Effect of traffic light food labels on consumers' food expectations and purchase intentions

Name:	**Daniel Rodermond**
Student number:	**s1391143**
Date:	**27.05.2016**
Type task:	**Master Thesis**
Specialisation:	**Marketing Communication and Consumer Behavior**
First Supervisor:	**Dr. Anna Fenko**
Second Supervisor	**Dr. Ad Pruyn**
Word count:	**10648**

UNIVERSITY OF TWENTE.

Abstract

Improper diet is a reason for health problems. The Food Standards Agency has developed the traffic light food label (TLFL) that allows people to choose healthy foods at first sight, in order to counteract unhealthy nutrition. The TLFL and the product category can influence the health and taste expectation, as well as the purchase intention. However, the literature suggests that people with low general health interest (GHI) choose for less healthy food and people with high GHI choose for healthier food. To prevent a contradictory effect of the TLFL, this study will answer the following question: "What impact has the TLFL in combination with healthy and unhealthy food products and the GHI on taste and health expectations, as well as on purchase intention?". In this study, participants were split into three groups. Each group saw a healthy and unhealthy food product with either a healthy TLFL, an unhealthy TLFL, or the same product without a label. Participants' GHI was used as a moderator. This created a 3 (healthy TLFL / unhealthy TLFL / control condition) by 2 (healthy product / unhealthy product) by 2 (low GHI / high GHI) model. The results indicate, that the TLFL had a positive influence on the health expectation, but not on the taste expectation and the purchase intention. The GHI does not moderate the effects of the TLFL on the taste and health expectation, as well as on the purchase intention. The healthiness of the product category positively influences the health expectation and it negatively influences the purchase intention and the taste expectation. A high GHI leads to a more positive taste expectation and purchase intention of the healthy product while a low GHI leads to a more negative taste expectation and purchase intention of the healthy product.

Keywords

Traffic light food label, health expectations, taste expectations, general health interest, purchase intention

Table of contents

1 Introduction

Nowadays there are more overweight people than ever before. In addition, there are many people with health problems that result from unhealthy nutrition (Grunert & Wills, 2007). For this reason, the desire of citizens for a health food labeling system is growing (Grunert & Wills, 2007). A health food label was developed in Europe by the Food Standards Agency (Kelly et al., 2009). This labeling system is called the traffic light food label (TLFL). The TLFL has an advantage compared to other formats of food labels, because the most important information related to health can be seen immediately (Borgmeier, 2009, Kelly, 2009).

The idea behind the TLFL is for people to make a conscious choice for healthy products. However, it is also possible that subconscious factors influence this decision (Lähteenmäki, 2013). Taste expectation, for example, can be such a factor that influences the subconscious decision (Clark, 1998). Therefore, taste expectation must be taken into account in this study.

However, the expectation towards the taste of different healthy ingredients can vary (Liem, Toraman Aydin et al., 2012). Consumers in general are not willing to trade taste for a potential health benefit (Verbeke, 2006). People tend to see the taste and health benefits of food as contradictory factors (Liem, Aydin & Zandstra, 2012). For this reason, taste and health are in a competition. This competition can lead to a conflict between taste and health expectation. In addition, consumers are not willing to trade taste for a potential health benefit (Verbeke, 2006). Therefore, it must be examined to which extend the TLFL with information about different ingredients affects the taste and the health expectation, as well as the purchase intention of consumers. In addition, whether products that are labeled as healthy are perceived as tasty or not may depend on the GHI of consumers (Liem, Toraman Aydin et al. 2012). It has been found that people with a high GHI are more inclined to purchase products with a healthy food label than people with a low GHI (Vyth et al 2001). This can lead to problems with the TLFL because people with a low GHI may be negatively influenced by a healthy TLFL.

Most research related to the TLFL is focused on the awareness and the understanding of the TLFL, but not on health and taste expectations or on how the General health interest (GHI) influences health and taste expectations, as well as the purchase intention. Although many studies examine the influence of healthy food labels on taste, or the health expectations on purchase intentions, only a few studies examine the effect of the GHI on the taste and health expectation, as well as on the purchase intention.

The lack of research taking into account all above described variables can lead to a problem. The problem that may occur is, that the TLFL could have a counterproductive effect on people who have a low GHI. Products that are labeled as healthy may be seen as less tasty (Liem 2012, Vyth et al 2001). Furthermore, taste is the most important variable for the purchase intention of people with a low GHI (Raghunathan 2006), which may lead to unwanted effects and to the risk of unhealthy diets for people with a low GHI.

For the reasons described above, this thesis examines the following main question:

What impact has the TLFL in combination with healthy or unhealthy food products and the general health interest on the taste and health expectations, as well as on the purchase intention?

2 Theoretical framework

This part of the study will explain the theoretical foundations of this study. The theoretical foundation includes the definition of TLFL, the different product categories, the general health Interest (GHI), and how the TLFL, the different product categories and the GHI can affect consumers' taste expectations, health expectations and purchase intentions. Afterwards, the hypotheses will be formulated related to the theoretical foundations.

2.1 TLFL

The TLFL was developed by the European Union to counter poor nutrition in the population. It was developed in collaboration with the food industry and the governments of different European countries (Borgmeier, 2009). The labels should allow the consumer to identify the health benefits of a product before purchase. This means that the information provided by the TLFL helps the consumer to identify unhealthy products. Thus, the consumer can avoid these unhealthy products and follow a healthier diet. The information includes the amount of calories, sugar, salt, saturated fat, and total fat (Beard, Nowson, & Riley, 2007; Borgmeier & Westenhoefer, 2009; Kelly et al., 2009; Liem, Toraman Aydin, & Zandstra, 2012; Sacks, Rayner, & Swinburn, 2009). Depending on how much of the daily needs of the different ingredients are in the product, these ingredients are categorized with a green label for healthy, a yellow label for neutral and a red label for unhealthy. The calories are in white, because the European Food Information Council (EU FIC) (2014) argues that calories cannot be categorized with a color code. An example of a TLFL is shown in figure 1. The idea behind the TLFL is that the information on it influences the consumer's decision making (Schade, 2012). Furthermore, studies show widespread consumer interests in nutrition information on food packages (Grunert & Wills, 2007). There are various types of TLFLs with different effects.

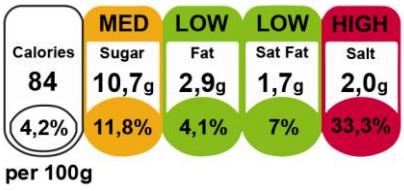

Figure 1

Example Traffic light food label (TLFL)

Borgmeier and Westenhoefer (2009) investigated which of the various versions of the TLFL was correctly understood by most people. They also examined which TLFL leads to the selection of healthiest products by most of the participants. Their study suggests that the most effective system shows the following five ingredients: (1) calories, (2) sugar, (3) fat, (4) saturated fatty acids, and (5) sodium, displayed in gram. In addition, this system indicates the recommended daily intake for each ingredient in percent, and marks the ingredients as healthy, neutral or unhealthy with the colors green, yellow or red. This system is called color-coded GDA (CGDA) (Borgmeier & Westenhoefer, 2009). Therefore, this study uses the color-coded GDA system without the color coding of calories.

2.2 Product category

The combination of product category and the information on the food packaging plays an important role in judging the expected healthfulness (Carrillo et al., 2012; Lähteenmäki, 2013). The literature suggests that consumer reaction to the TLFL depend on the combination of different TLFL and the product category (Verbeke, Scholderer, & Lähteenmäki, 2009). A healthy TLFL receives more acceptance when being displayed on products that already have a healthy image (Bech-Larsen & Grunert, 2003; Dean et al., 2007; Siegrist, Stampfli, & Kastenholz, 2008). As described earlier, health food labels influence taste expectation and this also influences the decision of the consumer (Balasubramanium & Cole, 2002). However, consumers tend to ignore health food labels if the information is presented on unhealthy food. And vice versa, if a product looks healthy, the consumer tends to search for a health food label (Balasubramaniam & Cole, 2002). Therefore, it is important to use different product categories, in order to see the influence of a healthy and unhealthy TLFL on a healthy and an unhealthy product. For this reason, two products were selected for this study: one that, without any manipulation, could be regarded as healthy, and one that, without any manipulation, could be

seen as unhealthy. Within this study it was chosen for a salad as healthy product and a spring roll as unhealthy product. You can find more about the product choice in section 3.3 Development of stimulus material. The product choice has the advantage that it shows the effect on taste and health expectations of a healthy TLFL on a normally unhealthy product, and the influence of an unhealthy TLFL on a normally healthy product. In addition, the control condition shows the influence of the health and taste expectation, as well as on the purchase intention without any manipulation.

2.3 General health interest (GHI)

Another variable that should be taken into account in this study is the GHI. The literature suggests, that the GHI plays an important role in evaluating the taste and the health of food (Liisa Lähteenmäki, 2013). Therefore, the GHI moderates the purchase intention (Liisa Lähteenmäki, 2013, Wansink and Park 2002, Liem 2012).

It depends also on the GHI, whether the labeled products are perceived as tasty or not (Liem, Toraman Aydin et al., 2012). Thus, people with a high GHI are more interested in healthy products than participants with a low GHI (Visschers, Hess, & Siegrist, 2010). People with a high GHI are more likely to purchase products with a healthy food label compared to people with a low GHI (Liem. 2012, Grunert & Wills. 2007, Borgmeier & Westenhoefer, 2009, Bower, 2003; Kozub, 2003). A consumer with a low GHI tends to perceive a healthy labeled product as less tasty and this can lead to a lower purchase intention (Borgmeier & Westenhoefer, 2009 Bower, Saadat and Whitten (2003), Liem, 2012).

Therefore, on the one hand people want to have health food labels, but on the other hand health food labeled products may be perceived as less tasty (Liem, 2012). This leads to the question, whether the TLFL has the opposite effect on low GHI people and whether the TLFL in fact leads to a less healthy diet for such consumers. To be able to answer the main research

question, this study examines the effect of different TLFLs, influenced by GHI, on taste and health expectations, as well as on purchase intentions.

2.4 Health and taste expectations

As described in the previous section, the TLFL does not only influence the health expectation, but also the taste expectation and the purchase intention. Therefore, the influence of the TLFL has been examined with regard to taste and the health expectation, as well as purchase intention.

A healthy TLFL leads to a higher health expectation, but perhaps also to a lower taste expectation, and that can negatively influence the purchase intention (Bower, Saadat and Whitten, 2003). The health food labels are only one part of the information with which consumers support their expectations and behavior (Lähteenmäki, 2013). Health food labels affect health, but also taste expectations and can influence purchase intentions. In addition, health food labels do not only influence taste expectations, but also the taste experience (Raghunathan, 2006). This can also affect a repeated purchase. As previously described, the expected taste is also a factor that can influence the purchase intention (Cardello 1995). The problem that arises is that consumers may see unhealthy food as being tastier than healthy food (Raghunathan 2006). In addition, the perceived taste and the perceived healthiness are negatively correlated, and health is seen as secondary to taste in the consumers' food purchasing intention (Roininen 1999). In addition, it has been found that health and taste are important predictors for food liking and consumption (Roininen 1999). A problem that occured in previous studies was that the results in the literature were contradictory The study direction determined of health food labels have a positive or a negative influence on the purchase intention.

On the one hand, it was found that people express the need for health food labels on products in order to make a healthier decision (Wills et al., 2007). People prefer products that are labeled as healthy, and this has a positive influence on the purchase intention (Bower, 2003, Kozub, 2003). If healthy nutrition information or health claims are present on packaging, consumers have a better expectation towards health, and this leads to a higher purchase intention (Kozub, 2003). On the other hand, it has been found that people do not necessarily perceive packaging with health food labels as attractive (Bower, Saadat and Whitten, 2003). This means that people want to have a TLFL to make conscious decisions, but this TLFL can change taste expectations in a negative direction. This can perhaps have an unconscious influence on consumers' decisions. Therefore, it is important to determine the influence of the TLFL on taste expectations, and the influences of taste and health expectations on purchase intentions. It is important within this study to clarify, whether the taste or the health expectation has greater influence on purchase intention. These findings are important in order to determine, whether a TLFL is able to achieve its goal. Therefore, it is important to measure the influence of the TLFL on health expectations, taste expectations and purchase intentions. In addition, it is also necessary to obtain a zero measurement with a control condition to have a reference to what happens without any manipulation. In other words, to have a reference value to the current situation.

For the reasons stated above the following hypotheses are formulated:

H1a: The product from a "healthy category" leads to a higher health expectation in comparison with a product from the unhealthy product category.

H1b: The product from a "healthy category" leads to a lower taste expectation in comparison with a product from the unhealthy product category.

H1c: The product from a “healthy category” leads to a lower purchase intention in comparison with a product from the unhealthy product category.

H2a: A healthy TLFL leads to a higher health expectation in comparison with an unhealthy TLFL.

H2b: A healthy TLFL leads to a lower taste expectation in comparison with an unhealthy TLFL.

H2c: A healthy TLFL leads to a lower purchase intention in comparison with an unhealthy TLFL.

H3a: High GHI people expect healthy products to be tastier in comparison with low GHI people.

H3b: High GHI people expect healthy products to be more likely to be purchased them in comparison with low GHI people.

H4a: High GHI people expect unhealthy products to be less tasty in comparison with low GHI people.

H4b: High GHI people expect unhealthy products to be less likely to be purchased them in comparison with low GHI people.

H5a: High GHI people expect a healthy TLFL to be tastier in comparison with low GHI people.

H5b: High GHI people expect a healthy TLFL to be more likely to be purchased them in comparison with low GHI people.

H6a: High GHI people expect products with an unhealthy TLFL to be less tasty in comparison with low GHI people.

H6b: High GHI people expect products with an unhealthy TLFL to be less likely to be purchased them in comparison with low GHI people.

The research model is illustrated in Figure2

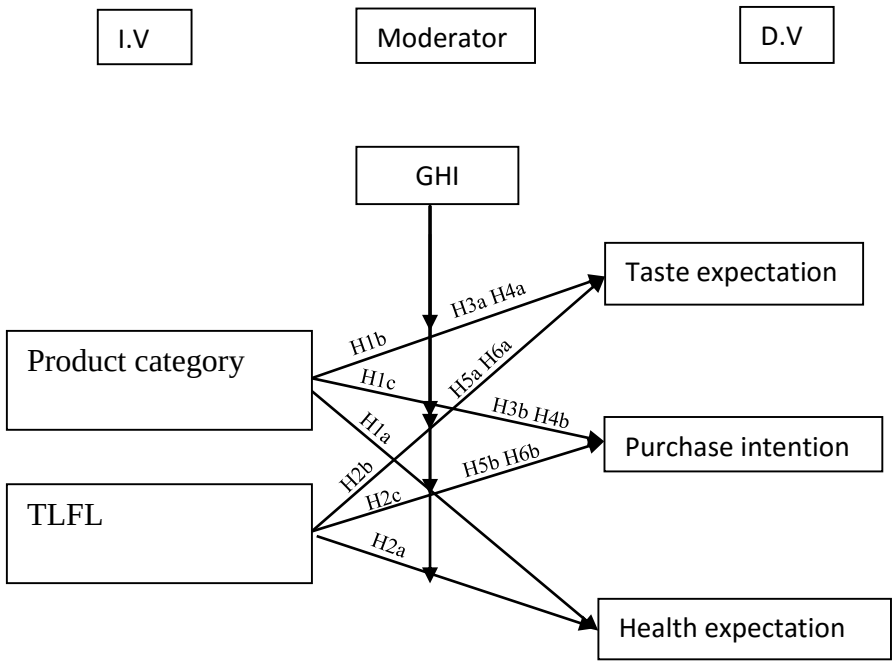

Figure 2.
Research design

3 Method

This section will discuss the research design, the selection of participants, the sample characteristics, the development of stimulus material and the stimulus material itself, the measures and the procedure.

3.1 Research design

This study is based on a 3 (healthy TLFL / unhealthy TLFL/ control condition) by 2 (healthy product / unhealthy product) by 2 (low GHI / high GHI) experimental design. The participants were randomly assigned to one of the three TLFL groups (independent variable), where they saw the same two products with a healthy TLFL, an unhealthy TLFL, or the same products

without a TLFL. The product category (healthy vs. unhealthy) was manipulated within subjects. The participants' GHI towards food was used as a moderator. The participants were split into a low and a high GHI group. Taste and health expectations, as well as the purchase intention were measured as dependent variables.

3.2 Participants

The participants were recruited via Facebook and with flyers including a link to an online questionnaire. The questionnaire was available in Dutch, German and English. The survey was in different languages, because this study was performed at an international university. German, Dutch and English were chosen to allow as many participants as possible to answer in their native language. To exclude the possibility of changes in the content by translation into another language, an expert performed a back translation. The back translation showed no difference in the content of the survey. In total, 154 participants took part in the experiment. The sample comprised 66 Dutch participants, 80 German participants, and eight participants from other countries. 84 participants were female and 70 were male. Furthermore, the mean age of the participants was M =24.7, SD =4.71. The participants were divided randomly into three different groups. The demographical distribution of the participants is displayed in Table 1 in the TLFL splits.

Table 1.
Demographic distribution

	TLFL											
	Healthy TLFL 0,64				Control Condition				Unhealthy TLFL			
	N	M	SD	%	N	M	SD	%	N	M	SD	%
Age:	50	24.56	5.42		53	24.75	5.13		51	24.78	3.43	
Male:	23			14.9	19			12.3	28			18.2
Female:	27			17.5	34			22.1	23			14.9
German:	25			16.0	29			18.6	26			16.6
Dutch:	24			15.4	21			13.4	21			13.4
Other countries:	1			0.64	3			1.9	4			2.6
Secondary school:	1			0.6	3			1.9	0			0
Apprenticeship:	4			2.6	7			4.5	6			3.9
Higher secondary education:	8			5.2	10			6.5	7			4.5
Higher professional education:	16			10.4	11			7.1	15			9.7
Higher education:	21			13.6	22			14.3	23			14.9

Furthermore, different sample characteristics may have influenced the results. The sample characteristics check variables that could influence the results in a negative way, such as whether the participant had noticed the TLFL on the packaging, his or her knowledge about TLFL and his or her trust in the TLFL. The variables of knowledge about the TLFL and of trust towards the TLFL were measured with a seven-point Likert scale. The variable of noticing the TLFL was measured with a yes or no question. To verify the balance between the three different TLFL groups, a one-way ANOVA and a chi-square was performed. With regard to noticing the TLFL, the chi-square showed a significant difference within the group (X^2 = (2)73.76, p=0.001). In this case that was the aim, because in the control condition there was no TLFL to notice. In the sample characteristics of trust in the TLFL and knowledge about the TLFL, the

ANOVA showed no significant difference within the groups. For the sample characteristic of knowledge about TLFL, the ANOVA gave the following values: $F(1,148)=1.74$ $p= 0.17$. For the sample characteristic of trust in the TLFL, the values were $F(1,148)=0.90$ $p= 0.4$. The sample characteristic check showed no statistical significant difference between the groups with regard to knowledge about the TLFL and trust towards the TLFL. Which means, that these variables do not negative influence the validity of this study. The distributions of the moderators in the three TLFL conditions are shown in Table 2.

Table 2.
Sample characteristics

	TLFL											
	Healthy TLFL				Unhealthy TLFL				Control condition			
	N	*M*	*SD*	*%*	*N*	*M*	*SD*	*%*	*N*	*M*	*SD*	*%*
Notice TLFL:	47			30.5	47			35.5	14			9.1
Had not notice TLFL:	3			1.9	4			2.6	39			25.3
Knowledge TLFL:	50	5.16	0.79		53	5.25	0.89		51	4.94	0.91	
Trust TLFL:	50	4.63	1.16		53	4.88	1.17		51	4.90	1.09	

3.3 Development of stimulus material (pre-test)

A pre-test was conducted in order to ensure the effect of different TLFLs on the health expectations of customers with regard to shown food products. The pre-test was done before the main research to prevent the stimulus material from showing no difference in terms of health expectations in the groups of healthy and unhealthy TLFL, as well as in the control condition. As stimulus material it a salad as health product and a spring roll as unhealthy product was used. The pre-test was conducted using the online tool Qualtrics. The participants were randomly distributed in the three different TLFL groups, where they get shown the healthy product (salad) and the unhealthy product (spring roll) with a healthy TLFL, an unhealthy TLFL or the same products without manipulation. The participants had to answer the question, “How

healthy do you think the shown product is?" There were six participants in the healthy TLFL group, eight participants in the unhealthy TLFL group, and six participants in the control condition. An independent t-test showed a significant difference in in health expectations in th healthy (salad) condition`s between the unhealthy and the healthy TLFL [t= 3.4 $d.f.$=1.98; p<0.005]. The descriptive statistics were M=5.28, SD= 0.98 for the healthy condition, M= 3.83, SD=2.31 for the control condition, and M= 3, SD= 1.6 for the unhealthy TLFL. The descriptive statistic for the TLFL in the spring roll setting was M= 3.14, SD= 1.46 for the healthy TLFL, M= 3.16, SD = 2.31 for the control condition, and M= 1.7, SD= 0.70 for the unhealthy TLFL. A dependent sample t-test also showed that there is a significant difference in the health expectation between the two product categories (salad / spring roll) [t= 4 $d.f.$=5; p<0.01]. The descriptive statistic for the healthy product (salad) was M= 4.3, SD= 2,32 and for the unhealthy product (spring roll), M= 3.15, SD = 2.31. The statistical distribution of the health expectation of the salad and the spring roll condition, as well as the distribution in the three different TLFL settings are shown in Table 3. The stimulus material can be found in Appendix A. The results of the pre-test indicate that by the healthy product (salad) and the unhealthy product (spring roll) a healthy TLFL was seen as significantly healthier than products with an unhealthy TLFL. In addition, the results indicated that the healthy product (salad) were seen as significant healthier than the unhealthy product (spring roll). This justifies the use of the stimulus material in the main study.

Table 3.
Development of stimulus material (pre-test)

		Group								
		Healthy TLFL			Unhealthy TLFL			Control condition		
Product		*N*	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*
Salad	Health expectation:	6	5.3	0.9	8	3.0	1.6	6	3.8	2.3
Spring rolls	Health expectation:	6	3.1	1.4	8	1.7	0.7	6	3.2	2.3

3.4 Stimulus material

The stimulus material was shown in each of the three groups. A salad packaging and a spring roll packaging were chosen. Products were chosen from different product categories in order to have one product that would be regarded as healthy without any manipulation, and one that would be seen as unhealthy without any manipulation. The product choice had the advantage of illustrating the influence on taste and health expectations of a healthy TLFL placed on a normally unhealthy product and the influence of an unhealthy TLFL placed on a normally healthy product. The label was shown at the front of the packaging of each product. In addition, all unnecessary information was deleted from the package, in order to reduce the influence of other stimuli. The values that were used on the TLFL in this experiment were based on the rules of the EU FIC (2014). These rules state the limit values of the different color codes for the different ingredients. Furthermore, they provide the standard recommended daily intake of the ingredients in order to determine the percentage of the recommended intake of those ingredients contained in the product. They also state the number of calories, sugar, salt, fat and saturated fat that have to be part of a TLFL. In addition, the number of calories must be white, because they cannot be simply classified with a color system (EU FIC, 2014). The table of limiting values and the table for daily requirements for every ingredient can be found in Appendix B. Based on these tables, a healthy and an unhealthy TLFL were developed for each product, as well as a control condition without manipulation. The stimulus material is also shown in figure 3 and in Appendix A.

Condition 1: Healthy TLFL

Condition *2: Unhealthy TLFL*

Condition 3: Control condition

Figure 3
Product category and TLFL

3.5 Measures

All questions in this questionnaire were answered with a seven-point Likert scale. To test the internal consistency of the different constructs a Cronbach's alpha analysis was performed. In the following, the constructs and their internal consistency are described.

The first construct, health expectation, refers to the shown products. The scale is a modified version of the "health interest towards food" scale by Roininen et al. (1999). This construct comprises ten items. The reliability of this construct was (α = .62). After deleting the

items 5, 6 and 7, the reliability increased to (α = .89). One example of the items of this scale is: I think this meal can be part of a healthy and balanced diet.

The next construct is the taste expectation. The taste expectation scale also refers to the shown products. The taste expectation scale is based on the "taste interest" scale by Roininen et al. (1999). This construct has six items. The reliability analysis showed a reliability of (α = .65). After deleting the items 1 and 5, the reliability increased to (α = .79). One example of the items of this scale is: I think I can enjoy the taste of this meal.

The third construct is purchase intention. The purchase intention scale was developed by Baker and Churchill (1977). This construct contains four items. The reliability analysis showed a reliability of (α = .90). One example of the items of this scale is: Would you buy this product, if you happened to see it in a store?

The next construct measured the participants' GHI towards food. This construct is a modified version of the food healthiness construct, developed by Roininen et al. (1999). This construct contains eight items. The reliability analysis showed a reliability of (α = .87). One example of the items of this scale is: I am very particular about the healthiness of food.

The author developed the following scale, which measures the awareness of the TLFL in general. This construct contains six items. The reliability showed a value of (α=.66) After deleting the items 1,2 and 5, the reliability is (α = .81). One example of the items of this scale is: I have seen the Traffic light food label on products in the supermarket.

The last construct measures the trust of participants towards the TLFL. This construct was developed by Obermiller et.al (1998) and contains nine items. The reliability analysis showed a value of (α = .9). After deleting the items 1 and 2, the reliability increased to (α = .91). One example of the items of this scale is: The aim of the Traffic light food label is to inform the consumer.

An overview of the used scales, the number of used items, the number of items after deleting and the reliability of the used scales are shown in table 4.

Table 4.
Construct overview

Scale	N item	N items after deletion	α
Health expectation	10	7	0.89
Taste expectation	6	4	0.79
Purchase intention	4	4	0.90
GHI	8	8	0.87
Awareness	6	3	0.81
Trust	9	7	0.91

3.6 Procedure

This study was based on an online experiment. The online experiment was created with the software tool Qualtrics. If the participant opened the survey with a mobile device, a window appeared with a text explaining that the survey stopped at that moment and that they must open the survey with a desktop computer to continue. This was necessary for seeing the manipulation on the stimulus material. The participant started the survey with a desktop computer, the experiment started with brief information about the study, but did not mention the goal of the study. A complete description of the study was revealed after the experiment. Furthermore, the participant was informed that the participation in this survey was anonymous, voluntary and that he or she could stop with the survey at any time. The participant could choose between the German, Dutch and English language, giving them the possibility to answer in their native language. Subsequently the participants answered demographic questions about age, gender, education, and the country from which they came. Afterwards the participants were randomly assigned to one of the three conditions. In all three conditions, the questions and the shown food packaging were identical. The only difference was that in the condition “unhealthy” the TLFL

showed that the products were unhealthy; in the condition “healthy” the TLFL showed that the same products were healthy; and in the control condition the shown products were without a TLFL. The participants were shown successively the salad and the spring roll packaging, and they had to give answers on the scales explained in the section measures. Participants had to answer questions about their health and taste expectations, as well as their purchase intentions about both products. In the following step the participants were asked to fill in a number of questions to determine their GHI. These questions were not related to the shown products. In the next step the participants were shown an example of a TLFL with the question of whether he or she had seen, read and understood this label on the previously shown packaging. Following this step, the participants had to answer questions related to how well they knew the TLFL and how much they trusted these kinds of labels. Finally, a short text followed with acknowledgments and a short explanation of the study and its goals. The complete online questionnaire can be found in Appendix C.

4. Results

This section works with the items and factors that were discussed and tested in the method section. An ANOVA was used to calculate the effect of the different product categories of the different TLFL`s, as well as the GHI on the taste and health expectations, and on the purchase intention.

To use the GHI in an ANOVA, a median split half method was used. The median split half was made by the GHI scale by a score of M= 4.5. To determine the results, Repeated Measures ANOVAs were performed with product category (within subject factor), TLFL (between subject factor) and GHI (low/ high between subject factor). The product category, the TLFL and the GHI were used as independent factors and the taste and health expectation as well as the purchase intention were used as dependent factors.

For the following section, all relevant descriptive statistics are found in Appendix D.

4.1 Health expectation

An ANOVA was conducted to examine the effect of the product categories, the different TLFL and the GHI on the health expectation. There was a statistically significant main effect of the different product categories F (1,148) = 341,4 p< 0,001. The healthy product was perceived as more healthy (M=4.4, SD= 0.99) than the unhealthy product (M=2.8, SD=0,8). In addition, the ANOVA showed a statistically significant main effect of the different TLFL groups, F (2,148)=8.864 p< 0.001. A Bonferroni analysis indicated that the healthy TLFL (M=3.92, SD=0.66) led to a higher health expectation than the control condition (M= 3.57, SD= .68 p= 0.38), and then the unhealthy TLFL (M= 3.34, SD= .72 p< 0.001). However, there was no significant difference between the control condition (M= 3.57, SD= 0.69) and the unhealthy TLFL (M= 3.34, SD= 0.72 p= 0.27). The descriptive statistics of the Bonferroni analysis are shown in Appendix D and illustrated in Figure 4. In addition, the ANOVA showed a marginal significant interaction effect between the product category and the TLFL on the health expectation F (2,148) = 2.8, p= 0.06. The ANOVA showed, that in the unhealthy product category the unhealthy TLFL (M= 2.68, SD= 0.85) were seen as more healthy as the control condition (M= 2,67, SD= 0.66) (see Figure 5 for illustration. Further, the ANOVA showed no other statistically significant main or interaction effects on the Health expectation (see Table 5 for full statistics).

Table 5.
Health expectation ANOVA

Effect	df	F	p
Product category	1	341.4	0.001
Product category*TLFL condition	2	2.8	0.064
Product category*GHI	1	1.24	0.268
Product category*GHI*TLFL condition	2	0.57	0.569
TLFL condition	2	8.86	0.001
GHI	1	2.25	0.138
TLFL condition* GHI	2	0.56	0.572

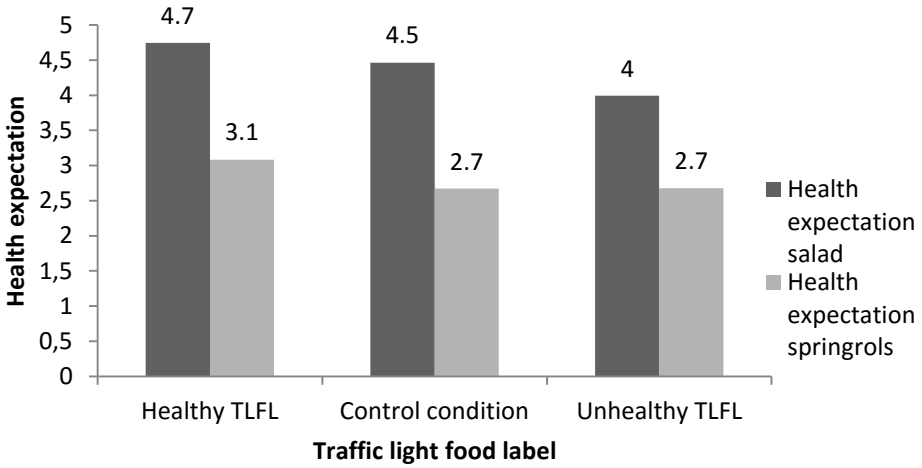

Figure 4
*Health expectation TLFL*product category*

Figure 5.

*ANOVA Health expectation product category*TLFL*

4.2 Taste expectation

To find out the effect of the product categories, the different TLFL and the GHI on the taste expectation, also an ANOVA was performed. There ANOVA showed a marginal significant main effect of the different product categories F (1.148) = 3.12 p< 0,08. The healthy product was perceived as less tasty (M=3.66, SD= 1.36) than the unhealthy product (M=3.87, SD=1.13). In addition, the ANOVA showed a marginal significant interaction effect between the product category and the TLFL on the tast expectation F (2,148) = 3.04, p= 0.051. The ANOVA showed, that the control condition (M= 3.97, SD= 1.48) in the healthy product category were seen as tastier as in the unhealthy product category (M= 3.73, SD= 1.08) while the healthy TLFL (M= 3.49, SD= 1.22) and the unhealthy TLFL (M= 3.51, SD= 1.34) in the healthy product category were seen as less tasty as the healthy TLFL (M= 3.89, SD= 0.96) and the unhealthy TLFL (M= 3.99, SD= 1.32) in the unhealthy product category (see Figure 6 for illustration). The ANOVA also showed a statistically significant interaction effect between the product category and the GHI F (1,148) = 8.44, p= 0.004. Based on the influence of the product category and the GHI, low GHI participants with had seen the salad product (M=3.47, SD= 1.23) had a lower score on the taste expectation than high GHI participants with had seen the salad (M=3.85, SD= 1.46). In addition, high GHI participants with had seen the spring roll product (M=3.67, SD= 1.11) had a lower taste expectation than low GHI participants with had seen the spring roll (M=4.05, SD=1.12). In other words, a low GHI led by a unhealthy product to a higher taste expectation in comparison to a healthy product and a high GHI led to a lower taste expectation by a unhealthy product in comparison with a healthy product. The distribution is also shown in Figure 7. Further, the ANOVA showed no other statistically significant main or interaction effects on the health expectation (see Table 6 for full statistics); the descriptive statistics of the ANOVA are shown in Appendix D.

Table 6.
ANOVA Taste expectation

Effect	df	F	P
Product category	1	3.12	0.080
Product category*TLFL condition	2	3.04	0.051
Product category*GHI	1	8.44	0.004
Product category*GHI*TLFL condition	2	1.16	0.315
TLFL condition	2	0.33	0.722
GHI	1	0.001	0.970
TLFL condition*GHI	2	0.89	0.412

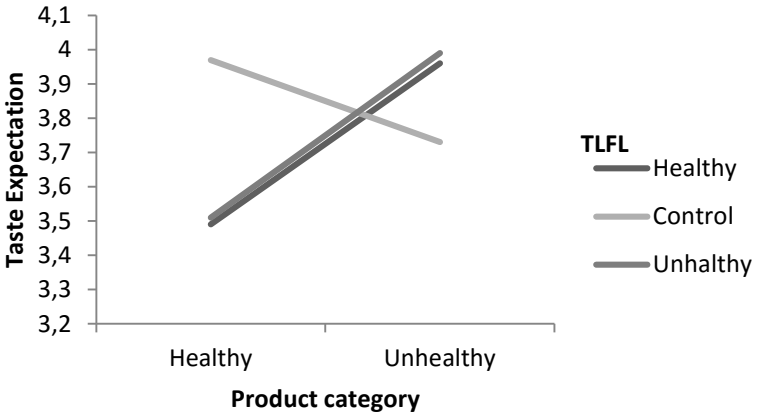

Figure 6.
*ANOVA Taste expectation product category*TLFL*

Figure 7.
*ANOVA Taste expectation product category*GHI*

4.3 Purchase Intention

An ANOVA was conducted to examine the effect of the three different TLFLs, the product category and the GHI on purchase intention. The results of the ANOVA showed a statistically significant main effect of the product categories on the purchase intention F (1,148) = 13.66, $p<0.001$. The spring roll (M=3.79, SD= 1.33) had a significantly higher score on the purchase intention scale than the salad (M=3.28, SD= 1.21). In addition, the ANOVA showed a statistically significant interaction effect between the product categories and the GHI, F (1,148) =7.86, p=0.01. Participants with high GHI which have seen the salad (M=3.48, SD= 1.59) had a higher purchase intention than participants with low GHI which have seen the salad (M=3.1, SD= 1.41). In addition, participants with low GHI which have seen the Spring roll (M=4, SD= 1.2) had a higher purchase intention than participants with high GHI which have seen the Spring roll (M=3.58, SD= 1.42). The distribution of the interaction between the GHI and the product category is shown in Figure 8. Further, the ANOVA showed no other statistically significant main or interaction effects on the Health expectation (see Table 7 for full statistics); the descriptive statistics of the ANOVA are shown in Appendix D.

Table 7.
Purchase intention product categories ANOVA

Expectation	Effect	df	F	p
Purchase intention	Product category	1	13.66	0.001
	Product category*TLFL condition	2	1.09	0.339
	Product category*GHI	1	7.89	0.006
	Product category*GHI*TLFL condition	2	1.5	0.226
	TLFL condition	2	0.17	0.841
	GHI	1	0.01	0.905
	TLFL condition*GHI	2	0.03	0.968

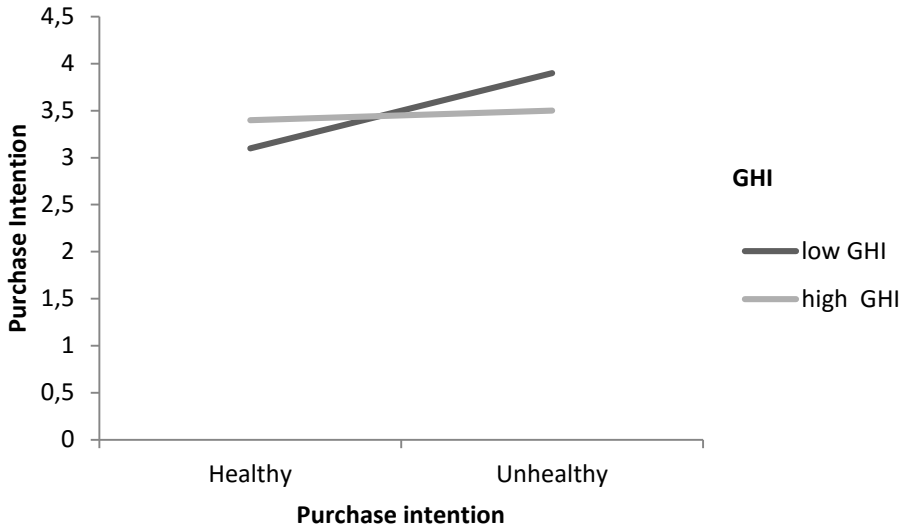

Figure 8.

*Purchase Intention*product category*GHI*

5. Discussion

In this discussion, the hypothesis will be explained as it relates to the main findings and to the overall purpose of this study. Afterwards, suggestions for future research will be made and the answer to the main question will be discussed. Furthermore, it will be evaluated in how far the results of this study is in line with existing knowledge in the field. The discussion section starts by discussing the hypothesis based on the results of this study.

Hypothesis 1a stated "The product from a "healthy category" leads to a higher health expectation in comparison with a product from the unhealthy product category." This hypothesis can be accepted. The results show a higher score for the healthy product category on the health expectation. The results are in line with the literature, which suggests, that most people interpret the healthiness of products correctly (Borgmeier, 2009).

Hypothesis 1b stated: "The product from a "healthy category" leads to a lower taste expectation in comparison with a product from the unhealthy product category." This

hypothesis can be accepted. The results show a marginal higher score for the unhealthy product category on the taste expectation. The results are in line with the literature, which suggests, that perceived taste and the perceived healthiness are negatively correlated (Raghunathan, 2006; Liem, 2012; Roininen 1999).

Hypothesis 1c stated: "The product from a "healthy category" leads to a lower purchase intention in comparison with a product from the unhealthy product category." This hypothesis can be accepted. The results show a higher score for the unhealthy product category on the purchase intention. The results are in line with the literature, which suggests, that health and taste expectation are negative correlated and that taste are the major predictor for the purchase intention (Raghunathan, 2006; Liem, 2012; Roininen 1999).

Hypothesis 2a stated: "A healthy TLFL leads to a higher health expectation in comparison with an unhealthy TLFL." This hypothesis can be accepted. The results showed that a healthy TLFL leads to a significant higher health expectation of the participants. These results are in line with the literature, which suggests that most people interpreted nutrition information correctly and made the right decision with regards to this information (Borgmeier, 2009).

Hypothesis 2b stated: "A healthy TLFL leads to a lower taste expectation in comparison with an unhealthy TLFL." This hypothesis cannot be accepted. The results showed no significant difference between the TLFL groups on the taste expectation. These results were not in line with the literature. Particularly, the literature suggests that health labels can influence the taste expectations, and that a high health expectation leads to a lower taste expectation (Raghunathan 2006, Liem, 2012, Roininen, 1999, Raghunathan 2006). Based on the present study, this assumption cannot be accepted. However, the results of this study were in line with the results of the study by Roberto et al. (2011), in which no influence could be found for

different healthy TLFLs on taste expectations. However, Roberto et al. (2011) did not suggest any reason for these results.

Hypothesis 2c stated: “A healthy TLFL leads to a lower purchase intention in comparison with an unhealthy TLFL.” This hypothesis cannot be accepted. The results showed no difference between the TLFL groups on the purchase intention. These results were not in line with the literature. However, this results are in line with the study of Roberto et al. (2011), who also did not find any influence from the TLFL on the purchase intention.

Hypothesis 3a stated: “High GHI people expect healthy products to be tastier in comparison with low GHI people.” The results showed that there is a significantly higher score for the healthy product in the high GHI group as compared to the low GHI group on taste expectation. These results are in line with the literature. Previous studies suggest that people who put more value on healthy food are more willing to purchase products with health food labels than people who were not interested in healthy food (Vyth et al., 2001).

Hypothesis 3b stated: “High GHI people expect healthy products to be more likely to be purchased them in comparison with low GHI people.” This hypothesis can be accepted. The results showed that there is a higher purchase intention for the high GHI by the healthy product than by the unhealthy product. These results are also in line with the literature. Previous studies suggest that people who put more value on healthy food are more willing to purchase products with health food labels than people who were not interested in healthy food (Vyth et al., 2001).

Hypothesis 4a stated: “High GHI people expect unhealthy products to be less tasty in comparison with low GHI people.” Also this hypothesis can be accepted. The results showed that the unhealthy product in the high GHI group had a significantly lower score on the taste expectation as the low GHI group. This results are in line with the literature. Previous studies

suggest that the GHI plays an important role in interpreting the taste and the health of food (Roininen 1999; Liisa).

Hypothesis 4b stated: “High GHI people expect unhealthy products to be less likely to be purchased them in comparison with low GHI people.” This hypothesis can be accepted. The results showed that in the high GHI and unhealthy product group the purchase intention decreased, as compared to the low GHI and unhealthy product group. The results are in line with the literature, which suggests, that the perceived taste is the primary factor for the purchase intention (Raghunathan, 2006; Liem, 2012; Liisa Lähteenmäki, 2013).

Hypothesis 5a stated: “High GHI people expect a healthy TLFL to be tastier in comparison with low GHI people.” This hypothesis cannot be accepted. The results show no difference in the taste expectation of the products with TLFL between the high and the low GHI. The results are not in line with the literature. However, it is in line with the study of Roberto et al. (2011), who also did not find any influence of the TLFL on the taste expectation.

Hypothesis 5b stated: “High GHI people expect a healthy TLFL to be more likely to be purchased them in comparison with low GHI people.” This hypothesis cannot be accepted. The results show no difference in purchase intention between the low and high GHI in the different TLFL conditions. The results are not in line with the literature. However, it is also in line with the study of Roberto et al. (2011), who also did not find any influence of the TLFL on the purchase intention.

Hypothesis 6a stated: “High GHI people expect products with an unhealthy TLFL to be less tasty in comparison with low GHI people.” This hypothesis cannot be accepted. The results show no difference in the taste expectation of the products with the different TLFL between the high and the low GHI group. That the different TLFL in combination with the GHI did not

influence the taste expectation is in line with the study of Roberto et al. (2011), who also did not find any influence of the TLFL on the taste expectation.

Hypothesis 6b stated: "High GHI people expect products with an unhealthy TLFL to be less likely to be purchased them in comparison with low GHI people." This hypothesis cannot be accepted. The results show no difference in the purchase intention of the products with TLFL between the high and the low GHI group. Also these results are in line with the study of Roberto et al. (2011), who did not find any influence of the TLFL on the purchase intention.

5.1 Limitations and suggestions for further research

This study had a few limitations. The first limitation was that the reliability of the taste interest was too low. Therefore, this scale was deleted from the study. One reason why the reliability was too low, might be that the survey was too long. The survey took participants an average of 16 minutes, and the taste interest questionnaire was the last part of the survey. It is possible that the online experiment was too long for many participants and they did not read the questions or give their own opinions. In addition, some participants in the control condition also stated that they had seen a TLFL on the product. This is also an indicator that the participants were not concentrated while filling in the survey, or that they wanted to finish the questionnaire as soon as possible and did not read the questions properly. A method to prevent both limitations is to ask about only one product in the online experiment, in order to make it shorter and to increase the motivation of the participants. Based on the literature this variable can be an important moderator. It is recommended to use the variable taste interest in a future study that uses a shorter survey.

A second limitation was that a few participants did not recognize the TLFL in the groups healthy and unhealthy TLFL. One way to solve the problem could be to make the TLFL bigger,

but this would influence the results of the study in an unnatural way and would lead to unreliable results.

A third limitation of this study is that the participants were from different countries. This means that the participants had different cultural backgrounds and gave different answers based on their background. To solve this problem, it could be possible to conduct this study not at an international university, but to recruit participants from one country only. The next limitation concerns the number of participants. This study had only 154 participants. It is difficult to generalize from such a small sample. Therefore, it is recommended to use a bigger sample size the next time.

A fourth limitation refers to the selection of the study participants. The participants were reached via social media and with flyers that provided a link to the online survey, which were distributed on the grounds of the local university. Doing so ensured that the participants were coming from the same age group and had a similar degree of education. The way in which the participants were recruited makes it difficult to generalize the findings of this study. One solution to this problem could be to choose the participants more randomly from the entire population. Another solution for most of the problems related to this study, could be to conduct a related study in a real life setting, in the form of an experiment, in which prepared stimulus material is, for example, distributed in a supermarket. Doing so would allow to look at how frequently each product is sold. The problem with a real life setting is that it is not possible to know the reasons why a product is chosen. This means, that it is not possible to determine the influence of the health and taste interest or the taste and health expectations. It is only possible to determine the purchase intention. However, this kind of study could provide more reliable information of the purchase intention with regard to different TLFLs. In this case, however, ethical issues make it more difficult to sell wrongly labeled products.

A fifth limitation is due to the contrast between the color of the TLFL and the background color of the food packaging. It is possible that the red TLFL (unhealthy) on the red packaging (spring roll) and the green TLFL (healthy) on the green packaging (salad) cannot be seen very well in contrast to the combination of the green TLFL (healthy) on the red packaging (spring roll) and the red TLFL (unhealthy) on the green packaging (salad). In this study this contrast error was tested. To test the contrast error, the interaction effect has been examined between the product category and the different TLFL conditions in the taste and health expectation, as well as the purchase intention. It exists a marginal significant interaction effect in the taste and the health expectation between the TLFL conditions and the product category. In the case of a contrast error, the participants do not see the TLFL very well. In this case the low contrast condition (spring roll and unhealthy TLFL / salad and healthy TLFL) must get a comparable score as the control condition. This is the case with the spring roll on the health expectation scale. That the control condition and the unhealthy TLFL on the spring roll have nearly the same score on the health expectation can also have another reason. Another reason can be that the spring roll control condition is seen as unhealthy as well. In all other cases the low contrast condition was not identical with the control condition (see figure 5 page 23 and figure 6 page 25). In the purchase intention it exists no interaction effect. Therefore, it will be assumed that in this study no contrast error exists. However, in further research this problem must be considered carefully.

A last limitation concerns the product selection. In this study a spring roll and a salad packaging were used. In other study it can be worked with other products. The use of other products may also lead to other results. Therefore, this study is not representative for all healthy or unhealthy products. It only gives an indication.

5.2 Conclusion

The goal of this study was to answer the following question: What impact has the TLFL in combination with healthy or unhealthy food products and the general health interest on the taste and health expectations, as well as on the purchase intention?

This study indicates that healthy products lead to a higher health expectation as compared to unhealthy products. However, a product from the healthy product category leads to a marginal lower taste expectation and also decreases the purchase intention in comparison to a product from the unhealthy product category. Also, a healthy TLFL increases the health expectation, but the higher health expectation has no influence on the taste expectation, as well as on the purchase intention.

In addition, high GHI people expect healthy products to be tastier and this increases the purchase intention in comparison to the low GHI people. In addition, the high GHI people expect unhealthy products to be less tasty and are less willing to buy unhealthy products in comparison with the low GHI people. However, the GHI has no influence on the health expectation of products. The results also showed no interaction between the GHI and the TLFL on the health and taste expectation, as well as the purchase intention.

In other words, the TLFL had a positive influence on the health expectation, but no influence on the taste expectation and the purchase intention. Also the GHI does not moderate the results of the TLFL on the taste and health expectation, as well as on the purchase intention. In addition, the healthiness of the product category positively influenced the health expectation, but influence marginal negatively the taste expectation and influenced negatively the purchase intention. The GHI moderate the result of the product category. A high GHI leads to a more positive taste expectation and purchase intention of the healthy product while a low GHI leads to a more negative taste expectation a purchase intention of the health products. Furthermore, a high GHI leads to a lower taste expectation and purchase intention of an unhealthy product

while a low GHI leads to a positive taste expectation and purchase intention of the unhealthy product.

6.1 Recommendations

Numerous studies have been conducted in the area of healthy food labels. Most of the study in this area was related to the taste or health expectations of consumers. The results about these two issues were very contradictory. Only a few studies were combining both issues. However, it is very important to consider the relationship between the health and taste expectation. As Roinen and Lähteemäki (1999) argued, these two factors were important predictors of liking food and consuming it. Accordingly, this study combined the taste and the health expectation, and closed the gap of previous studies. In addition, this study adds two additional variables. First of all, this study showed that the variables GHI and the product category are two important variables that have to be taken into account in this area of research. The variable GHI showed that different groups of the society react differently on the healthiness of food products. In order to not discriminate a particular societal, this variable must be taken into account in further research. The results of this study helps to give a reason for the contradictory results of previous studies and has an additive value to the existing literature. In addition, the results of this study give new information to influence the discussion of the economy and the polity to introducing the TLFL.

Literature

Figure: Europe must give green light to traffic light food labelling. (2014). In traffic-light-label (Ed.). World Cancer Research Fund.

Baker, M. J., & Churchill Jr, G. A. (1977). The impact of physically attractive models on advertising evaluations. *Journal of Marketing research*, 538-555.

Balasubramanian, S. K., & Cole, C. (2002). Consumers' search and use of nutrition information: The challenge and promise of the nutrition labeling and education act. *Journal of marketing*, *66*(3), 112-127.

Beard, T. C., Nowson, C. A., & Riley, M. D. (2007). Traffic-light food labels. *Medical journal of Australia*, *186*(1), 19.

Becker, L., van Rompay, T. J., Schifferstein, H. N., & Galetzka, M. (2011). Tough package, strong taste: The influence of packaging design on taste impressions and product evaluations. *Food Quality and Preference*, *22*(1), 17-23.

Borgmeier, I., & Westenhoefer, J. (2009). Impact of different food label formats on healthiness evaluation and food choice of consumers: a randomized-controlled study. *BMC Public Health*, *9*(1), 184.

Borin, N., Cerf, D. C., & Krishnan, R. (2011). Consumer effects of environmental impact in product labeling. *Journal of Consumer Marketing*, *28*(1), 76-86.

Bower, J. A., Saadat, M. A., & Whitten, C. (2003). Effect of liking, information and consumer characteristics on purchase intention and willingness to pay more for a fat spread with a proven health benefit. *Food Quality and Preference*, *14*(1), 65-74.

Cardello, A. V. (1995). Food quality: relativity, context and consumer expectations. *Food Quality and Preference*, *6*(3), 163-170.

Carrillo, E., Varela, P., & Fiszman, S. (2012). Effects of food package information and sensory characteristics on the perception of healthiness and the acceptability of enriched biscuits. *Food Research International*, *48*(1), 209-216.

Clark, J. E. (1998). Taste and flavour: their importance in food choice and acceptance. *Proceedings of the Nutrition Society*, *57*(04), 639-643.

EU-FIC. (2014). Guide to creating a front of pack (FoP) nutrition label for pre-packed products sold through retail outlets. *Department of health, Food Standarts Argency, The Scottish Goverment,*.

Grunert, K. G., & Wills, J. M. (2007). A review of European research on consumer response to nutrition information on food labels. *Journal of Public Health*, *15*(5), 385-399.

Kelly, B., Hughes, C., Chapman, K., Louie, J. C.-Y., Dixon, H., Crawford, J., . . . Slevin, T. (2009). Consumer testing of the acceptability and effectiveness of front-of-pack food labelling systems for the Australian grocery market. *Health promotion international*, *24*(2), 120-129.

Kozup, J. C., Creyer, E. H., & Burton, S. (2003). Making healthful food choices: The influence of health claims and nutrition information on consumers' evaluations of packaged food products and restaurant menu items. *Journal of Marketing*, *67*(2), 19-34.

Lähteenmäki, L. (2013). Claiming health in food products. *Food Quality and Preference*, *27*(2), 196-201.

Leathwood, P. D., Richardson, D. P., Sträter, P., Todd, P. M., & van Trijp, H. (2007). Consumer understanding of nutrition and health claims: sources of evidence. *British Journal of Nutrition*, *98*(03), 474-484.

Liem, D., Toraman Aydin, N., & Zandstra, E. (2012). Effects of health labels on expected and actual taste perception of soup. *Food Quality and Preference*, *25*(2), 192-197.

Neuhouser, M. L., Kristal, A. R., & Patterson, R. E. (1999). Use of food nutrition labels is associated with lower fat intake. *Journal of the American Dietetic Association*, *99*(1), 45-53.

Obermiller, C., & Spangenberg, E. R. (1998). Development of a scale to measure consumer skepticism toward advertising. *Journal of consumer psychology*, *7*(2), 159-186.

Raghunathan, R., Naylor, R. W., & Hoyer, W. D. (2006). The unhealthy= tasty intuition and its effects on taste inferences, enjoyment, and choice of food products. *Journal of Marketing*, *70*(4), 170-184.

Roberto, P. M. A. B., MS, MPhil; Marissa J. Seamans, BA; Regine L. Mechulan, BA; Nicole Novak, MS; Kelly D. Brownell, PhD, Christina A. (2011). Evaluation of Consumer Understanding of Different Front-of-Package Nutrition Labels, 2010–2011. *Chenter for Disease Control and Prevention*.

Roininen, K. (2001). *Evaluation of food choice behavior: development and validation of health and taste attitude scales*: University of Helsinki.

Roininen, K., Lähteenmäki, L., & Tuorila, H. (1999). Quantification of consumer attitudes to health and hedonic characteristics of foods. *Appetite*, *33*(1), 71-88.

Sacks, G., Rayner, M., & Swinburn, B. (2009). Impact of front-of-pack 'traffic-light'nutrition labelling on consumer food purchases in the UK. *Health promotion international*, *24*(4), 344-352.

Schade, A. (2012). Lebensmittelindustrie und Verbraucherschutz.

Sonnenberg, L., Gelsomin, E., Levy, D. E., Riis, J., Barraclough, S., & Thorndike, A. N. (2013). A traffic light food labeling intervention increases consumer awareness of health and healthy choices at the point-of-purchase. *Preventive medicine*, *57*(4), 253-257.

Van Kleef, E., van Trijp, H. C., & Luning, P. (2005). Functional foods: health claim-food product compatibility and the impact of health claim framing on consumer evaluation. *Appetite, 44*(3), 299-308.

Van Trijp, H. C., Hoyer, W. D., & Inman, J. J. (1996). Why switch? Product category: level explanations for true variety-seeking behavior. *Journal of Marketing Research*, 281-292.

Visschers, V. H., Hess, R., & Siegrist, M. (2010). Health motivation and product design determine consumers' visual attention to nutrition information on food products. *Public health nutrition, 13*(07), 1099-1106.

Verbeke, W. (2006). Functional foods: consumer willingness to compromise on taste for health? *Food Quality and Preference, 17*(1), 126-131.

Vyth, E. L., Steenhuis, I. H., Mallant, S. F., Mol, Z. L., Brug, J., Temminghoff, M., . . . Seidell, J. C. (2009). A front-of-pack nutrition logo: a quantitative and qualitative process evaluation in the Netherlands. *Journal of health communication, 14*(7), 631-645.

Wansink, B., Ittersum, K. v., & Painter, J. E. (2004). How diet and health labels influence taste and satiation. *Journal of Food Science, 69*(9), S340-S346.

Wansink, B., & PARK, S. B. (2002). SENSORY SUGGESTIVENESS AND LABELING: DO SOY LABELS BIAS TASTE? 1. *Journal of Sensory Studies, 17*(5), 483-491.

Zandstra, E., De Graaf, C., & Van Staveren, W. (2001). Influence of health and taste attitudes on consumption of low-and high-fat foods. *Food Quality and Preference, 12*(1), 75-82.

Appendix A (Stimulus material)

Appendix B (Color code distribution)

Table 2: Criteria for 100g of food (whether or not it is sold by volume)

Text	LOW	MEDIUM	HIGH	
Colour code	Green	Amber	Red	
Fat	≤ 3.0g/100g	> 3.0g to ≤ 17.5g/100g	> 17.5g/100g	> 21g/portion
Saturates	≤ 1.5g/100g	> 1.5g to ≤ 5.0g/100g	> 5.0g/100g	> 6.0g/portion
(Total) Sugars	≤ 5.0g/100g	> 5.0g and ≤ 22.5g /100g	> 22.5g/100g	> 27g/portion
Salt	≤ 0.3g/100g	> 0.3g to ≤ 1.5g/100g	>1.5g/100g	>1.8g/portion

Note: portion size criteria apply to portions/serving sizes greater than 100g

Table 3: Criteria for drinks (per 100ml)

Text	LOW	MEDIUM	HIGH	
Colour code	Green	Amber	Red	
Fat	≤ 1.5g/100ml	> 1.5g to ≤ 8.75g/100ml	> 8.75g/100ml	>10.5g/portion
Saturates	≤ 0.75g/100ml	> 0.75g to ≤ 2.5g/100ml	> 2.5g/100ml	> 3g/portion
(Total) Sugars	≤ 2.5g/100ml	> 2.5g to ≤ 11.25g/100ml	> 11.25g/100ml	> 13.5g/portion
Salt	≤ 0.3g/100ml	>0.3g to ≤0.75g/100ml	> 0.75g/100ml	> 0.9g/portion

Energy (kJ)	8,400
Energy (kcal)	2,000
Fat	70g
Saturates	20g
Sugars	90g
Salt	6g

Appendix C (Survey)

English

Default Question Block

intro

Welcome!

In this research, it will be show a new package design of two food products and we ask you for your opinion.

At the end of this online experiment, you will find further explanation about the aims and goals and how you helped to find the information where is looking for. It is not given more information yet, to do not influence the result of the research.

This research takes10 minutes time to finish. We ask you to be as honest as possible and answer the questions in a natural way, based on your attitudes and opinion.

The participation in this survey is anonymous and voluntary, you can stop this survay every time, agreeing in to participate means agreeing with the publication of the collected data. If you want to accept, please click on NEXT.

Thank you in advance

Demographic

What is your age?

What is your gender?

- Male
- Female

What is your highest education ?

- Lower vocational education (VMBO)(Weiterführende Schule)
- Intermediate vocational education (MBO) (Berufsausbildung)
- Higher secondary education (HAVO) (Gymnasium)
- Higher professional education (HBO) (Fachhochschule)
- Higher education (WO) (Universität)

From what country are you ?

- Germany
- Netherland

If not, from what other country are you from?

healthy TLFL

Take some time to look carefully at the shown product and its packaging.

What is your most probable opinion about the statements below?

What is your moste probable expectation about the following statements?

	Absolutely disagree	Disagree	A little disagree	Neutral	A little agree	Agree	Absolutely agree
1. I think this meal is healthy	○	○	○	○	○	○	○
2. I thing this meal can be part of a healthy and balanced diet.	○	○	○	○	○	○	○
3. I think this meal is low in fat.	○	○	○	○	○	○	○
4. I think that this meal contains a lot of vitamins and minerals.	○	○	○	○	○	○	○
5. I do not think about the healthiness aspects of food.	○	○	○	○	○	○	○
6. I think this meal raise my cholesterol.	○	○	○	○	○	○	○
7. I think this meal contains many calories.	○	○	○	○	○	○	○
8. I think this meal are very sweet	○	○	○	○	○	○	○

9. I think this meal is well salted	○	○	○	○	○	○	○
10. I think this meal has too much sat fat.	○	○	○	○	○	○	○

What is your moste probable expectation about the following statements?

	Absolutely disagree	Disagree	A little disagree	Neutral	A little agree	Agree	Absolutely agree
1. I do not believe that this meal will be a source of pleasure.	○	○	○	○	○	○	○
2. The meal looks tasty.	○	○	○	○	○	○	○
3. It is important for me to eat something like this meal on weekdays as well as weekends.	○	○	○	○	○	○	○
4. I think I can enjoy the taste of this meal.d.	○	○	○	○	○	○	○
5. I think that I do not like the taste of this meal.	○	○	○	○	○	○	○
6. An essential part of my weekend is eating eat meals like this.	○	○	○	○	○	○	○

What is your moste probable expectation about the following statements?

	Absolutely disagree	Disagree	A little disagree	Neutral	A little agree	Agree	Absolutely agree
1. Would you like to try this product?	○	○	○	○	○	○	○
2. Would you buy this product, if you happened to see it in a store?	○	○	○	○	○	○	○
3. Would you actively seek out this product ?	○	○	○	○	○	○	○
4. I would patronize this product?	○	○	○	○	○	○	○

Take some time to look carefully at the shown product and its packaging. What is your most probable opinion about the statements below?

What is your moste probable expectation about the following statements?

	Absolutely disagree	Disagree	A little disagree	Neutral	A little agree	Agree	Absolutely agree
1. I think this meal is healthy	○	○	○	○	○	○	○
2. I thing this meal can be part of a healthy and balanced diet.	○	○	○	○	○	○	○
3. I think this meal is low in fat.	○	○	○	○	○	○	○
4. I think that this meal contains a lot of vitamins and minerals.	○	○	○	○	○	○	○
5. I do not think about the healthiness aspects of food.	○	○	○	○	○	○	○
6. I think this meal raise my cholesterol.	○	○	○	○	○	○	○
7. I think this meal contains many calories.	○	○	○	○	○	○	○
8. I think this meal are very sweet	○	○	○	○	○	○	○
9. I think this meal is well salted	○	○	○	○	○	○	○
10. I think this meal has too much sat fat.	○	○	○	○	○	○	○

What is your moste probable expectation about the following statements?

	Absolutely disagree	Disagree	A little disagree	Neutral	A little agree	Agree	Absolutely agree
1. I do not believe that this meal will be a source of pleasure.							
2. The meal looks tasty.							
3. It is important for me to eat something like this meal on weekdays as well as weekends.							
4. I think I can enjoy the taste of this meal.d.							
5. I think that I do not like the taste of this meal.							
6. An essential part of my weekend is eating eat meals like this.							

What is your moste probable expectation about the following statements?

	Absolutely disagree	Disagree	A little disagree	Neutral	A little agree	Agree	Absolutely agree
1. Would you like to try this product?							
2. Would you buy this product, if you happened to see it in a store?							
3. Would you actively seek out this product ?							
4. I would patronize this product?							

unhealthy TLFL

Take some time to look carefully at the shown product and its packaging. What is your most probable opinion about the statements below?

What is your moste probable expectation about the following statements?

	Absolutely disagree	Disagree	A little disagree	Neutral	A little agree	Agree	Absolutely agree
1. I think this meal is healthy	○	○	○	○	○	○	○
2. I thing this meal can be part of a healthy and balanced diet.	○	○	○	○	○	○	○
3. I think this meal is low in fat.	○	○	○	○	○	○	○
4. I think that this meal contains a lot of vitamins and minerals.	○	○	○	○	○	○	○
5. I do not think about the healthiness aspects of food.	○	○	○	○	○	○	○
6. I think this meal raise my cholesterol.	○	○	○	○	○	○	○
7. I think this meal contains many calories.	○	○	○	○	○	○	○
8. I think this meal are very sweet	○	○	○	○	○	○	○
9. I think this meal is well salted	○	○	○	○	○	○	○
10. I think this meal has too much sat fat.	○	○	○	○	○	○	○

What is your moste probable opinion about the following statements ?

	Absolutely disagree	Disagree	A little disagree	Neutral	A little agree	Agree	Absolutely agree
1. I do not believe that this meal will be a source of pleasure.	○	○	○	○	○	○	○
2. The meal looks tasty.	○	○	○	○	○	○	○
3. It is important for me to eat something like this meal on weekdays as well as weekends.	○	○	○	○	○	○	○
4. I think I can enjoy the taste of this meal.d.	○	○	○	○	○	○	○
5. I think that I do not like the taste of this meal.	○	○	○	○	○	○	○
6. An essential part of my weekend is eating eat meals like this.	○	○	○	○	○	○	○

What is your moste probable opinion about the following statements ?

	Absolutely disagree	Disagree	A little disagree	Neutral	A little agree	Agree	Absolutely agree
1. Would you like to try this product?	○	○	○	○	○	○	○
2. Would you buy this product, if you happened to see it in a store?	○	○	○	○	○	○	○
3. Would you actively seek out this product ?	○	○	○	○	○	○	○
4. I would patronize this product?	○	○	○	○	○	○	○

Take some time to look carefully at the shown product and its packaging. What is your most probable opinion about the statements below?

What is your moste probable opinion about the following statements ?

	Absolutely disagree	Disagree	A little disagree	Neutral	A little agree	Agree	Absolutely agree
1. I think this meal is healthy	○	○	○	○	○	○	○
2. I thing this meal can be part of a healthy and balanced diet.	○	○	○	○	○	○	○
3. I think this meal is low in fat.	○	○	○	○	○	○	○
4. I think that this meal contains a lot of vitamins and minerals.	○	○	○	○	○	○	○
5. I do not think about the healthiness aspects of food.	○	○	○	○	○	○	○
6. I think this meal raise my cholesterol.	○	○	○	○	○	○	○
7. I think this meal contains many calories.	○	○	○	○	○	○	○
8. I think this meal are very sweet	○	○	○	○	○	○	○
9. I think this meal is well salted	○	○	○	○	○	○	○
10. I think this meal has too much sat fat.	○	○	○	○	○	○	○

What is your moste probable opinion about the following statements ?

	Absolutely disagree	Disagree	A little disagree	Neutral	A little agree	Agree	Absolutely agree
1. I do not believe that this meal will be a source of pleasure.	○	○	○	○	○	○	○
2. The meal looks tasty.	○	○	○	○	○	○	○
3. It is important for me to eat something like this meal on weekdays as well as weekends.	○	○	○	○	○	○	○
4. I think I can enjoy the taste of this meal.d.	○	○	○	○	○	○	○
5. I think that I do not like the taste of this meal.	○	○	○	○	○	○	○
6. An essential part of my weekend is eating eat meals like this.	○	○	○	○	○	○	○

What is your moste probable opinion about the following statements ?

	Absolutely disagree	Disagree	A little disagree	Neutral	A little agree	Agree	Absolutely agree
1. Would you like to try this product?	○	○	○	○	○	○	○
2. Would you buy this product, if you happened to see it in a store?	○	○	○	○	○	○	○
3. Would you actively seek out this product ?	○	○	○	○	○	○	○
4. I would patronize this product?	○	○	○	○	○	○	○

zero measurement

Take some time to look carefully at the shown product and its packaging. What is your most probable opinion about the statements below?

What is your moste probable opinion about the following statements ?

	Absolutely disagree	Disagree	A little disagree	Neutral	A little agree	Agree	Absolutely agree
1. I think this meal is healthy	○	○	○	○	○	○	○
2. I thing this meal can be part of a healthy and balanced diet.	○	○	○	○	○	○	○
3. I think this meal is low in fat.	○	○	○	○	○	○	○
4. I think that this meal contains a lot of vitamins and minerals.	○	○	○	○	○	○	○
5. I do not think about the healthiness aspects of food.	○	○	○	○	○	○	○
6. I think this meal raise my cholesterol.	○	○	○	○	○	○	○
7. I think this meal contains many calories.	○	○	○	○	○	○	○
8. I think this meal are very sweet	○	○	○	○	○	○	○
9. I think this meal is well salted	○	○	○	○	○	○	○
10. I think this meal has too much sat fat.	○	○	○	○	○	○	○

What is your moste probable opinion about the following statements ?

	Absolutely disagree	Disagree	A little disagree	Neutral	A little agree	Agree	Absolutely agree
1. I do not believe that this meal will be a source of pleasure.	○	○	○	○	○	○	○
2. The meal looks tasty.	○	○	○	○	○	○	○
3. It is important for me to eat something like this meal on weekdays as well as weekends.	○	○	○	○	○	○	○
4. I think I can enjoy the taste of this meal.d.	○	○	○	○	○	○	○
5. I think that I do not like the taste of this meal.	○	○	○	○	○	○	○
6. An essential part of my weekend is eating eat meals like this.	○	○	○	○	○	○	○

What is your moste probable opinion about the following statements ?

	Absolutely disagree	Disagree	A little disagree	Neutral	A little agree	Agree	Absolutely agree
1. Would you like to try this product?	○	○	○	○	○	○	○
2. Would you buy this product, if you happened to see it in a store?	○	○	○	○	○	○	○
3. Would you actively seek out this product ?	○	○	○	○	○	○	○
4. I would patronize this product?	○	○	○	○	○	○	○

Take some time to look carefully at the shown product and its packaging. What is your most probable opinion about the statements below?

What is your moste probable opinion about the following statements ?

	Absolutely disagree	Disagree	A little disagree	Neutral	A little agree	Agree	Absolutely agree
1. I think this meal is healthy	○	○	○	○	○	○	○
2. I thing this meal can be part of a healthy and balanced diet.	○	○	○	○	○	○	○
3. I think this meal is low in fat.	○	○	○	○	○	○	○
4. I think that this meal contains a lot of vitamins and minerals.	○	○	○	○	○	○	○
5. I do not think about the healthiness aspects of food.	○	○	○	○	○	○	○
6. I think this meal raise my cholesterol.	○	○	○	○	○	○	○
7. I think this meal contains many calories.	○	○	○	○	○	○	○
8. I think this meal are very sweet	○	○	○	○	○	○	○
9. I think this meal is well salted	○	○	○	○	○	○	○
10. I think this meal has too much sat fat.	○	○	○	○	○	○	○

What is your moste probable opinion about the following statements ?

	Absolutely disagree	Disagree	A little disagree	Neutral	A little agree	Agree	Absolutely agree
1. I do not believe that this meal will be a source of pleasure.	○	○	○	○	○	○	○
2. The meal looks tasty.	○	○	○	○	○	○	○
3. It is important for me to eat something like this meal on weekdays as well as weekends.	○	○	○	○	○	○	○
4. I think I can enjoy the taste of this meal.d.	○	○	○	○	○	○	○
5. I think that I do not like the taste of this meal.	○	○	○	○	○	○	○
6. An essential part of my weekend is eating eat meals like this.	○	○	○	○	○	○	○

What is your moste probable opinion about the following statements ?

	Absolutely disagree	Disagree	A little disagree	Neutral	A little agree	Agree	Absolutely agree
1. Would you like to try this product?	○	○	○	○	○	○	○
2. Would you buy this product, if you happened to see it in a store?	○	○	○	○	○	○	○
3. Would you actively seek out this product ?	○	○	○	○	○	○	○
4. I would patronize this product?	○	○	○	○	○	○	○

attitude

General question about your attitude.
What is your moste probable opinion about the following statements?

	Absolutely disagree	Disagree	A little disagree	Neutral	A little agree	Agree	Absolutely agree
1. I am very particular about the healthiness of food.	○	○	○	○	○	○	○
2. I always follow a healthy and balanced diet.	○	○	○	○	○	○	○
3. It is important for me that my diet is low in fat.	○	○	○	○	○	○	○
4. It is important for me that my daily diet contains a lot of vitamins and minerals.	○	○	○	○	○	○	○
5. I eat what I like and I do not worry about healthiness of food.	○	○	○	○	○	○	○
6. I do not avoid any food, even if they may raise my cholesterol.	○	○	○	○	○	○	○
7. The healthiness of food has little impact on my food choices.	○	○	○	○	○	○	○
8. The healthiness of snacks makes no difference to me.	○	○	○	○	○	○	○

General question about your attitude.
What is your moste probable opinion about the following statements?

	Absolutely disagree	Disagree	A little disagree	Neutral	A little agree	Agree	Absolutely agree
1. I do not believe that food should always be a source of pleasure.	○	○	○	○	○	○	○
2. The Appearance of food makes no difference to me.	○	○	○	○	○	○	○
3. It is important for me to eat delicious food on weekdays as well as weekends.	○	○	○	○	○	○	○
4. When I eat, I concentrate on enjoying the taste of food.	○	○	○	○	○	○	○
5. I finish my meal even when I do not like the taste of food.	○	○	○	○	○	○	○
6. An essential part of my weekend is eating delicious food.	○	○	○	○	○	○	○

sub moderator

In this survey, the Traffic light food labels was displayed on the packaging. The following questions are about how well you know this kind of label.

(The Traffic light food label includes information about the number of cal, sugars, salt, sat fat and fat. The ingredients are shown in the collar green, yellow red or wit.)

What is your moste probable opinion about the following statements?

	Absolutely disagree	Disagree	A little disagree	Neutral	A little agree	Agree	Absolutely agree
1. I have heard from the Traffic light food label in the media.	○	○	○	○	○	○	○
2. I have seen the Traffic light food label on products in the supermarket.	○	○	○	○	○	○	○
3. My decision what food I chose depends on the information on the Traffic light food label.	○	○	○	○	○	○	○
4. I talk with people about the healthiness of food based on the information from the Traffic light foot label.	○	○	○	○	○	○	○
5. I recognize the information on the traffic light food label.	○	○	○	○	○	○	○
6. I look consciously of the traffic light food label is on a product.	○	○	○	○	○	○	○

In this survey, the Traffic light food labels was displayed on the packaging. The following questions are about how much you trust this food labeling.

What is your moste probable opinion about the following statements ?

	Absolutely		A little				Absolutely

	disagree	Disagree	disagree	Neutral	A little agree	Agree	agree
1. We can depend on getting the truth on the given information on the Traffic light food label.	○	○	○	○	○	○	○
2. The aim of the Traffic light food label is to inform the consumer.	○	○	○	○	○	○	○
3. I believe that the Traffic light food label is informative.	○	○	○	○	○	○	○
4. The Traffic light food label is generally truthful.	○	○	○	○	○	○	○
5. The Traffic light food label is a reliable source of information about the healthiness of food products.	○	○	○	○	○	○	○
6. The Traffic light food label is truth well told.	○	○	○	○	○	○	○
7. In general, the Traffic light food label presents a true picture of the product.	○	○	○	○	○	○	○
8. I feel I've been accurately informed after looking at Traffic light food label	○	○	○	○	○	○	○
9. Most Traffic light food labels provide consumers with essential information.	○	○	○	○	○	○	○

end

Thank you for taking part of this investigation. Your participation was relevant for this investigation and gifs new argumentation material for the pro and contra argumentation for the launch of a traffic light food label.

Content of this investigation

Improper diet is a reason for health problems (Grunert & Wills, 2007). The EU has developed the Traffic light food label allowing people to decide at first view for healthy foods and thus counteract the unhealthy nutrition (Kelly er al, 2009). However, the choices of food products are mostly subconscious (Lähteenmäki 2013). Furthermore, labels that show reduction of fat, salt or other ingredients are seen as less tasty but as more healthy(Raghunathan 2006). In addition, there are people they choose food based on the best taste and other people choose food based on health aspects (Roininen (1999). Based on this idea this research will shown of the Traffic light food labels has a positive of maybe an negative effect on the taste and health expectation and which consequence this has on the purchase intention.

Click, for the last time, on NEXT to close the survey.

Appendix D (Descriptive statistics)

Table 8.
Bonferroni health expectation distribution traffic light food label

Product	TLFL (I)	TLFL (J)	(I-J)	SE	Sig
Salad	Healthy TLFL	Control condition	0.283	0.186	0.392
		Unhealthy TLFL	0.755	0.188	0.005
	Control condition	Healthy TLFL	-0.283	0.186	0.392
		Unhealthy TLFL	0.472	0.185	0.036
	Unhealthy TLFL	Healthy TLFL	-0.755	0.188	<0.005
		Control condition	-0.472	0.185	0.036
Spring rolls	Healthy TLFL	Control condition	0.412	0.148	0.019
		Unhealthy TLFL	0.405	0.150	0.024
	Control condition	Healthy TLFL	-0.412	0.148	0.019
		Unhealthy TLFL	-0.006	0.148	1.000
	Unhealthy TLFL	Healthy TLFL	-0.405	0.150	0.024
		Control condition	0.006	0.148	1.000

Table 9.
Health expectation ANOVA Descriptive Statistics

Product	TLFL	GHI	M	SD	N
Salad	Healthy TLFL	Low	4.830	0.778	27
		High	4.652	0.782	23
		Total	4.748	0.777	50
	Control TLFL	Low	4.432	1.039	25
		High	4.492	1.067	26
		Total	4.464	1.044	53
	Unhealthy TLFL	Low	4.040	0.755	25
		High	3.946	1.190	26
		Total	3.992	0.991	51
	Total	Low	4.444	0.913	77
		High	4.356	1.067	77
		Total	4.400	0.991	154
Spring rolls	Healthy TLFL	Low	3.156	0.745	27
		High	3.000	0.909	23
		Total	3.084	0.819	50
	Control TLFL	Low	2.728	0.759	25
		High	2.621	0.564	28
		Total	2.672	0.658	53
	Unhealthy TLFL	Low	2.944	0.994	25
		High	2.423	0.586	26
		Total	2.678	0.846	51
	Total	Low	2.948	0.846	77
		High	2.998	0.721	77
		Total	2.808	0.796	154

Table 10.

Taste expectation ANOVA Descriptive Statistics

Product	TLFL	GHI	M	SD	N
Salad	Healthy TLFL	Low	3.463	1.284	27
		High	3.522	1.175	23
		Total	3.490	1.223	50
	Control TLFL	Low	3.520	1.275	25
		High	4.366	1.566	26
		Total	3.967	1.485	53
	Unhealthy TLFL	Low	3.430	1.178	25
		High	3.596	1.490	26
		Total	3.515	1.335	51
	Total	Low	3.471	1.231	77
		High	3.854	1.467	77
		Total	3.662	1.364	154
Spring rolls	Healthy TLFL	Low	3.963	0.985	27
		High	3.794	0.943	23
		Total	3.885	0.960	50
	Control TLFL	Low	3.890	1.125	25
		High	3.580	1.037	28
		Total	3.726	1.080	53
	Unhealthy TLFL	Low	4.310	1.232	25
		High	3.683	1.350	26
		Total	3.990	1.319	51
	Total	Low	4.052	1.115	77
		High	3.679	1.116	77
		Total	3.865	1.128	154

Table 11.
Purchase intention ANOVA Descriptive Statistics

Product	TLFL	GHI	M	SD	N
Salad	Healthy TLFL	Low	3.148	1.542	27
		High	3.326	1.468	23
		Total	3.230	1.496	50
	Control TLFL	Low	3.100	1.486	25
		High	3.857	1.789	26
		Total	3.500	1.681	53
	Unhealthy TLFL	Low	3.050	1.243	25
		High	3.202	1.439	26
		Total	3.128	1.335	51
	Total	Low	3.101	1.414	77
		High	3.477	1.590	77
		Total	3.289	1.512	154
Spring rolls	Healthy TLFL	Low	3.861	1.151	27
		High	3.620	1.386	23
		Total	3.750	1.257	50
	Control TLFL	Low	4.080	1.224	25
		High	3.402	1.490	28
		Total	3.722	1.400	53
	Unhealthy TLFL	Low	4.030	1.279	25
		High	3.731	1.423	26
		Total	3.878	1.349	51
	Total	Low	3.987	1.205	77
		High	3.578	1.425	77
		Total	3.783	1.331	154