



# What is healthy food? Objective nutrient profile scores and subjective lay evaluations in comparison



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## ABSTRACT

To date, it is unclear how consumers evaluate the healthiness of individual foods and meals and how consumers' perceptions are related to expert opinions. This knowledge is essential for efficient communication of nutrition information with the goal of promoting healthy eating.

This study used the fake food buffet method to investigate health perceptions of selected meals and of 54 individual foods and beverages. Lay consumers' subjective healthiness evaluations of meals and foods were compared to objective nutrient profile scores, which were previously shown to correlate highly with expert opinions.

The results show that nutrition profile scores and lay evaluations were highly correlated, which indicates that lay people used similar criteria as experts to evaluate the healthiness of foods. However, lay consumers tended to neglect the amount of saturated fat, protein and sodium for their judgments. Also, it was found that while lay consumers were quite able to evaluate single food products, they had difficulties in evaluating entire meals.

Future interventions should focus particularly on educating the consumer about the negative effects of diets high in salt and saturated fat and they should improve the consumer's abilities to evaluate entire meals.

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## 1. Introduction

Understanding how people make food choices is highly relevant for prevention of disease and promotion of healthy eating. Theoretical models of food choice suggest that consumers' beliefs and assumptions about food are key determinants of food choice (Furst, Connors, Bisogni, Sobal, & Falk, 1996). Besides taste, naturalness and convenience, healthiness is a very important product attribute that shapes individuals' ideas about food products (Grunert, 2006). For the last 50 years, health has been of increasing importance for consumers' food choices, and analyses of consumer food quality perception indicate that health and sensory considerations have about equal weight (Grunert, 2006).

Experts and lay people would probably agree that there are some 'healthy' food groups, such as fruits and vegetables, of which one should eat more, and others, which should be consumed in

moderation, such as sugary and fatty foods. However, to date, it is largely unknown how consumers evaluate the nutritiousness of foods and how they weigh different nutritional criteria to make their judgments on single foods and much less on entire meals (Paquette, 2005). This knowledge is essential to target interventions that aim to improve eating behavior and public health. In particular, understanding how consumers judge single foods and meals to decide whether something is beneficial for them could help tailor product information and improve nutrition education.

To determine whether a food is healthy, experts consider a variety of criteria such as energy density, type of fat and sodium content. To put this complex dietary advice into practice, one-dimensional guides, such as the Swedish Keyhole logo (LIVSMEDELSVERKET National Food Agency, 2007) and the international healthy choice label (The Choices International Foundation, 2014), have been developed to help consumers put generalized dietary advice into practice. Besides providing assistance with simple decisions for the consumer, the labels should also promote product reformulation and development of healthier products (The Choices International Foundation, 2014). The logos guarantee that a product has a reduced amount of fat, sugar or salt,

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and/or has a high amount of fibre compared to other products within the same food category.

However, relative guiding schemes have certain drawbacks; a food that is healthier within a category of unhealthy foods, still might not be healthy. Also, labels such as the Keyhole logo usually do not include unpacked foods like fruits and vegetables.

To solve these issues, nutrient profiling systems that combine several product attributes into a single score have been developed. Nutrient profiles (NP) aim to categorize foods according to their nutritional composition, while taking into account current objectives of nutrition policies (Lobstein & Davies, 2009). NP scores can be used to show that a product is nutritionally better than another and are therefore expected to set incentives for product reformulation by the industry (Rayner, Scarborough, & Lobstein, 2009).

One very elaborate nutrient profiling system that combines several different nutrients into a single score is the UK Ofcom NP score used by the UK Food Standards Agency (Rayner et al., 2009). This particular profiling system was used to set boundaries for advertisement bans of unhealthy food products to children and reflects experts' opinions well (Lobstein & Davies, 2009).

Yet, although NP scores allow objective evaluation of the healthiness of foods, to date little is known about how lay consumers weigh various nutritional criteria to evaluate the healthiness of single foods or even meals and whether consumers' perceptions are related to NP, which reflect expert opinions. A review article on consumers' perceptions of healthy eating by Paquette found that food characteristics such as naturalness, fat, sugar and salt contents were relevant for shaping people's ideas about food (Paquette, 2005). Another study on the perception of the healthiness of soft drinks found that fruit content was positively related to health perception, while sugar concentration was negatively associated with healthiness evaluations (Bucher & Siegrist, 2015).

Based on this previous research, we therefore hypothesize that fruit/vegetable/nut content is positively associated with health perceptions of consumers while sugar, fat and salt content could be predictors for a more negative evaluation of a food. To test this hypothesis, we invited participants to serve themselves a meal from an extensive buffet of fake foods and let the respondents evaluate the healthiness of all individual food products on the buffet as well as the entire meal. Macronutrients as well as fruit/vegetable/nut, salt and fibre content were used as variables in regression analysis to predict perceived healthiness ratings. Furthermore, consumers' subjective evaluations of the individual foods and the meals were compared to the Ofcom NP as an objective evaluation measure.

## 2. Method

### 2.1. Study subjects

Persons taking part in the study were recruited via the subject pool of the University of Zürich. A total of 85 people (41 women, 44 men) were included in the final analysis. Most of the participants were students (78%). There were 39 people (44.1%) who were nutritional gatekeepers, meaning that they are responsible for purchasing and preparing food at home. Participating persons were between 19 and 45 years old ( $M = 25.9$ ,  $SD = 6.1$ ), had never participated in a study with fake foods and were on average normal weight (BMI  $M = 22.3$ ,  $SD = 3.1$ ). People studying food or nutrition sciences, following a medical diet or suffering from an eating disorder were excluded from participation. Participants received

monetary compensation (10 CHF) and were debriefed after task completion.

### 2.2. Study procedure

To investigate consumers' health perceptions, a buffet containing various replica foods suitable for a lunch was used. This 'fake food buffet' method was developed and validated by Bucher et al. (Bucher, van der Horst, & Siegrist, 2012). It was shown that food choices from the fake food buffet agreed well with food choices from a corresponding buffet with real food products and that participants' selected meals that were related to their individual dietary needs (Bucher et al., 2012).

The participants were instructed to serve themselves a meal they would normally eat for lunch if they had the given selection available. Therefore, a variety of 54 food items was arranged similar to a standard buffet used in previous studies (Bucher, van der Horst, & Siegrist, 2013). The buffet contained a selection of starters (salad), main dishes (meat and fish, vegetables and starchy foods), desserts (sweets and fruits) and beverages. All food items were labeled in German. The fake food items were made of polyvinylchloride and most of them were produced by Döring GmbH in Munich, Germany. Fish, fish sticks, rice and the apple tart were obtained from Replica Ltd. in London, UK.

A serving tray ( $38 \times 58$  cm; area = 2204 cm<sup>2</sup>) and a selection of dishes (bowl:  $d = 14$  cm; bottom plate:  $d = 16$  cm) were provided to the participants. Participants were either provided with small or standard sized plates (Experimental condition). However, consistent with previous literature (Rolls, Roe, Halverson, & Meengs, 2007), neither the total energy content of the meals ( $M_{small} = 3424$  kJ,  $SD = 1662$  kJ,  $M_{normal} = 3337$  kJ,  $SD = 1194$  kJ,  $t_{(83)} = -.277$ ,  $P = 0.782$ ) nor the macronutrient compositions differed between the small and the standard sized plate conditions. Data were therefore pooled for the analysis of the health perceptions.

The study was conducted from October to November 2013 in an experimental room at ETH Zürich. Each participant was invited individually. Three pretests were conducted before the beginning of the experiment to standardize the experimental procedure.

After participants had selected their meal, they filled out a questionnaire on a computer. The questionnaire was programmed with the software Inquisit (Millisecond Software, Seattle, USA). Meanwhile, the experimenter photographed the meal, and counted or weighed the food items with a scale (Mettler, Toledo) out of the participant's sight. The fake food buffet was reconstructed after every task, so that the conditions were identical for each participant. The study lasted between 20 and 30 min per person.

### 2.3. Measures

The questionnaire contained a series of questions concerning the perception of the foods and participants' eating behavior. First, the participants estimated which percentage of their daily energy need would have been covered by the chosen meal. Next, the overall perceived healthiness of the selected meal ( $OPH_{meal}$ ) was rated from 1 = "not healthy at all" to 6 = "very healthy". People further rated how much they liked the 54 foods ( $L_{food}$ ), on a scale from 1 = "don't like at all" to 6 = "like very much" (In German: Wie gerne mögen Sie ... "überhaupt nicht gerne" (1), "sehr gerne"(6)). In addition, they rated foods for their perceived healthiness ( $H_{food}$ ) from 1 = "not healthy at all" to 6 = "very healthy".

Each participant's health consciousness was evaluated with 10 questions on a 6-point scale derived from Roininen et al. (Roininen et al., 2001) and Jayanti and Burns (Jayanti & Burns, 1998) (i.e. "I

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