# HEALTHY FOOD RECOGNITION: THE IN-STORE DECISION-MAKING PROCESS OF YOUNG SHOPPERS

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## Abstract

*This paper presents the results of empirical research designed to examine the in-store decision-making process taken by young shoppers when selecting healthy cereal flakes.*

*The research was carried out in January 2018 on a sample of 66 students (17-18 years old) at 3 high schools located in the Wielkopolska region. Data collection was performed through an experiment and the PAPI technique. The experiment was carried out in the ShopLab at the Poznań University of Economics and Business – a research laboratory organized as a mock-up of a convenience store and dedicated to empirical studies of in-store purchasing behaviours.*

*The main findings show that young shoppers consider nutrients (in particular sugar content), packaging, brand and type as the most important characteristics of cereals as a product, with nutritional information being the main decision-making criteria used for selecting healthy cereals. Empirical studies conducted with the use of an eye-tracker confirmed compliance between declarations and actual behaviour only in case of nutrients. In other cases there were significant differences, as much as 50%, between the former and the latter.*

**Keywords:** *healthy food, in-store decision-making process, young consumer buying behaviour, eye-tracker*

**JEL Classification:** *M31, Q13*

# 1 Introduction

The observed increase of interest in healthy food (Fiore et al. 2017; Hoek et al. 2017; Ghvanidze et al. 2016) has its origin in several phenomena. One of them is the growing number of obese people, which reveals the size of the epidemic and which is associated with the threat of numerous illnesses: diabetes, heart disease, hypertension (Sigurdsson, Larsen and Gunnarsson 2014; Noble et al. 2007). In connection with this numerous national programmes have been launched to promote a healthy lifestyle; such as, among other things, introducing healthy food into the mass catering offers of schools, kindergartens and hospitals (Yeh et al. 2008). Actions have also been undertaken by entrepreneurs who have increasingly introduced healthy food into their offers in stores (Śmigielska 2013) and restaurants. Unfortunately, these activities are largely ineffective (Francis et al. 2008), which can be attributed to the methods of communicating their values (Mahr, Kalogeras and Odekerken-Schröder 2013). It should be kept in mind that in the case of the retail trade, healthy food is not always displayed as a separate category, in many situations healthy products are displayed among numerous product categories, e.g. breakfast ones. This raises the cognitive (but also practical) problem of choosing a product that meets healthy requirements in the best way, and the article presents the results of a survey which was carried out along with an experiment to examine the process of in-store decision-making taken by young shoppers when selecting healthy cereal flakes.

# 2 Related Work

The meaning of healthy food cannot be overestimated as it normalizes the biological systems and physiological functions of the body, and maintains human well-being (Norazah 2013; Lu and Hsu 2006). It has been found that consumers have an increasingly active interest in sustainable and healthy food, although the problem of healthy food and its recognition is not a new one and has been a subject of research for almost 50 years (Lenahan et al. 1972; Jones and Weimer 1980; Capps and Schmitz 1991). In particular, attitudes towards healthy food and shopping intentions have been examined (Tung et al. 2012), but the decision-making process of purchase has relatively rarely been studied (Sigurdsson, Larsen, and Gunnarsson 2014), especially at the point where it often takes place – in the store. In the recent years many research works have demonstrated that machine learning and computer recognition techniques can help build systems to automatically distinguish diverse foods and to estimate the quantity of food (e.g. Wu and Yang 2009). But it is a much more complex task to recognize the quality of food just by

looking at a pack of flakes that is full of information: brand names, signage, numbers and pictures. So the main issue addressed in this research is to determine the stages of the in-store decision-making process.

# 3 Research

The main aim of this research was to identify what criteria are taken into account when choosing a product which the buyers consider to be healthy. The study was based on products belonging to the category of breakfast cereals. It was assumed that choosing a healthy product would on the one hand force the consumers to analyse the ingredients from which breakfast cereals are made, and on the other hand it would decrease the importance of such elements of the packaging as the brand or advertising slogans. In addition, the research aimed to discover how the decision about choosing a product is made in the store. The authors also wanted to compare buyers' declarations regarding the selection criteria with their actual behaviour.

The choice of research methods and tools was determined by the research aims, and the task of comparing declarations with actual behaviour required the use of triangulation. The diagnosis of behaviour was conducted by means of a laboratory experiment, whereas the declarations were examined by means of a questionnaire. The experiment also enabled the mapping of the in-store space and an eye tracker was used as a research tool during the experiment. The people participating in the experiment were given the task of choosing the healthiest breakfast cereal (see next chapter).

## 3.1 Methodology

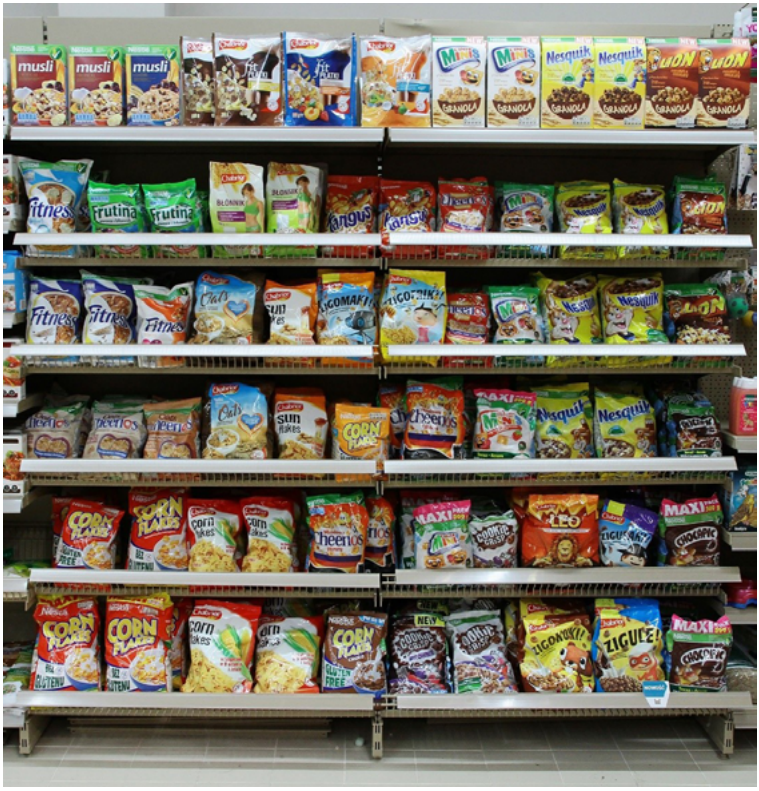
The experiment was conducted in a laboratory called a ShopLab, which serves to analyse the in-store behaviour of shoppers. For this reason the ShopLab was designed as a mock-up of a convenience store. The laboratory is equipped with a number of shop fittings such as a fruit and vegetable rack, a refrigerated display case for fresh and processed meat, a bakery display case, promotional display racks, high and low shelving, as well as a cash point. The ambient conditions in the laboratory can be controlled and the laboratory occupies a 50m$^2$ room in a building of the Poznan University of Economics and Business.

The laboratory was appropriately prepared for the purpose of the experiment. The window blinds were closed to block out daylight and diffused cool lighting was used. The temperature inside the laboratory was the same as the temperature in the rest of the building. No music was played and no scents were used during

the experiment. The intention was to limit the possible factors that could distract the participants' attention from their task.

Breakfast cereals, which were the principal element of the experiment, were placed on two identical one-meter wide display racks, each having six shelves. A total of forty-four items belonging to the breakfast cereal product category were displayed on the shelves. The placement of the cereals is shown in Figure 1.

Figure 1 **The placement of breakfast cereals on the display racks**




*Source:* Own compilation.

The experiment made use of SMI Eye Tracking Glasses 2 Wireless (SMI ETG 2w). The sampling rate was set at 60Hz, and the scene mode at 1280*960, 24Hz. The collected data was analysed using the SMI BeGaze software 3.7.42. Prior to the experiment, each participant was subjected to a calibration procedure. A one-point calibration was used at first, but when the results were not satisfactory a three-point calibration was used.

The participants in the experiment were 70 students attending three secondary schools from the Wielkopolska region (Poznań, Śrem, Słupca). They were 17 or 18 years old; with 54% of the surveyed group being female, 46% male.

### 3.2 Experimental scenario

Before the experiment each person was informed that participation in the experiment is voluntary and can be stopped at any time. All the participants were gathered in a room located next to the ShopLab. Each of them was individually taken to the laboratory, where they put on the mobile eye-tracker and underwent the calibration procedure. Then the participant was presented with the task of choosing the healthiest breakfast cereal. They were asked to behave 'as during normal shopping' – that is, if they wanted, they could pick up the products, look at them, compare them, etc. The participants were instructed to put the selected packet of cereal in a designated place and informed that there was no time limit. After ensuring that the participant understood the nature of the task that they were asked to perform, they were led to the shelves with the breakfast cereals. In order not to exert any pressure on the participant, the researcher left the ShopLab for the duration of the experiment. After making their selection, each participant was asked to fill in a short anonymous questionnaire, which concerned such issues as the frequency of cereal consumption, the person in the household responsible for purchasing breakfast cereals, and, above all, the declared criteria on the basis of which the participant selected the cereal.

Every effort was made to ensure that the people who had completed the experiment did not contact those who were waiting for their turn.

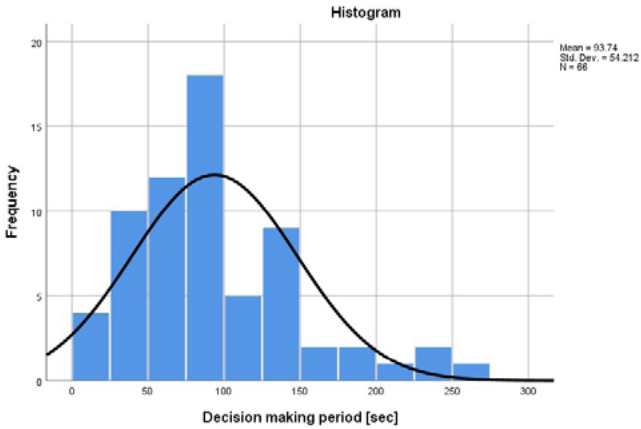
## 4 The Results

The final analysis was based on data collected from 66 participants. Four people had to be excluded due to the low quality of the obtained eye-tracking data (for example, lack of a point indicating the place of eye fixation). The exclusion of the four cases, however, did not alter the gender structure of the participants: females accounted for 54.5% of the group and males for 45.5%.

The data collected was used to calculate the basic parameters of the experiment (Table 1). The decision making period ranged from 10 seconds to 268 seconds (4 minutes and 28 seconds). The mean was 94 seconds, the standard mean error 7 seconds, and the median 85 seconds. The frequency distribution (Figure 2) demonstrates moderate positive skewness – 50% of participants needed less than 90 seconds to make their decision which accounted for 33% of the

maximum process length. The small value for the standard mean error (relative to the experimental mean) indicates that the experimental results can be treated as an accurate reflection of reality.

Figure 2 **Distribution of decision-making intervals**




*Source:* Own compilation.

Table 1 **Statistics for decision making intervals**

| Decision making interval statistics | Value (sec) |
|---|---|
| **minimum** | 10 |
| **maximum** | 268 |
| **mean** | 93.74 |
| **standard mean error** | 6.67 |
| **median** | 84.50 |

*Source:* Own compilation.

Based on the experimental results, the in-store decision-making process for selecting healthy cereals has been defined as consisting of four activities:

1. Shelf eye study
2. In-hand nutrition facts study
3. In-hand package design study
4. Product selection

The first three activities can be performed multiple times in random order; the fourth activity is performed only once and finishes the process.

In the *Shelf eye study* activity, a two second fixation was assumed as a threshold; that is, participants had to hold their gaze steady facing a specific product for at least two seconds to make this product considered as 'eye-studied'. It was deliberately decided to allow such a long period of time to ensure that fixing their gaze on the specific product was the result of a participant's intentional action and not just a symptom of an 'ordinary' visual process where there are involuntary fixations lasting from 200 to 500 milliseconds (Wedel, Pieters 2015).

The *In-hand package design study* activity included all the actions of a participant in reaching for a cereal package, and then (while keeping the package in hand) holding their gaze for more than two seconds on at least one of the package's graphical elements; e.g., buzzwords, logo, etc.

The *In-hand nutrition facts study* activity also assumed holding a cereal package in hand; however, only cases where the gaze was fixed on a table of nutrition facts for more than two second were taken into account. Because such a table is typically located on the back of the package, the activity required turning the package around.

The scope of information obtainable during the *In-hand package design study* was to some extent convergent with that obtained during the *Shelf eye study*. However, it was assumed that the *In-hand nutrition fact study* and to a lesser extent the *In-hand package design study* activity indicated a more intense engagement by participants in deciding (selecting) a specific product as being healthy.

The experiment made it possible to identify the important elements in participants' behaviour. The following table (Table 2) depicts the number of products examined by participants along with specific activities performed in the process.

Table 2 **The number of products examined by participants and the specific activities performed in the process**

| Number of brands | Shelf eye study (percentage of participants) | In-hand nutrition facts study (percentage of participants) | In-hand package design study (excluding nutrition facts) (percentage of participants) |
|---|---|---|---|
| **0** | 54.5% | 19.7% | 54.5% |
| **1** | - | - | - |
| **2** | 6.1% | 15.2% | 19.7% |
| **3** | 12.1% | 13.6% | 12.1% |
| **4** | 6.1% | 9.1% | 9.1% |
| **5** | 4.5% | 9.1% | 1.5% |

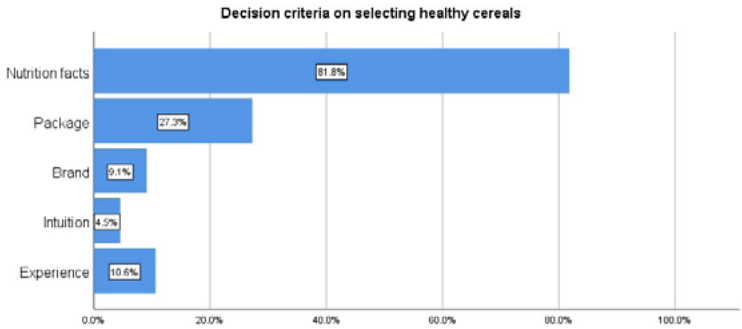
| Number of brands | Shelf eye study (percentage of participants) | In-hand nutrition facts study (percentage of participants) | In-hand package design study (excluding nutrition facts) (percentage of participants) |
|---|---|---|---|
| **6** | 4.5% | 15.2% | - |
| **7** | 1.5% | 9.1% | 3.0% |
| **8** | 4.5% | 1.5% | - |
| **9** | - | 4.5% | - |
| **10** | - | - | - |
| **11** | 30.0% | 1.5% | - |
| **12** | 1.5% | - | - |
| **13** | - | 1.5% | - |
| **14** | 1.5% | - | - |
| **Total** | 100.0% | 100.0% | 100.0% |

*Source:* Own compilation.

The findings show that a much greater percentage of respondents examined the composition of the cereal rather than just the package design. Only 19.7% did not scrutinise the nutrition facts relating to any of the products (with the largest number of products examined in terms of ingredients being 13); and as many as 54.5% did not pick up any product simply to look at the package design (without inspecting the nutrition facts). This essentially means that they did not examine such elements of the packaging as the brand or type of cereal. The largest number of products picked up in order to peruse the packaging was 7. The limited role of package design is also evidenced by a high percentage of people (over 50%) who, when looking at the shelves, did not focus their eyes on any specific product for more than 2 seconds. This may indicate that young consumers who are looking for healthy breakfast cereals focus their attention mainly on the nutrition facts. It is worth noting that none of the products used in this study (31) had information about the ingredients on the front the packaging, there were only statements relating to, for example, the product having a low sugar content or being gluten-free.

The results of the survey conducted after the experiment indicate that there are two issues that significantly dominate declarations as regards to the decision-making criteria for selecting healthy cereals: the respondents unambiguously indicated nutrition facts the highest (82%); with the next criterion, package design, accounting for only 27% (Figure 3).

Figure 3 **Decision-making criteria for selecting healthy cereals**




*Source:* Own compilation.

## 4.1 Analysis of behaviours in the decision-making process vs. declarations

Table 3 presents a comparison of declarations vs. actual behaviours demonstrated by participants during the decision-making process.

Table 3 **Comparison of declarations vs. actual behaviours demonstrated by participants during the decision-making process**

| Decision-making criteria declared for selecting healthy cereals | Shelf eye study during the experiment (percentage of participants) | In-hand nutrition facts study during the experiment (percentage of participants) | In-hand package design study during the experiment (percentage of participants) |
|---|---|---|---|
| **Nutrition facts** | - | **87.0%** | - |
| **Package design** | **50.0%** | - | **44.4%** |

*Source:* Own compilation.

As mentioned earlier, one of the objectives of this study was to compare the participants' declarations regarding their criteria for the selection of healthy cereals with their actual behaviour during the experiment. The data presented in Table 3 indicates that the declarations did not correspond to in-store behaviour. However, the extent of these discrepancies varies. The smallest difference occurred with regard to nutrition facts. In this case, 87% of the participants who

in the questionnaire declared that nutrition facts were an important factor in the selection of a healthy breakfast cereal actually analysed them during the experiment. This confirms the conclusions from the previous analyses, indicating the fundamental importance of nutrition facts when selecting food which people perceive as healthy.

Far greater discrepancies occurred among the participants who declared package design as the primary selection criterion. In this case, only 44.4% of participants performed in-hand package study activity; moreover, only 50% of participants examined any specific product when performing shelf eye study activity.

# 5 Conclusions and Future Work

In this paper, a descriptive model of the in-store decision-making process for selecting healthy cereals was proposed. The model was defined based on the results of experimental research on a set of young shoppers (high-school students) wearing mobile eye-tracker glasses. The model consists of four activities performed in front of store shelving occupied by cereal products. The model was contrasted with an in-depth survey on participants carried out directly after the experiment. The survey results showed that young shoppers (the experiment participants) consider nutrition facts (in particular sugar content), packaging, brand and type as the most important characteristics of cereals as a product, with nutritional information being the main decision-making criteria for selecting healthy cereals. Similar conclusions can be drawn by analysing the results of the experiment; 80% of participants scrutinised the nutrition facts of at least two products; however, in other cases there were significant differences, as much as 50%, between the survey and the experiment results.

Future research on the in-store decision-making process for selecting healthy cereals or healthy products in general should involve other groups in the broader population, selected on the basis of different criteria such as age, or engagement in making purchases for a household. Another important issue regarding the model that should be developed is its quantitative elements based on fixation times and saccade counts.

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