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A sensory characterization of bread and yoghurt

– using the partial Napping® method on an untrained consumer panel

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Abstract

Sensory analysis is a common part of the new product development process and for product optimization. Sensory characterization and product profiling is traditionally made by trained expert panels. However, food industries and market have nowadays more demands for rapid techniques likewise request for consumer preference and perception. Methods using consumer profiling have been developed although slightly used and evaluated so far.

This Master's project and thesis is an evaluation based on a pilot-study using the partial Napping® method on an untrained consumer panel, characterizing products from two different product categories namely bread and yoghurt separately. The study was complemented with preference scaling, rating and a focus group interview.

The results and reflections from this study did end up in a list of improvement factors, for the future use of such sensory method. All from how to introduce the method to the consumers, the number of samples to the sensory differences between the products in the evaluated sample sets are important aspects to consider in the future use of the Napping® technique. The largest advantage of the method is however that you actually receive perceived similarities and differences, as well as descriptions of the tested products from the consumer perspective which is different to sensory profiling normally performed by trained sensory panels.

When too large differences are present, it will most certainly serve as main focus for profiling and slightly or less obvious differences risk to stay unnoticed. It is important in future studies and evaluations of such sensory profiling methods to initially focus on designing suitable sample sets, find appropriate products to characterize and also have a well-defined aim correlated to a potential outcome. The Napping® technique can result in a great amount of data but without further implementation and aim in practice the outcome will mostly reflect on a specific amount of characterized products and tell less about either general consumer perception or product preferences.

Keywords: Sensory analysis, sensory characterization, napping, consumer testing

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1. Introduction

Most new food products launched on the market fail (Stewart-Knox & Mitchell, 2003) and are withdrawn in just a year of time. Generally, food innovations of today are rather incremental product developments, which might be an answer to a significant amount of fear connected to high failure rates but perhaps depend on insufficient or irrelevant focus throughout the development process. Sensory analyses are crucial parts in the processes of new product development and for product optimization. Different sensory methods are already used regularly as quality control of products, in R&D and in marketing (Chollet *et al.*, 2011) often together with trained assessors in expert sensory panels. Consumer voices are of highest relevance throughout the process as well (Moussaoui *et al.*, 2010) but often used differently compared to trained sensory panels.

Sensory analysis is traditionally referring to three main methods: *discrimination* (between products), *description* (of products within a group) and *hedonic judgments* (Pagès *et al.* 2010). Descriptive analyses are commonly used in food industry when it comes to product development, quality evaluation and market research (Abdi & Valentin, 2007). Recently has sensory science and its evaluation methods been developed parallel to industrial requests for faster and cheaper analyses of food. Most sensory analyses today are still implemented by trained assessors in an expert panel. However, the awareness during the last decades has been focused more and more on consumers' perception of food (Giacalone, 2010/2011). Truth is, not only to recruit but to train and maintain the level of knowledge in expert panels are both time-consuming and financial expensive. New sensory descriptive methods have instead demand for being quick and easily executed and also, preferably, include both sensory data and at the same time reflect on consumer perceptions.

By this, it can be assumed that better and more suitable sensory methods are needed. The methods should be useful during innovation processes and phases of food product development as well as for sensory analyses which evaluate relevant product properties. A common approach nowadays, when it comes to new food product optimization, is consumer research with focus on overall liking of a number of product samples (Ares *et al.*, 2011). Traditionally are consumers told to make hedonic judgment but not to make sensory descriptions of the food tested, where instead sensory profiles of food are made by trained assessors (Veinand *et al.*, 2011). When sensory modalities of the most appreciated products are evaluated by a trained panel of assessors, consumers' perceptions is just indirectly stated and the results might of course provide misleading data not at all correlated to consumer preferences.

However, new sensory methods have recently become more visible in consumer testing. The methods are used parallel to the work of trained sensory panels. These new developed descriptive sensory methods are for instance Free Choice Profiling, Flash Profiling and Sorting Task. In this report another descriptive method called Projective Mapping (PM) and further on developed to Napping® is presented, used and evaluated. The study is considered a pilot project and is performed in collaboration with PhD Anna Holmer and SIK (the Swedish Institute for Food and Biotechnology) within the project "*Consumers' food choices, how, why and when?*" which is an ongoing three years project.

1.1 Background

In the following literary review and presentation of relevant background material, Projective mapping (PM) and Napping® are presented separately, since the sensory methods are differentiated from each other in some ways. In the end of the chapter, general facts about focus group interviews and breakfast habits are presented.

1.1.1 Projective mapping

Projective mapping (PM) (Risvik *et al.*, 1994) is a two-dimensional descriptive technique which demands the assessors to place samples on a delimited area regarding to the assessor's own choice of

perceived similarities and differences between the samples. The technique has been suggested as a potential tool when connecting sensory analysis and consumer research (Risvik *et al.*, 1994). It is of importance to mention that the outcome and results from the method is sensitive to the choice of samples in the set, which is commonly discussed throughout literature. When including samples with obvious or large differences that will most probably form the main focus for the assessors when making their judgments on the total characterization. Meaning that similarities or rather small differences might get less attention where the focus is easier placed on other criteria/aspects/dimensions. When mapping very similar product samples, the opposite principal is occurring with all samples placed too close to each other resulting in lack of relevant outcome. PM is preferably to be used by consumers and sometimes used in qualitative market research in order to find out about consumer attitudes regarding sensory aspects, packaging, (Risvik *et al.*, 1994) advertising (Ares *et al.*, 2010) and so forth.

The original PM in practice means that each assessor receives a paper of A4-size, marked with two crossed axes (x- and y- axis) (Risvik *et al.*, 1994). The assessors are informed to place the samples by own choice on the two-dimensional paper sheet according to perceived relationship between them. Similar products shall be placed near each other and when samples are different, they should be placed farther apart. The outcome might be hard to evaluate in comparison to other well-established sensory methods primarily because alternative techniques seldom are two-dimensional. The major difference compared to established and well-used profiling methods is that traditional and conventional techniques are often used together with a trained sensory panel where instead PM in fact commonly is used on (naïve) consumer panels (Risvik *et al.*, 1997). The methods might therefore not easily be compared or evaluated from its effectiveness. A combination of the two varieties will however instead provide both product description and meanwhile deliver an understanding for consumer perception. An additional technique is therefore common in the practice of sensory science. Particularly PM has been proven as useful for the food industry when it comes to product development and marketing because it provides data on major differences between food products. PM compared to simply categorization methods, like sorting, additionally shows that PM is a more appropriate choice in order to differentiate products (Nestrud & Lawless, 2009) where sorting instead only group or arrange samples in a set.

PM has been used in several sensory studies on varying types of products and panels. The method has been compared and evaluated to different reference methods thereby provided numerous of aspects to consider for future use. For instance are trained assessors experts on the identification and description of minor sensory differences (Barcenas *et al.*, 2004). However, consumers should most possibly not be considered to require this expert qualification when used for sensory characterization of food. Results from sensory evaluations might of course therefore end up favoring data from expert panels in those cases when these rather different panels are compared. Anyhow, the newer methods have become popular partly because of the elimination of training procedures of the panel (Albert *et al.*, 2011) where instead single sensory sessions with flexible and spontaneous appearance are provided (Moussaoui *et al.*, 2010). These points give food companies benefits in the new product development process. A restriction with the PM technique is that it might be hard to explain for consumers, compared to for instance rating or ranking (commonly used in consumer testing and easily understood by first users) which must be considered before implementation (Veinand *et al.*, 2011). And in some reference studies, the assessors tended to place samples preferably only horizontally, which might depend either on the rectangular form of the paper (Ares *et al.*, 2010) or on insufficient information given. PM can also become a time-consuming method to analyze, if a high number of samples are used (a lot of data-coordinates) as well as several consumers/assessors (resulting in numerous maps). A delimitation with PM is also that unfortunately no analyze method exist that really determines what consumers actually mean by given descriptive words when characterizing samples.

1.1.2 Napping®

The Napping® method is a later and somewhat further developed mapping technique with similarities to PM. The name comes from the French word *nappe*, which means tablecloth, and refers to the size of the paper sheet used, originally 40cm x 60cm (Pagès, 2005). The paper sheet in the Napping® is totally blank. Assessors are principally informed to evaluate similarities and dissimilarities between

served samples. The characterization has to be made from own choice of criteria, there are no better or bad answers, but instead reflections on the most important aspects from the individual assessor's point of view. The samples, just like in PM, shall be placed on the tablecloth/paper sheet in relation to the other samples, when two samples are similar to each other they end up close and vice versa. The assessors should be encouraged to use the whole paper area. It is also essential that assessors write down both the code for the sample and the own choice of descriptive words on the exact place on the tablecloth before handing in the paper, or else there will be no data to analyze (Pagès, 2005). When required to delimit the amount of descriptive words an upper limit per sample can be determined before start. Each sample is then placed on a specific location on the tablecloth, and the location is after completed session translated into x- and y- coordinates. The origin is easiest placed in the left bottom corner although other placement is possible as long as there is consistency.

1.1.3 Partial Napping®

Partial Napping®, or *Napping by modality*, is considered an easier version of Napping® where only one modality of the samples is characterized at a time (Pfeiffer & Gilbert, 2008). When taste/flavor, appearance, texture or odor is evaluated separately the total amount of descriptive words for each attribute in connection to every sample might be an easier task to perform. Pfeiffer & Gilbert (2008) also showed that results from this version of the Napping® technique were more interpretable and better correlated to results from descriptive profiling. Unstructured versus more structured PM techniques have shown similar results (King *et al.*, 1997) which can be considered as additional to this reasoning. The numbers of descriptive words are also increased when mapping one modality at a time (pers. com., Dehlholm, 2012).

1.1.4 Previous studies

PM and Napping® as sensory methods have been used in studies of many different kinds of food under a wide range of investigation conditions. Chocolate (Risvik *et al.*, 1994), blueberry soups (Risvik *et al.*, 1997), snack bars (King *et al.*, 1997), ewes milk cheeses (Barcenas *et al.*, 2004), wines (Pagès, 2005, Perrin *et al.*, 2007), citrus juices (Nestrud & Lawless, 2008), fruit smoothies (Pagès & Cadoret, 2010), milk and dark chocolates (Kennedy & Heymann, 2008), apple and cheese (Nestrud & Lawless, 2009), granola bars (Kennedy, 2010), chocolate desserts (Ares *et al.*, 2010), fish nuggets (Albert *et al.*, 2011), orange-flavoured powdered drinks (Ares *et al.*, 2011), hot beverages (Moussaoui & Varela, 2010), beers (Abdi & Valentin, 2007, Giacalone, 2010/2011), lemon ice tea (Veinand *et al.*, 2011) and liver pâté (Dehlholm *et al.*, 2012). The size of the sample sets in the literature has varied between the numbers of 6-18 samples. Although, most commonly about 8-9 samples have been included in a set, often with at least one duplicate as a reference sample. A frequent reflection in literature is whether there are an optimal number (or not) of samples to evaluate during a session, or how large differences/similarities the samples within a set should have in order to ideally use the PM/Napping® techniques. At least 5, but optimal 6-10 samples is for instance listed by DMRI (2011) referring to meat products. It is also considerable in the meantime to make reflections whether different food/beverage samples might be more or less suitable for the methods. Overall is the most important issue to enable the differences to be mapped, because then there is possibility to make conclusions from the results (Ares *et al.*, 2010). The differences between the samples in the set must be detectable for the assessors (pers. com., Dehlholm, 2012). What differences or similarities that are mapped and considered when placing them on the paper sheet are essential. Even in studies where hedonic judgments place all samples within a set rather low (in liking), if also containing descriptive words, then the results might still be useful outcomes. By this, meant that the possibility for assessors to evaluate both major and minor differences could be the best conditions in order to assemble a set.

1.1.5 Preference rating and ranking

Traditionally consumer testing is done by measure preference on different scales. The 9-point hedonic scale was designed already in 1947 (Cardello & Jeager, 2010) and assumes that consumer preferences do exist, likewise that this preference can be categorized based on like-dislike judgment. The word hedonic refers to pleasure and the rating on such a scale is actually more of a measurement of acceptance because the like-dislike judging can be made without the presence of other products

(Lawless & Heymann, 2010). The 9-point hedonic scale is commonly used in consumer testing although the outcome not necessary has to reflect on whether the product will be successful or not on the market. Products not only have to be scored high on such a scale but price, packaging and for instance brand is often very important properties once the product is launched on the market. Not to forget that products scored low on a hedonic scale probably would not become successful even with great marketing.

Another traditionally used measurement of preference is ranking, where products are considered better or worse than other present products and thereby ranked in relation to each other. Ranking is seen as an effortless and easy performed method by most consumers (Lawless & Heymann, 2010), and is traditionally used in consumer testing as well.

A crucial part of the preference rating and ranking procedure is although to recruit a well-balanced and sufficient large group of participants who are frequent users of included products because that will result in more potentially adequate results.

1.1.6 Focus group interviews

Focus group interviews, as the name implies, focuses on a specific topic or theme for discussion (Bryman, 2008). The difference compared to regular group interviews is not distinct but focus group interviews tend to be more restricted in its purpose. Focus group interviews are a qualitative research method and are usually led by a visible moderator. The method has been used for many years in marketing research occasions, advertising initiatives and for consumer responses to new products. The interview not only includes a number of people but all participants in a focus group session should be familiar to the subject of discussion. In the situation of focus group interviews and food attitudes it is common to ask the group to arrange different products in relation to each other, either from a single sensory attribute or as a whole product (Risvik *et al.*, 1994). The reason to why the specific product is evaluated in a certain way is then discussed from some prepared questions presented by the moderator. All questions are prepared in advance in order to minimize influences of the moderator (Bryman, 2008) then the moderator instead works to keep the interview in focus and invite and guide all participants to be equally involved in the discussion. The formulation of the prepared questions depends on the subject in focus, but can be either very open or structured in different subsections.

The focus group method aims to make it possible to discuss *why* people within the group feel the way they do. The focus is not only to investigate what thoughts or views the group has, but to understand and discuss deeper about the reasons for such thoughts. Those participating in the focus group interview are forced to make reflections and perhaps change old thoughts and considerations. In order to capture all parts of the interview in practice, participants must be informed to talk one at a time and the interview should preferably be recorded. When group interviews are recorded a secretary can instead make notes on other things, such as gesticulations and body language which might be useful results (Bryman, 2008).

The ideal number of participants in focus group interviews might depend on the topic. 6-10 people are suggested, with preferably the minor number present when it is thought that the participants have much to discuss, are very much involved in the subject or when it is a complex topic (Bryman, 2008).

The focus group interview, despite opportunities, has some limitations. The researcher might have less control over the proceeding action compared to individual interviews (which not necessarily is a negative aspect). It is however a critical issue to consider how involved the moderator should be in order to make the group alive but at the same time not lose its focus. It can further on be hard to analyze all data, dependent of the use of equipment (recorder and notes). But even when all data is well recorded it takes up to eight hours to write down one hour of taped interview. And if not implemented in connection to other tests and sessions it might be hard to get participants to show up on time (or at all) and the focus group interview depends on a well-functioning group with an appropriate amount of participants. All subjects or topics should not be considered appropriate for focus group interview occasions either, for instance very intimate and private topics might not receive any useful information. The group has to be balanced too, not including obvious differences in for instance hierarchical status because that might affect and influence the outcome and discussion.

1.1.7 Breakfast behavior

Swedish breakfast traditions are far from uniform with the rest of the world. In for instance south Europe, breakfast often includes just coffee and a cookie. Traditional British breakfasts containing egg, bacon/sausages and beans are rather uncommon in Sweden nowadays. The transformation to eight hour working days changed eating habits for most parts of the population where people got more scheduled and limited to eat when work permitted (Rössner & Astrup, 2009). Working outside home also meant less time to prepare meals not least such as egg, bacon and beans every morning. This change of working conditions was the starting point for breakfast with food like porridge and sour milk. Cereals were launched in the beginning of the 1900's although got popular in the 50's. The breakfast known by many today, including cereals or muesli and milk/yoghurt/sour milk perhaps supplemented with a sandwich became common as late as in the decades of the 60-70's. Fruit yoghurt was launched in the end of the 1960s'.

1.2 Aim

With the partial Napping® method, sensory characterize products commonly eaten for breakfast

- Bread
- Yoghurt

The main purpose of this Master's thesis was to sensory characterize different products from two common breakfast food categories (bread and yoghurt) using the partial Napping® method. The thesis also aimed to evaluate the Napping® technique and its potential appropriateness as a sensory profiling method on an untrained consumer panel. The evaluation will form the basis for continued planning into the next stage in the larger project; *"Consumers' food choices, how, why and when?"*.

The napping study was executed together with judgment of consumer preference rating and ranking as well as a focus group interview with emphasis on questions regarding the included food categories, breakfast behaviors and potential improvement factors for tested products, whereby also these results will be presented and discussed as part of the aim of this thesis.

1.3 Delimitation

In order to delimit the amount of data from the partial Napping®, no individual consumer data is presented but instead consensus maps constructed by all participants in collaboration with the panel leader (Anne Normann).

In the focus group interview as well as in the hedonic judgment and ranking parts of the study, all products were evaluated from a breakfast point of view. It is known that all included food products could very well be consumed in other meal situations besides breakfast, although a wider perspective possibly would end up in an enormous range of data or complicate the implementation for the consumers which was not considered appropriate or necessary due to the scope of this thesis.

2. Materials and methods

This chapter will further describe in details how the consumer testing/Napping® study was executed, how the focus group interview was implemented and the data evaluated. This section will include presentation of literary search and how all background preparations were completed for this thesis to get started and take form.

2.1 Literature searches

The initially search in the database Web of Knowledge, available through the library on SLU; Swedish University of Agricultural Sciences, was made from well-chosen key words. In the first search box the words *napping* or “*projective mapping*” was chosen. The choice to either find articles on *napping* or *projective mapping* was because there is such small range of literature in the subject in total and the two sensory methods are quite similar to each other. Since the two techniques were considered as synonyms, it was presumed together to bring useful information. In the second search box in Web of Knowledge “*sensory analysis*” or “*sensory evaluation*” or “*sensory characterization*” was stated. All definitions were chosen because they were supposed to be used as synonyms in literature, but potentially used differently by diverse authors. The search resulted in 20 hits.

When adding *food* as a keyword in the third search box, it resulted in 19 hits. If instead adding *consumer* it resulted in just 10 hits. The 20 articles from the first search, were all investigated further due to the relatively minor search result. Some of the 20 articles found in Web of Knowledge were not able to open in full text, where instead Google Scholar and Gothenburg University Library (www.ub.gu.se) were very useful in order to receive them.

Searching on Google scholar with the same keywords generated 36 hits. Most articles were the same compared to the search in Web of Knowledge, and the hits considered irrelevant for this thesis was focusing either on another sensory analysis method, characterized personality or cosmetics instead of food or were schedules for oral presentations on international conferences. When searching in LUKAS, LIBRIS and EPSILON neither *napping* nor *projective mapping* did get any useful hits.

Also reference lists from the 20 articles found were searched through. When reading through other authors’ choices of literature it not only provides potential good articles/material but also increases a vocabulary in the subject. Thereby, a new search was made in Web of Knowledge using instead the key word “*sensory mapping*” which only ended up in additional 3 hits. “*Partial napping*” or “*napping by modality*” as key words did not matched any articles although formed at least the potential for an extended search. Unfortunately no additional literature was thereby found from these added searches.

A sub-subject for this Master’s thesis is to evaluate the focus group interview made in connection to the Napping® study. When searching for “*focus group*” and *food* and *consumer* in Web of Knowledge, 292 hits were found. Because of existing relevant and useful reference literature in this field, it was considered a more appropriate choice to use in order to delimit the otherwise required comprehensive literary review.

2.2 The consumers

SIK, the Swedish Institute for Food and Biotechnology, together with some well-known Swedish food companies¹ runs a three years long project called *Consumers’ food choices, how, why and when?* Where SIK:s own consumer panel has had an essential part for the data collection so far. In May 2011,

¹ Campbell Soup, Arla, Fazer Bakery and Confectionary, Pågen, Abba Seafood, Findus. Linköping University is also part of the project.

45 consumers participated in a text message study (called the ESM-survey, ESM stands for Experience Sampling Method) as an initial part of the project. All 45 included consumers (chosen from the significant larger consumer panel) had at least one child (<18 years) that still lives at home, this because of selected focus on families with children in the ESM-survey. Consumers that work with food, such as chefs and dieticians were excluded. The rather huge and informative ESM-survey, which will not be further explained in details in this thesis, focused on decision-making situations five times a day for two weeks (14 days). In September 2011 all consumers that had stated from at least one text message that they took some kind of decision during mornings got the possibility to answer a questionnaire via email about choice of breakfast products, assuming that decisions during morning time refers to choice of potential breakfast products. Results from the ESM-survey showed a majority of decisions made on dairy products, cereal/grains and/or coffee/tea in the mornings. The emailed questionnaire thereby was focused on questions about these product categories. The questionnaire was made in the data program *Lykta Affärsverktyg* and the consumers were named when they filled out the form. The seven included questions in the form are shown in a Word-reformatted appearance in Appendix 1.

A total of 35 consumers answered to the breakfast questionnaire and out of these individuals, eight (8) consumers who reported that they had both bread and yoghurt for breakfast was offered to participate in the forthcoming Napping® study. The eight consumers were both contacted through email and by telephone in order to ensure that they would appear on the right date and on correct time but also to guarantee that no food allergies would stop them from being able to perform the sensory characterization. The initial email is shown in Appendix 2 and was later complemented with information through telephone regarding exact time and schedule and also questions to assurance no allergies or intolerances existed for included categories of food products. The Napping® study was implemented on November the 21st 2011 and due to sickness, and thereby a last minute drop out, seven (7) consumers participated in the Napping® study testing six different samples of bread and six different samples of yoghurt. The assessors were between 35-48 years of age and consisted of five women and two men.

2.3 The samples

The examined products were chosen by the food companies Fazer, Pågen and Arla, which are all taking part in the *Consumers' food choices, how, why and when?* project, and had its beginning from the results from the questionnaire. All bread had the same baking day (21st November). The bread was served on paper plates and in one serving size (meaning one slice or one top and bottom) without butter or similar. The yoghurts were served in glass bowls of approximately 150 gram each, and were eaten with metallic dessert spoons. The yoghurt was served just from refrigerator, thereby in a temperature of about 6 degrees (not measured). The different yoghurt products did not have exactly the same production day but were far from expiration date and the shelf life is due to Arla 28 days for yoghurt, listed on the package. All products were purchased in a regular food retail/supermarket. More info about each product's nutritional content is found in Appendix 3.

All products were given a color as de-identification code. The bread was marked on the paper plates and the yoghurt on the outside of the glass bowls. The product packages were never shown to the consumers. Table 1 and 2 on next page, show the different color cods and products, the names of the producer/food company are in parentheses. Colors were used instead of numbers (which are traditionally used) as encoding firstly because it was an easy and new way of working with de-identification of samples, also because it was assumed that colors instead of three digit codes on six different samples were easier to keep split from each other when placed on the A3 paper sheet, placing them on the consensus chart not least easier to keep the products in mind and diverse them from each other in the following focus group interview. For administration issues it was more beneficial to use the same colors/pins/magnets for the characterization procedures because the materials were reused from the first napping to the second, throughout all the different modalities.

Table 1. Bread de-identification colors

Red	Frökusar (Fazer)
Green	Rågform (Fazer)
Blue	Fröjd (Pågen)
Black	Äntligen (Pågen)
White	Rågkaka (Polarbröd)
Yellow	Polarpärlan vete (Polarbröd)

Table 2. Yoghurt de-identification colors

Red	Natural 3% (Arla)
Green	Mild 3% (Arla)
Blue	Mild 0.5% (Arla)
Black	Vanilla 0.5% (Arla)
White	Vanilla 2% (Arla)
Yellow	Vanilla 2.1% (Valio)

2.4 Study methods used

2.4.1 Napping®

The seven consumers arrived at 4 pm and entered the well-prepared seminar room at SIK Gothenburg. Each consumer was shown to a table and seat of their own. The tables were prepared with five pieces of A3-paper sheets, two pencils, a glass of water, napkins, unsalted crackers and the color marked pins/magnets that represented the different samples. The six samples of bread were also already placed on the tables when the consumers entered the room.

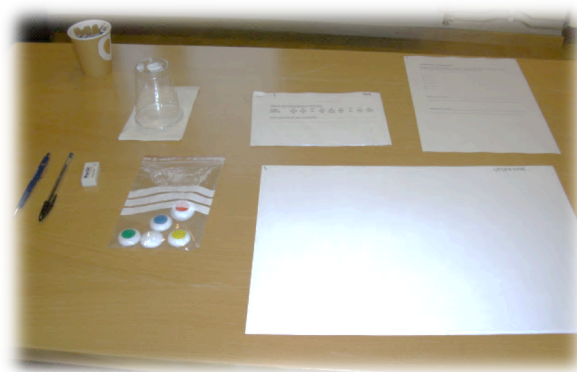


Figure 1. The material used for the napping.

First, some information was given orally regarding what was about to happen during the next few hours and the consumers were introduced to the partial Napping® technique. None of the consumers had completed such test before. The information given concerned that three sensory modalities of bread was about to be characterized and two sensory aspects of a dairy product. The bread was up first and on the A3 paper placed on top on each assessor's table, was written *Appearance* in the upper right corner. This was also the attribute initially evaluated. The samples were either to be placed close or far from each other on the A3 paper sheet regarding perceived properties, using the color pins/magnets as representatives for the similar marked samples. The consumers were informed that they could place the samples on both horizontal and vertical dimensions and were allowed to try the product samples as many times as they wanted and also rearrange their placement on the paper sheet until they were satisfied with its location. The consumers were encouraged to use as much of the paper area as possible and evaluate the products out of many different aspects within each given modality.

When the assessors was satisfied and had placed all six samples, they were told to also write down those descriptive words for each sample which referred to why they placed the sample on that specific

spot in relation to the other products. They were given examples on words such as squared formation, seeds, floury and thin just to clarify with example words of what that could be. The appearance of the bread was considered a relative effortless characterization to execute, and because of the easy judgment it was mostly to be seen as a test session for the consumers to try the Napping® method. The modalities for sensory characterization of bread were (1) Appearance, (2) Texture and (3) Taste. The sensory characterization was summarized to consensus on the whiteboard after each and every modality, done everyone at the same time and led by the panel leader Anne Normann. When introducing next sensory modality it was given some aspects regarding for instance texture just to get everyone familiar with the fact that it both concerned feeling in mouth when chewing, holding by hand etc. just to make sure that all assessors had a set off point.

An upper limited number of descriptive words for each assessor to match to the samples were not restricted in the tests, neither the size of the panel nor the size of sample set were in that extent that it was assumed to receive far too much data. The consumers were informed to rinse their mouth with water between the testing of different samples and if needed also unsalted crackers were available during both bread and yoghurt sessions.

The yoghurt was tested according to the sensory modalities (1) Taste and (2) Texture and was also summarized to consensus on the whiteboard before moving from (1) to (2). The yoghurt products were very similar in color and therefore appearance was not evaluated, assuming not to add any relevant information due to too narrow differences. Odor was not included in neither of the two product categories since no product actually did have much of an odor at all. During the whole session, Swedish words were used (Swedish consumers) and the attribute taste should be considered synonymous to flavor because the Swedish language does not have a comparable word to flavor. The word “smak” in Swedish must therefore be supposed as a more complex word than taste and thereby including aspects of smell/odor, more similar to the flavor attribute. By this, it can be assumed that relevant aspects of odor were included although indirectly evaluated.



Figure 2. The seven assessors napping bread

2.4.2 Preference rating and ranking

All products were, after completed Napping®, rated both on a hedonic 9-point like-dislike scale and ranked from best to worst (1-6, product placed on first place represented the most liked). The bread was completed before the napping of the yoghurt started, to finish one category at a time. The hedonic 9-point like-dislike scale was equal spaced in a bipolar horizontally layout, originally found in Lawless & Heymann (2010) but changed from the vertical layout in order to fit two copies on one page. The layout is shown in Appendix 4. The presentation of the hedonic 9-point scale was thereby slightly different compared to the one presented in reference literature. But different layouts have regarding Lawless & Heymann (2010) not shown to produce different results whereby the chosen design should be considered adequate. Lawless & Heymann (2010) confirm that no studies shown

inconsistency in results from neither descending versus upward scales, but consumers tend to rarely use the extremes, although stated that it would most probably be the case even if fewer points than 9 were used as well. Finally, the hedonic like-dislike scale is to be considered easy to use and implement for assessors as well as to evaluate results from, although connected to some drawbacks which to some extent will be further discussed later.

The ranking was simply made by placing the colors on first to sixth place and add some motivation to the first and last placements. The assessors were told to judge and rank all products with like/dislike as its potential of being a breakfast product.

Each product category was finished in about 40 minutes, meaning that the napping and sensory characterization of both bread and yoghurt was completed within the two hours that was counted for.

2.4.3 Focus group interview

When the partial Napping® and preference tests were finalized, the assessors had a minor pause with fruit, chocolate, coffee/tea and then the one hour focus group interview started. The seminar room was now rearranged and the consumers all sat down placed around a large assembled table where everyone could see each other.

The start and introduction of the interview followed what is suggested from Bryman (2008). The moderator, Susanne Ekman, is employed by SIK in the department of sensory and flavor science and has great experiences of leading focus group interviews. Gratefully, Susanne was able to help out during this interview since neither master's student Anne Normann or PhD. Anna Holmer had any previous experience from being moderators of such interviews. Susanne had seen the formulated questions in advance and had also got introduced to the Napping® proceeding. Susanne started by introducing herself and explained shortly how an interview of focus group character looked like. All participants were informed and gave permission that the interview was recorded with a Dictaphone. Because of the recording it was requested to speak one at a time. It was informed that Anne Normann would make notes if needed, and that all statements during the interview were to be confidential and used by personnel at SIK and SLU only. Last but not least everyone was stated as equal important in the group and interviews of this kind does not include right or wrong answers but individual thoughts which are the main focus. The interview started with questions regarding bread and was followed by similar structure for yoghurt; the questions are found in Appendix 5.

The interview was ended after one hour, the consumers signed out their payment (vouchers) and the meeting was ended.

2.5 Statistical analysis and evaluation of data

The coordinates from the different consensus maps were digitalized with the origin in the left bottom corner. Thereby, each product received separate x- and y-values for the modalities analyzed. The coordinates were listed in an excel sheet with guidance from an analysis regulation presented by DMRI (2011) which followed the format possible to import to PanelCheck. PanelCheck is a free software and easier to use than many other data analyze programs in the field, for instance R. To balance the words and described properties mentioned on the consensus maps, all individual maps were reviewed and the words on the consensus maps got a weighting factor also written down in the excel sheet, for the descriptive words chosen. This enabled the analysis to state which properties that were more important for the profiling of the products, specified by how many consumers that actually wrote the word individually. All words mentioned, which are listed in Table 3 - 7 in the next section, were neither very useful nor possible to manage when doing the multivariate analysis and Tucker1 plots in the program, therefore only the aspects/words thought as most relevant were taken into consideration. Synonyms or near synonyms were grouped to each other, for instance runny and thin were grouped under watery (characterizing yoghurt texture).

The use of multivariate analysis makes it possible to reflect out of many dimensions and was desirable. Tucker1 plot is a type of PCA (Principal Component Analysis). The PC1, presented on the x- axis, always shows the highest value, PC2 the second highest and so forth in descending order. The higher value on PC1 (in percentage) the more that axis is explaining and affecting the product location on the map, meaning that less influence is seen from PC2 (or other PC:s), PC1 and PC2 together with

all PC:s stand for 100%. PC1 and PC2 thereby explain the largest variance of the data which is shown when totaling the two percentages in parentheses on the both axes.

The products are placed on the PanelCheck Tucker1 plot as an average of imported coordinates and are placed in relation to other aspects and products. Tucker1 plots are used because it gives an easy and clear image where the axes are adjusted to fit the data and is suitable when there is few data to manage. The two PC1 and PC2 axes are namely correlated to show that there are differences even though differences might sometimes be very small. This fact needs to keep in mind when using figures and analyzing data since PC1 sometimes explains much more than PC2 and thereby has a larger influence on the data in total. The percentages of PC1 and PC2 respectively, not only added together, are thereby important to take notice of, because they will show the relationship between the axes and also give an indication whether other PC:s (PC3, PC4 and so forth) are relevant or not. PC1 and PC2 axes are sometimes presented in different size (with an offset origin). That is done because of visual concerns and thereby needs to be complemented by the percentage mentioned.

The management and analysis of consumer preference data was manually complied. Results from the focus group interview were written down while listening to the recorded discussion.

3. Results and discussion

In this section results from the Napping®, preference judgment and focus group interview will be presented. Previous studies have mentioned tendencies for assessors to complete napping faster after a couple of session (Kennedy, 2010) which is seen in this study as well, not only within the napping of bread but also when changed over to the sensory profiling of yoghurt. The sensory characterization and rating/ranking of the products will be presented in tables, figures and associated texts. The focus group interview will be highlighted out of some chosen topics and quotes.

3.1 Partial Napping® of bread

As described above the napping of bread was divided in three modalities. The results will be presented in figures made in PanelCheck, both divided and united because the appearance is selected to keep apart from taste and texture. Since just some descriptive words are chosen for the figures, all words mentioned are shown in tables of their own.

3.1.1 Appearance

The sensory characterization of the modality appearance is, because of a widespread sample set, to be considered too obvious and more of a tryout of the method for the consumers. The descriptive words listed by the assessors on the consensus map are shown in Table 3 and concerns size, shape and thickness of the slices, but also reflect on color and in a way appeared texture, such as seeds. Even though the characterization and profiling of appearance was to be considered as a testing of the method for the consumers, results and mapped coordinates are presented below in Figure 3 and 4 respectively. Since PC1 and PC2 together stand for 99.7% of the variance it is considered a large coefficient of determination and no more dimensions are presented because that would not add relevant information. In Figure 3 and 4 it also needs to be stated that PC1 alone stands for as much as 88.7%, i.e. nearly nine times as much as PC2, meaning that PC2 does not have such a large impact as the image possibly indicates.

Table 3. Bread – descriptive words of Appearance

Frökusar (Fazer)	Rågform (Fazer)	Fröjd (Pågen)	Äntligen (Pågen)	Rågekaka (Polarbröd)	Polarpärlan vete (Polarbröd)
Squared	Rectangular	Squared	Squared	White	White/golden color
Seeds	Dark brown color	Seeds	White	Round	Round
Brown	Two-pieces	Medium brown color	Golden brown color	Flat	Flat
Dark	Thin	Dark			
Thick		Thick			
Two-pieces		Two-pieces			

Figure 3 shows the placement of the products in relation to each other out of profiled appearance. PC1 (x-axis) expresses 88.7% of the whole variance within the sample set. PC2 (y-axis) explains 11% where Rågform has an influence from PC2 comparably larger than other included products. The products located near each other are similar from given dimension. Together, as mentioned above, PC1 and PC2 express a 99.7% coefficient of determination, to be considered a very high value.

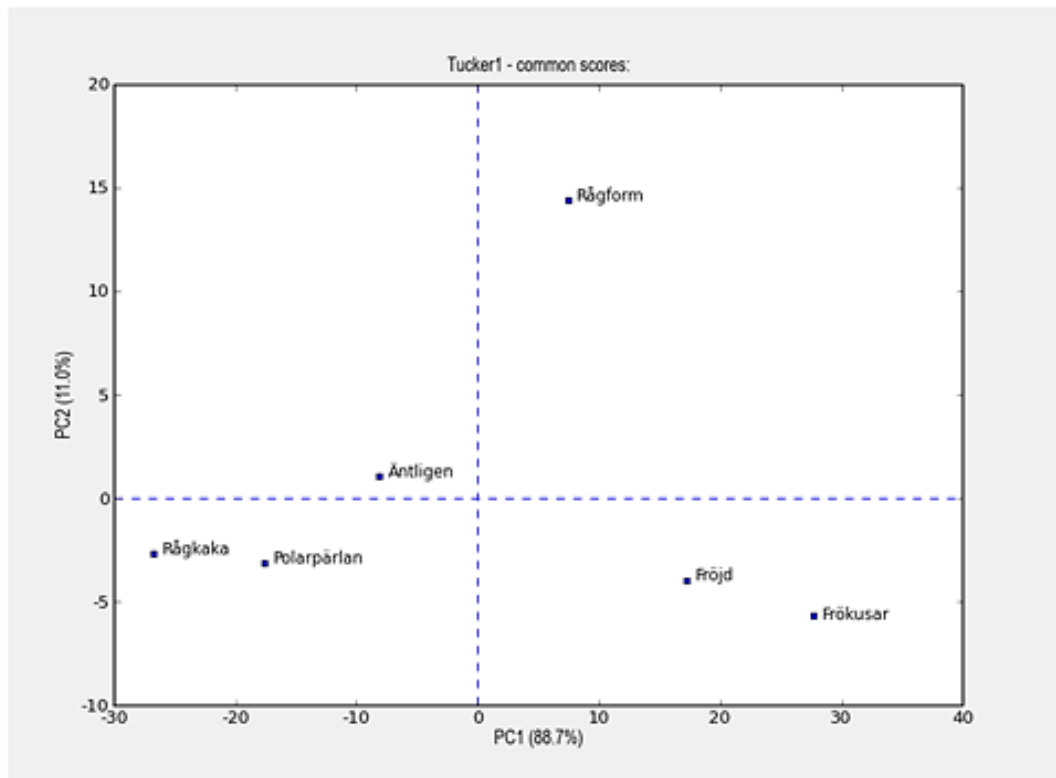


Figure 3. The figure describes the product locations from perceived appearance for bread products.

Figure 4 visualizes that PC1 stands for the highest explanation showed by the location of Apx and Apy (Ap stands for Appearance). Apx and Apy are weighted coordinates showing the total variance for the appearance in the direction of x and y. Since Apx and Apy stretch out horizontally and are very close to the endpoints on PC1 it shows that appearance is mostly represented in this direction. Figure 4 also imagines significance because of the blue circles, where descriptive words placed more towards the outer blue circle have significant effect on the profiling. *Thin* is located higher and indicate that products placed higher in Figure 3 have some influence from this aspect. *Seeds* and *thick* are placed on top of each other because of a very similar location, in the lower right corner.

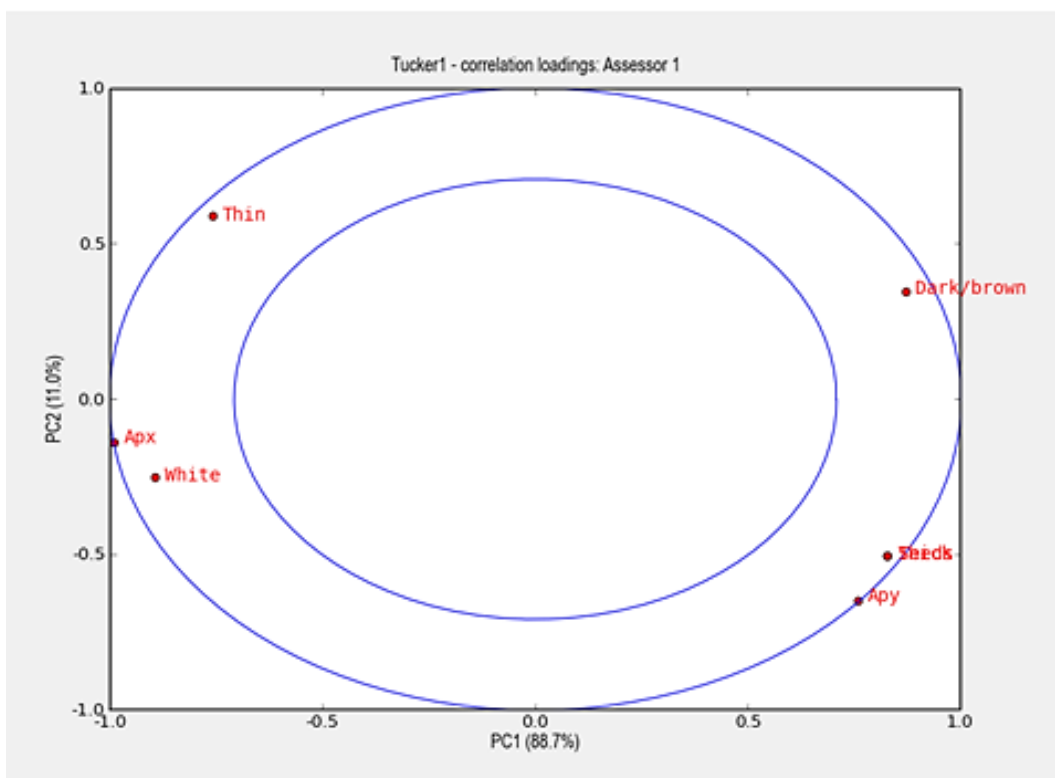


Figure 4. The figure shows the weighted coordinates, Apx and Apy, as well as the descriptive words chosen and their influence for the product location seen in Figure 3.

3.1.2 Texture

The texture of the bread refers to both mouthfeel and when touching/squeezing the bread with the hand. The descriptive words listed by the assessors are shown in Table 4. The coordinates for each sample and the most commonly used words (also mentioned on the consensus map) are shown in Figure 5 and 6 together with words and coordinates regarding taste.

Table 4. Bread – descriptive words for Texture

Frökusar (Fazer)	Rågform (Fazer)	Fröjd (Pågen)	Äntligen (Pågen)	Rågakaka (Polarbröd)	Polarpärlan vete (Polarbröd)
Rough	Rough	Very soft	Soft	Tough	Soft
Soft	Hard	Juicy	Somewhat tough	Little dry	Fluffy
Fluffy	Tough	Fluffy	Little dry	Hard on some spots, soft on other	Kind of juicy
Juicy	Dumb	Crispy seeds	Doughy		
Crispy seeds	Dry	Airy and light		Doughy	
Compact/dense	Dense				
Mastication					

3.1.3 Taste

The consumers were encouraged to taste the products as many times as they needed/wanted before placing them on the map and describing the samples. The descriptive words listed by the consumers are shown in Table 5. The coordinates for each sample and the most commonly used words (also mentioned on the consensus map) are shown in Figure 5 and 6 together with words and coordinates regarding texture.

Table 5. Bread – descriptive words for Taste

Frökusar (Fazer)	Rågform (Fazer)	Fröjd (Pågen)	Äntligen (Pågen)	Rågkaka (Polarbröd)	Polarpärlan vete (Polarbröd)
Somewhat sweet	Somewhat sour	Little sweet	Some sweet	Little sweet	Sweet
Taste of seeds	Unsweetened	Some taste of rye	Rye and wheat taste	Wheat flavor	Wheat flavor
Rye	Like hard bread	Somewhat sour	Unsweetened	Taste of Norrland	Wheat bun
Sour	Sour dough	Taste of seeds	Salty	Rye	Meaningless
Much taste/tasty	Bitter	Unsweetened	Wheat	Tasteless	
	Rich in flavor	Salty	Little rye	Paper	
	Salty	Healthy	Tasteless		
			Unhealthy		

3.1.4 Combined results from partial Napping® of bread

When importing the data to PanelCheck for both taste and texture it gives a more complex, multidimensional image of perceived similarities and differences. Because of relatively large sample differences the two dimensions (PC:s) presented are explaining for as much as 94.8% of the variance, PC1 alone explains 78.1% and thereby stands for a much larger impact than PC2 (16.7%) when analyzing the Figures 5- 6. Tex and Tey (Te stands for Texture) as well as Tax and Tay (Ta stands for Taste) are the weighted coordinates showing the total variance for each aspect in the x- and y-direction and indicate which aspects that are correlated mostly to each axis. Tax and Tay are both placed near the endpoint on PC1 and thereby are mostly explained on this axis. Texture is instead to some extent influenced by PC2 not to forget the large difference in current percentage between PC1 and PC2.

If showing only texture and taste separately it would not add much more relevant information because many words stated were synonyms and did not add any more useful discrimination information. The two visualized dimensions are just two out of many dimensions which is important to keep in mind, even if the remaining PC dimensions cover only the 5.2% left.

All bread products are strongly influenced by PC1 and Polarpärlan and Rågform are placed furthest away from each other. Products profiled as more *sweet* and *wheat* tasting are placed horizontally to the right (Polarpärlan, Äntligen and Rågkaka). Products placed vertically upwards are profiled as *soft*, downwards instead *hard/dry* as shown in Figure 6. As seen in Figure 5, Fröjd is located upwards and is expected to some extent to be influenced by PC2 and thereby placed high on this axis. The different scales for PC1 and PC2 should be noted, which will give a larger gap between the products than actually accurate. Rågform is located in correlation to both *unsweetened* and *hard/dry*.

The blue circles seen in Figure 6 describe significance, with significance for words placed in the outer blue circle, thereby showing *rye* and *unsweetened* as insignificant aspects, probably influencing the outcome to some extent but not as much as the other aspects.

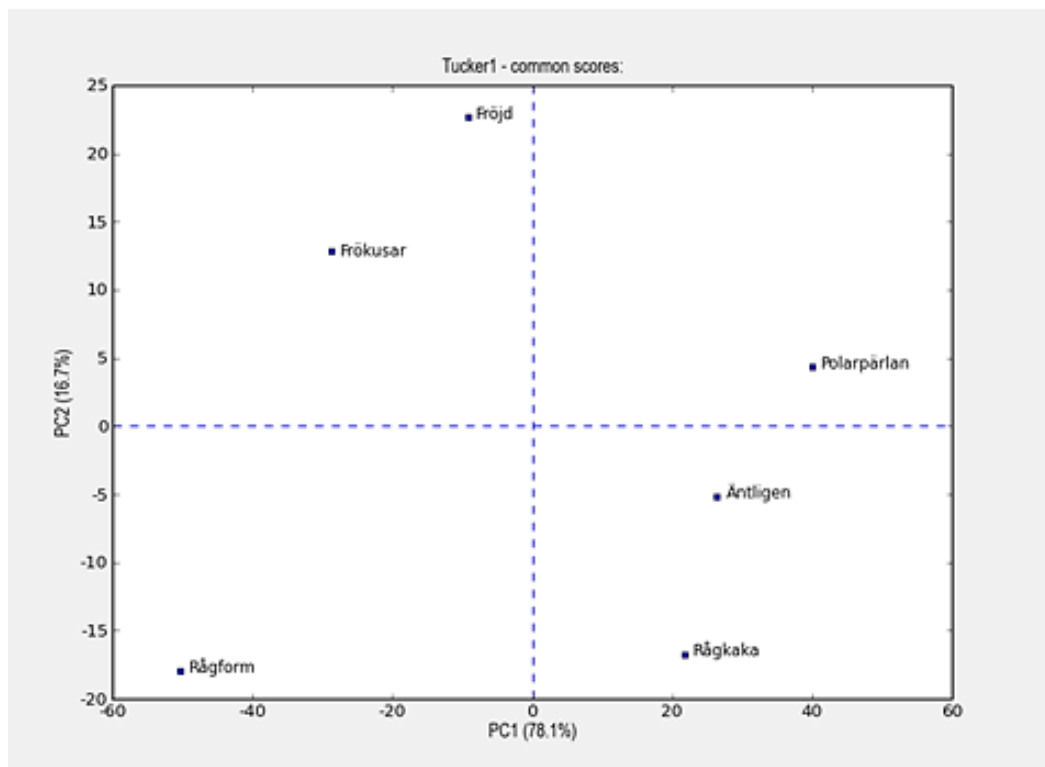


Figure 5. The image shows a combination of taste and texture for bread products with, PC1 (78.1%) and PC2 (16.7%) together explaining 94.8% of the discrimination.

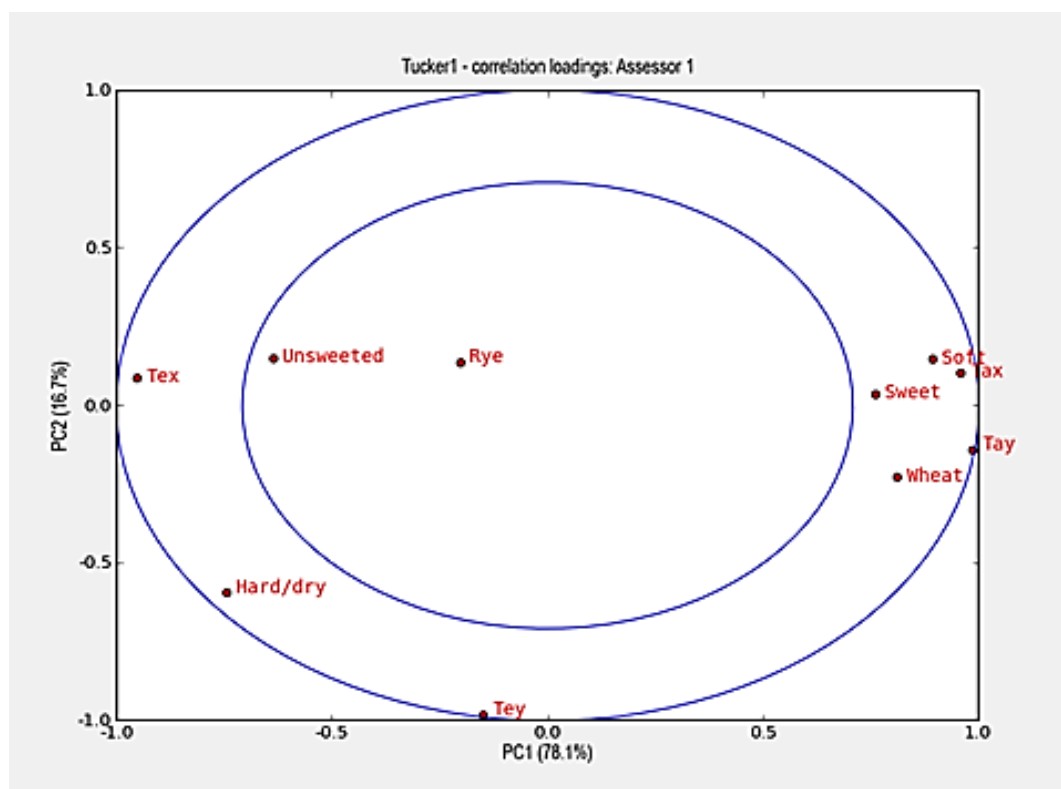


Figure 6. The figure shows the combined results for taste and texture, as well as the descriptive words chosen and their influence for the product location seen in Figure 5. The blue circles show significance.

3.2 Partial Napping® of yoghurt

Since the yoghurt was barely able to differ in color and appearance just the two sensory modalities, taste and texture were characterized. The structure follows the results presented for bread by first listing descriptive words in tables, followed by PanelCheck figures of combined results of both taste and texture.

3.2.1 Taste

The consumers were encouraged to taste the products as many times as they needed/wanted before placing them on the map and describing the samples. The descriptive words listed by the consumers are shown in Table 6. Some chosen descriptive words mentioned on the consensus map as well as the coordinates for each product's placement on the map is shown in Figure 7 and 8 complied with coordinates and results for texture.

Table 6. Yoghurt – descriptive words for Taste

Natural 3% (Arla)	Mild 3% (Arla)	Mild 0.5% (Arla)	Vanilla 0.5% (Arla)	Vanilla 2% (Arla)	Vanilla 2.1% (Valio)
Sour	Mild	Somewhat sour	Sweet	Sweet	Very sweet
Taste that lasts	Natural flavor	Quite mild	Vanilla	Vanilla	Unnatural taste
Bitter	Round in taste	Neutral	Somewhat bitter	Round taste	Vanilla
Scarp	Tart	Not so sour	Not very sweet		Creamy
Unsweetened	Rough	Tasteless	Mild		Artificial
	Tasteful	Thin			
	Bitter	Bitter			

3.2.2 Texture

The sensory characterization of texture refers to feeling in mouth but also the perceived texture when pouring the yoghurt with the spoon and stirring the yoghurt in the bowl. The descriptive words listed by the assessors are shown in Table 7. The descriptive words used on the consensus map as well as coordinates for each product's placement on the map of texture is shown in Figure 7 and 8 complied with coordinates for taste.

Table 7. Yoghurt – descriptive words for texture

Natural 3% (Arla)	Mild 3% (Arla)	Mild 0.5% (Arla)	Vanilla 0.5% (Arla)	Vanilla 2% (Arla)	Vanilla 2.1% (Valio)
Watery	Rough	Little creamy	Thin	Creamy	Soft
Smooth	Quite thin	Smooth	Runny	Round	Quite creamy
Light	Neither creamy or watery	Watery/thin A bit grainy	Watery Soft Light	Smooth mouthfeel Thick Little hard Solid	Smooth Plain Thick Hard Whipped cream Dull Soft Heavy

3.2.3 Combined results from partial Napping® of yoghurt

When importing the data coordinates to PanelCheck for both taste and texture it gives a more complex, multidimensional image of perceived similarities and differences between the samples not only including just one aspect or dimension of the products but reflecting on the whole implemented profiling. Because of relatively large differences between some samples two main groups of products can be seen from their locations in Figure 7 with natural flavor to the left and sweet vanilla flavor to the right. PC1 (x- axis) refers to 63.4% of the variance in the data collected for yoghurt. This axis is most influenced by the aspect of taste marked in Figure 8 as Tax and Tay. Together, PC1 and PC2 are explaining as much as 94.5% of the variance within the dataset and it is to be considered a high coefficient of determination making the remaining 4.5% less convenient to focus on at this point. As mentioned above regarding the figures for bread the axes are not equal in the aspect of percentage and degree of explanation which is important to keep in mind.

Tex and Tey are total coordinates for Texture, Tax and Tay are total coordinates for Taste in x- and y-direction. Tex in Figure 8 has for instance a larger influence from both axes (not just mainly PC1) visualized with its location in the middle of the horizontal axis, instead of being located at the endpoints. Tay is located just beside *sour/bitter* in the figure. Texture is by this shown in both dimensions, PC1 and PC2, but Taste is instead explained horizontally on PC1 with as much as 63.4% of the variance in the data explained by namely taste. PC2 explains 31.1% which is half as much.

Because *mild* is located nearest to the middle in Figure 8, this is the aspect with insignificant impact. It is likely to think that *smooth* do have some impact on the placement of the products on the chart even though the words placed more towards the outer blue circle are more significant.

Vanilla 0.5% has a larger influence from PC2 than Vanilla 2% and Vanilla 2.1% because it is described as watery and less creamy (more influenced by texture). Vanilla 2.1% is characterized as the sweetest product and Natural 3% as the most sour/bitter. Since Vanilla 2% and Vanilla 2.1% at the same time as being sweet has influence of being creamy they are placed further down on PC2 on an average placement out of those aspects.

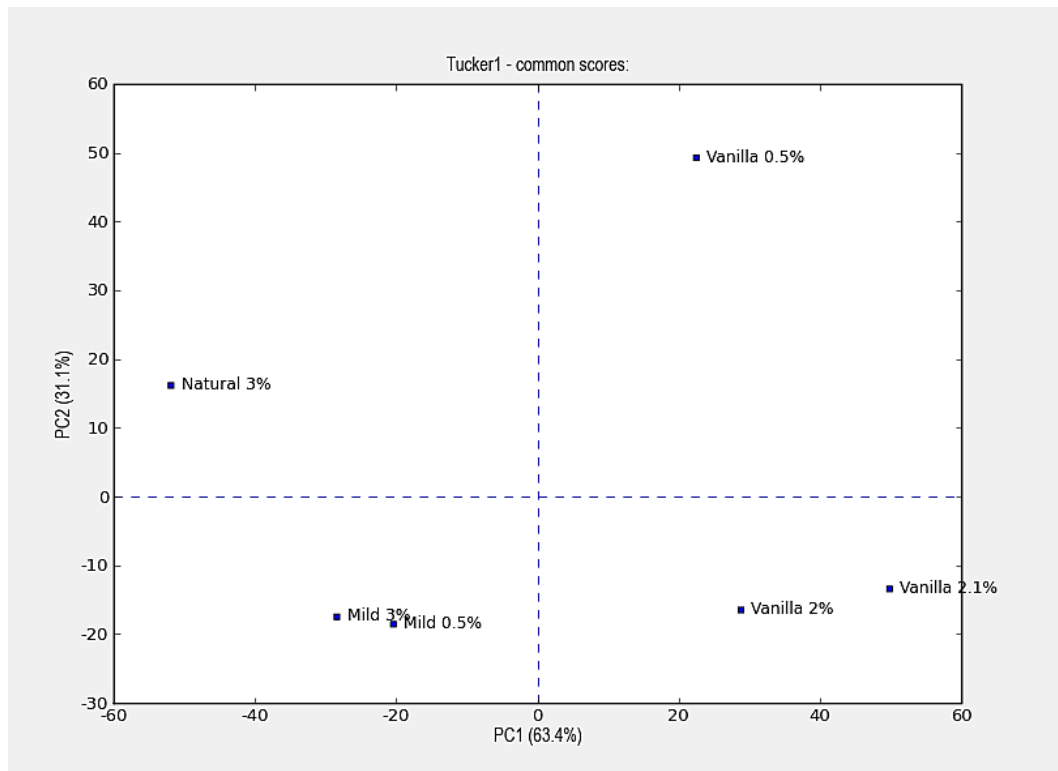


Figure 7. Products located from combined coordinates for yoghurt taste and texture.

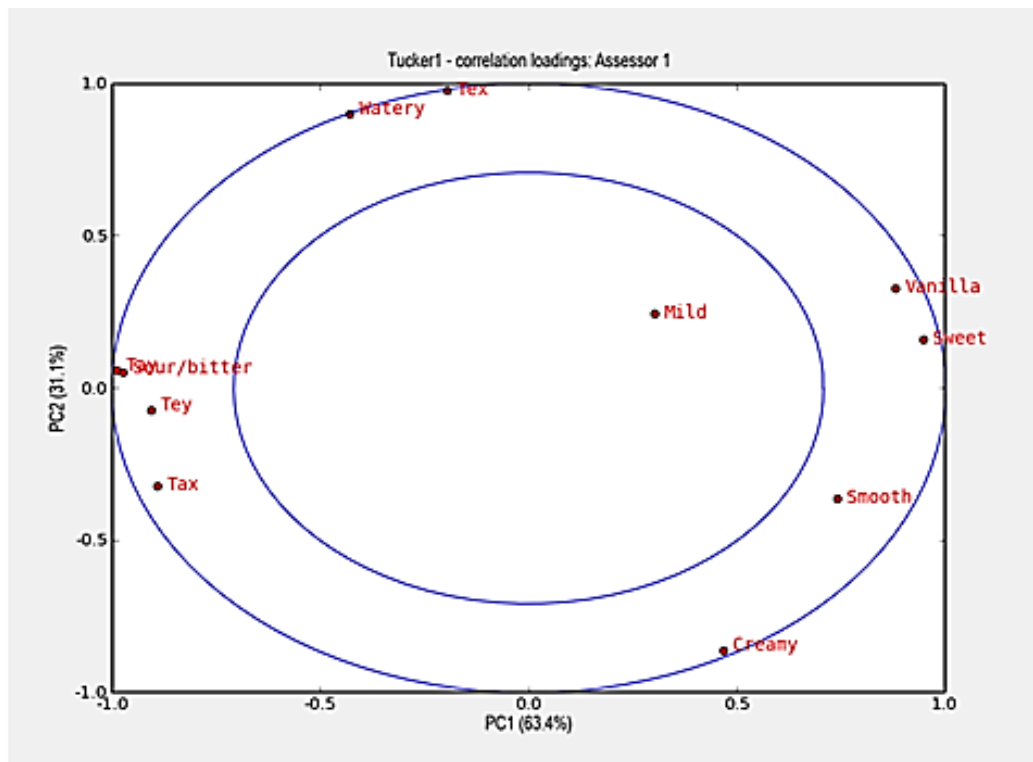


Figure 8. The aspects involved for the discrimination of yogurt regarding taste and texture.

3.3 Consumer preference

This section concerns presentation of both hedonic rating and ranking of liking, divided into bread and yoghurt separately. First the results from the 9-point hedonic like/dislike scale are presented. A disadvantage discussed in literature towards the use of such a scale is that the extremes are seldom used by assessors (Lawless & Heymann, 2010). Another weakness to the 9-point hedonic scale is that the space/distance between the intervals on the scale actually are not as equal as one can initially believe (Cardello & Jeager, 2010), meaning that the step between “neither like or dislike” to “like slightly” is to be considered as a smaller interval than the step between “like moderately” and “like very much” (and vice versa on the dislike scale). Assessors might thereby hesitate to place their preference on the extremes because it communicates such an extreme liking for the specific sample, perhaps not possible to experience after just tasting. This outcome might be the most frequent for a majority of studies performed, in some ways even reflecting results from this study. The extremes were used regarding a few samples and by some consumers but most ratings were placed in the middle of the scale. This can be seen in the listed variation in the bottom of the tables below (Table 8 and 11). The number of consumers in this study is however to be considered as too small in order to make any general assessments regarding the use of such hedonic scales, although valuable to consider.

The results show that even though the extremes on the scales were far from always used, they were chosen by some consumers which indicate that all steps were relevant for the judgment of included samples. No bread products were placed on the extreme for dislike although one yoghurt product was scored twice as “dislike extremely”. The fact that all 9-points on the scale was used might be a result from chosen sample sets which were quite varied and wide in appearance and maybe easier to diverse (like/dislike) than if the samples had been more similar to each other. But this reflection is just to be considered as assumptions; the amount of data is still too small to be significant. “Like extremely” is coded as [9] and “dislike extremely” is coded as [1] when calculating the average score on the 9-point hedonic scale.

The consumers ranked the products from 1-6 where 1 meant the *best* product/placed in first place (most liked as a breakfast product). On the hedonic as well as on the ranking scale it was also possible to write down some additional descriptive words about why a product received the highest and the

lowest scores. The motivations are presented in Appendix 5. These additional motivations and descriptive words are in some ways similar to the words presented above from the Napping® but referred of course more to aspects of *good* and *bad*. Since the motivations at this point were not assumed to form additional information they are placed in appendix form.

3.3.1 Bread

Results from the hedonic 9-point scale are presented in Table 8 and results for the ranking in Table 9 and 10, with the ranking presented in two different layouts.

Table 8. Bread – overall liking of the product, placed on a hedonic 9-point scale.

	Fröjd (Pågen)	Äntligen (Pågen)	Frökusar (Fazer)	Rågform (Fazer)	Polarpärlan vete (Polarbröd)	Rågkaka (Polarbröd)
Like extremely [9]	2					
Like very much [8]	3	1	1	2		
Like [7]	2	1	4	2	1	
Like slightly [6]		1	1	2	4	1
Neither like or dislike [5]		4			1	3
Dislike slightly [4]					1	2
Dislike [3]				1		1
Dislike very much [2]						
Dislike extremely [1]						
Mean score	8 8=like very much	5.9 6=like slightly	6 6=like slightly	6.4 6=like slightly	5.7 6=like slightly	4.6 5=neither like or dislike
[min-max]	[9-7]	[8-5]	[8-6]	[8-3]	[7-4]	[6-3]

Fröjd (Pågen) is clearly the highest rated product with consumer preference never below [7] “like”, but interesting enough is that the other five products are rather similar in its rating ending up in average numbers around [5] “neither like or dislike” and [6] “like slightly” as can be seen in the lower part of the table. To summarize the bread products are to be considered as generally liked by most participating consumers, where only Rågform (Fazer) and Rågkaka (Polarbröd) got dislike- scores once.

Table 9. Bread – Ranking with all individual scores

Assessor/consumer	Fröjd (Pågen)	Äntligen (Pågen)	Frökusar (Fazer)	Rågform (Fazer)	Polarpärlan vete (Polarbröd)	Rågkaka (Polarbröd)
1	2	6	1	3	4	5
2	1	4	3	2	5	6
3	1	4	2	3	6	5
4	1	4	2	3	6	5
5	1	5	2	4	3	6
6	1	4	3	2	5	6
7	2	4	1	6	5	3
Mean score	1.3	4.4	2	3.3	4.9	5.1
[min-max]	[1-2]	[4-6]	[1-3]	[2-6]	[3-6]	[3-6]

The most preferred bread product was Fröjd (Pågen) and the least liked was Rågkaka (Polarbröd), which can be seen from calculated average numbers scored from each assessor in Table 9 or in the scoreboard presented in Table 10. As seen in Table 9, Frökusar (Fazer) was also a popular breakfast product and placed in first place by two out of seven assessors, and not below third place by any. Because of a small consumer panel, Äntligen (Pågen), Rågform (Fazer) and Rågkaka (Polarbröd) all had a large variation in their min-max scores which placed them further down on the scoreboard, leaving unawareness whether a larger amount of data would place these products differently, meaning that individual preference has a greater influence in small panels. It is also important to state once again that the consumers rated the products from a breakfast point of view where some products perhaps had received higher or lower scores if seen from a wider perspective but such reasoning will remain unknown.

Table 10. Bread – Scoreboard of ranking for total group preference

Fröjd (Pågen)	1.
Frökusar (Fazer)	2.
Rågform (Fazer)	3.
Äntligen (Pågen)	4.
Polarpärlan (Polarbröd)	5.
Rågkaka (Polarbröd)	6.

3.3.2 Yoghurt

Results from the hedonic 9-point scale are presented in Table 11 and results from the ranking in Table 12 and 13, with the ranking presented in two different layouts.

Table 11. Yoghurt – overall liking of the product, placed on a hedonic 9-point scale

	Natural 3% (Arla)	Mild 3% (Arla)	Mild 0.5% (Arla)	Vanilla 0.5% (Arla)	Vanilla 2% (Arla)	Vanilla 2.1% (Valio)
Like extremely [9]						1
Like very much [8]				2	5	
Like [7]		1	1	2	1	
Like slightly [6]		3	1	2		1
Neither like or dislike [5]	1		3	1		1
Dislike slightly [4]	1	3	2		1	2
Dislike [3]	2					1
Dislike very much [2]	1					1
Dislike extremely [1]	2					
Mean score	2.6 3=dislike	5.3 5=neither like or dislike	5 5=neither like or dislike	6.7 7=like	7.3 7=like	4.7 5=neither like or dislike
[min-max]	[5-1]	[7-4]	[7-4]	[8-5]	[8-4]	[9-2]

Vanilla 0.5% (Arla) and Vanilla 2% (Arla) are both scored high, but with a slightly higher score for the 2%, placed on [8] “like very much” by as much as five consumers. The Natural 3% (Arla) scored low by all, never higher than [5] “neither like or dislike” and instead placed twice on the [1] “dislike extremely”. Within the sample set there are sweetened and unsweetened flavors and the natural flavors are generally scored lower, however is the Vanilla 2.1% (Valio) a product placed both low and high on the scale.

Table 12. Yoghurt – *Ranking with all individual scores*

Assessor/consumer	Natural 3% (Arla)	Mild 3% (Arla)	Mild 0.5% (Arla)	Vanilla 0.5% (Arla)	Vanilla 2% (Arla)	Vanilla 2.1% (Valio)
1	6	3	4	2	1	5
2	6	3	4	1	2	5
3	4	5	2	3	1	6
4	3	4	5	2	1	6
5	6	4	5	3	2	1
6	6	4	3	2	1	5
7	6	5	4	2	1	3
Mean score [min-max]	5.3 [3-6]	4 [3-5]	3.9 [2-5]	2.1 [1-3]	1.3 [1-2]	4.4 [1-6]

Vanilla yoghurt 2% (Arla) was frequently placed high on the ranking scale, never further down than on second place, and by this considered the most suitable and appreciated breakfast yoghurt at least seen within this sample set scored by participating consumers. The difference in variation of ranking is interesting where for instance Vanilla 2.1% (Valio) is placed both first and last, indicating that you either *love* or *hate* this product, although more often disliked then liked by this minor panel. The variation is rather large in ranking of most products except Vanilla 0.5% (Arla) and Vanilla 2% (Arla), these products are also probably quite similar in sensory experience. The two natural flavored yoghurts, Mild 0.5% (Arla) and Mild 3% (Arla) are mostly placed in between the other samples, with just slightly variation between its min-max scores in the middle, never placed first or last. The Natural 3% (Arla) is placed on the sixth place by as many as five assessors and is by that to be considered the “winner of the losers” when it comes to being a preferred breakfast yoghurt.

Table 13. Yoghurt – *Scoreboard of ranking for total group preference*

Vanilla 2% (Arla)	1.
Vanilla 0.5% (Arla)	2.
Mild 0.5% (Arla)	3.
Mild 3% (Arla)	4.
Vanilla 2.1% (Valio)	5.
Natural 3% (Arla)	6.

3.4 Focus group interview

In similarity to the structure of the results presented above with the two product categories separated from each other, the results from the focus group interview will also be kept apart in this section. As mentioned before, all questions are to be found in Appendix 6 and the presentation below is instead focused on the reasoning and summarizing thoughts and topics discussed by the consumers. All products stayed color coded throughout the whole interview.

3.4.1 Bread

Weekday or weekend. One of the main results from the focus group interview was the clear difference of choice and consumption comparing weekdays to weekends. The tendency was towards more consumption of white bread and baguettes on Saturday and Sunday mornings. During the week the consumers preferred sliced bread or the newly upcoming *portion bread/bread rolls* with healthier and more satiating character. The main argument to why consumers prefer sliced bread during the week is because it eases morning routines.

Everyone participating in the interview stated that the baking day/date was one of the most important criteria when choosing bread. The bread has to be fresh. Many consumers said that all bread bought is placed in the freezer immediately after home transportation, just to keep it as fresh as

possible and the quantity assumed to be used is gradually removed from the freezer. It is likely to think that sliced bread thereby is a favorable choice and faster to defrost in shorter time for those stressful mornings.

An argument to why there is such a difference between weekdays and weekends are that weekdays are thought to be more “healthy” where instead weekends give space for what is considered more of luxury or indulge. Weekends mean more time and opportunity to visit a bakery even though some consumers consider *store baked* bread/baguettes (for instance at ICA) as a bakery baked option. Some consumers mentioned that the optimum would be to bake bread of their own, but at the same time seem to find it untrue to happen due to time constraints. It is also mentioned that bread from bakeries are not sliced which give a less convenient use.

One for me and one for you. The majority of consumers mention that they normally buy one kind of bread to themselves and another to their children. The arguments are generally that they rather see their children eating one slice of white bread than no breakfast at all. One consumer mentioned that her son buys bread of his own if the “wrong” bread is presented at home. But another consumer has successfully served white bread products with added fiber. The consumers themselves preferred healthier, darker, whole grain and fiber bread partly because of a higher degree of fullness. Consumers stated that they find it important that the bread bought to their children is healthy, but still, interesting enough, in many cases actually bought very sweet bread for their children (authors note).

The variety in stores. Except for one consumer participating in this interview, the most bread is bought together with other food products in the supermarket/store. The one exception lives close to a local bakery and choses to buy bread there even on weekdays. The consumers find much of the selection inside supermarkets taste very much the same and that they easy get tired of the different kinds of bread available. Even all new products (and that is truly a great number of products) are too similar to other brands or already existing products on the market. Many new products also contain rye which is stated by one consumer as a potential explanation to this reduced variety among bread products. There was also some discussion about improvement factors connected to the size of packaging and that there are almost no small packaging of bread nowadays, although it was also discussed as maybe unnecessary because most participating consumers store all bread inside the freezer anyway. One consumer also mentions that it would be nice to find more spices in bread, like caraway or anise.

Table 14 lists specific feedback comments and improvement factors mentioned by different consumers.

Table 14. Comments and potential improvements for included bread products

Rågkaka (Polarbröd)	“This product can be improved in every aspect, I would say” “More taste” “It is not a breakfast product for me” “You do not get satiated from this” “No, you can eat five and still feel nothing” “The color is bad and it tastes like paper”
Polarpärlan vete (Polarbröd)	“Maybe more fiber in it...” The kids like it!” “You do not stay full on this for a long time” “It is very dependent on what you add on top”
Äntligen (Pågen)	“Looks nice and inviting” “The taste is rougher” “The flour on top might look nice but it makes the taste less pleasant”
Fröjd (Pågen)	“Nothing to change, I will buy it” “The seeds are good” “Sometimes my children can say they would have preferred one without seeds though”
Frökusar (Fazer)	“It is more compact” And it is somewhat sweet, but I enjoy the taste” “It is well-tasting”
Rågform (Fazer)	“It is dry, compact and taste carton packaging” “Depending on what you put on top of it, cannot eat too much of it” “This is breakfast for me” “You need to masticate and that is good” “You stay satiate” “I rather eat hard bread than this one”

3.4.2 Yoghurt

Products which remain the same. It can nearly be stated that the consumers stay loyal to their choice of yoghurt. A couple of consumers have changed from full fat to low fat, but since long time always chosen vanilla flavor. Another consumer lets her children decide when they go shopping and because of that (and also what store they visit) different flavors end up in the shopping basket. Vanilla is however considered a good flavor basis by the majority of participating consumers, to mix with fresh fruit, cereals or muesli. Some consumers prefer texture with fruit pieces while others always chose smooth yoghurt. Products with high sugar content are mentioned as less preferable and there was some discussion whether a high fat content was assumed as a better option or not, but only resulting in the fact that there was diverse opinions considered this aspect. One consumer stated that the most important issue is what he will eat together with the yoghurt, meaning that some cereals or mueslis are better mixed with less creamy yoghurt or else it just becomes a large lump in the bowl. One consumer says that she had different flavors weekday/weekend, but others instead reflect that it might be no yoghurt at all during weekends (instead large sandwiches). Lastly one consumer mentioned that yoghurt is only eaten during weekends when there is more time for larger breakfasts. It is considered by all that it is favorable with such a wide range of products on the market, even though almost everyone still chose the same flavor over and over again.

They eat what is served. The children seem to accept what is offered at home. One consumer, as mentioned above, let her children chose their own favorite flavor but otherwise no consumer remembers their children being picky on specific flavors. Where instead one consumer point out that a smooth texture is far more important than flavor. Not to forget that all consumers within this group always choose flavored yoghurt. Although a reasoning regarding this fact will stay as assumptions, it is probably easier for children to accept flavored yoghurt compared to natural ones.

Packaging. There are some different packages present on the market, but most consumers find them all stupid and hard to really empty in a proper way. A few would like larger packages, not just one liter. There was also some dialogue between two consumers who had children with lactose intolerance, and the higher price of those products in comparison to regular. All consumers bought yoghurt at the same time as other food products often at supermarkets such as ICA and Coop.

In Table 15 below specific feedback and comments for each product are presented. The improvement factors were mentioned by different consumers.

Table 15. Comments and potential improvements for included yoghurt products

Mild 3% (Arla)	"Not really good" "Something to put garlic and cucumber in, but no, not for breakfast" "It cannot be something sour for breakfast" "I want flavor"
Natural 3% (Arla)	"This goes away, not going to try it again" "No, there are no improvement possibilities for this one" "Is it past expiration date?"
Vanilla 2.1% (Valio)	"This I like" "It is almost too sweet" "Less sweet but same taste" "Maybe a fresher taste" "I like it just the way it is"
Mild 0.5% (Arla)	"It taste nothing" "Somewhat sour" "Not for breakfast" "Something for cooking"
Vanilla 2% (Arla)	"This I liked the most" "With pleasure even more vanilla flavor" "Not sweeter" "I would like it sweeter"
Vanilla 0.5% (Arla)	"More taste" "Watery" "I would like it with fruit or berries in it"

4. General discussion

The Napping® method is probably most useful when rather broad and rough, as well as quick and easy sensory profiling sessions are desired. The Napping® method (as well as PM) is efficient when mapping large sample sets which is different compared to other sensory methods often used for product profiling. There is no requirement for panel training or exact details about accurate profiling, and it is a single session. The future for the use of such a method perhaps especially lies in the need to evaluate the most appropriate products, which optimal number of samples and which size of panel that are ideal and perhaps also which other sensory methods that could be a suitable complement in practice. All these aspects are intended to be discussed in this section.

4.1 Sensory analysis and the Napping® method

Expert sensory panels have a long training with focus on characterizing products in a similar way. In a napping session their maps should thereby be similar to each other. But this is not really the intention of using a Napping® technique. Napping® is meant to provide a great variety. Using a trained sensory panel might reduce the number of individual maps but when working with naïve consumers instead the most important attributes are analyzed and described (Kennedy & Heymann, 2008). The two completely different types of panels should therefore not be compared or weighted against each other. But perhaps instead analyze and evaluate different products and diverse sample sets, with potentially and hopefully different outcomes.

Studies in sensory analysis of food are far from similar to each other. Either are there differences within the sample set, the sensory method used or the aim of the study performed. First and foremost food/beverages products are very diverse in themselves. Also panels of assessors are unique and not really comparable to other panels, not only might they differ in knowledge and skills, but trained assessors are anything but equal to naïve consumers. This last fact is not necessary a negative aspect, although a fact to keep in mind.

Former Napping® studies have generally used a global/holistic approach and evaluated all modalities/attributes of samples at a time. The alternative method, partial Napping®, used in this study, is to be considered a variety and even more rarely used in sensory analyses so far. Thereby results and reflections from the Napping® study 21st November are not really comparable to previous studies presented in the literary review. But it should still be discussed whether the partial Napping® is to be considered to be a more appropriate choice in consumer testing, or not. The partial Napping® will probably result in three times as much data (if using three different modalities) without actually taking three times as long in practice. It might be an easier task to perform as well.

It can be concluded that several descriptive words were collected in this particular study (without having another study to compare with), and next step is just to know what the words tell us. Are more descriptive words a better outcome and result? The answer needs to be made in connection to the aim of the study. In this particular case it was beneficial to receive as much data as possible in order to have material to work with and evaluate, due to a small panel of assessors the data is still minor. However, an interesting aspect to note and reflect about is if a global/holistic Napping® instead would only yield those aspects truly important for the consumers, after all, they are in those cases individually chosen and thereby maybe more useful outcomes and more correlated to the true essence by using this sensory method in the first place. By this said, meaning that one modality might not at all be considered significant for one sample (by one or several consumers), although in a partial Napping® forced to be characterized. But in the meanwhile, consumers might be helped by guidance instead of finding the napping task too fuzzy and unstructured.

Another potential limitation with this particular pilot-study is the usage of consensus mapping, because some information might get lost due to that the loudest voice is the one heard when making group summaries. When going through all individual maps afterwards (because they were all collected at the end of the session) this drawback was solved. Since the number of consumers in this case was

small, it was not really a problem going through all individual maps and compare them to the consensus one, but when performing larger studies it might be an important aspect to consider. Consensus maps in this study should instead potentially be seen as a support for both consumers and panel leaders to verify that the technique was understood, but nothing to continuously execute in future studies. Consensus maps can, and often are, easily compiled in data programs from the individual maps anyway.

There is also generally a larger need for more assessors when using methods of rapid character because the results are less specific and qualitative. This puts a pressure on recruitment of assessors and more sessions in total, if not having locational space for several assessors at the same time, and of course require more samples in total. What a minimum number of assessors would be in order to verify and receive proper results will stay unanswered at this point, because of inadequate knowledge.

4.2 The sample set

Napping® is thought to provide a holistic approach on samples within the evaluation, but the evaluation is not concerning products in general, but among the specific products within the sample set. The design of the sample set is thereby very important. The included samples in the set have been discussed slightly before but can very well be mentioned once again. The sample set is of high importance regardless of the sensory method used, although maybe even more important in techniques testing several products. The Napping® method describes, but also group, samples from perceived similarities and differences. Of course, thereby the included samples are affected by other products present at the same time. The sample set does and will contribute to which results and outcomes to be expected but should also influence which method/methods to actually use. The Napping® technique cannot be considered to be the ideal choice in all sensory analyses but instead an option under correct conditions. For instance might some product attribute be hard for consumers to measure, such as mouthfeel and afterfeel (Moussaoui *et al.*, 2010) which stresses the fact that no method or panel excludes others. Although, the *correct conditions* are after this completed bread- and yoghurt study to be considered as insufficiently investigated.

Sample sets with large differences will impact the outcome (Kennedy & Heymann, 2008). Trained assessors are generally trained to find small differences but even within sample sets comparing natural and vanilla flavored yoghurt most probably the outcome would be similar to what was found in this study made with consumers. The differences between the samples were too large, especially regarding the bread products, meaning that some results are not very useful because they were too obvious.

Napping® is by that a useful technique when mapping differences in those cases where the differences are neither too large nor too trivial. Different manufactories, various seasoning and fat content are some better examples of sample variations (pers. com., Dehlholm, 2012). In the sample set of yoghurt the three different vanilla yoghurts and the three different natural flavored yoghurts were actually rather well composed within each sub-group, although too few (just three each) to optimally use the Napping® technique. Instead perhaps only flavored yoghurts should have been used, with different fat content and different manufactories. It is likely to think that the design of the perfect sample set is a very important consideration or else the results will provide less/nothing.

4.3 Disadvantages and weaknesses with the Napping® study

4.3.1 The Swedish language

Another reflection made, not only regarding this particular partial Napping® study, but with the Swedish language, is the word *flavor*, because it does not really exist a proper Swedish word for flavor. Flavor includes both odor and taste where instead “smak” in Swedish can be considered as a word for both flavor and taste separately. It seems that the consumers in this study evaluated the taste of vanilla even though vanilla actually is a flavor, but a risk when using consumers is always that they might understand and interpret words differently receiving very diverse outcomes. When using consumer panels, a great variety in outcome could be seen as favorable and valuable instead of as a disadvantage, but the method is limited in this case, since what is really meant by a certain word is not

really evaluated. This study performed the consensus maps and thereby provided all consumers to reflect and listen to other descriptive words from the other consumers, but consensus maps have other drawbacks as mentioned above. When using consumers it is important and essential not to use words and a language that is too internal and difficult to understand, and in this case not to forget that the whole study was performed in Swedish, whereby the word “smak” must be considered appropriate.

4.3.2 Breakfast products

The consumers were throughout the whole study told to characterize and evaluate the samples as the potential of being breakfast products. During the focus group interview it became clear that the consumers did find a preference for some products scored low during the characterization session, but in those cases used for other occasions than breakfast. Perhaps was the breakfast delimitation too narrow, especially in relation to chosen samples. It might also have been favorable to delimit the product usage because food products are such a wide concept, influenced by several factors and contexts. The consumers not least did say that they bought some of the products frequently, but for their children and others for themselves. It will never become clear if the results from the preference rating and ranking would have been very different if not using the breakfast focus but it can be expected that it would have made influence, since the products most likely had been evaluated from a context chosen individually by participating consumers. Perhaps the restricted context was instead beneficial for the very widespread sample set. Unfortunately such thoughts will stay as assumptions too.

Sensory analysis is always to be considered as somewhat an awkward situation, without a normal eating situation. The products in this study might also, like many other products, get affected by this detail. Bread for breakfast is normally consumed with butter, cheese, ham or similar and yoghurt often with cereals or muesli. But the products were not evaluated out of that angle. The session was neither taking place in the morning/time for breakfast but in the afternoon. And when eating breakfast, often more than just a spoon or a piece of bread is consumed, and products tend to be perceived differently comparing tasting to eating a portion size. These drawbacks are rather general for all sensory analyzes and widely known by everyone working in the field but still interesting to highlight because the work continues more or less the same at sensory departments. Sadly enough, the answer to such reasoning will not be stated here at this point but in order to really use sensory analysis for product development processes it can be expected that the link between test sessions and reality must come closer. And as part of the project *“Consumers' food choices, how, why and when?”* the intention is to dig deeper into the complexity of consumer behavior whereby this reflection might be even more suitable.

4.4 Possibilities and future improvement factors

Napping® can be very useful as a rapid method in order to overview a larger part of a product category with several samples at the same time. A reference duplicate could have been a good estimation of reliability not to forget that assessors are informed to discriminate samples meaning that the two similar samples must be assumed to end up on different locations, although hopefully near each other. A duplicate sample was used during the napping of béarnaise sauces as part of the next phase in the project *“Consumers' food choices, how, why and when?”* implemented in April/May 2012 and will be further evaluated but not in this thesis.

Kennedy (2010) states that assessors tend to complete the Napping® faster after just a few implementations. This reflection was made in this study as well indicating that the method is time-efficient and unique in its rapidness with a short learning procedure.

Further estimations for upcoming Napping® studies could evaluate whether the partial Napping® receives in higher preference for the included samples than global/holistic Napping®, because the consumers evaluate and analyze the products more complex and “get to know them” better. Assessors also have the potential to really try the products because they are encouraged to test and taste the samples many times, in a non-randomized order. The Napping® method increases the knowledge about included products and might thereby reflect more accurate on the outcome from upcoming performed preference tests, meaning that a more complex judgment might give a more real picture on actual consumer liking where instead traditional consumer testing is just a bite/spoon of a sample

tested once. Still, not to forget that Napping® will be very dependent on the set of samples and the kind of products that are included and not least that food choice in reality depends more than on actual preference, which was confirmed in the focus group interview.

If using sample sets of more similar products (or less obvious dissimilarities) it is likely to think that results from trained assessors compared to consumer panels should indicate more valid results but this is nothing further investigated at the moment, although might form a basis for future use of the Napping® technique. Future science in the field could therefore advantageously examine the optimal sample set for using the PM/Napping, which been stated by many researches before. How the diversity and how samples within a set influence each other, probably best done by implementing several sessions of different appearance and study objectives. The objective in this particular study was mostly to try out a novel method which nobody within the project actually knew much about and also evaluate and find possible improvement factors and things to take into consideration for the future use of the method (already April/May 2012). By this, it is unfortunately hard to make any true validity on the outcome since there was no particular expected outcome at all. Included food companies might have had a particular interest in consumer preference and for instance to compare the preference for products from different production processes (Polarbröd uses a fresh frozen production process). The fact is, Polarbröd got far from highest scores in the preference test but these products were also very different from the most liked products and it is hard to actually compare them. The production process might have influenced the preference for those products but it is likely to think that other aspects had larger influence.

The assessors might have found it helpful to have a stencil on the side just to make some notes about the samples while testing them, which could ease the napping procedure afterwards as well. Even though the Napping® technique is a non-randomized method with an optional testing order, there were no further thoughts or evaluations about if consumers likewise tended to start with specific samples such as the whitest bread, a particular de-identification code or similar. Because of that no additional discussion regarding this consideration can be made, and perhaps is the thoughts more appropriate when it comes to hot/warm samples because these will gradually cool down and impact the sensory experience. Seen from this perspective, some products most probably are less suitable for large sample sets. It is not assumed that the yoghurt reached room temperature before the session was ended, although of course became slightly warmer than when it was initially served.

4.5 The management, analysis and potential use of sub-collected data

4.5.1 Preference tests

The measurement of preference was made on a 9-point hedonic scale. Such traditional and well-used scale is limited because assessors might namely like some parts of a product but dislike others, for instance like the texture but dislike the odor. But the 9-point hedonic scale is just a one-way or an overall rating of the product. In worst case scenarios it will end up in a large number of “neither like or dislike” scores. Another tool, preferably where assessors can both state their degree of liking and disliking separately on each product, would perhaps provide more relevant results. This study was not mainly focused on consumer preferences for selected samples; it was more of a sub-evaluation to the main objectives. But it is still interesting to reason about that the 9-point hedonic scale is very frequently used, although very flat in its potential for relevant conclusions especially when it comes to the use for evaluation regarding new product development.

4.5.2 Focus group interview

The focus group interview made it clear that not only sensory aspects but other conditions contribute to consumers' choice of food products. This cannot be considered revolutionary news but gives a much deeper understanding for the characterization of included food samples. The discussion from the executed interview must be considered useful and gave the consumers freedom in order to state their own thoughts and ideas. The included products got the opportunity to be verified as products outside the breakfast aspects and it became clear that some products very much could be bought and consumed in combinations with for instance spreads and muesli. Since the project “*Consumers' food*

choices, how, why and when?” is oriented towards a holistic view on consumer behavior such complement as a focus group interview must be considered appropriate and highlight aspects not directly connected to sensory experiences but likewise important for the consumption and preference of the product. A focus group interview without an initial sensory session could contribute to participants talking out of different contexts, likewise might the practical Napping® session been limiting where consumers probably thought more of tested products than if they had not tested them in beforehand. Focus group interviews are time-consuming and very specific, reflecting only on individual opinions. Focus group interviews should most likely optimally be held with different group constellations until no additional information emerges. A required number of sessions are of course difficult to state (not least depending on the topic), although one single session is to be considered as too narrow. This fact obviously reduces the use of these results even though more sessions were not possible in the scope of this master’s thesis.

4.6 Summarizing conclusions and closing remarks

The implemented study was made as a pilot as part of a much larger project. All members of the preparatory work in this Napping® study are beginners on both planning and executing of such sensory tests. The results and reflections from this study did end up in a list of improvement factors, for the future use of such a technique. Initially, it was hard to introduce the method to the consumers in a proper way, without giving too much of guidance and own words of examples, not to influence the consumers own thoughts but still deliver enough information to understand the somewhat fuzzy task. Ending up with maps where it only says “good or bad taste” does not receive very useful information. Rapid and unstructured sensory methods on consumer panels are perhaps still in a large phase of development and additional evaluation of the usage and potential objectives/outcomes needs to be done. Employees working with consumer testing need to state the intention with such studies and the use of consumer panels as well, or else might the result mostly be a lot of data.

The Napping® method says less about whether products are more or less liked, if they will be successful on the market, or whether the product could be improved in some ways, and the method does not have that intention either. But it might be concluded that this profiling method thereby needs to be supplemented with other methods, for instance an interview, a scaling method of some kind, depending on the aim, desired outcome and panel used within a specific study. Further evaluations most certainly need to be done for an optimal use of the results in practice, perhaps in food industries, consumer research and new product development.

Finally, a sensory method is never in its own more beneficial than another but instead relies on the understanding of its usage. By this meaning that all assessors in a panel need to know how to perform the evaluation otherwise the method is inappropriate. The method proposed as most suitable for the panel also needs to be correlated to the aim of the study and the intended outcome from the evaluation, not to forget that the selected sensory method is dependent on the products within the sample set. It is concluded in many studies before this one, that no certain sensory method is to prefer but instead combinations or different methods for different occasions. Therefore it should be concluded that the Napping® technique most probably fulfill a demand not least when it comes to rapid characterizations of large sample sets. But the method needs to be further evaluated and verified where an optimal number of samples, a balanced variation and suitable choice of product sets must be investigated even more. Just in these days, a study in Copenhagen is in its startup phase for investigating whether the size and shape of the paper affects the outcome; there will be investigations with blank papers squared 60x60 cm and also paper sheets in circular shape. The Napping® method as a sensory technique does have an evaluative and developmental process ahead. This was just a small beginning.

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Appendix 1

Recruitment questionnaire for a sensory study - breakfast habits

1. First- and family name

☐ :

2. Where do you usually eat your breakfast?

- ☒ At home
- ☐ At work
- ☐ Another location, where?
- ☐ Do not eat breakfast

3. Which dairy products do you eat for breakfast? (several options can be selected)

- ☐ **Sour milk.** What kind? (flavor, fat content, brand etc.)
- ☐ **Yoghurt.** What kind? (flavor, fat content, brand etc.)
- ☐ **Milk/Milk drink.** What kind? (fat content and brand)
- ☐ **Cheese.** What kind? (flavor, fat content, brand etc.)
- ☐ **Butter/margarine/spreads.** What kind? (fat content and brand)
- ☐ **Other.** What? (kind, fat content, brand etc.)
- ☐ **Do not eat dairy products for breakfast**

4. **What cereals/muesli/grain do you eat for breakfast?** *(several options can be selected)*

☐

Porridge. *What kind and brand?*

☐

Cereals. *What kind and brand?*

☐

Muesli. *What kind and brand?*

☐

Others. *What? (kind and brand)*

☐

Do not eat cereals/muesli/grain for breakfast

5. **What bread do you eat for breakfast?** *(several options can be selected)*

☐

White bread. *What kind and brand?*

☐

Dark bread. *What kind and brand?*

☐

Hard bread/crisp bread. *What kind and brand?*

☐

Others. *What?*

☐

Do not eat bread for breakfast

6. **What drink do you choose for breakfast?** *(several options can be selected)*

☐

Coffee. *What kind and brand?*

☐

Tea. *What kind and brand?*

☐

Fruit-drink, such as juice, rosehip/blueberry soup, Proviva etc. *What kind and brand?*

☐

Others. *What?*

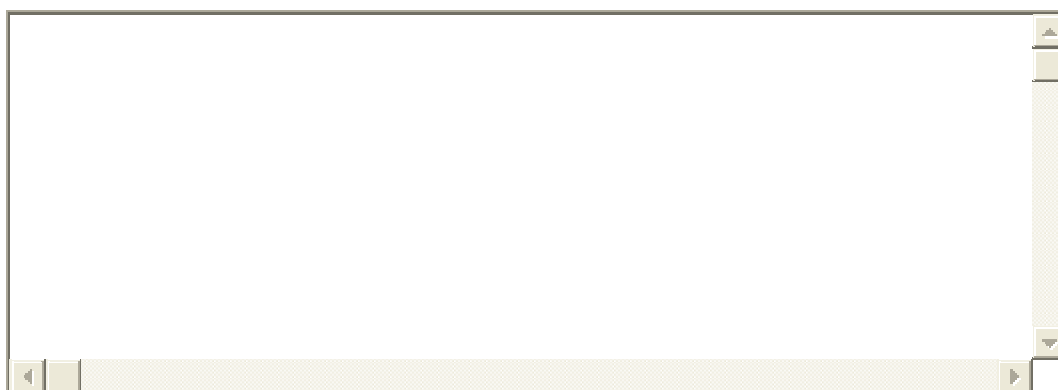
☐

Do not drink anything in the morning

7. **Do your breakfast habits differ weekends compared to weekdays?**

- ☐ **Yes**, completely different. How?
- ☐ **Yes**, some. How?
- ☐ **No**, not at all.
- ☐ **Sometimes**. How?
- ☐ **Do not eat breakfast on weekends**

8. **Other comments:** *(Write if you find something particular of interest to know about your breakfast habits, for instance any food allergy/intolerance)*



SKICKA

Appendix 2

Gothenburg 2011-10-07

Request to participate in a sensory study of two different categories of breakfast products

Hello,

Since you, by answering a questionnaire about what you usually eat for breakfast, also reported interest to participate in the next phase of the study, this letter is sent to you. The next phase of the study is sensory evaluating of various products. You have been selected to be part of the sensory tasting of breakfast products.

The sensory study will form the basis for a master's thesis which is done in collaboration with SIK and SLU (Swedish University of Agricultural Sciences). This particular sensory evaluation is part of the larger project "*Consumers' food choices - how, why and when?*", a project cooperation between SIK, Linköping University, and food companies.

The purpose of the sensory evaluation is to reflect and evaluate a method called Napping® which was not previously been used together with consumers at SIK in a widely setting. The method involves placing samples of various foods in relation to each other based on the observer's perceived smell, taste and texture.

The sensory test will take place at SIK on Monday 21st of November. The meeting will include both individual tasting and group discussion about food choices. The session will take place afternoon-evening, about 3-4 hours in total. The group will consist of about 8 people/consumers. You will receive a compensation of 400 SEK in national coupons.

Results from the sensory tasting will be included in a master's thesis finalized in spring 2012, and will also be available as a SIK-report. Participation in the study is completely voluntary and the results will be reported so that no individual can be identified. If you have questions about the study please contact Anne Normann by Phone: **0705-735 959**, E-mail: **Anne_Normann@hotmail.com** or Anna Holmer Phone: **010-516 66 59**, E-mail: Anna.Holmer@sik.se

To register for participation in the study, please answer this e-mail as soon as possible. We will thereafter contact you through phone and inform an accurate time when you are welcome to the meeting at SIK.

Regards

Anne Normann, Anna Holmer, Karin Wendin, Annika Åström och Daniel Västfjäll



SIK – Institutet för Livsmedel och Bioteknik AB
Sensorik och Arom

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Appendix 3 Nutritional content and product information

Frökusar (Fazer)

Nutritional content

Flour (whole meal flour from wheat, graham), wheat flour, spelt 10% (flour and flakes), water, sunflower seeds 9%, flaxseed 5%, syrup, wheat gluten, yeast, rye fiber (Fazer Rye Fiber®), scalding of whole grain rye flour, wort, pumpkin seeds 2%, salt, thickener (guar gum), rye malt, preservatives (sorbic acid). Contains 19% whole grain, 25% of dry weight.

Nutritional information per 100 g:

Energy	260 calories/1100 kJ
Protein	11.5 g
Carbohydrate	35 g
<i>Sugars</i>	4.5 g
Fat	7 g
<i>Saturated</i>	1.5 g
Fiber	5.5 g
Sodium	0.4 g



Rågform (Fazer)

Nutritional content

Water, whole rye flour, sourdough whole meal rye flour, wheat flour, rye flakes, wort of barley, yeast, salt, rapeseed oil. 66% of total grain is rye. Contains 38% whole grain, 73% of dry weight.

Nutritional information per 100 g:

Energy	220 calories/930 kJ
Protein	7.5 g
Carbohydrate	43 g
<i>Sugars</i>	4 g
Fat	2 g
<i>Saturated</i>	1 g
Fiber	9.5 g
Sodium	0.4 g (1 g salt)



Äntligen (Pågen)

Nutritional content

Wheat flour, water, whole wheat flour, sourdough wheat, sifted rye flour, corn-starch, vegetable oil, oat scalding, yeast, wheat gluten, sugar, fermented wheat flour, malt, salt, malt vinegar, baking soda (E503, E450 and E500) and vegetable emulsifier (E471). Contains 19% whole grain, 25% of dry weight.

Nutritional information per 100 g:

Energy	280 calories/1150 kJ
Protein	8.5 g
Carbohydrate	44 g
<i>Sugars</i>	5 g
Fat	5.5 g
<i>Saturated</i>	0.8 g
Fiber	7 g
Sodium	0.4 g (1 g salt)



Fröjd (Pågen)

Nutritional content

Wheat flour, water, whole grain oat flour, sunflower seeds 6.5%, yellow and brown flaxseeds 6%, whole grain rye flour, whole grain wheat flour, sifted rye flour, yeast, syrup (glucose, sucrose and fructose), wheat gluten, malt, vegetable oil, oat grains, melon seeds 1%, rye sourdough, salt, fermented wheat flour, vegetable emulsifier (E471, E482), malt flour and baking powder (E450, E500). Contains 19% whole grain, 25% of dry weight.

Nutritional information per 100 g:

Energy	300 calories/1250 kJ
Protein	12 g
Carbohydrate	39 g
<i>Sugars</i>	5 g
Fat	9.5 g
<i>Saturated</i>	1.3 g
Fiber	6 g
Sodium	0.4 g



Rågkaka (Polarbröd)

Nutritional content

Wheat flour, sifted rye flour, water, syrup, sugar, yeast, wheat gluten, vegetable oil (rapeseed oil), fiber from sugar beet, salt, potato starch, emulsifier (mono-and diglycerides from fatty acids, mono-and diglycerides from mono-and diacetyl tartaric acid), baking powder (ammonium carbonate), fructose, sourdough/yeast culture, flour treatment (ascorbic acid), enzyme. Free from milk.

Nutritional information per 100 g:

Energy	270 calories/1150 kJ
Protein	7.8 g
Carbohydrate	51 g
<i>Sugars</i>	9.2 g
Fat	2.9 g
<i>Saturated</i>	0.9 g
Fiber	4.7 g
Sodium	0.4 g (1.1 g salt)



Polarpärlan vete (Polarbröd)

Nutritional content

Wheat flour, water, yeast, sugar, syrup, vegetable oil, fermented wheat flour, wheat gluten, salt, fiber from sugar beet, emulsifiers (mono- and diglycerides of fatty acids, mono- and diglycerides of mono and diacetyl tartaric acid), baking powder (ammonium carbonate), fructose, flour treatment (ascorbic acid), enzyme. Free from milk.

Nutritional information per 100 g:

Energy	260 calories/1160 kJ
Protein	8.4 g
Carbohydrate	51 g
<i>Sugars</i>	7.4 g
Fat	3.3 g
<i>Saturated</i>	0.9 g
Fiber	3.1 g
Sodium	0.3 g (0.7 g salt)





Yoghurt Natural 3% (Arla)

Nutritional content

Pasteurized milk (high temperature) and yogurt culture.

Nutritional information per 100 g:

Energy	60 calories/240 kJ
Protein	3.3 g
Carbohydrate	4 g
Fat	3 g
Riboflavin	0.14 mg
Vitamin B12	0.3 µg
Calcium	120 mg

Yoghurt Mild 3% [Natural] (Arla)

Nutritional content

Pasteurized milk (high temperature) and mild yogurt culture.

Nutritional information per 100 g:

Energy	60 calories/240 kJ
Protein	3.3 g
Carbohydrate	4 g
Fat	3 g
Riboflavin	0.14 mg
Vitamin B12	0.3 µg
Calcium	120 mg

Yoghurt 0.5% Mild [Natural] (Arla)

Nutritional content

Pasteurized milk (high temperature), milk protein, mild yogurt culture, vitamin A and D.

Nutritional information per 100 g:

Energy	40 calories/160 kJ		
Protein	4 g	Vitamin A	25 µg
Carbohydrate	4 g	Vitamin D	0.38 µg
<i>Sugars</i>	4 g	Riboflavin	0.14 mg
Fat	0.5 g	Vitamin B12	0.3 µg
<i>Saturated</i>	0.3 g	Calcium	120 mg
Fiber	0 g		
Sodium	0.05 g		

Yoghurt [Mild] Vanilla 0.5% (Arla)

Nutritional content

Pasteurized milk (high temperature), sugar (5%), milk protein, vanilla aroma, vanilla extract and mild yoghurt culture.

Nutritional information per 100 g:

Energy	60 calories/240 kJ
Protein	4 g
Carbohydrate	9 g
<i>Sugars</i>	9 g
Fat	0.5 g
<i>Saturated</i>	0.3 g
Fiber	0 g
Sodium	0.03 g
Vitamin B12	0.27 µg

Yoghurt [Mild] Vanilla 2% (Arla)

Nutritional content

Pasteurized milk (high temperature), sugar (5%), milk protein, vanilla aroma, vanilla extract and mild yoghurt culture.

Nutritional information per 100 g:

Energy	70 calories/300 kJ
Protein	4 g
Carbohydrate	9 g
<i>Sugars</i>	9 g
Fat	2 g
<i>Saturated</i>	1.3 g
Fiber	0 g
Sodium	0.03 g
Vitamin B12	0.27 µg

Yoghurt Vanilla [Original] 2.1% (Valio)

Nutritional content

Pasteurized milk (high temperature), berry processing (Sugar, water, thickener (modified maize starch and guar gum), flavors (including vanilla and vanillin), and acid (citric acid)), lactase, yoghurt culture, Lactobacillus acidophilus, Bifidobacterium sp. and vitamin D. Amount added sugar per 100 g is 8 g (8%).

Nutritional information per 100 g:

Energy	85 calories/360 kJ
Protein	3.5 g
Carbohydrate	13 g
<i>Sugars</i>	13 g
Fat	2.1 g
<i>Saturated</i>	1.2 g
Sodium	0.04 g
Vitamin D	1 µg
Riboflavin	0.14 mg
Vitamin B12	0.4 µg
Calcium	120 mg



Appendix 4 9-point hedonic scale

What is your total liking of this sample? [*Color*]

☐

Dislike
extremely

☐

Dislike
very much

☐

Dislike
moderately

☐

Dislike
slightly

☐

Neither like
or dislike

☐

Like
slightly

☐

Like
moderately

☐

Like
very much

☐

Like
extremely

Why do You think like this? Comments:

Appendix 5 More descriptive words

All words listed below were individual motivations formulated in connection to preference tests and ranking. In order to make it clearer the words are all presented in pros and cons represented by plusses and minuses respectively. Because many words are very informal and to be considered as spoken language, they are presented in its original form. Thereby, the following appendix is in Swedish, since translation would not make the words enough justice.

Bread

Fröjd (Pågen):

- + Luftigt, god smak, nyttigt, bra storlek, heltäckande frukostbröd, favorit i alla kategorier, lagom frösmak, mustigt, mjukt, saftigt, färskt, lagom mörkt, lite grövre, mindre sött, trevlig form, inbjudande, matigt, vackert, tuggmotstånd
-

Frökusar (Fazer):

- + Bra/god smak, goda fröer, nyttigt, bra med olika konsistenser, fluffigt, mjukt, matrikt, kraftigt, saftigt, känslan av nygräddat
- Lite för hård, svampigt

Rågform (Fazer):

- + Nyttig, matrik, mättnadskänsla, smakrik
- Torr, hård, salt, besk, för grov, tråkigt

Polarpärlan vete (Polarbröd):

- + Bra till barnen
- Onyttig, söt, smaklös, degig, behövs pålägg, tråkig konsistens, inte "varje dag" bröd, blir dåligt mätt, smakar bulle/vetebröd

Äntligen (Pågen):

- + Mjukt, färskt, fin färg, trevligt intryck, ok, enkelt, barnmacka, äta ibland, går att äta, vitt bröd som ska verka nyttigt
- Smaklöst, tunn, varken från eller till för mättnad, inte så nyttig, ganska menlös, smaklöst, smakar bara mjöl

Rågkaka (Polarbröd):

- + Känns hyfsat nyttig, ganska god, ok smak
- Torr, platt, färglös, smaklös, lite mat, meningslös, som en pappersbit i munnen, tråkigt, blir inte mätt, degig, inget frukostbröd

Yoghurt

Vanilj 2% (Arla):

- + Lagom söt, bra, krämig, god, bra syra, smakar mycket vanilj, len, lätt
- Okej i smak och konsistens, för söt, tunn, blaskig

Vanilj 0.5% (Arla):

- + Smakar mycket, lagom tjock och söt, fast konsistens, god, bra, mild och krämig smak, mycket vaniljsmak, lagom tjocklek
- Lite för lite vaniljsmak, för tunn

Mild 0.5% (Arla):

- + Len, lätt, mindre söt, frukostfavorit, krämig, neutral, ok med lite bär
- Smakar inget, menlös, lite för sur, ingen direkt smak

Mild 3% (Arla):

- + Len, osötad, lagom/bra konsistens, mild smak, syrlig, ok om man lägger i lite bär
- Osötad, smakar filmjolk (blå), smakar inget, smaklös, lite sur

Vanilj 2.1% (Arla):

- + Kanonbra smak och konsistens, krämig, som mellanmål
- Konstgjord smak, alldeles för söt, klumpig, för tjock, glass

Naturell 3% (Arla):

- +
- För sur/syrlig, sträv, rinnig/tunn, vänder sig i munnen, besk smak, inte god, bitter, går inte att äta, grymig

Appendix 6

Focus group interview: Questions

Bread products

General questions

- What products do you buy in current daily situation? (size, packages, bakery baked) Why? (taste, health aspects, appearance)
- What products do you not buy? Why not? (taste, too expensive, unhealthy, habits)
- On what occasions do you consume the different breads? Are there dissimilarities between weekdays and weekends?
- What do you think is positive and/or negative with the present products on the market? (narrow range of products/large variety of products, bread taste similar/unlike other brands, packages/size, sliced bread). If you were about to change the market in some way, what would it be?
- What do you find most important when you purchase bread for your children? (taste, nutritional content, packaging, sugar, fiber, usage).
- Where do you buy the products? (Supermarket, special stores/bakeries, bakes at home).

Sensory: (the products are served in front of the consumers once again)

- In what way could the sensory properties be improved?
 - Appearance
 - Taste/flavor
 - Texture
 - Anything else that could be improved or changed?

Yoghurt products

General questions

- What products do you buy in current daily situation? Why? (taste, health aspects, appearance)
- What products do you not buy? Why not? (taste, too expensive, unhealthy, habits)
- On what occasions do you consume yoghurt? (breakfast, afternoon, evening) Are there dissimilarities between weekdays and weekends?
- What do you think is positive and/or negative with present products on the market? (narrow range of products/large variety of products, similar/unlike flavors and brands, packages function/size). If you were about to change the market in some way, what would it be?
- What do you find most important when you purchase yoghurt for your children? (taste, nutritional content, packaging, sugar, usage)
- Where do you buy the products? (Supermarket, special stores/bakeries)

Sensory: *(the products are served in front of the consumers once again)*

- In what way could the sensory properties be improved?
 - Taste/ flavor
 - Texture
 - Anything else that could be improved or changed?