Children cooking and eating insects as part of a teaching program - effects of cooking, insect type, exposure and food neophobia

Ching Yue Chow*,
Reisya Rizki Riantiningtyas*,
Michael Bom Frøst
*These two authors contributed equally to the work

Design and Consumer Behaviour,
Department of Food Science
UNIVERSITY OF COPENHAGEN

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Overview

Background
• Eating insects
• Insect food barriers: Disgust, Accept, Cooking and Food Neophobia

Experimental setup
• Using teaching activities as experimental settings
• Cross-sectional and between-participants experimental design

Results
Discussion and conclusions
Eating insects

- Substantial fraction of the world food cultures have insects as ingredients
- It is often a cherished seasonal food, not a cheap sustenance food
- Yet remarkably absent in modern westernized food culture and habits
- Until diet and protein sustainability became a pressing issue.
Barriers to eating insects in Europe

Food industry complex perspective

• EU legislation to accept insects as food has been slow
• High production cost, as efficiency of scale is not yet obtained
  • INvaluable project WPs work to overcome this
  • Relies on robotics and automation of handling processes

Consumer perspective

• Initial accept: Need to overcome culturally based disgust
• In addition - low familiarity and low knowledge gives low accept
Disgust, accept, neophobia and cooking

- Four types of reasons for food rejection
  - distaste, disgust, inappropriateness, and danger

- Disgust types
  - core disgust, animal reminder disgust, and contamination disgust
  - for insects all can be relevant – cooking can decrease animalness

- Interest in and accept of unfamiliar foods is modified by food neophobia
  - Food Neophobia Test Tool is validated for use with children
  - Much work to understand children’s accept of vegetables, very little with other food groups

- Tactile interactions through e.g. cooking can create positive experiences and increase familiarity to novel foods
  - Not tested in this age group and with insects
Experimental setup

- Forskningens døgn – Danish science festival aimed at school children
- Recruited more than 240 11-13 year-olds (5th and 6th grade)
- Three hour teaching with 4 different activities
  - 1. Answer familiarity with insect foods, WTT insect foods and Food Neophobia test tool (FNTT 9 item scale)
  - 2. Lecture about insects as food
  - 3. Cooking and tasting insect food (hedonic 7-point smiley scale)
  - 4. CATA and hedonic response to six types of roasted edible insects (unreported here)
- For logistic reasons all participants on a day had same test order in 3.
  - Day 1: cook and taste self-made food first, taste other-made food second
  - Day 2: taste other-made food first, cook and taste self-made food second
  - Insects – Grasshoppers (GH) and Mealworms (MW) balanced within day
Insect cooking activities – making oatmeal balls

Logistic concerns lead to ‘dry and cold’ cooking activities

1. Prepare roasted insects
   GH: Remove wings, legs and cut body into small pieces
   MW: Crush into rough powder

2. Make oatmeal balls from pre-weighed set of ingredients (oats, chocolate, peanut butter*, butter and honey)

Recipes developed to have recognizable flavours from the insects, but be dominated by other ingredients

*due to allergy concerns teachers were informed of this before arrival
Results:

- Teaching activity and not all parents returned consent forms regarding use of data for scientific purposes (GDPR)
- 139 of 148 enrolled children completed all tasks, questionnaires, and tasted (some) of the foods.
  - No one was pressured by experimenters to taste insects
- No differences were found between children participating in the two study days

<table>
<thead>
<tr>
<th>Main effect</th>
<th>Factor</th>
<th>Hedonic mean*</th>
<th>Standard deviation</th>
<th>p-value</th>
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<tr>
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<td>1.8</td>
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<td>Mealworm</td>
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<td>1.8</td>
<td>0.729</td>
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<td></td>
<td>No (not self-cooked)</td>
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<td></td>
<td>2nd time</td>
<td>4.6</td>
<td>1.8</td>
<td></td>
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</tbody>
</table>

*Hedonic scale 7-point smiley
Insect type x cooking effect (p=0.029)

![Graph showing estimated marginal means of liking for insect type and cooking condition.](Image)

- **Insect**: GH (light blue) and MW (red)
- **Tasting condition**: Not self-cooked and Self-cooked
- **Estimated Marginal Means of Liking**
- **Error bars**: 95% CI
- **NS**: Not significant
Effect of Neophobia

Correlation to hedonic rating ($r=-0.468$, $p<0.001$)

Neophobia levels according to the frequency distribution of FNTT score (1st quartile: Neophilic; inter-quartile: Neutral; 4th quartile: Neophobic),
The unexpected order effect

- Anticipation: First exposure to unfamiliar food should get lower hedonic response, due to low familiarity and some resistance to try insect foods
- Observation: First exposure received highest rating

**Assimilation-contrast effect explains this**

- Initial very low hedonic expectations leads to a contrasting higher response as the oatmeal balls where much more palatable than expected
- In second exposure the expectations are adjusted to perception from first exposure, and the result is a lower response, assimilated to the now higher expectations
Animalness and cooking process differences

• Grasshopper
  • Larger insect
  • Very visible eyes and body parts
  • Tear of wings
  • Cut into smaller parts with knife
  • Less liked, and higher animalness in finished oatmeal balls
  • High animalness overcome better by the drastic transformation

• Meal worm
  • Smaller insect
  • No tearing of body parts
  • Crush into rough powder with spoon
  • More liked, and lower animalness in finished oatmeal balls
  • Hedonic response not affected by less drastic transformation
Conclusions

• This cooking activity alone did not increase hedonic response to insects food
  • Suggest to increase the dose of cooking and test again
• As expected neophobia level also affects children’s accept of insect foods
• Insect foods may be so novel and disgust-provoking that expectations are radically different from actual product performance
  • Contrast effect suggest this
• The more radical transformations during cooking better decreases animalness-derived disgust for Grasshopper.
My very talented co-authors

In search of new opportunities after completion of their MScs in Food Innovation and Health by end of September

E-mail addresses

Ching: chingyuechow@gmail.com
Reisya: reisyarizki@gmail.com
Thank you for your attention

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Photo credits: Charikleia (Klelia) Karagiannaki, Julia Sick, Anna Hartmann

References