<td>-0.024*</td>
<td>-0.03*</td>
<td>0.088</td>
<td>0.056</td>
<td>0.055</td>
<td>0.032*</td>
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<tr>
<td>Citrus frts</td>
<td>ns</td>
<td>ns</td>
<td>0.083</td>
<td>0.052</td>
<td>0.085</td>
<td>0.075</td>
</tr>
<tr>
<td>Other frsh fruits</td>
<td>ns</td>
<td>-0.37*</td>
<td>0.128</td>
<td>0.127</td>
<td>0.087</td>
<td>0.119</td>
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</table>
Texture exposure 6 to 12 months-

- The tongue learns to move solid food around mouth in preparation for swallow.
- Infant learns to recognise food by sight.
- Infant needs to be exposed to tactile stimulation i.e. messy food/messy play.
- Puree and bite and dissolve (yoghurt and crisps) are easier textures
Infants’ chewing skills develop most markedly between the ages of 6 to 10 months, but only if the infant has experience of food in the mouth.

Gisel (1991)

At this age oral motor skills may not be good enough to separate out lumps that are big enough to trigger the gag reflex, from those that can be swallowed using a liquid swallow.

Texture acceptance

The delayed introduction of lumpy solids can lead to problems of acceptance in later childhood. Mason & Harris (2006)

Because:-

• the tongue and the sides of the mouth are not desensitized early,
• oral motor development is delayed,
• the onset of oral defensiveness, towards the end of the first year, precludes acceptance of different food textures.


Feeding difficulties at 15 months.

<table>
<thead>
<tr>
<th>Age of intro.</th>
<th></th>
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<tbody>
<tr>
<td>&lt;6mths</td>
<td>29.1%</td>
</tr>
<tr>
<td>6-9mths</td>
<td>38.6%</td>
</tr>
<tr>
<td>&gt;10mths.</td>
<td>52.3%</td>
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We have looked to see whether this effect is still present in children of 7 years of age – using the ALSPAC data-base.

Children introduced to lumpy solids after the age of 9 months were reported as having more feeding problems at 7 years (food refusal and food ‘fussiness’).

(Coulthard, Harris, Emmett & Northstone, 2009)

The neophobic stage.
Food refusal at 2 years.

Nature!
The end of mere exposure 12 to 18 months – a developmental stage

The start of the neophobic response

When new foods, and some previously accepted foods will be rejected. Foods are rejected on sight.

Toddlers become increasingly reluctant to try new foods during the second year of life – the neophobic stage.

They also stop eating foods that they used to eat. Brown & Harris (2012)

During this process, infants become more aware of the ‘local’ details of food, and refuse to eat food that doesn’t look ‘right’.

Toddlers are more likely to refuse a food if it differs at subsequent presentations.
Furthermore, the highest frequency of colour reported as being rejected was “mixed” and these data are reported in figure 4.4.

However, new and recent research is indicating that children who have been introduced to a variety of foods early in the weaning period are less **neophobic** at the pre-school stage.

Children show a **disgust and contamination response** as early as 20 months. They will reject a food that has been **touched** by a disliked food. They will reject food that is **hidden** in other foods.

*(Brown & Harris, 2012)*
Nature and nurture
Children move out of the neophobic stage because of:

- less emphasis on local features of foods and objects.
- development of food categories
- imitation of other’s behaviours.
- exposure to new foods.
Children **imitate other adults** – and their parents’ eating behaviour, and will try new foods that they see their parents eat. Harper & Sanders (1975)

Children of nursery school age will *imitate the eating habits and food preferences of other children*. Birch (1979)

In a study by Birch et al (1987)

69% of 2 year olds refused a novel food but only
29% of 3 year olds
1% of 5 year olds

So neophobia decreases with age, but the number of exposures required to induce a preference increases with age, from one or two of certain tastes in the first 6 months, to 14 or so in later childhood.
Childhood temperament & Sensory sensitivity

Nature
Child temperament

Are some children more difficult than others about accepting foods?

Children differ according to their innate characteristics and the degree to which they are sensory sensitive. Both of these affect food acceptance.

Nature
There are inherited traits which determine which foods might be rejected or accepted.

The foods which are most likely to be rejected are **those of a difficult texture**

• Meat
• Fish
• Fruit
• Vegetables

**Not fatty foods of smooth texture** such as yoghurts

(Breen, Plomin, & Wardle,. Heritability of food preferences in young children. Physiology & Behaviour 2006; 88:443-447.)
Innate differences.

The extent to which children and adults are willing to accept a new food differs along a continuum - we are either **neophobic** or **neophiliac**.
The dimensions of appetite regulation and food acceptance

- Neophobic
- Neophiliac
- Autistic spectrum

- Under
- Over
- Appetite regulation
- Food acceptance

Growth faltering
Children who are ‘fussy’ eaters tend to score **high on emotionality** and **low on sociability** on measures of child temperament.

Some children find it difficult to accept foods if they differ **from the known prototype**. They do not progress from the neophobic stage. These children tend to be.......
Sensory sensitive.
Children with these problems can show food refusal from:
• the introduction of purees,
• the introduction of lumpy textures,
• 18 months.

These children can dislike touch, sound, taste and smell. Visually they are hyper-aware of changes - especially to food packaging.
Extreme food refusal. *(Avoidant/restrictive ED)*

**Innate disposition:** -

- child shows extreme *anxiety* if offered new foods, or foods that they don’t like;
- show *brand loyalty* and eating specific to context.
- child may *gag or vomit* if offered disliked foods.
- usually *boys.*
- often associated with *ASD*

*(Paterson & Peck J. Human Nutrition and Dietetics 2011 24 277-310)*
Parental factors

Nurture

How might parents contribute to food refusal?

- Authoritative?  
  *(prompt and structure)*
- Authoritarian?  
  *(associated with force feeding)*
- Permissive?  
  *(eat what you like)*

Strategies that increase intake of new foods:

- Modelling
- Prompting (possibly)
- Exposure

Strategies that decrease intake of new foods:

- Rewarding consumption of one food with another
- Coercion
- Sitting in front of new foods until it is eaten
Have we looked at all definitions?

- Variable acceptance, eating more on one day than another; eating some foods one day but refusing them on another. *(Nature and nurture)*
- Not taking in sufficient calories to maintain growth along expected centiles. *(Nature and nurture)*
- Not accepting a range of foods that would be optimal in a ‘healthy’ diet. *(Nature and nurture)*
- Rejecting foods of specific texture. *(Nature and nurture)*
- Refusing new foods or foods that have been eaten before. *(Nature and nurture)*
Finally - Advice for parents

DO ->

• Introduce the foods you want your child to eat as early as possible

• The experience, not the amount is important.

• Move from mash to ‘bite and dissolve’ foods as quickly as possible (from 7 months).

• Encourage the child in ‘messy play’.

• Eat the foods you want your child to eat.
DON’T ->

• **Force** feed.

• Leave **long gaps** between meals

• Put **disliked** food on the plate next to liked food.

• Try and ‘**hide**’ disliked foods

• Expect all children to eat **as ‘well’** as one another.
Above all Don’t Panic - fussy children do grow out of it - although not until late childhood.
For extremely fussy children

Avoidant/restrictive ED.

This is an innate disposition: -

• child shows extreme anxiety if offered new foods, or foods that they don’t like.

• child may gag or vomit if offered disliked foods.

• usually boys.
Energy intake must be the first priority. Dietary balance must take second place.

DO->

✓ Give only the foods that they will eat.
✓ Give short, but frequent eating opportunities.
✓ Encourage and promote messy play.
✓ Help the child to generalise their food choices.

Look for other problems that might be worrying the parent - this type of food refusal occurs more frequently in children who are on the autistic spectrum.