Promoting children's acceptance of fish through sensory-based experiments and experiential learning: Breaking through the disgust barrier

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**Introduction**

Danes eat less fish than recommended by health authorities. Children in the age range 10-17 years only eat 106 g fish per week, one third of the recommended 350 grams per week.1 Considering that Denmark has more than 8,500 km of coastal line, it is not the lack of access to good fishing waters. Eating fish, especially fatty fish, contributes with the polyunsaturated fatty acid DO3 to the diet, which has a positive effect on cognitive function and reduces the risk of cardiovascular diseases.2

Exposure to unfamiliar or novel healthy foods like fish, vegetables, fruit etc. can increase children’s diet variety.3,4 A varied diet including healthy foods is assumed to be beneficial for health and part of a healthy lifestyle, also later in life.1,2 As humans we evaluate food based on sensory properties, anticipated consequences of ingestion, and ideas about its nature or origin.1 In order to accept a novel food, it has to be categorized as “safe”.3,4 Furthermore acceptance is also influenced by the child’s habits, the context and social setting in which the food item is meet.1,2

Fresh whole fish still have all their organs, have a particular smell and natural slime-cover. Visual, olfactory, and touch perceptions are all tough barriers to overcome in the acceptance process; before even getting to the tasting part.5

In Danish schools, the course Family and Consumer Sciences (FCS) is mandatory for one year in 4th, 5th, or 6th grade, which makes it an unique arena for learning and promoting diverse and healthy food habits.

The objective of this study is to investigate the experiential and sensory-based experiment: Gyo-taku (a traditional Japanese fish printing technique) as a way of breaking through the disgust barrier when it comes to children accepting fish.

**Methods and Materials**

**Intervention design**

The gyo-taku experiment is the first experiment in a 5 week theme course on fish developed for FCS in 5th – 6th grade (5 x 3 lessons of 45 min.). This experiment is suitable for 2-3 lessons of 45 min. As part of the 5 week theme course the pupils will learn how to evaluate freshness, gut, filet, cook, and make a recipe. Furthermore, they will learn about the senses, nutrition, food waste, preservation techniques, food culture, and sustainable fishing. The 5 week theme course on fish was developed for the main intervention, that was conducted in the spring 2017 with 16 classes on Zealand (n=321).

In the gyo-taku experiment the pupils work together in groups. They pick up the fresh fish, followed by washing it under cold water to remove the slime. After they dry the fish and place it on a cutting board. Squid ink is applied by using a sponge. A piece of paper is placed under the ink and by striking the ink of the fish appears. The paper is removed and the gyo-taku is done.

**Study design and procedure**

The observational study was conducted during spring 2016 and 2017, as a part of the main intervention based on mixed methods research strategy. Observations were conducted as participant observation, where the observer is an active part of the situation.7 Field notes was written down during and after the experiments, followed by categorization in a theme matrix. During paper an image special focus was on pupils’ first reaction when seeing the fresh fish, and how this reaction developed or changed during the sensory-based interaction.

**Study population**

Pupils age 11-13 years from 5th - 6th grade. The pupils came from six different public schools on Zealand (n = 129).

**Results and Discussion**

Typical initial reactions were disgust. This was expressed both verbally (looked disgusting, smelled ‘fishy’ and felt ‘slimy’) and with mimics and sounds indicating disgust. The first barrier was to pick up the fish. This pupils handled this by supporting each other: They typically were two to pick up the fish and wash it. It was a “us-against-them” (the fish), which Sennett (2013) calls a win-win exchange strategy, when working together on experiments11.

Over the Gyo-taku process stage, the disgust reaction started to change to curiosity and exploration. Studies combining taste play as a way of promoting food acceptance for the age group of this study population could not be identified, but Nederkoorn, Jensen, and Havermans (2010)16 and Courtland and Thakker (2015)17 found a tendency of reduced neophobia in relation to fruit and vegetables as a result of tactile play in pre-school children. This is supported by Sennett (2009): "play is a school for learning”.

Even though disgust signs seemed to reappear in the filleting process, this was quickly converted to “this is how it is approach. Also even though the pupils frequently asked for advice in the process, they were very explicit about not wanting practical help. They wanted to do it themselves; expression of autonomy, which Ryan and Deci (2000) has identified, in the theory of self determined behavior, as one of the main factors in promoting motivation and engagement together with competences, and relatedness16. This could also be an expression of what Sennett (2009) calls the emotional reward for attaining a skill: Pride in their work.16

The majority of pupils chose to taste their fried fish filet; also pupils that showed intense disgust in the beginning. This observation is supported by Birch (1999), that preferences for food are learned via practical experience with food.11 Furthermore, by findings done by Muscaton and Tuorila (2010) in Finland4, Alfret and colleagues (2016) in Spain5, and Jasper-Ramler and colleagues (2016) in USA9. Nevertheless studies on experiential sensory based education in schools have yet to demonstrate a time stable change in food preferences and liking for novel food.

**Conclusions**

This observational study showed that by using the fish as a creative and sensory-based medium facilitated curiosity and thereby exploration of other aspects of the fish, e.g. the anatomy of the fish. Furthermore, this experiential teaching method was observed to deeply engage the pupils in their class work. The observations also revealed that the pupils’ disgust, as a result of the visual, olfactory and tactile challenges from working with fresh whole fish, can be overcome through craftsmanship, autonomy and working together in groups.

Finally, observations indicated that disgust - being a point of disgust, then the disgust declines during the printing process, but takes a small loop back starting the filleting. In the end, when the filets are fried, observations showed that liking is predominant. Probably because it now looks like something the pupils know, and categorize “safe” to eat.