Can a consumers' gaze be controlled?

An analysis of the impact of social cues and nutrition claims in packaging design.

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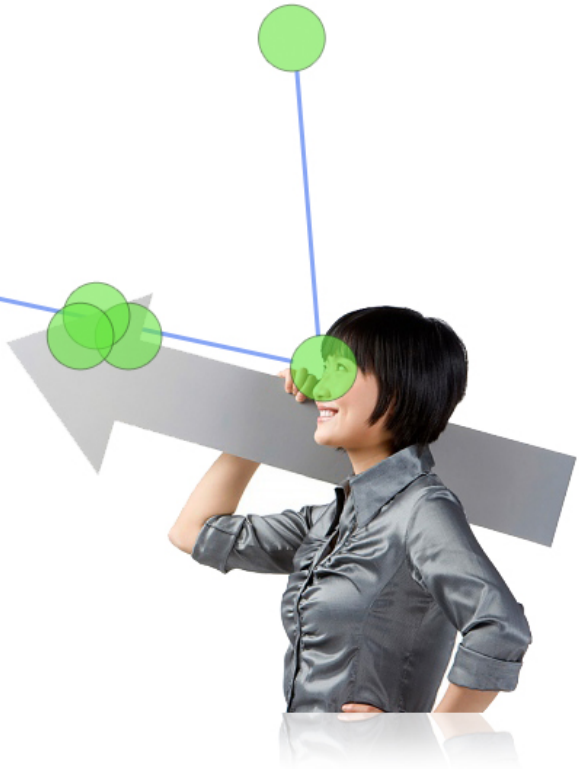

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Abstract

Product packaging designers use several instruments to attract the attention of a consumer. The front of a package is considered very important in this matter, because most consumers base their decision to buy only on this part of the package. Considering packages of dairy products, there are only a few square centimeters to convince a consumer that this package should win the election. While putting all convincing elements (e.g. nutrition claims, price discounts, improved taste and depictures of ingredients) on these few square centimeters, it is important a consumer sees most of it to ensure maximum persuasion. Gaze directing cues (like arrows, eyes, shapes and colors) can assist in this matter.

This research investigates the power of social cues and nutritionclaims on the front of a package of a dairy product. Impact on perceived attractiveness and purchase intent is measured and gaze controlling power is recorded by an eye tracking device in a lab setting, while participants were presented several packages on a computerscreen. Results indicate that a social cue directing to a protein claim significantly decreases the chance such claim is noticed. Furthermore, attractive social cues on the front of a package significantly lower the perceived attractiveness of a product of consumers with a low health interest, but have no significant influence on purchase intent. A protein claim has no significant impact on purchase intention or perceived attractiveness, regardless of the health awareness of a consumer.

Keywords: Social Cue, control element, eye tracking, front of package, purchase intent, attractiveness, dairy product package.

Table of Contents

1. Introduction

You walk in a store. It's about six p.m. and after a hard days work you find yourself in a hurry. You're tired, hungry and there is no food at home, so you have to buy some. You haven't got specific products in mind, yet. You scan a shelf, grab a package and without a real thought you throw it in your cart. Within five minutes you have selected 12 packages for purchase and you're ready to check out. This situation probably looks familiar to you. Over 70% of all consumers make their product choice in-store (Dickson & Sawyer, 1990; Rettie & Brewer, 2000). However, shopping for groceries is a proces where consumers take little time. Despite this, many psychological processes follow each other in a swift order, most of them absolutely unconsciously. Russo and Leclerc (1994) described three stages during the choice process: (1) orientation, (2) evaluation and (3) verification.

During the orientation stage, people overview the product display and sometimes screen out some unwanted alternatives. Their eyes switch between two conditions (Salvucci & Goldberg, 2000). During a fixation, the eye is in a relatively stationary position and the fovea, a part of the eye located in the center of the macula region of the retina, (see figure 1) is focused on a specific area for a specific amount of time (Zeffren, Applegate, Bradley & van Heuven, 1990). The visual stimuli entering the 2° foveal region can be processed and enables us to see detail.

To shift the gaze from one area of interest to another, saccades occur. These are fast movements of the eye in which no visual stimuli can be processed (Fuchs, 1971; Salvucci & Goldberg, 2000). While looking for products in a store, the gaze is directed along the shelves. This is top down processing; the mind decides where the fovea is at. Most visual attention follows the fovea, but this is not always the case (Tonkin, Ouzts & Duchowski, 2011).

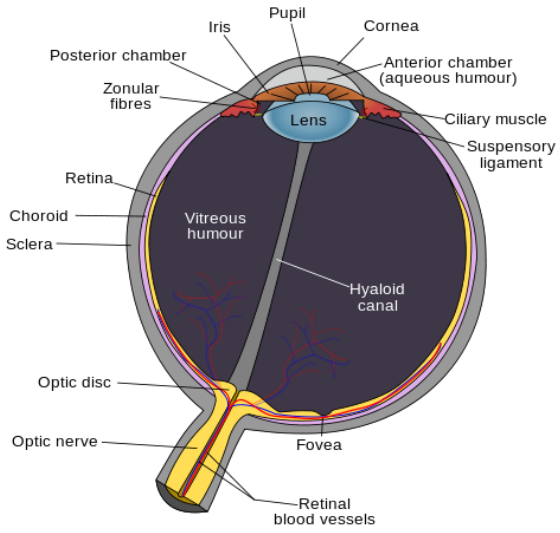

Figure 1: Schematic view of the human eye (source: Wikipedia)

The parafoveal region (the area surrounding to the fovea) is responsible for peripheral vision and, while less able to detect detail, it provides an overview of the environment. This facilitates orientation while for example looking at a shelf with products (Clement, 2007). It is the same parafoveal area that might catch a bright contrasting object somewhere in the area, for example a product package that is in contrast with the packages surrounding it. This area makes a person, driven by instinct, switch his/her visual attention to that object, fixating the gaze to see it in detail. This is called bottom up processing; an external object draws attention. Research by Underwood, Klein and Burke (2001) and Orth and Malkewitz (2008) indicated that when brand recognition is very clear, top down processing is dominant. But when this is not the case, bottom up processing gets more important and attention-drawing packages have greater impact and are key in buying decisions.

After the orientation stage is completed and the object of interest is spotted, the evaluation stage commences. This is the longest stage by far (Tonkin et al., 2011) and consists of comparisons between two or three packages. 'Long' is relative, since the complete stage duration is often below 10 seconds (Clement, 2007). Familiarity with the product

category can shorten this stage even more. When comparing two or three packages, almost all attention goes to the Front Of the Package (FOP). 90% of all consumers base their choice on viewing only the FOP (Clement, 2007; Urbany, Dickson, & Kalapurakal, 1996). The information presented on the FOP has to be persuasive enough to convince the consumer this product is the right choice. Judgments on attractiveness, quality and a price expectation are factors that play a major role during this stage (Orth, Campana and Malkewitz, 2010).

During the last stage, verification, one checks whether it would be possible to have missed a package in the evaluation. These 'hidden alternatives' are mostly packages that received no attention (fixations) until then. The final purchase is based on brand recognition and visual equity (Tonkin et al., 2011), which is an increasing consideration of items that draw attention. A product package which survives all the selection criteria a consumer has and that has been salient enough to be part of the selection can eventually make it to the shopping cart.

1.1 Packaging Design

As is clear from the above, many psychological processes are involved during the selection of products in store. The appearance of a product package plays an important role in this matter (Pilditch, 1972; Conolly & Davidson, 1996; Fenko, Schifferstein & Hekkert, 2010). Companies have long abandoned the idea that a package only has functional attributes like protecting the content (Orth et al., 2010) and spend billions of dollars each year on creating new package designs for positioning and differentiating their products to appeal to their customers (Dumaine, 1991). Aside from branding purposes, specific design elements can be of influence on the psychological processes and decision making. Consumers tend to choose products that have aesthetic package design over brands they know or which are cheaper (Reimann, Zaichkowsky, Neuhaus, Bender, & Weber, 2010). An fMRI study of Stoll, Baecke

and Kenning (2008) indicates that attractive and unattractive packages are able to trigger different cortical activity changes. With attractive packages, significant activity was measured in regions associated with reward mechanisms, while unattractive packages activated areas in the frontal lobe associated with processing aversive stimuli like disgusting pictures or unfair offers. Activity changes in these regions of the brain might reflect individual preferences regarding package design and the selection of the optimal evaluation choice.

Packaging design not only has to be attractive, it also must communicate the products' attributes. The overall impression must be presented through design elements such as illustration, colour, typography and shape (Masten 1988). It is still unclear which combination of those elements finally triggers a consumer to select a package (Clement, 2007). Not only is there still much to learn about the psychological processes during these stages, the lack of knowledge makes it very hard for designers to base their choices of implementing specific elements on an FOP on. This research gives insights into the effects of some specific elements on an FOP during the orientation stage - the situation where a consumer has to select a specific package for further investigation and is checking the information presented on two or three packages. The focus in this study is on dairy products in Tetra Rex aseptic packages, which is the most common way to pack pasteurized milk in The Netherlands. This focus is because of the involvement of FrieslandCampina, one of the world's five largest dairy companies.

1.2 Nutrition claims

When looking at eye-tracking data, it is clear that an FOP has certain hotspots where visual attention is drawn to (see figure 2 from our pilot study).

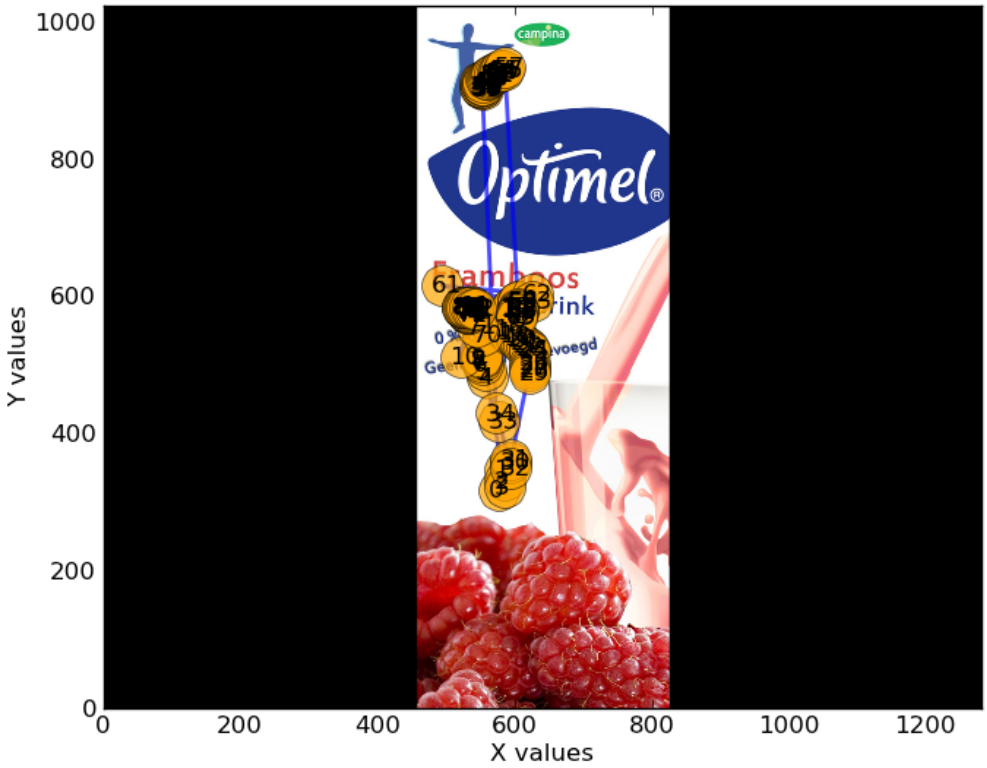

Figure 2: Fixations on a package from our pilot study

Packages of dairy products like Optimel often have claims about proteinlevels or being a healthy choice on the FOP to ensure a consumer notices it and to increase the purchase intent. While aiming at consumers with a high health interest, it seems obvious that such claims would increase purchase intent. But is this true? Do such consumers even see those claims? Orquin and Scholderer (2011) state that the more healthful someone is, the less pictorial fixations (images and health symbols) are registered during eye tracking. Their analysis revealed that the only element operating as a health cue during product healthfulness evaluation was the nutrition label. This label is mostly positioned at the backside of a package. Their study also implies that organic claims are equally fixated on by health motivated people as less health motivated people. Visschers, Hess and Siegrist (2010) state that people with a high health interest tend to watch the nutrition label more often, but do not care about health symbols on the FOP. And a study of Roberto, Shivaram, Martinez, Boles,

Harris and Brownell (2012) shows that claims about the calories per serving on the FOP do increase the consumers' knowledge about the product, but do not alter purchase intent or other behaviour. These sometimes contrasting findings cannot answer the effect of protein claims on purchase intent and attractiveness of the package unanimously, and therefore the first hypothesis (divided in A and B) emerges as follows:

H1-a: Protein claims about healthiness on the FOP of dairy products increase the attractiveness of the package.

H1-b: Protein claims about healthiness on the FOP of dairy products increase the purchase intent of consumers with a high health interest more than of consumers with a low health interest.

1.3 Social cues

Although protein claims are on the FOP, it is possible that such claims are ignored or go unnoticed. Designers use control elements to direct consumers to such claims. Those control elements can be divided into three groups (Klimchuck & Krasovec, 2006). There are social cues like a person pointing a finger to a certain area of the package or a pair of eyes looking at the consumer. This effect works because of the theory of joint attention (Friesen & Kingstone, 1998). People have an automatic tendency to look at the same things that draw the attention of someone else. Then there are causal elements, images of (seemingly) moving objects like flowing liquids or falling candy. The last group of control elements is graphical devices, such as arrows, symbols and areas of high contrast. Those are used to organize visual information on a package and to control the gaze of a consumer. To what extend those elements really affect gaze direction, however, remains unknown. When a social cue would 'look' at a claim, would that increase the chance of consumers noticing the claim? And would

that increase the purchase intent? And when a social cue would look a consumer in the eye, would that increase the product attractiveness? Research of Ewing, Rhodes and Pellicano (2010) states that product attractiveness is greater when a social cue is looking at the consumer (directed gaze) than when the gaze is averted (to for example a claim). A study by Strick, Holland and Knippenberg (2007) confirmed that attractive faces on packages lead to more positive evaluations of that product. Faces are considered more attractive when these are showing a smile (O'Doherty, Winston, Critchley, Perrett, Burt, & Dolan, 2003) and are symmetrical. Gender has no influence on perceived attractiveness (Kampe, Frith, Dolan, & Frith, 2001).

What would be the trade off between product attractiveness and purchase intent? These questions lead to hypotheses 2 and 3.

H2-a: Social cues directing to protein claims increase noticing the claim.

H2-b: Social cues directing to protein claims increase the purchase intent of consumers with a high health interest.

H3-a: Social cues in form of attractive people looking at the consumer increase the attractiveness of the package

H3-b: Social cues in form of attractive people looking at the consumer increase the purchase intent of consumers with a high health interest.

With these three hypotheses we tried to find scientific proof of the effects of implementing elements like protein claims and social cues on the front of a package on perceived attractiveness and purchase intent. The experiment was conducted in two phases. Phase one consisted of a pilot study to discover how consumers scan a product package, while the

second phase was conducted to answer the research questions related to the hypotheses above.

2. Methods

This chapter describes the methods used to create and perform the pilot test, as well as the main test that followed up. Of this pilot test, also the analysis and results are included in this section, since they are part of the method used for the main test.

2.1 Pilot Study

The main goal of the pilot study was to get a clear view of how consumers scan a product. For example, when people visually scan a package according to a identifiably pattern, the use of directing cues would require a whole different approach than when a scan would always be random. Secondary goals were to discover possible implications of the use of the available eye-tracking device and the duration of calibration and actual testing. The findings of the pilot study were evaluated and followed by valuable next steps and alterations of the main study.

2.1.1 Participants

To discover the presence of patterns in package-scanning, a small sample of participants was sufficient. A total of nine people were tested. Of these participants (mostly students) three were male and six female. All participants were able to read and understand Dutch text.

2.1.2 Design

To register someone's gaze, an eye tracker is a reliable instrument; gaze coordinates are clearly objective and measurable, which makes it much more valid and reliable than for instance retrospective or concurrent think aloud methods. Tonkin et al. (2011) concluded that one alternative, individual retrospection of what drew attention on a package, was far from accurate and that brand recall delivers invalid results (large brands inhibit the memory of

smaller brands). Because of the reliability of eye-tracking devices, the choice to use this instrument was easily made.

2.1.3 Setup

In the pilot study, consumers had to scan specific packages and answer questions about those packages. These questions were created in 3 categories: multiple choice questions (with three or four options and questions like 'what was presented on the package?'), rating questions (like 'how much do you like this product?') and retrospective open questions (like 'what was presented on the lower third of the package?'). These questions were created to give participants a reason the scan the packages and to measure the correlation between visual attention and location of a fixation.

Experiments took place in a laboratorial setting. Participants were placed in front of a table mounted eye‐tracking device (FaceLab, figure 3).

Figure 3: Table mounted FaceLab eyetracking setup

This device is capable of registering gaze direction, eye closure, facial gestures and head position. It consists of two video camera's and infrared emitters (figure 4).

Figure 4: Eyetracking components (1: infrared emitting pod 2: video camera)

The device is connected to two computers, and the central monitor, mouse and keyboard can be switched by a KVM-switch (Keyboard, Video, Mouse). One computer offers the experimental task (stimuli) with a program called *Gazetracker,* while the other receives data from the eye tracking device thru FireWire and converts all imagery data to eye movements. These intensive tasks are divided to keep computing and processor workload within the safety margins. The converted data is being sent to a server over a local area network where it is stored (see figure 5 for a schematic view).

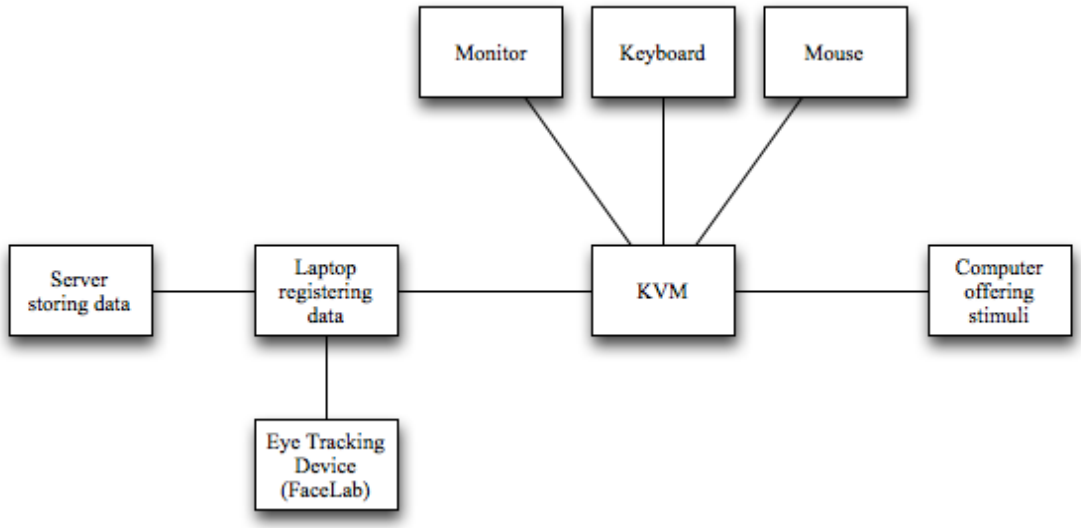

Figure 5: Schematic view of experiment setup

The stimuli presented by Gazetracker were created as scripts where screenshots, buffer slides, frame slides and question slides were presented with programmed exposure times. Figure 6 shows a typical order in which stimuli were presented.

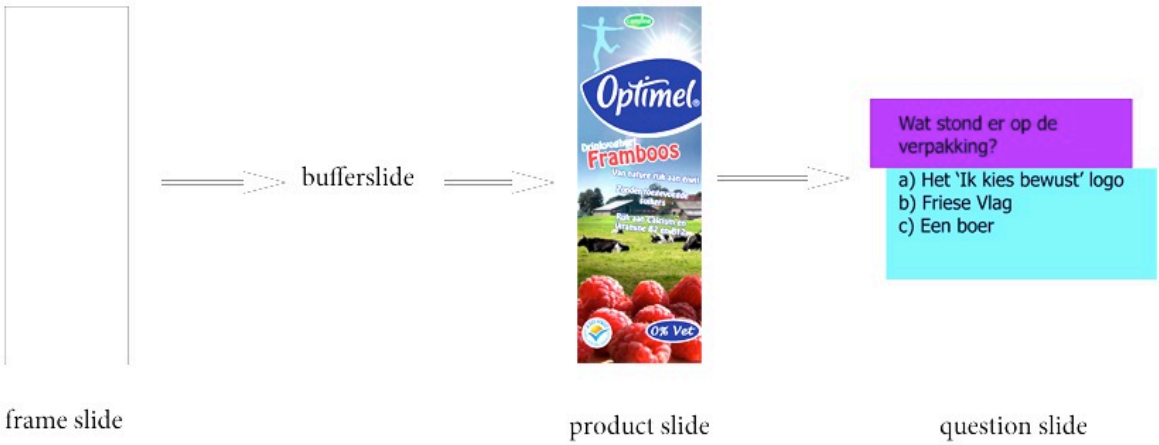

Figure 6: A typical order of stimuli presented by Gazetracker.

The frame slide was presented to ensure a participant knew where to expect the product to enter the screen. This eliminates orientating gazes outside the package. The product slide was presented 1, 2, 3 or 4 seconds, depending on the script that was running.
A total of 3 scripts were constructed, all of them consisting 25 images of packages in a random order. The packages were all of a typical kind one would expect to find in a supermarket. Among them were hair dying products, dairy products and baking powder. The data of one participant had to be excluded because of interference of eye make-up and contact lenses with the eye tracking device.

Subsequently the data was stored and exported to CSV files containing the filename of the product slide, gaze number (an incrementing number of every gaze coordinate that was registered), x-coordinate of the gaze, y-coordinate of the gaze and the time. Raw gaze data was kept raw at the export on purpose, to have full control over the filters that would be applied to the data. Although the Gazetracker software offered a way to recalculate the data

and export only the fixations (in which we are particularly interested), we chose to base the definition of a fixation not on the internal interpretation of Gazetracker, but on recent literature. Research by Karsh and Breitenbach (1983) stated that different fixation identification algorithms can produce vastly different results. We chose to process all gaze data through a dispersion based algorithm (Dispersion Threshold Identification), which produces robus identification results (Salvucci & Goldberg, 2000).

2.1.4 Analysis

Post editing of data took place using Python Eclipse. The first step was to filter all fixations from the gaze data (code in appendix A). Fixations were defined as a gaze on a 35x35 mm area for at least 100 ms (Salvucci & Goldberg, 2000). Our code converted the gaze coordinates into fixations and stored these in a file that could be read by the code in step two.

The second step was to plot these fixations on the specific product slides including order numbers (code appendix B). A special plug-in (Matplotlib) was used to edit the product slides graphically and add the fixations and saccades. Fixations of eight people were plotted and the results of plotting were interpreted. In extension to the individual plots, heat maps were created showing the hotspots on product packages defined by all fixations of all participants. These hotspot images were created using Photoshop CS5, by layering all fixations per package.

2.1.5 Results

The heat maps and plots showed that there is a number of hotspots visible and certain areas of the package which are less gazed upon (especially the lower third and the brand name). An exposure time of one second leads to a small number of fixations, where a larger exposure time (three or five seconds) leads to hotspots been fixated on more frequently. Analysis also

indicated that there is no possibility to identify control elements like social cues (e.g. eyes or a pointing finger), graphical devices (e.g. abstract shapes) or causal elements (e.g. flowing liquids) based on the fixations of these participants. The functioning of a causal element for example, should have been demonstrated by fixations that follow the depicture of flowing milk on a package. Such patterns could not be recognized and therefore a cue could not be identified.

That such patterns could not be identified does not imply that fixations were completely at random. There are still certain hotspots that attract attention. The findings set the restraints of our main study and helped creating the hypotheses as described above.

2.2 Main Study

The main study has been build on conclusions drawn from the results of our pilot study. New research questions were formed that reflected the need for certain knowledge about cues on packages (partially based on subjects introduced by FrieslandCampina) and the - from a psychological point of view - interesting behaviour of a consumer when scanning one or multiple product packages prior to selecting one.

2.2.1 Participants

32 participants were recruited at the University of Twente and public places in Enschede, The Netherlands (Mean age = 31, SD = 10,8, Min age = 21, Max age = 60). All of them could read Dutch fluently. Of them were 22 male and 10 female. Exclusion criteria were consumers with allergic reactions to dairy products and non dairy vegans, since they would not buy dairy products on a regular basis and are no target group of FrieslandCampina. Consumers who do not buy their own groceries for at least once a week and people wearing glasses were excluded as well (glasses interfere with the eye tracking device). After the experiment, two

participants were excluded from further analysis because their eye tracking data was incomplete due to tracking problems. A reason might be that the eye tracking software had problems detecting and following the pupils when eyelids are covering the eyes relatively more than normal.

2.2.2 Setup

The set-up was exactly the same as in the pilot study. Lighting circumstances in the new eye tracking room were improved, resulting in better and more accurate tracking of the gaze.

2.2.3 Measures

Three questionnaires were created; one to measure health awareness, one to measure purchase intent and one to measure perceived attractiveness of the package. The survey to measure health awareness was based on two validated scales. Blending the Health and Taste Attitude Scale (Roininen, Tuorila, Zandstra, De Graaf, Vehkalahti, Stubenitski & Mela, 2001) and the Health Concerns Scale (Kähkönen & Tuorila, 1998) led to fifteen questions divided in 3 topics: general health, biological food and light products. The output of the survey is a mean score between 1 and 5, where 1 is indicating low health awareness and 5 indicates high health awareness. 11 Participants with a score between 1 and 2,8 were considered low health aware, while eight participants with a score above 3,2 were coded as high health aware. A score between 2,8 and 3,2 indicated neutral health awareness and therefore 11 participants were excluded from analysis where a score on health awareness was relevant.

The purchase intent questionnaire was based on validated surveys of Dodds, Monroe and Grawal. (1991); Sweeney, Soutar and Johnson (1999); and Sääksjärvi and Morel (2010). The survey consisted of four questions that indicated the willingness of a participant to buy

the product. The five point Likert scale made a mean score of 1 to 5 possible, where 1 indicated a low willingness to buy the product and 5 a high willingness.

The survey for measuring perceived attractiveness was based on items from a validated scale of Ohanian (1990) and consisted of four questions. All questionnaires are available as appendix C.

2.2.4 Task & procedure

Before inviting participants to the lab, an invitation was sent for filling in a survey about health and food consumption, using the health awareness questionnaire described above. This questionnaire was hosted online, the invitation was sent by mail, including a unique ID number for every participant. The results of this survey were downloaded for further analysis.

After completing the health questionnaire, participants were individually invited to the lab. The scheduled time for every participant was one hour. In most cases this was sufficient. After welcoming the participant by the instructor, a short briefing followed. In this briefing, the participant was told that the test consisted of two stages. In both stages, a number of images would be shown and for each image, five questions would be asked. It was made clear that there were no wrong answers, that a participant could stop or pause at any time he or she liked and that results would be processed anonymously.

After calibration of the eye-tracking device, which is necessary every time a new participant starts with the test, the experiment proceeded with the first stage.

The first part of the experiment consisted of measuring product attractiveness. 24 screenshots of (partially non existing) dairy products were created in six categories:

1. with protein claim, without social cue;
2. with protein claim and social cue looking at claim;

3. with protein claim and social cue looking at consumer;
4. without protein claim, with social cue looking at consumer;
5. without protein claim, with social cue looking at graphic (e.g. fruit) element;
6. without protein claim, without social cue.

These screenshots were shown on screen for five seconds, where one screenshot consisted of only one front of package. After each picture, the participant was asked to rate the attractiveness of the product by answering four questions on a five point Likert scale. Memory of elements, to measure the processing of visual stimuli and the ratio between number of fixations and recollection, was also tested retrospectively. The order in which the images were displayed was completely random, but of each category four images were shown; two of a real brand and two of a non existing one. A fake brand was included to measure possible brand specific evaluation of packages by participants. During answering a question, there was no time limit so participants would not feel rushed giving their opinion. All answers were written down by the instructor, to prevent the participant having to leave their gaze from the monitor.

After the attractiveness phase, purchase intent was measured. Participants were instructed to make a choice from the products shown on screen for each screenshot. 20 screenshots of fronts of packages on shelf level (see figure 7 for an example) were presented. Each screenshot consisted of three packages based on the categories mentioned above, randomly ordered and showed for ten seconds. To stimulate in-store behaviour, the exposure time of ten seconds matched the maximum time people need to decide which product to buy in store (Clement, 2007).

Figure 7: Screenshot of shelf level

Although random, every variation occurred equally often. As stated by Tonkin et al. (2011), the stage of orientation often means comparing two or three products, so these conditions represented the situation as in store, to simulate in-store buying behaviour. Purchase intent was measured after each slide as well as recollection of elements on the packages.

After the second phase, participants were asked what they thought was the purpose of this study. This was to prevent possibly biased data to have influence on the results. No participant turned out to be aware of the hypotheses, so no negative test effects could be observed.

2.2.5 Analysis

After the data was gathered, analysis took place using SPSS statistical software (version 20). All analyses were executed with confidence levels (α) of .05. Plots were created using a routine programmed in Python Eclipse with implementation of NumPy as numerical mathematics extension and Matplotlib as plotting library. Aside from the 200 plots from the pilot test, a total of 1410 plots were individually created from fixations gathered in the main

study. The output of all plots were PNG files of 800x600 pixels and the results were coded using MS Excel and SPSS.

3. Results

3.1 Reliability of the questionnaires

Before checking the reliability of the scales, all negatively worded items were reversed, to make sure that a score of five on a question indicates a high health interest, high perceived attractiveness or high purchase intent, and a score of one indicates the opposite. We used Cronbach's alpha coefficient as indicator of internal consistency. Of every scale, improvement of alpha by removing items has been investigated and performed where appropriate.

3.1.1 Health awareness questionnaire

Cronbach's alpha value was .75 for the 16 item health awareness scale. Although this number indicates acceptable reliability, it turned out that eliminating 2 items from the questionnaire, the value would rise to .79. The following questions were therefore eliminated from further analysis:

QB4: Ik geloof dat je van lightproducten meer kunt eten zonder teveel calorieën binnen te krijgen.

QC3: Kunstmatige smaakstoffen zijn niet slecht voor mijn gezondheid.

3.1.2 Attractiveness questionnaire

Analysis of the 4 item attractiveness scale revealed a Cronbach's alpha value of .91, which indicates a high reliability. Factor analysis shows that the first component accounts for 79% of the total variance with a total Eigenvalue of 3,16. This is a clear sign that the scale is one-dimensional.

3.1.3 Purchase intent questionnaire

According to Sääksjärvi and Morel (2010), Dodds et al., (1991) and Sweeney et al. (1999), the Purchase Intent scale has good internal consistency, with a reported Cronbach alpha coefficient between .80 and .86. In the current study the Cronbach alpha coefficient was .45. This is too low to indicate internal consistency. Removing one or more items of the three item scale would result in a maximum coefficient of .62, which is still below the important threshold of .70. Therefore, an alternative way of measuring the purchase intent was chosen, namely comparing the ratio in which packages were chosen during the second stage of the experiment. That is:

Hypothesis 1: The number of times a package was chosen with a protein claim versus the number of times a package was chosen without such claim;

Hypothesis 2: The number of times a package was chosen with a social cue directing to a claim versus the number of times a package was chosen where no social cue was present to direct to the nutrition claim;

Hypothesis 3: The number of times a package was chosen with a social cue looking at the consumer versus the number of times a package was chosen without such social cue.

3.2 Hypothesis 1: Nutrition claims

1A: "*Claims about healthiness on the FOP of dairy products increase the attractiveness of the package.*"

Analysis shows that there is no significant difference in attractiveness between packages with protein claim on the FOP and those without such claim. A total of 264 packages with a nutrition claim were rated on attractiveness with a mean score of $M_{withclaim} = 2{,}90$ (SD = .86), while the other 264 packages without such claim were rated with a mean of $M_{noclaim} = 2{,}95$ (SD = .87) on a scale of 1 to 5. An independent samples t-test shows that this small difference is not significant ($\alpha = .05$, $p = .48$).

For both people with a high health interest and those with a low health interest, attractiveness was not increased significant either ($p_{highhealthinterest}$ = .53, $p_{lowhealthinterest}$ = .60).

When looking at the small insignificant differences, people with a high health interest rate the attractiveness of packages with a nutrition claim slightly higher than those without such claim. The same counts for people with a low health interest.

1B: "*Claims about healthiness on the FOP of dairy products increase the purchase intent of consumers with a high health interest more than of consumers with a low health interest.*"

A one-sample binomial test was used to determine the influence of nutrition claims on purchase intent. Participants with a high health interest chose a package with nutrition claim 23 times, while a package without such claim was chosen 20 times. This is not significant ($p_{highhealthinterest}$ = .76). Participants with a low health interest preferred packages with a nutrition claim as well (40 times versus 38 times) but this difference is not statistically significant either ($p_{lowhealthinterest}$ = .91).

3.3 Hypothesis 2 : Social cues to claims

2A: "*H2: Social cues directing to claims increase noticing the claim."*

To explore the relationship between the two categorical variables 'social cue to claim' and 'claim noticed', we used a chi-square test for independence. Because both variables only have 2 categories, we corrected for continuity (Yates' Correction for Continuity), to compensate for the overestimate of the chi-square value. We found that social cues directing to nutrition claims (N = 616) significantly (p = .02) decrease noticing the claim. This outcome is only significant when the data of all participants is included, regardless of their health interest. When investigating this effect for people with high health interest (N = 224), this effect is not

significant (p = .42). For people with low health interest (N = 336), this effect is at the borderline of significance (p = .05) and again in the opposite direction.

2B: "Social cues directing to claims increase the purchase intent of consumers with a high health interest."

Because the data considering purchase intent is measured on a nominal scale, a non-parametric one-sample binomial test has been used to measure the effect of social cues directing to claims on the purchase intent. People with a high health interest chose a package with a social cue directing to a nutrition claim 26 times. When the social cue directing to that claim was absent, the package was chosen 23 times. This difference is far from significant (p = .78). In an extra analysis the effect turned out to be insignificant for people with a low health interest as well.

3.4 Hypothesis 3: Social cues to consumer

H3A: "*Social cues in form of attractive people looking at the consumer increase the attractiveness of the package."*

Analysis by using an independent samples t-test shows that there is almost a statistically significant (p = .06) difference in the mean scores for the two groups. The mean attractiveness of packages with social cue looking at the consumer is $M_{socialcueconsumer}$ = 2,86 (SD = .87), while that of packages without such clue is $M_{nosocialcue}$ = 3,04 (SD = .92). This means that social cues looking at the consumer have an almost significant negative impact on the attractiveness. Levene's test for equality of variances indicates that the variances for the two groups are the same (F = 3.506, p > .05). Interesting is that for people with a high health interest, this effect is far from significant (p = .78), while the effect for consumers with a low health interest is significant (p = .03).

H3B: " Social cues in form of attractive people looking at the consumer increase the purchase intent of consumers with a high health interest."

Again, a one-sample binomial test has been used to measure the effect of social cues looking at the consumer on the purchase intent. People with a high health interest chose a package with such a social cue 59 times, versus 43 times a package without that social cue. This major difference is almost significant (p = .14). Analysis of the effect for people with low health interest turned out that this is far from significant (p = .68, package without social cue was chosen 78 times, versus 72 times one with such cue).

Although this is not in line with previous studies, one must say that an attractive person on the front of package looking at the consumer doesn't always lead to an increased attractiveness of the package.

It seems that social cues might influence the purchase intent of consumers with a high health interest, but there is no significant difference between the direction of the gaze.

3.5 Brand attractiveness

The test included pictures of a fake brand (called Delisse), to measure any influence of participants knowing the brand Frysland Campina. The mean attractiveness of Delisse packages was $M_{delisse}$ = 2,74 (SD = .82), while that of FrieslandCampina packages was $M_{frieslandcampina}$ = 3,12 (SD = .80). Levene's test for equality of variances indicates that the variances for the two groups are not the same (F = .62, p > .43). Therefore, we have to compensate for the fact that we cannot assume equal variances. Packages of Delisse are rated significantly lower (p = .00) on attractiveness than packages of FrieslandCampina.

4. Discussion & Conclusions

In this research, the main goals were to investigate the effects of nutrition claims and social cues on product packages on purchase intent and perceived attractiveness. The results showed that some of these effects were significant.

4.1 Social Cues directed to the consumer

We expected that attractive people depicted on a package, looking at the consumer, would increase the attractiveness of the package. Instead, there was an almost significant negative impact on perceived attractiveness. Interesting to see is that this is particularly the case for people with a low health interest (this effect is even significant). Why would those cues decrease attractiveness, while a vast amount of studies (Aharon, Etcoff, Ariely, Chabris, O'Conner & Breiter, 2001; Strick et al., 2007; Rhodes and Pellicano, 2010) concluded the opposite? First of all, 13 participants have expressed themselves negatively about the depictures of 'attractive' social cues during the experiment. Quotes like 'ugly girl' or 'strange child' don't indicate a high perceived attractiveness and some participants mentioned that those social cues had significant impact on the overall impression. Secondly, the depicted social cues did not seem to reflect the target group. Reactions of participants pointed out that the use of social cues has a substantial impact on the perceived brand style and focus group. The use of children's faces for example confused some participants and made them think the dairy product was intended for young infants. Depicted oriental people lead to the expectation that the dairy would be Asian flavoured, although the package clearly stated otherwise. A last possible contribution to these results is the fact that the embedding of the social cues on the packages was not performed by a professional. Some participants appointed they could see

the images were not embedded properly, with edges being cut-out improperly. The difference between people with a high health interest and those with a low health interest is quite unexpected and cannot be explained at the moment. New studies could investigate other contributing factors, like for example the effects of the social comparison theory of Leon Festinger (1954). Upward comparison with models on the FOP could for example lower self esteem and therefore make the package less attractive.

The depicture of any social cue on an FOP is not an easy instrument to raise perceived attractiveness. Like with any element in design, it takes effort to find the right one that appeals most people in the target group. The basic elements of an attractive social cue (a smiling symmetrical face) must be supplemented with the appearance a target group can relate to (cultural, age, social economic status, etc.). Furthermore, the location of the social cue seems to be important, since most elements in the lower third of an FOP remain unnoticed by a consumer, even highly dominant social cues. Companies interested in using social cues on their packages should do thorough research on the effects of the cues they chose, because negative side effects may outweigh the positive persuasive effect. A good understanding of the characteristics of your focus group is key in selecting appropriate social cues. Future research should also take the negative aspects of some of the social cues of this study into account, to measure the positive influence of social cues to its full extend.

4.2 Protein claims on the FOP

Nutrition claims on the FOP have no significant impact on attractiveness, regardless the health interest. This is no surprise, since a study by Roberto et al. (2012) stated that health claims on the FOP do not change behaviour and attitude of people (only their knowledge about the product). The fact that also purchase intent remains unchanged after exposure to health claims fits in the conclusions of Roberto et al., but it is remarkable that this also true

for people with a high health interest. One would expect (and companies in the dairy industry share this idea) that consumers, sensitive to nutrition claims, would rate a product healthier because of such claims, creating more reasons to prefer such product over a less healthy alternative.

One reason why this research does not indicate a significant effect of protein claims on purchase intent is the relative low number of purchase decisions (the original purchase measuring scale could not be used because its construct was measuring multidimensional). When looking at the raw numbers, we see a slight advantage of packages with nutrition claims over those without regarding scores on purchase intent. It is possible that these small differences become significant when more results could be gathered. Therefore, this study cannot be seen as a valid falsification nor confirmation of the effect of health claims on the FOP on purchase intent. Any recommendation to (or not to) put nutrition claims on the FOP are therefore untimely.

4.3 Social Cues directed to a nutrition claim

It is very interesting to see that the presence of social cues directing to protein claims decrease the chance such claim is noticed by a consumer. The function of the social cues might be undermined by the dominance of social cues on a package. While a directing social cue is being seen in 80 times of 240 times it was shown (33,3 per cent), this led only 35 times to following the cue. In this case, the absence of a social cue could have led to the nutrition claim climbing the ladder of prevalence, thus increasing the chance it would be seen by a consumer. Another way to put it, is to say that the directing power of a social cue is too low to function properly. The first step, getting attention, is successful, but the second step, directing attention, works only sometimes. This contradicts previous studies (Bayliss, Cannon & Tipper (2006); Van der Weiden, Veling & Aarts, 2010), where the directing power of

social cues is evident. Possible reasons why in this experiment such cues are less effective, are the relative positions of some of the cues and nutrition claims on the package. Exactly 50 per cent of all directing social cues is directing to the lower third of the package; a region that is less fixated on (as shown in our pilot study). Additional research could investigate whether the functioning of steering social cues would improve when both cue and claim would be positioned in areas that are more frequently fixated on. In addition, a social cue might direct a gaze to a location on a package that would otherwise only seldom gazed upon.

For now, this study does not advocate the use of social cues to direct the gaze of a consumer. A designers' toolbox contains more effective instruments, like areas of high contrast and bright colors.

4.4 Extended Research

From a psychological point of view, it is very interesting to know how processes differ between various distances from the shelf. As described in this study, top-down and bottom-up processes succeed on another, depending on the stage someone is in. At greater distance from a product, one seems more susceptible for signals that trigger bottom-up processing (like bright colours or flashing light). But is this true? What would reckoning with that mean for the design? This research studied the effects of certain design elements in a specific stage of a consumers' search and selection process. But a package has to work in every stage to increase the chance of being noticed and examined. A specific design element might work in the orientation stage, but could induce negative side effects in the evaluation stage. It would be very interesting to measure the effects of specific design elements per stage.

Also the effects of performing a study like this one with a head mounted eye tracking device could deliver interesting results. Some studies (Tan, Gergle, Scupelli & Pausch, 2006) suggest that a lab setting eye tracking experiment can deliver invalid results because of the

distance to reality (screen projection versus tactile). Therefore, such effects could be investigated by letting participants perform tasks in a real supermarket. Performing an eye tracking study in a supermarket could also facilitate the measurement of design effects per stage as mentioned above.

Acknowledgements

Combining an experiment with working and organizing a major dancesport event is something that not only calls upon my patience, but also on that of the people around me. I would like to thank my employers Jelle Vos, Martijn Huve and Sjaak Lubach for their flexibility and for granting me time for my study. Furthermore, a big thanks to my supervisors Frank van der Velde, Frederik Hoolhorst and Mariana Gelici-Zeko, for guiding me into the right direction, helping me out when I got stuck and giving me the time and space to fit this thesis in a packed agenda. I was also very happy with the feedback of Martijn Veltkamp of FrieslandCampina Innovation. Our conversations were key in monitoring the practical aspect of my research and gave me interesting insights into the way companies stay innovative and use science in their marketing strategies.

Then, I was surprised of the willingness of so many friends to join my research as a participant. Completely voluntarily, they spent quite some time giving feedback about dairy packages while sitting in some sort of isolation room. I appreciated that very much. Of all the students that helped me, Randy Klaassen deserves a special annotation, because he helped me with the time consuming struggle of programming in Python. And finally, I am very grateful for the support I received from Geert, Annemiek, Jans, Ineke and especially Marit. Not only for study related support, but also for your love and positive energy. Thank you so much!

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Appendix A: Python code fixation

```
'''
@author: Thomas van den Berg
'''

import matplotlib.pyplot as plt
import numpy as np

def read_coordinaten(filename):
    List = []
    fixaties = []
    infile = open(filename, 'r')
    for line in infile:
        words = line.split(',')
        volgnummer = (words[1])
        x = (words[2])
        y = (words[3])
        time = (words[4])
        afbeelding = words[0]
        verpakking = afbeelding.split('\\')
        lijst = [verpakking[-1], volgnummer, x, y, time]
        List.append(lijst)

    n=1
    for verpakking in List:
        cur_afbeelding = verpakking[0]
```

```
cur_volgnr = verpakking[1]
cur_x = verpakking[2]
cur_y = verpakking[3]
cur_time = verpakking[4]

next_verpakking = List[n+7]
next_afbeelding = next_verpakking[0]
next_volgnr = next_verpakking[1]
next_x = next_verpakking[2]
next_y = next_verpakking[3]
next_time = next_verpakking[4]

xn = float(next_x)
xc = float(cur_x)
yn = float(next_y)
yc = float(cur_y)

deltax = xn - xc
deltax = abs(deltax)
deltay = yn - yc
deltay = abs(deltay)
if deltax < 36 and deltay < 36:
    #print "deltax = " + str(deltax)
    #print "deltay = " + str(deltay)
    #print verpakking[0:5]
    fixaties.append(verpakking[0:5])
```

```
        if n == (len(List) - 8):
            #print fixaties

            for item in fixaties:
                wegschrijven = open("save.txt", "a")
                #print item
                print >> wegschrijven, item
            break

        n = n+1
        #print "lengte list = " + str(len(List))
        #print "n: " + str(n)

    infile.close()

read_coordinaten('gaze.out')
```

Appendix B: Python code fixation plots

```
'''
@author: Thomas van den Berg
'''

#importeren plotting library en NumPy
import matplotlib.pyplot as plt
import numpy as np


def read_coordinaten(filename):
    List = []
    fixaties = []
    xs = []
    ys = []

    infile = open(filename, 'r')
    for line in infile:
        words = line.split(',')
        volgnummer = (words[1])
        time = (words[4])
        afbeelding = words[0]
        if ("filename.jpg" in afbeelding ):
            xs.append(words[2].replace(' ',
'').strip("'").strip("'"))
            ys.append(words[3].replace(' ',
'').strip("'").strip("'"))
```

```
    infile.close()


    plt.plot(xs, ys, '-o', ms=20, lw=2, alpha=0.7,
mfc='orange')

    plt.axis([0, 1280, 0, 1024])

    plt.xlabel("X values")

    plt.ylabel("Y values")



    i=0

    for x in xs:

        xtext = int(x)-12

        ytext = int(ys[i]) - 12

        plt.annotate( i, xy=(x, ys[i]), xytext=(str(xtext),
str(ytext)), arrowprops=None)

        i=i+1

    im = plt.imread('optimel10.jpg');

    implot = plt.imshow(im);

    figure = plt.gcf()

    figure.figsize=(1, 1)

    figure.dpi=(100)

    #figure.set_size_inches(58.5,30.5)

    plt.savefig('opt10_pp10.png',dpi=100)


    plt.show()


read_coordinaten('fixaties PPxx.txt')
```

Appendix C: Questionnaires

Vragenlijst ter discriminatie:

1. Ben je allergisch voor zuivelproducten? *[ja = uitsluiten]*

2. Doe je tenminste 1 keer per week je eigen boodschappen? *[nee = uitsluiten]*

Vragenlijst basics:

1. Geslacht: *M/V*

2. Leeftijd: *[open]*

3. Welke zuivelproducten nuttig je tenminste 1 keer per week?

[melk, yoghurt, drinkyoghurt, vla, kaas, boter/margarine, kwark]

Vragenlijst health awareness:

General Health Interest

1. Ik ben erg precies als het aankomt op de gezondheid van voedsel *[niet waar - helemaal waar op 5 point likert scale]*

2. Ik volg altijd een gezond en gebalanceerd dieet *[niet waar - helemaal waar op 5 point likert scale]*

3. Het is belangrijk voor mij dat mijn voedsel weinig vetten bevat *[niet waar - helemaal waar op 5 point likert scale]*

4. Het is belangrijk voor mij dat mijn voedsel veel vitamines en mineralen bevat *[niet waar - helemaal waar op 5 point likert scale]*

5. Ik eet wat ik lekker vind en bekommer me niet om de gezondheid van een product *[niet waar - helemaal waar op 5 point likert scale]*

6. Ik let niet op de invloed van bepaald voedsel op mijn cholesterol *[niet waar - helemaal waar op 5 point likert scale]*

Light Product Interest

1. Ik ben van mening dat het gebruik van lightproducten niet van invloed is op iemands gezondheid *[niet waar - helemaal waar op 5 point likert scale]*

2. Ik geloof dat het nuttigen van lightproducten het cholesterolniveau onder controle houdt *[niet waar - helemaal waar op 5 point likert scale]*

3. Ik geloof dat het nuttigen van lightproducten ervoor zorgt dat je lichaam in vorm blijft *[niet waar - helemaal waar op 5 point likert scale]*

4. Ik geloof dat je van lightproducten meer kunt eten zonder teveel calorieën binnen te krijgen *[niet waar - helemaal waar op 5 point likert scale]*

5. Ik geloof niet dat lightproducten gezonder zijn dan conventionele producten *[niet waar - helemaal waar op 5 point likert scale]*

Natural Product Interest

1. Ik maak me niet druk om additieven in mijn voedsel *[niet waar - helemaal waar op 5 point likert scale]*

2. Ik ben van mening dat biologisch voedsel niet beter is dan conventioneel gemaakt voedsel *[niet waar - helemaal waar op 5 point likert scale]*

3. Kunstmatige smaakstoffen zijn niet slecht voor mijn gezondheid *[niet waar - helemaal waar op 5 point likert scale]*

4. Ik probeer ervoor te zorgen dat mijn voedsel geen additieven bevat *[niet waar - helemaal waar op 5 point likert scale]*

5. Ik zou graag enkel biologisch voedsel tot me nemen *[niet waar - helemaal waar op 5 point likert scale]*

Vragenlijst attractiveness:

1. Ik vind de inhoud van dit product aantrekkelijk / lekker *[niet waar - helemaal waar op 5 point likert scale]*

2. Ik vind de verpakking van dit product aantrekkelijk *[niet waar - helemaal waar op 5 point likert scale]*

3. Ik vind de verpakking van dit product stijlvol *[niet waar - helemaal waar op 5 point likert scale]*

4. Ik vind de verpakking van dit product mooier dan de meeste andere in zijn soort *[niet waar - helemaal waar op 5 point likert scale]*

5. Welke elementen stonden er op de verpakking? *[open vraag tbv het meten van het verwerken van visuele stimuli en het ratio fixaties/herinnering element]*

Vragenlijst koopintentie:

1. Welke verpakking zou je hieruit kiezen? *[1, 2 of 3]*

2. Hoe waarschijnlijk is het dat je dit product in een winkel zou kopen? *[niet waarschijnlijk - erg waarschijnlijk op 5 point likert scale]*

3. Hoeveel euro zou je maximaal willen betalen voor dit product? *[open vraag]*

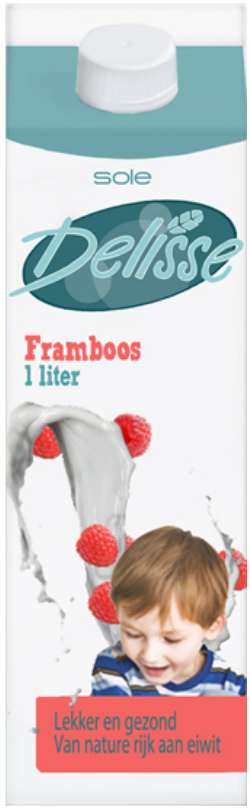
4. Hoe waarschijnlijk is het dat je het product zou adviseren bij je vrienden? *[niet waarschijnlijk - erg waarschijnlijk op 5 point likert scale]*

5. Welke elementen stonden er op deze verpakking? *[open vraag tbv het meten van het verwerken van visuele stimuli en het ratio fixaties/herinnering element]*

Vragenlijst Wrap:

1. Welke hypothese denk je dat ten grondslag ligt aan dit onderzoek? *[open vraag om testeffecten uit te sluiten]*

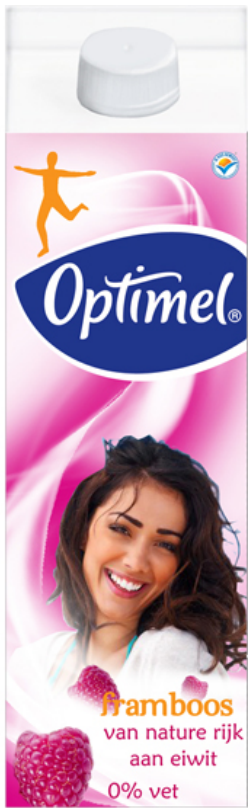
Appendix D: Designs of the packages




sole
Delisse
Drinkyoghurt
Framboos
Van nature rijk
aan eiwit


sole
Delisse
Framboos
0,2 % vet
Van nature rijk aan eiwit

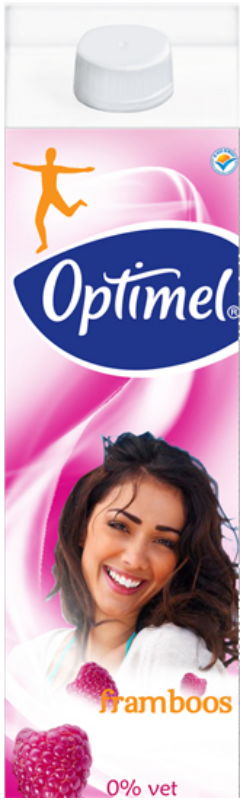

campina
Optimel
0% Vet
Framboos
Drinkyoghurt


Optimel
framboos
van nature rijk
aan eiwit
0% vet


sole
Delisse
Framboos
1 liter
Lekker en gezond
Zonder toevoegingen


sole
Delisse
Drinkyoghurt
Framboos
1 liter


campina
Optimel
0% Vet
Framboos
Drinkyoghurt


Optimel
framboos
0% vet


sole
Delisse
0 %
vet
Framboos


sole
Delisse
1 liter
Extra lekker
Drinkyoghurt Framboos


campina
Optimel
Met 85% melk
Met vitaminen
Met Calcium
0% vet
130 kJ
per 100 ml


campina
Optimel
Framboos
Drink
0%
VET
GEEN SUIKER
TOEGEVOEGD
Bron van vitaminen en calcium


sole
Delisse
Framboos
Yogurtdrink
0,2 procent vet
Geen toegevoegde
kleurstoffen


sole
Delisse
Framboos
lekker en gezond
1 liter


campina
Optimel
Framboos
Drink
0%
VET
GEEN SUIKER
TOEGEVOEGD
Bron van vitaminen en calcium


campina
Optimel
geen suiker toegevoegd
bron van calcium
en vitamine B2 en B12
Gezond & bewust
Drink
Yoghurt
0% vet