ERASMUS UNIVERISTY ROTTERDAM

Erasmus School of Economics

Bachelor Thesis Economie en Bedrijfseconomie

Discovering overconfidence in nutritional knowledge and stimulating information search

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Date final version: 30-06-2021

Abstract

This paper investigates overconfidence in nutritional knowledge and tries to close the knowledge gap. The main research question that is tried to answer via a survey in Qualtrics is: *"Is the Dutch population overconfident in their nutritional knowledge and can awareness of this lack of knowledge motivate them to learn more about good nutrition?".* I found that the Dutch population is, in general, overconfident in their nutritional knowledge. Overconfidence is not different for different genders and ages. It does significantly increase for every educational level above primary school, however, between the different education levels, no clear distinction in overconfidence can be made. Next to that, I found that nutritional knowledge decreases in some form of higher education and increases with age, meanwhile gender does not influence one's nutritional knowledge. Furthermore, it can be concluded that awareness in the form of feedback and correct answers decreases the willingness to learn more about good nutrition.

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1. Introduction

Over the last years, the Dutch population adopted a slightly healthier lifestyle (het Rijksinstituut voor Volksgezondheid en Milieu, 2017). Dutch citizens started eating more fruit and less products that are high in fats and sugars. However, about 75% of the Dutch population does not meet the health council guidelines for good nutrition (Centraal Bureau voor de Statistiek, 2015). Since nutrition and health are correlated, a healthy diet is needed in order to obtain a good health status (Voedingscentrum, 2021). Good nutrition lowers the risk of chronic diseases such as diabetes and cardiovascular diseases (RIVM, 2014). In order to prevent more of these chronic diseases, people have to adopt a healthier food pattern. Furthermore, eating healthy lowers the chance of being overweight, which is a serious problem. In 2019, about 18% of the Dutch population who are under the age of 25 are overweight (CBS, 2019). For young adults who are older than 25, this is even 25%. This is an increase compared with 2018 when these numbers were 16 and 24 percent respectively, which means that it is a growing problem. Meanwhile, 91% of the population under the age of 25 and 88% of the young adults over the age of 25 state that they are healthy. These beliefs might be incorrect, which shows a gap between what people think and what is actually true. Overweight can be reduced or avoided by making healthy food choices.

There are multiple barriers as for why people do not easily choose a healthier diet. The main barriers are the lack of suitable food options and the ignorance about good nutrition (Gracey, Stanley, Byrke, Corti & Beilin, 1996). The main focus of this thesis will be on the lack of nutritional knowledge. Providing people with information about healthy food options will ultimately lead to improved food patterns (Parmenter & Wardle, 1999). Furthermore, beliefs and attitudes about good nutrition are also main determinants for one's food choices. Wrong beliefs and attitudes could lead to ignorance on good nutrition. One's knowledge is hardly ever errorless or complete (Alba & Hutchinson, 2000). Previous research suggested that the around 84% of the Dutch population thinks they have a good knowledge about living healthy (TNS NIPO, 2007). It is therefore interesting to investigate whether these people are overconfident about their nutritional knowledge, meaning that people might think they know more about good nutrition than they really do. Judgements about the healthiness of a food product are influenced by the knowledge one believes to have (Pillai, Brusco, Goldsmith & Hofacker, 2015). Overconfidence can lead to less information search on related topics (Radecki & Jaccard, 1995), causing unhealthy food choices. When providing people with information about these incorrect beliefs, they might realise that they should invest more time in studying nutrition.

The purpose of this study is to find out if people are overconfident in their knowledge about good nutrition and whether awareness of their potential lack of knowledge makes people more willing to seek information on good nutrition. The following research question will be answered:

"Is the Dutch population overconfident in their nutritional knowledge and can awareness of this lack of knowledge motivate them to learn more about good nutrition?"

Abundant evidence suggests that most people are overconfident most of the time, meaning that they overestimate their knowledge (Deaves, Lüders & Schröder, 2010). Earlier research has examined nutritional knowledge among nurses and doctors who were giving nutrition guidance to patients (Mowe et al., 2008). Their results indicated that these nurses and doctors overestimated their own knowledge on good nutrition and therefore sometimes gave incorrect advice to patients. It can be interesting to investigate whether overconfidence in nutritional knowledge can also be found for the Dutch population. Earlier research mainly focussed on overconfidence in other domains or among professionals. However, to the best of my knowledge, this thesis makes a first attempt to investigate overconfidence for nutritional knowledge among the Dutch population, causing this research to be scientifically relevant. When trying to make people aware of overconfidence and therefore showing them a potential lack of knowledge, they can be motivated to gather more information about good nutrition. Here social relevance can be found. People with unhealthy lifestyles, such as an unhealthy diet, require more health care and therefore have higher healthcare costs. If overconfidence in nutritional knowledge is identified, people can be made aware of this, which could lead them to try to improve their general knowledge on healthy food options. This could lead people to adapt a healthier food pattern, which might improve the overall health of society.

To answer the research question, firstly, I will investigate whether the Dutch population is overconfident in their nutritional knowledge. Thereafter, I will investigate whether awareness on their potential lack of knowledge motivates them to learn more about good nutrition in order to close the knowledge gap. I will first present an overview of the existing literature. Secondly, I present the methodology and data. After that, the results are presented and this thesis is concluded with a discussion in which a summary of the findings can be found, along with limitations and suggestions for further research.

2. Literature review

2.1 Overconfidence

The Dutch know a lot less about good nutrition than they think they do. Around 12% of the Dutch population thinks they have an unhealthy diet (TNS NIPO, 2007). Meanwhile, het Centraal Bureau voor de Statistiek (CBS) (2015) reported that around 75% of the Dutch population does not have a healthy diet according to the nutritional guidelines. Knowledge about good nutrition is an important factor for making healthy food choices (Thomas, 1994). In general, people with a better knowledge of good nutrition, make healthier food choices (Soliah, Newell, Vaden & Dayton, 1983). However, people do not always have enough knowledge to make healthy choices (Gracey et al., 1996). There are multiple factors that influence nutritional knowledge. One possible explanation for the lack of knowledge is knowledge calibration. This is the degree of conformity between perceived and actual knowledge (Alba & Hutchinson, 2000). Knowledge calibration is based on confidence, what one believes he or she knows, and accuracy, what one really knows. Research has shown that individuals frequently evaluate their own knowledge incorrectly and are therefore less well calibrated (Parker & Stone, 2014). The most common form of poor calibration is overconfidence, which means that people rate their knowledge better than it in fact is (Lichtenstein & Fischhoff, 1977).

Overconfidence can be divided into three broad categories (Moore & Healy, 2008). These three forms are: overestimation, overplacement and overprecision. The main form of overconfidence is the overestimation of one's knowledge, ability or chance of success. This is that for example, after a quiz with ten questions, someone states they got seven right but in fact only answered five correctly. Overestimation will be the main focus of this thesis. Whenever overconfidence is mentioned, this will be about overestimation. Overplacement is that people believe they are better than others, they rate themselves higher than the median. Overprecision is about the certainty one has on the accuracy of his or her beliefs. When participants have to give an answer to a question with a confidence interval, they are too sure that the correct answer is in their indicated interval.

Overestimation is different depending on the task that is performed. When a participant needs to perform a hard task, it is likely that one will overestimate his or her own score (Moore & Small, 2007). While for an easy task, people often underestimate their own performance. Since it is expected that participants think they have a good knowledge about healthy food options, they might consider the task as rather difficult, since some questions might come up that they cannot answer with certainty. Overestimation can be measured by subtracting a participant's actual score from his or her reported

estimation of the score. Whenever the reported score is higher than the actual score, it can be concluded that one has overestimated his or her knowledge.

Plous (1993) once said: “No problem in judgement and decision-making is more prevalent and more potentially catastrophic than overconfidence.” (p. 217). Biased knowledge calibrations can indeed be a problem because individuals who do not know that their knowledge is incorrect, are unable to deal with this lack of knowledge (Diekmann, 2017). Overconfidence can lead to insufficient information search and therefore to suboptimal choices (Feick, Park & Mothersbaugh, 1992). It is therefore interesting to investigate whether people are overconfident. When this is indeed the case, this can cause people to not invest enough time into gathering information on good nutrition, leading to less knowledge and unhealthy food choices.

Prior research has already shown signs of overconfidence in multiple domains. Reagan (2015) has done research on the nutritional knowledge and overconfidence in that knowledge among tennis coaches in the United States. He found that most coaches lacked knowledge, meanwhile the coaches stated that they had a good knowledge. Mowe et al. (2008) investigated the nutritional knowledge of doctors and nurses in Denmark, Norway and Sweden. They found that nurses and doctors often have insufficient information about healthy food options, leading them to give incorrect recommendations to patients. Since most doctors and nurses are overconfident of their own knowledge, they are not aware of this knowledge gap. Perhaps this overconfidence is also present among the general Dutch population since, as mentioned before, a lot of Dutch citizens claim to have a healthy lifestyle meanwhile het CBS indicates that this is not completely true. It is possible that the Dutch hold wrong beliefs about their health and knowledge, which leads to the first hypothesis:

1: “The Dutch population is overconfident about its nutritional knowledge”

It is interesting to try to identify sources of overconfidence in nutritional knowledge. Certain groups in populations have a better knowledge about healthy food options in general. Even though differences in knowledge for people with different characteristics are already researched before, it is interesting to try and replicate these results. Next to that, it is interesting to look at overconfidence in the Netherlands, since this has not been research before. Overconfidence could be different for people with certain characteristics. A difference in overconfidence could be an explanation for differences in nutritional knowledge and differences in eating habits. This is because overconfidence could lead people to not invest enough time into studying nutrition. When differences are found, policies can be

specified to target those population groups that would most benefit from tools to help improve their knowledge.

Firstly, it is investigated whether differences in nutritional knowledge and overconfidence can be found for different genders. Kim (2003) found that, among college students in South-Korea, the nutritional knowledge of females was much higher than that of males. It is already known that males are, in general, more overconfident than females. This might be a reason for the difference in knowledge. Pulford and Colman (1997) investigated overconfidence in general knowledge and confirmed that, on average, males are more overconfident than females in their knowledge. Barber and Odean (2001) came to the same conclusion when looking at investing behaviour between genders. It is expected that the higher overconfidence for males found in other domains can also be found in nutritional knowledge. Since this lower overconfidence could lead to better knowledge, the second hypothesis consists of two parts:

2a: "Males are more overconfident in their nutritional knowledge than females"

2b: "Females have a better nutritional knowledge than males"

Next to that, it is interesting to see whether differences in nutritional knowledge and overconfidence can also be found for different ages. Jovičić (2015) found that older people, in general, have a better knowledge about healthy eating. It might be the case that this is a result of a difference in overconfidence in nutritional knowledge. It is found that age and overconfidence are namely correlated. Confidence decisions under uncertainty were investigated by asking both young and old individuals how well they think they performed on several trivia questions (Kovalchik, Camerer, Grether, Plott & Allman, 2005). They found that younger individuals were more overconfident than older people. This lower overconfidence among older people might also be present in nutritional knowledge. This leads to hypothesis 3, which also consists of two parts:

3a: "Overconfidence in nutritional knowledge decreases with age"

3b: "Nutritional knowledge increases with age"

Lastly, differences in knowledge and overconfidence are tested for different levels of educational attainment. It is found that higher and lower educated people have a similar nutritional knowledge (Bhandari & Deaves, 2006). However, it is still possible that there are differences in overconfidence among different levels of educational attainment. Earlier research on stock market investments shows

that higher educated people are on average more overconfident (Mishra & Metilda, 2015). Trejos, van Deemen, Rodríguez and Gómez (2019) investigated overconfidence in investing behaviour. They also found that higher educated people are, on average, more overconfident than lower educated people. It is therefore interesting to see whether overconfidence and educational attainment are also correlated for nutritional knowledge and whether there are differences in nutritional knowledge for different educational attainments. The fourth hypothesis therefore is:

4a: "Higher educated people are more overconfident in their nutritional knowledge"

4b: "Nutritional knowledge is similar for different levels of educational attainment"

2.2 Stimulating information search

Previous research has shown that information on good nutrition can improve one's food choice. In an experiment, Garg, Wansink and Inman (2007) let participants examine nutrition labels, after which they let participants make food choices. When participants examined the nutrition label, and thus got some information about the nutrition of specific products, they made healthier choices. This confirms that people make healthier choices when presented with information. It is therefore interesting to investigate whether people could be motivated to learn more about good nutrition. When such a motivational factor can easily be implemented, people will be stimulated to learn more about good nutrition and therefore possibly adopt a healthier food pattern.

The knowledge gap that this thesis tries to resolve is possibly partly due to overconfidence. Overconfidence namely leads people to not invest time into studying a specific topic (Radecki & Jaccard, 1995). Vancouver, More and Yoder (2008) investigated the learning behaviour of undergraduates. They found that overconfident students failed to prepare sufficiently and therefore performed worse than the not overconfident students. It can be the case that this negative effect of overconfidence can also be identified in nutritional knowledge among the general Dutch population. It is possible that overconfident people do not invest enough time into studying healthy food options, leading them to make unhealthy food choices.

It might be useful to try to make people aware of overconfidence to stimulate people into gathering more information on healthy food choices. By simply asking questions about a certain topic, people can realise that they lack some knowledge. TNS NIPO (2013) researched the self-evaluated knowledge of the Dutch population. Before the start of the experiment, 61% of all participants indicated that they knew enough about good nutrition. In the experiment, the participants were provided with basic questions about everyday food products. After this questionnaire, only a small fraction of 29%

indicated that they thought they knew enough about good nutrition. It might be the case that only after being confronted with their knowledge, people realized that there is a knowledge gap. People already adjusted their perceived knowledge based on the questions that were asked, even though no feedback or correct answers were given.

Next to making people aware of a certain knowledge gap, they need to be stimulated to learn more about good nutrition. An effective way to do this is to provide participants with useful feedback on their knowledge (Russo & Schoemaker, 1992). Feedback can lead to improved searching behaviour, which improves knowledge (Hattie & Timperley, 2007). Arkes, Christensen, Lai and Blumer (1987) investigated how they could make people aware of overconfidence. They divided participants into two groups, a treatment group who got feedback and a control group who received no feedback. They found that the treatment group was less overconfident after the feedback compared to the control group. When providing people with feedback on their knowledge, they might realise that their perceived knowledge is higher than their actual knowledge. When people are made aware of their knowledge, this might make them realise they should invest more time into learning about good nutrition.

Combining the effect of asking questions and providing feedback, participants will be more aware of their nutritional knowledge and potential overconfidence. Both the treatment and the control group will thus probably update their beliefs about their knowledge, however, the treatment group will update it more and more accurate. Feedback is provided in the form of information. Providing participants with the correct answers to a series of questions and explaining why their answer is correct or incorrect might make them aware of a potential knowledge gap. Once this gap is identified, people can be motivated to close it by searching for information. When learning more, people's knowledge improves, which helps them to make healthier choices. The fifth hypothesis therefore is:

5: "After being presented with feedback on their nutritional knowledge, people are more likely to look up information about good nutrition."

3. Data & Methodology

3.1 Experimental design

An online survey is executed in Qualtrics. This survey can be found in Appendix A, along with a flow chart of the survey in Figure 6. The survey consists of six stages. In the first stage, participants are asked to rate their general knowledge on nutrition. They are told that in the next phase of the survey, they will get ten multiple choices questions about basic nutritional knowledge. They have to indicate how many of these ten questions they think they will answer correctly. This can be indicated on a scale with a range from 0 to 10. Zero meaning they expect to not answer a single question correctly, ten meaning they think they will answer all questions correctly.

In the stage 2, this knowledge is tested via ten multiple choice questions. For measuring people's knowledge, the survey of Parmenter and Wardle (1999) is used, which consists of five components extracted from the literature. The survey questions have been checked on difficulty, meaning that not everyone should already know the answer in advance, but also that it cannot be possible that no one knows the answer. This thesis only adopted the most relevant component about nutritional knowledge of Parmenter and Wardle's survey to avoid making the study too long at the cost of data quality. At a random stage during the survey, participants get an attention check question. Participants are asked to select a certain answer to ensure that participants are paying attention. Respondents who answered this questions incorrectly will be removed from the analysis.

In stage 3 participants are asked to estimate how many questions they think they have answered correctly in the previous ten nutritional knowledge questions. Overconfidence is measured in two different ways. First, the indicated score in stage 1 is compared to the number of correct answers a participant has given in stage 2. Whenever the indicated score is higher than the actual score, it is concluded that one is overconfident in his or her own knowledge. Next to that, the indicated number of correct answers after completing the ten question, stage 3, is compared to the actual number of correct answers. Overconfidence is calculated by deducting the number of questions a participant answered correctly from the indicated number of questions a participant stated they got right after seeing the questions. The second form of overconfidence can be different frompage the prior one because participants can update their beliefs as posing questions is an indirect way of creating awareness for a potential knowledge gap (TNS NIPO, 2013). When comparing the two forms of overconfidence, the effect of posing questions on overconfidence can be measured.

The fourth stage is the treatment. All participants are randomly assigned to either the control or the treatment group. Participants in the control group receive no manipulation at all and go directly to stage 5. Participants in the treatment group are, in stage 4, provided with feedback on their knowledge.

This is done by giving the right answers to the questions from stage 2 and explaining why their answers are right or wrong. Participants will receive a custom message containing a number indicating how many questions they got right and answers with explanations for the questions they did not answer correctly. This might make people aware of a certain lack of knowledge and can therefore lead to participants being more willing to invest time into gathering information about nutrition to close this knowledge gap. After the manipulation, both groups go to stage 5, where they are presented with the opportunity to gather information. Participants are asked whether they want to learn more about good nutrition. When this question is answered with yes, participants are redirected to a new page where they are provided with some information. At the bottom of this page, a question is asked about healthy food choices to check whether the participants paid attention while reading the information. When participants choose the option no, they immediately go to stage 6. It is expected that after the manipulation, those who have received feedback want to learn more about good nutrition.

Lastly, in stage 6, participants are asked to answer some questions about baseline characteristics. Participants are asked about their age, gender and educational level.

3.2 Variables

The two main dependent variables in this experiment are overconfidence and learning. Overconfidence is measured by comparing the number of correct answers one thinks he or she has given to the actual number of correct answers given, regardless of the group a participant belongs to. The expected number of correct answers, indicated in stage 1, is displayed in the variable *Estimation 1,* which has a value between [0-10]. The indicated number of correct answers given in stage 3 after answering the question is given in *Estimation 2,* also with values [0-10]. These scores are compared to the actual number of correct answers, displayed in the variable *Actual performance,* with scores between [0-10]. Overconfidence is measured in two ways. *Overconfidence 1* is the level of overconfidence before participants answered the ten multiple choice questions. *Overconfidence 2* is the overconfidence measured after they answered the ten multiple choice questions. Both types of overconfidence are continuous variables ranging from [-10-10]. The value for both types of overconfidence is the number that remains after the reduction of the actual performance from the estimation. A positive score means that an individual is overconfident, the higher the score, the more overconfident. A negative score indicates that a participant is underconfident, meaning that he or she underestimates his or her own knowledge. When the score is 0, one is perfectly calibrated.

The variable *Learning* indicates whether a participant is willing to learn more about good nutrition. Learning is a binary variable, which has value 1 when an individual is willing to learn more about good nutrition and 0 when the opposite is true. Whenever a participant is willing to learn more about good

nutrition, he or she gets a question after being provided with the information to check whether one paid attention to the provided information. It is important to note that all participants correctly answered this question, meaning that they probably read the provided information and thus increased their knowledge. The independent variable is *Treatment*, which indicates whether a participant belongs to the control group. The binary variable has value 1 for someone who is in the treatment group and value 0 for someone who is in the control group.

Participants are asked about three baseline characteristics. The variable *Age*, indicates the age of a participant in years. The categorical variable *Gender* has four options [male, female, other, prefer not to say]. Lastly, *Educational Attainment* indicates the highest degree one has obtained or one is currently working on. This variable has eight categories [Primary school, VMBO, HAVO, VWO, MBO, HBO, WO bachelor, WO master]. VMBO, HAVO and VWO are three different levels of secondary education with VMBO being the lowest level and VWO the highest. MBO, HBO, WO bachelor and WO master are degrees you can obtain after finishing secondary education, where MBO is the lowest level and WO master the highest.

Descriptive statistics of these main variables are displayed in Table 1. The Table shows that the sample consists of a diverse population with different characteristics, which helps strengthen the external validity of the experiment. It can be concluded that there is a broad age distribution and that about two-third of the participants are female. Most participants are high educated, meaning that most participants finished or are working on an HBO, WO bachelor or WO master.

Before answering the questions, participants thought they would answer on average 6.8 questions correctly. After answering the questions, they lowered their expectations by one point to 5.8. Out of the ten questions, participants answered on average 4.6 questions correctly. All participants answered at least 1 question and at most 9 questions correctly.

Overconfidence 1 has a positive mean, which indicates that most participants were overconfident. The most overconfident 1 participant overestimated his or her own knowledge by seven point, the most underconfident participant underestimated his or her knowledge by four points. For the second overconfidence, the score decreased but was still positive, meaning that most participants were still overconfident. Furthermore, most participants were willing to learn more about healthy eating, on average 81.50%. However, participants in the control group were more willing to learn compared to participants in the treatment group.

Table 1: Descriptive statistics of the main variables

	No. Obs.	Mean (SD)/ Percentage	Min.	Max.
Gender				
Male	66	33.00%		
Female	131	65.50%		
Other	1	0.50%		
Prefer not to say	2	1.00%		
Age	200	36.165	14	87
		(17.112)		
Education attainment				
Primary school	1	0.50%		
VMBO	9	4.50%		
HAVO	16	8.00%		
VWO	12	6.00%		
MBO	23	11.50%		
HBO	64	32.00%		
WO bachelor	42	21.00%		
WO master	33	16.50%		
Estimation 1	200	6.805	2	10
		(1.486)		
Estimation 2	200	5.805	1	9
		(1.486)		
Actual performance	200	4.601	1	9
		(1.594)		
Overconfidence 1	200	2.200	-4	7
		(2.093)		
Overconfidence 2	200	1.200	-5	6
		(2.093)		
Learning				
Treatment group	90	73.33%		
Control group	110	88.18%		

Notes: This table shows the descriptive statistics of the main variables. The first column shows the number of observations, the second column displays the mean with standard deviation for continuous variables and the percentage for categorical variables. Min and max present the minimal and maximum score for continuous variables. Age is displayed in years.

3.3 Data

In this experiment the Dutch population is targeted, however, no specific target group within this population is used since all ages, genders and educational attainments are investigated. For respondents under eighteen years old, permission of parents is asked prior to filling out the survey. In total 248 people participated in the experiment. After removing three participants who failed to answer the control question correctly and removing 45 participants who did not finish the survey, a data set of 200 participants remained. Of these 200 participants, 90 were in the control group and 110 in the treatment group.

A balance test is performed to check whether the control and treatment group consist of respondents with comparable characteristics. The results of this balance test are displayed in Table 2. From Table 2, it can be concluded that there are no significant differences between the control and the treatment group. Therefore, it is likely that a difference in outcome variables between the treatment and control group is due to differences in treatment and not due to observed differences between the groups.

Table 2: Balance Test

	Mean control group	**Mean treatment group**	**P-value**
Gender			
Male	0.308	0.330	0.754
	(0.045)	(0.050)	
Female	0.673	0.660	0.840
	(0.046)	(0.051)	
Other	0.000	0.011	0.320
	(0.000)	(0.011)	
Prefer not to say	0.019	0.000	0.158
	(0.013)	(0.000)	
Age	36.700	35.511	0.630
	(1.563)	(1.900)	
Educational attainment			
Primary school	0.000	0.011	0.320
	(0.000)	(0.011)	

VMBO	0.055	0.033	0.464
	(0.022)	(0.019)	
HAVO	0.073	0.089	0.680
	(0.025)	(0.030)	
VWO	0.045	0.078	0.353
	(0.020)	(0.028)	
MBO	0.136	0.089	0.289
	(0.033)	(0.030)	
HBO	0.336	0.300	0.585
	(0.045)	(0.049)	
WO bachelor	0.190	0.233	0.470
	(0.038)	(0.045)	
WO master	0.164	0.170	0.955
	(0.035)	(0.040)	
Estimation 1	6.791	6.822	0.883
	(1.497)	(1.481)	
Estimation 2	5.791	5.822	0.883
	(1.497)	(1.481)	
Actual performance	4.534	4.690	0.507
	(0.145)	(0.178)	

Notes: This table shows the mean outcome of variables for both the treatment and control group. The last column represents the p-value of the balance test. The standard errors are displayed in brackets.

3.4 Analysis strategy

Since the assignment is random and a balance test has shown that the control and treatment group are not significantly different, results of both groups can be compared. Firstly, stage 1 and 2 are compared to check whether people are overconfident and to test hypothesis 1. This will be done by comparing the self-evaluated knowledge, estimation 1, to the actual knowledge score of stage 2, actual performance. Since in stage 1 an indication of stage 2 is asked, the questions concern the same knowledge and their scales are similar, they can be compared. Whenever the indicated knowledge is higher than the actual knowledge, it can be concluded that one is overconfident in his or her knowledge. After this, the indicated knowledge after completing the multiple-choice questions, estimation 2, is compared with the number of correct answers is stage 2. Here I investigate how overconfidence changes after answering the questions.

Next to that, it is investigated via multiple regressions whether people with certain baseline characteristics are more or less overconfident to test the first part of the second, third and fourth hypothesis. Two different regressions are performed, one with overconfidence 1 as dependent variable and one with overconfidence 2 as dependent variable. To test the second part of these three hypothesis, a multiple regression analysis is performed with actual performance as dependent variable. It is investigated whether participants with different ages, genders and levels of educational attainment have a different nutritional knowledge.

A multiple regression analysis with a between subject design is used to test the fifth hypothesis. The main outcome variable of this survey is whether people are more likely to look up information about good nutrition when made aware of their lack of knowledge. The dependent variable is the amount of people that indicated they wanted to learn more about good nutrition, this is the outcome of stage 5. The independent variable is whether a participant belongs to the treatment or control group. When more people look up information about healthy food choices after the treatment, it can be concluded that it is possible to motivate people into learning more about good nutrition after making them aware of a knowledge gap.

4. Results

4.1 Overconfidence

Figures 1-5 show the results of measuring overconfidence. All figures are histograms with the score displayed on the X-axis and the number of participants with that score displayed on the Y-axis. Before answering the questions, participants thought they would answer 6.8 questions correctly. A distribution of the estimations made by participants is displayed in Figure 1. Figure 2 shows the number of questions participants answered correctly. The average score is 4.6, which means that on average the participants answered 4.6 questions correctly. 82% of the participants overestimated their nutritional knowledge. The distribution of the variable overconfidence is displayed in Figure 3. Overconfidence 1 has a minimum score of -4, meaning that a participant underestimated his or her own knowledge by four points. It has a maximum score of 7, indicating that a participant thought he or she had answered seven more questions correctly than he or she in fact did.

Participants adjusted their overconfidence after answering the questions. After the ten multiple choice questions, they thought they answered 5.8 questions correctly. This means that they lowered their expectations by one point. Important to note is that the participants had not been given any answers at that point. The distribution of the second estimation of the number of correct answers given, is displayed in Figure 4. The number of participants that were overconfidence after answering the ten questions decreased, however, still 64% of the participants were overconfident. The degree of overconfidence 2 is visible in Figure 5. It shows that more participants were underconfident after answering the questions, and the participants that were still overconfident, lowered their degree of overconfidence. This provides evidence for hypothesis 1, which states that the Dutch population is overconfident in their nutritional knowledge. It also suggests that participants already update their beliefs about their food knowledge after being confronted with questions about their knowledge regardless of the correct answers.

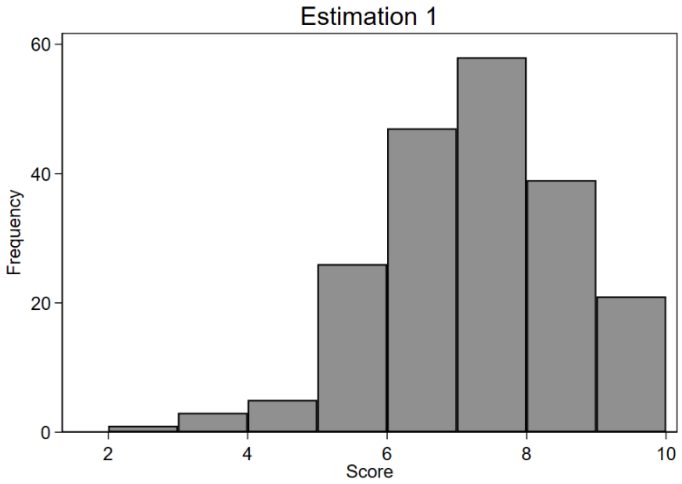

Figure 1: Histogram estimation correct answers before answering questions

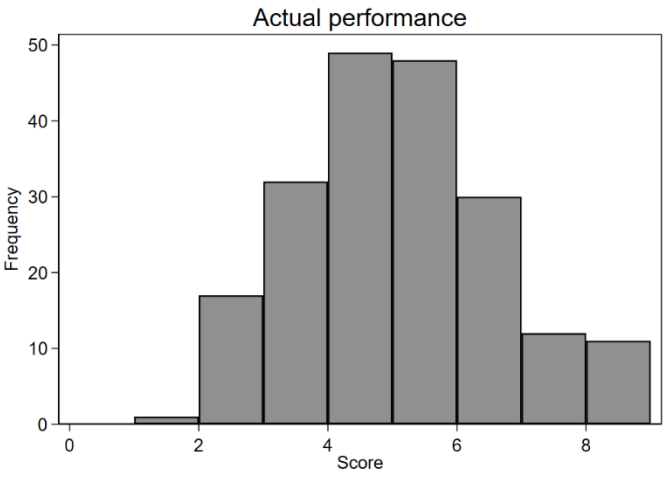

Figure 2: Histogram number of correct answers

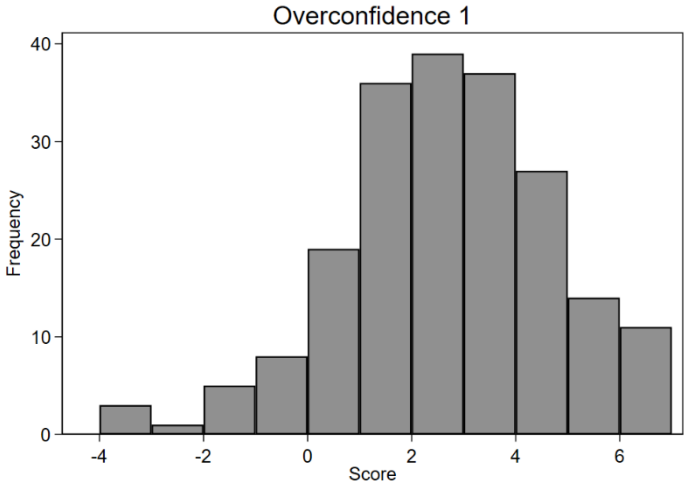

Figure 3: Histogram overconfidence 1

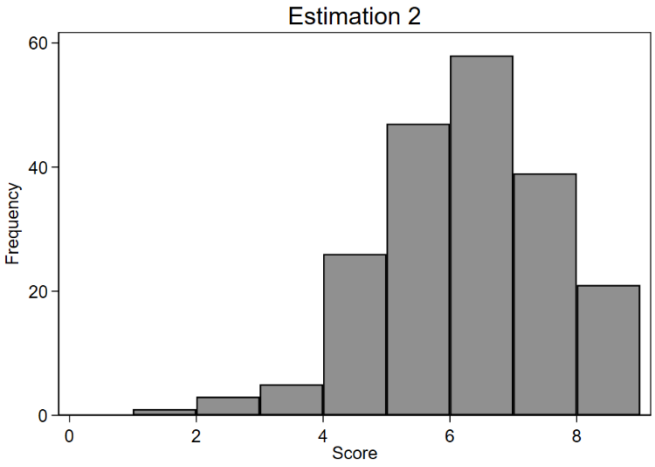

Figure 4: Histogram estimation correct answers after answering questions

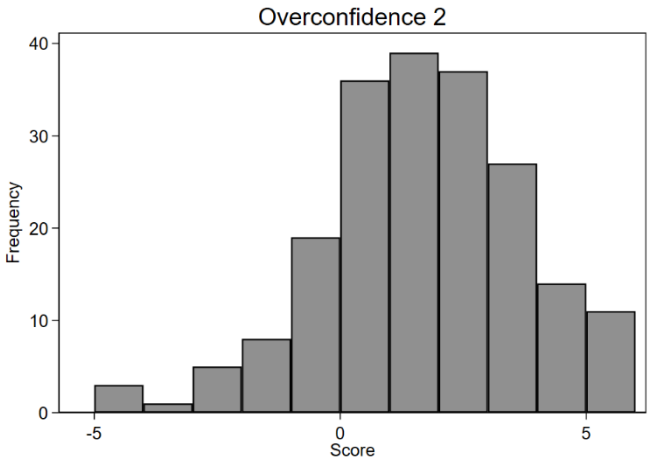

Figure 5: Histogram overconfidence 2

To test the first part of hypotheses 2,3 and 4, a multiple regression is performed. The results of this regression are displayed in Table 3. For gender, only categories prefer not to say and other provide significant results. Since no conclusion can be drawn from these answers and the other gender types do not have a significant effect in either one of the measured overconfidence types, hypothesis 2a, that overconfidence in nutritional knowledge is lower among females than among males, is rejected. The same holds for hypothesis 3a, which states that overconfidence decreases with age. Due to insignificant results, this hypothesis is not supported.

For hypothesis 4a significant results can be found for all education types. Since primary education is the baseline category and all coefficients are significantly positive, it can be concluded that at least some form of higher education significantly increases overconfidence. This effect is visible for both overconfidence 1 and overconfidence 2. However, the effects between the different types of education differ. Overconfidence 1 for people who followed VMBO for example, is higher than for HBO, which is considered a higher educational level than VMBO. Therefore, no clear conclusion can be drawn from the results from the multiple regression of both overconfidence 1 and overconfidence 2. Thus, for both overconfidence types, no supporting evidence for hypothesis 4a is found.

Table 3: Multiple regression overconfidence

	Overconfidence 1	**Overconfidence 2**
Gender		
Female	0.009	0.009
	(0.319)	(0.319)

Prefer not to say	-1.957***	-1.957***
	(0.666)	(0.666)
Other	2.360***	2.360***
	(0.349)	(0.349)
Age	-0.008	-0.008
	(0.012)	(0.012)
Educational attainment		
VMBO	3.029***	3.029***
	(0.473)	(0.473)
HAVO	2.115***	2.115**
	(0.982)	(0.982)
VWO	2.112**	2.112**
	(0.970)	(0.970)
MBO	3.492***	3.492***
	(0.541)	(0.541)
HBO	2.464***	2.464***
	(0.470)	(0.470)
WO bachelor	3.724***	3.724***
	(0.694)	(0.694)
WO master	2.953***	2.953***
	(0.502)	(0.502)
Constant term	-0.384	-1.384
	(0.918)	(0.918)
No. Obs.	200	200
R^2	0.102	0.102

Notes: This Table displays a multiple regression of certain baseline characteristics on two types of overconfidence. No. Obs. shows the number of observations. The first column displays the effect on overconfidence 1 and the second column represents overconfidence 2. For gender, male is the baseline category. For educational attainment the baseline category is primary education. The standard errors are displayed in brackets. *** p<0.01, ** p<0.05, * p<0.1

To test the second part of hypothesis 2, 3 and 4, a multiple regression analysis is performed. Table 4 displays this multiple regression with actual performance as dependent variable. Hypothesis 2b stated that nutritional knowledge is higher among females. However, the results in Table 4 do not provide

evidence for this hypothesis, since the results for females are not significant and no conclusion can be drawn from the gender types prefer not to say and other. Therefore, hypothesis 2b is not supported.

It can be concluded that age significantly increases one's nutritional knowledge. Whenever age increases with one year, the test score increases with 0.17 points. Therefore, hypothesis 3b, which stated that nutritional knowledge increases with age, is supported. The second part of hypothesis 4 stated that nutritional knowledge is similar among different levels of educational attainment. However, the results in Table 4 indicate that knowledge significantly decreases for all education types. This means that the test score decreases for all educational levels compared to primary education. Next to that, the scores for the different types of educational attainment are not the same. Therefore, hypothesis 4b is rejected.

Table 4: Multiple regression actual performance

	Actual performance
Gender	
Female	-0.141
	(0.253)
Prefer not to say	-1.430***
	(0.271)
Other	-1.087***
	(0.320)
Age	0.169*
	(0.010)
Educational attainment	
VMBO	-3.183***
	(0.487)
HAVO	-2.464***
	(0.721)
VWO	-2.590***
	(0.777)
MBO	-3.234***
	(0.463)
HBO	-2.683***
	(0.427)

WO bachelor	-2.752***
	(0.548)
WO master	-2.926***
	(0.394)
Constant term	6.892
	(0.754)
No. Obs.	200
R^2	0.070

Notes: This Table displays a multiple regression of certain baseline characteristics on actual performance, this is the number of correct answers a participant had given. No. Obs. shows the number of observations. For gender, male is the baseline category. For educational attainment the baseline category is primary education. The standard errors are displayed in brackets. *** p<0.01, ** p<0.05, * p<0.1

4.2 Stimulating information search

To test the effect of being in the treatment group on willingness to learn more about good nutrition, firstly, a simple regression is performed. From Column 1 in Table 5 it can be concluded that the treatment, contrary to the expectation, has a significantly negative effect on willingness to learn more about good nutrition. This means that after participants received the number of questions they answered correctly along with the right answers and some feedback, they were less willing to learn more about good nutrition than participants who did not receive any feedback.

To check whether the willingness to learn more about nutrition is dependent on the degree of overconfidence, multiple other multiple regressions are performed. Column 2 displays the effect of overconfidence 1 on the willingness to learn. Overconfidence 1 does not give a significant effect, meaning that when participants are more or less overconfident, this does not influence their willingness to learn. The same results can be obtained from Column 3, where the same regression is performed only with overconfidence 2. It can therefore be concluded that overconfidence does not influence the willingness to learn.

Column 4 and 5 display the effect of overconfidence combined with treatment on willingness to learn. It becomes clear that, as seen in Column 2 and 3, neither overconfidence 1 nor overconfidence 2 significantly influence one's willingness to learn. The interaction effect between treatment and degree of overconfidence also does not give significant results, meaning that it is not the case that overconfident people in the treatment group are more willing to learn compared to overconfident people in the control group. Given all this information, hypothesis 5, which stated that people are more willing to learn more about good nutrition after being provided with feedback on their knowledge, is

not supported. In fact, the results show evidence for the fact that the treatment negatively influences the willingness to learn, since the treatment effect is significantly negative for all performed regressions.

Table 5: Multiple regression on willingness to learn

	Learning (1)	**Learning (2)**	**Learning (3)**	**Learning (4)**	**Learning (5)**
Treatment	-0.148***	-0.150***	-0.149***	-0.157**	-0.154**
	(0.056)	(0.056)	(0.056)	(0.073)	(0.061)
Overconfidence1		-0.009		-0.010	
		(0.012)		(0.014)	
Overconfidence1* treatment				0.004	
				(0.024)	
Overconfidence2			-0.009		-0.010
			(0.012)		(0.014)
Overconfidence2* treatment					0.004
					(0.024)
Constant term	0.882	0.901	0.893	0.905	0.895
	(0.031)	(0.039)	(0.033)	(0.040)	(0.033)
Observations	200	200	200	200	200
R^2	0.036	0.038	0.038	0.038	0.038

Notes: This Table represents five multiple regressions all with learning as dependent variable and treatment as main independent variable. Overconfidence*Treatment displays the interaction effect between these two variables. The standard errors are displayed in brackets. *** p<0.01, ** p<0.05, * p<0.1

5. Discussion

5.1 Conclusion

The results show that the Dutch population is on average overconfident in their nutritional knowledge. Therefore, hypothesis 1, that the Dutch population is overconfident in its nutritional knowledge, is supported. This is in line with earlier research from CBS (2015) that investigated nutritional knowledge in the Netherlands and with research from Mowe et al. (2008) and Reagan (2015) who investigated overconfidence among nurses in Denmark, Norway and Sweden and among tennis coaches in the United States. Overconfidence does decrease after providing participants with information, but, the largest share of the population remains overconfident. Hypothesis 2a, which stated that males are more overconfident than females, and hypothesis 3a, which was that overconfidence decreases with age, are not supported due to insignificant results. This is in contrast with the results from Pulford and Colman (1997) and Kovalchik, Camerer, Grether, Plott and Allman (2005) who found higher overconfidence levels for males and younger people when investigating general knowledge.

For hypothesis 4a, which stated that overconfidence increases with educational attainment, the results only show an increase for every educational level relative to primary education. Results of the different levels of educational attainment do not follow a clear pattern, therefore this hypothesis is also rejected. This is also not in line with prior literature from for example Mishra and Metilda (2015) who showed that on stock markets, higher educated people are on average more overconfident. A possible explanation for the deviation of the results from prior literature is that this experiment has taken place in the Netherlands, meanwhile other experiments were executed in different countries. Nationality could influence overconfidence. Next to that, these prior experiments never investigated nutritional knowledge but always looked at other domains such as general knowledge or stock investments. It is therefore possible that overconfidence in nutritional knowledge is simply different from the earlier researched overconfidence, which explains the differences between the results in this paper and the already existing literature.

When looking at the nutritional knowledge, it becomes clear that gender does not significantly influence one's nutritional knowledge. Therefore, hypothesis 2b, which stated that females have a better nutritional knowledge, is not supported. For educational attainment, no clear conclusion can be drawn from the results. It is clear that some form of higher education lowers one's nutritional knowledge and the scores for the different types of educational attainment are not the same. Therefore, hypothesis 4b, that nutritional knowledge is similar among different levels of education, is rejected. This is different from the results from Kim (2003) and Bhandari and Deaves (2006) who found that, on average, females have a better nutritional knowledge and that nutritional knowledge is the

same among different levels of educational attainment. As mentioned before, it is possible that some of these results do not match the results found in other papers since this experiment is performed in the Netherlands, meanwhile the other experiments were performed in other countries. It could be that nationality has a different effect on nutritional knowledge. However, the results show a significant effect for age. It becomes clear that age significantly increases nutritional knowledge, thus hypothesis 3b is supported. This result confirms the results of Jovičić (2015) who also stated that knowledge increases with age

Hypothesis 5 stated that when people are provided with the correct answers and feedback on the questions, they are more willing to learn about good nutrition. The results show an opposite effect, people who got feedback and the correct answers were less willing to learn more about good nutrition. Therefore, hypothesis 5 is rejected. This is in contrast to what has been shown in prior literature. For example, Hattie and Timperley (2007) found in their experiment that feedback increases the willingness to learn. It is interesting to investigate why an opposite effect is found. I will elaborate on this at the end of the discussion.

With the answers of all the hypotheses, the main research question can be answered. This main question was:

"Is the Dutch population overconfident in their nutritional knowledge and can awareness of this lack of knowledge motivate them to learn more about good nutrition?"

It can be concluded that the Dutch population is overconfident in their nutritional knowledge and that knowledge significantly increases with age and decreases with some form of higher education. However, awareness in the form of feedback and correct answers does not motivate the population to learn more about good nutrition.

5.2 Limitations

Note that this experiment only provides evidence for the Dutch population, therefore, no conclusions about people outside the Netherlands can be drawn from this experiment. This is because people with other nationalities might react differently to feedback, which could change the results. Further research could try and focus on finding overconfidence in other countries to see whether overconfidence in nutritional knowledge is only a problem in the Netherlands or whether this problem also exists elsewhere. This limits the external validity of the experiment. However, since the baseline statistics show a diverse sample, it is likely that the results are representative for the whole Dutch population and the experiment is externally valid on general.

The relatively large sample size and the random distribution of treatment contribute to a higher internal validity. However, this paper also has some limitations regarding the internal validity. It cannot be ensured that all assumptions of multiple regression are satisfied. It is possible that there are omitted variables, causing the estimators to be biased and the zero conditional mean assumption to not be fulfilled.

This paper also has some other limitations. One possible limitation is that participants could have looked up the answers to the ten multiple choices questions, making the results for overconfidence unreliable. Since a lot of the participants were still overconfident after answering the questions, it is likely that most participants did not look up any of the answers, however, this can never be ensured. This effect is tried to limit by telling the participants that they should not look up the answers.

Next to that, since overconfidence is measured twice, this could give a biased estimator. Participants often feel the urge to be consistent in their answers, so even though the two overconfidence questions were slightly different, one is asker prior and one after the ten multiple choice questions, it is possible that participants did not want to admit that their beliefs regarding their knowledge have changed and therefore indicated the same expected knowledge before and after answering the questions. This could lead to a higher score for the second type of overconfidence than is actually the case.

Lastly, it is suggested that the treatment, providing participants with feedback and the correct answers, makes the participants aware of a potential knowledge gap. However, one can never be sure that this is indeed the case. Participants could have decided to click through the treatment stage and therefore not realize that they probably overestimated their own knowledge. Furthermore, the effect of feedback on the identification of a knowledge gap is never tested. It could be the case that participants did read the feedback but simply did not realize that they overestimated their knowledge, therefore leading them to not feel any urge to learn more about good nutrition.

5.3 Further research

Further research can focus on explaining the negative effect of treatment on willingness to learn. Since the results show an opposite effect of what was expected, it is interesting to investigate why this is the case. A positive relation was expected, since earlier research has showed that feedback can lead to improved search behaviour (Hattie & Timperley, 2007). Feedback namely helps closing a potential knowledge gap (Russo & Schoemaker, 1992). There are multiple reasons possible as for why participants in the treatment group were even less willing to learn compared to individuals in the control group. One possible explanation could be that participants in the treatment group already had

the feeling that they learned something due to the feedback and correct answers. They might therefore thought it was less useful to learn about good nutrition.

Next to that, it might be because participants in the treatment group had a longer survey due to the correct answers and feedback. On average, their survey time is almost thrice as long compared to participants in the control group. Due to the already longer survey, participants might not have been willing to spend more time on the survey, leading them to not want to learn more about nutritional knowledge. It can be investigated whether this is a potential reason for the negative effect by adding a new treatment group to the experiment who will get a manipulation that does not have anything to do with healthy eating, but that does make the survey longer. It can then be concluded whether a longer survey time makes people less willing to learn more about good nutrition.

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7. Appendix

7.1 Survey flow

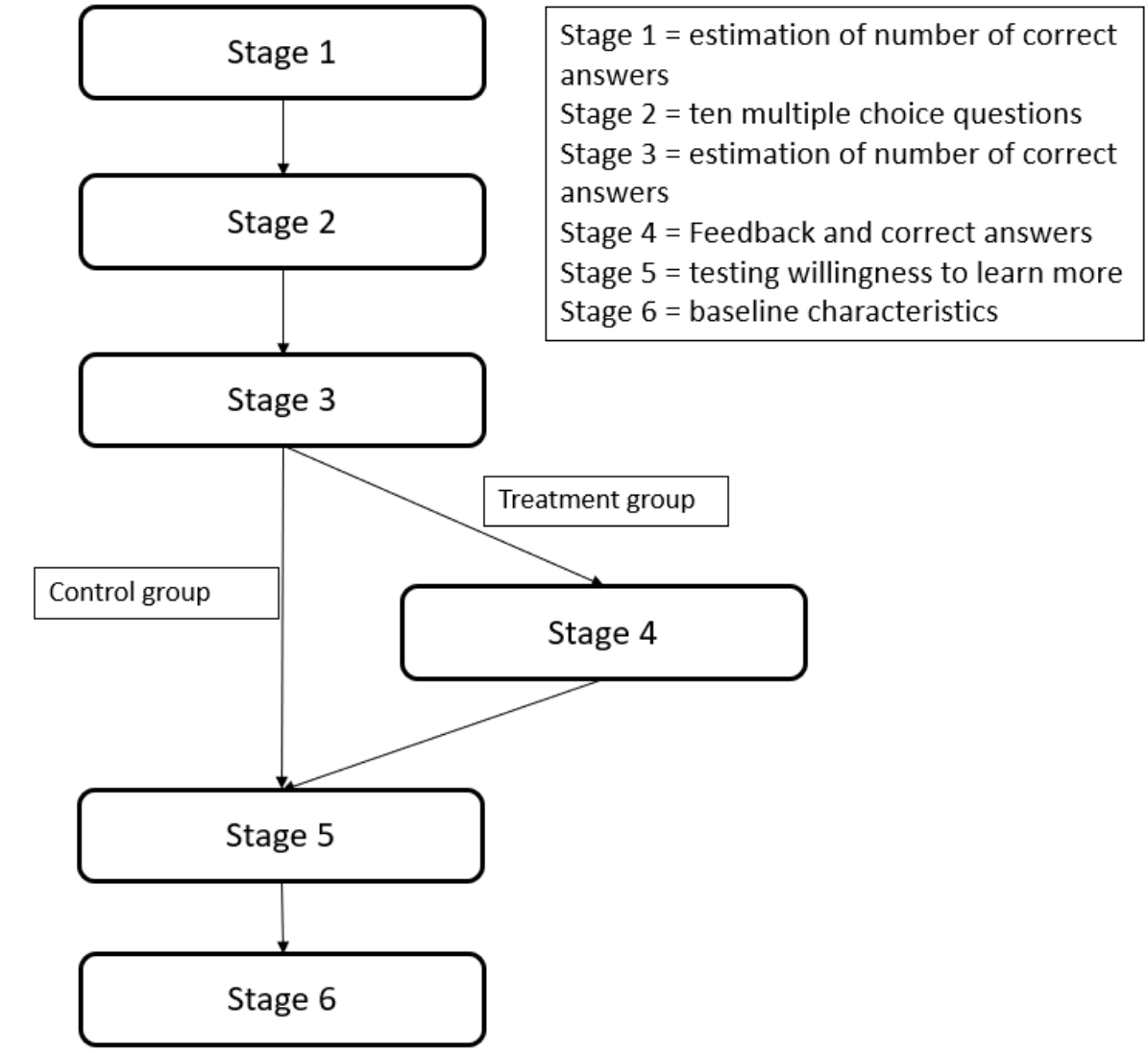

Figure 6: survey flow experiment

7.2 Survey

Thesis

Start of Block: Intro

Intro
You have been invited to participate in a survey for a thesis. If you wish to participate, you must agree to the consent form below. If you do not wish to participate, you can either quit the survey immediately or answer the consent form below with "I do not agree". The survey will then stop automatically. If you are younger than 18, please ask your parents' permission.
For questions and/or comments, please email:
509877md@student.eur.nl
Thank you in advance for your time!

Merel Dekker

Consent form. By participating in this study, you agree that your answers may be used for scientific research. Your answers will remain anonymous and can never be traced back to you.

- ○ I agree (1)
- ○ I do not agree (2)

Skip To: End of Survey If By participating in this study, you agree that your answers may be used for scientific research.... = I do not agree

End of Block: Intro

Start of Block: Stage 1

Estimation 1
Next you will be asked 10 multiple-choice questions about healthy eating. These are basic questions about what foods are healthy and what foods are not. How many of the 10 questions do you expect to answer correctly?

You can answer on a scale from 0 to 10, where 0 means that you do not expect to answer any question correctly and 10 means that you expect to answer all questions correctly.

- ○ 0 (1)
- ○ 1 (2)
- ○ 2 (3)
- ○ 3 (4)
- ○ 4 (5)
- ○ 5 (6)
- ○ 6 (7)
- ○ 7 (8)
- ○ 8 (9)
- ○ 9 (10)
- ○ 10 (11)

End of Block: Stage 1

Start of Block: Stage 2

Introduction
You will now be given 10 statements/questions about (un)healthy eating. Please do not look up answers but only consult your own knowledge.

End of Block: Stage 2

Start of Block: Q1

Q1 A glass of unsweetened fruit juice counts as one serving of fruit.

- ○ True (1)
- ○ False (2)

End of Block: Q1

Start of Block: Q2

Q2 Brown sugar is a healthy alternative to white sugar.

- ○ True (1)
- ○ False (2)

End of Block: Q2

Start of Block: Q3

Q3
There is more protein in a glass of whole milk than in a glass of skim milk.

- ○ True (1)
- ○ False (2)

End of Block: Q3

Start of Block: Q4

Q4 Margarine contains less fat than butter.

- ○ True (1)
- ○ False (2)

End of Block: Q4

Start of Block: Q5

Q5 There is more calcium in a glass of whole milk than in a glass of skim milk.

- ○ True (1)
- ○ False (2)

End of Block: Q5

Start of Block: Q6

Q6 Margarine contains fewer calories than butter.

- ○ True (1)
- ○ False (2)

End of Block: Q6

Start of Block: Q7

Q7 Dairy contains less saturated fat than vegetable oils.

- ○ True (1)
- ○ False (2)

End of Block: Q7

Start of Block: Q8

Q8 Which of the following breads contains the most minerals and vitamins?

- ○ White bread (1)
- ○ Multigrain bread (2)
- ○ Brown bread (3)
- ○ Whole wheat bread (4)

End of Block: Q8

Start of Block: Q9

Q9 Which type of oil contains the most amount of unsaturated fat?

- ○ Coconut oil (1)
- ○ Sunflower oil (2)
- ○ Olive oil (3)
- ○ Palm oil (4)

End of Block: Q9

Start of Block: Q10

Q10 Which of the following products contains the fewest calories per 100 grams?

- Fat (1)
- Sugar (2)
- Fibre (3)
- Starchy foods (4)

End of Block: Q10

Start of Block: Controle control

Control: For this question, please select the answer: "true"

- True (1)
- False (2)

End of Block: Controle control

Start of Block: Q11

Q11 A glass of unsweetened fruit juice counts as one serving of fruit.

- True (1)
- False (2)

End of Block: Q11

Start of Block: Q12

Q12 Brown sugar is a healthy alternative to white sugar.

- ○ True (1)
- ○ False (2)

End of Block: Q12

Start of Block: Q13

Q13
There is more protein in a glass of whole milk than in a glass of skim milk.

- ○ True (1)
- ○ False (2)

End of Block: Q13

Start of Block: Q14

Q14 Margarine contains less fat than butter.

- ○ True (1)
- ○ False (2)

End of Block: Q14

Start of Block: Q15

Q15 There is more calcium in a glass of whole milk than in a glass of skim milk.

- False (1)
- True (2)

End of Block: Q15

Start of Block: Q16

Q16 Margarine contains fewer calories than butter.

- True (1)
- False (2)

End of Block: Q16

Start of Block: Q17

Q17 Dairy contains less saturated fat than vegetable oils.

- True (1)
- False (2)

End of Block: Q17

Start of Block: Q18

Q18 Which of the following breads contains the most minerals and vitamins?

- White bread (1)
- Mulitgrain bread (2)
- Brown bread (3)
- Whole wheat bread (4)

End of Block: Q18

Start of Block: Q19

Q19 Which type of oil contains the most amount of unsaturated fat?

- Coconut oil (1)
- Sunflower oil (2)
- Olive oil (3)
- Palm oil (4)

End of Block: Q19

Start of Block: Q20

Q20 Which of the following products contains the fewest calories per 100 grams?

- ○ Fat (1)
- ○ Sugar (2)
- ○ Fibre (3)
- ○ Starchy foods (4)

End of Block: Q20

Start of Block: Controle treatment

Controle For this question, please select the answer: "true"

- ○ True (1)
- ○ False (2)

End of Block: Controle treatment

Start of Block: Stage 3

Estimation 2
Of the 10 questions just answered, how many do you expect to have answered correctly?

You can answer on a scale of 0 to 10 where you answer 0 if you do not expect to have answered any question correctly and 10 if you think you have answered all questions correctly.

- ○ 0 (1)
- ○ 1 (2)
- ○ 2 (3)
- ○ 3 (4)
- ○ 4 (5)
- ○ 5 (6)
- ○ 6 (7)
- ○ 7 (8)
- ○ 8 (9)
- ○ 9 (10)
- ○ 10 (11)

End of Block: Stage 3

Start of Block: Stage 4

Display This Question:

If A glass of unsweetened fruit juice counts as one serving of fruit. , True Is Displayed

Q58 Here you can see how many questions you got right: ${gr://SC_eVb6pUhW5pUQtU2/Score}

Below you will see the questions you answered incorrectly with corresponding answers and a small explanation.

Display This Question:

If A glass of unsweetened fruit juice counts as one serving of fruit. = False

Q11.1
A glass of unsweetened fruit juice counts as a serving of fruit. --> TRUE

Unsweetened fruit juices and smoothies can count as 1 serving of fruit. The advice is to drink no more than 150ml, equivalent of a small glass, per day. However, keep in mind that there are often more sugars in fruit juice (even without added sugars) than in one piece of fruit. (source: toyodacenter.nl).

Display This Question:

If Brown sugar is a healthy alternative to white sugar. = True

Q12.1
Brown sugar is a healthy alternative to white sugar --> FALSE

Brown sugar is as (un)healthy as white sugar. Apart from taste and color, there are few differences. They both contain about the same amount of calories and the difference in minerals is negligible (source: healthline.com).

Display This Question:

If There is more protein in a glass of whole milk than in a glass of skim milk. = True

Q13.1

There is more protein in a glass of whole milk than a glass of skim milk. --> FALSE
A glass of whole, semi-skimmed and skimmed milk each contain the same amount of protein. The number of minerals and vitamins is also the same. However, skimmed milk contains fewer calories and fat (source: lekkervanbijons.nl).

Display This Question:

If Margarine contains less fat than butter. = True

Q14.1
Margarine contains less fat than butter --> FALSE

Even though butter contains more saturated fat than margarine, they have the same amount of total fat (source: Providence Health & Services)

Display This Question:

If There is more calcium in a glass of whole milk than in a glass of skim milk. = True

Q15.1

There is more calcium in a glass of whole milk than a glass of skim milk. --> FAlSE

Skim milk and whole milk both contain the same amount of calcium. The only difference between the two types is the number of calories and the amount of fat per glass (source: health.be).

Display This Question:

If Margarine contains fewer calories than butter. = True

Q16.1

Margarine contains fewer calories than butter. --> FALSE

Margarine contains as many calories as butter. However, margarine does contain less cholesterol than butter (source: voedingscentrum.nl).

Display This Question:

If Dairy contains less saturated fat than vegetable oils. = False

Q17.1

Dairy contains less saturated fat than vegetable oil. --> TRUE

Dairy contains less saturated fat than vegetable oil. Dairy contains an average of about 0.3 grams of saturated fat per 100 grams while vegetable oil contains an average of 14 grams of saturated fat per 100 grams (source:samengezond.nl).

Display This Question:

If Which of the following breads contains the most minerals and vitamins? = White bread

Or Which of the following breads contains the most minerals and vitamins? = Mulitgrain bread

Or Which of the following breads contains the most minerals and vitamins? = Brown bread

Q18.1

Which of the following breads contains the most minerals and vitamins? --> WHOLE WHEAT

Whole wheat bread contains the most minerals and vitamins. White bread contains only 30% of the nutrients you get from a whole wheat sandwich, even though there are more calories in white bread. After white bread, brown bread contains the least minerals and nutrients. Multigrain bread comes in second, but whole wheat bread is really the best choice (source: supersnelgezond.nl).

Display This Question:

If Which type of oil contains the most amount of unsaturated fat? = Coconut oil

Or Which type of oil contains the most amount of unsaturated fat? = Olive oil

Or Which type of oil contains the most amount of unsaturated fat? = Palm oil

Q19.1
Which type of oil contains the most amount of unsaturated fat? --> SUNFLOWER OIL

Sunflower oil contains the most unsaturated fat. Olive oil by itself contains a lot of unsaturated fat, yet sunflower oil contains more unsaturated fat because it has been modified so that there are more unsaturated fats instead of saturated fats (source: todaysdietitian.com).

Display This Question:

If Which of the following products contains the fewest calories per 100 grams? = Sugar

Or Which of the following products contains the fewest calories per 100 grams? = Fat

Or Which of the following products contains the fewest calories per 100 grams? = Starchy foods

Q20.1
Which of the following products contains the fewest calories per 100 grams? --> FIBRE

Fibre contains the least amount of calories per 100 grams. When you eat 100 grams of fibre, this contains about 200 calories. With starchy foods you eat around 320 calories and sugar abound 390 per 100 gram. Fat contains the most calories, namely 900 per 100 grams (source: voedingswaardetabel.nl).

End of Block: Stage 4

Start of Block: Stage 4

Q9 Are you willing to learn a little more about healthy eating in just 1 minute?

- ○ Yes (1)
- ○ No (2)

Skip To: End of Block If Are you willing to learn a little more about healthy eating in just 1 minute? = No

Page Break

Q72 The daily diet of most Dutch people contains too many unhealthy nutrients. About 75% of the Dutch population do not meet the guidelines for healthy eating. This is often because people do not have enough knowledge about healthy food. You might recognize the following situation, you are in the supermarket looking for an healthy meal to prepare tonight.

Pasta is always a good idea. But there is a big difference in fibre between "normal" and whole grain products. If we look at a portion of pasta, a whole grain type contains on average 60% more fibre, in addition, whole grain products also contain less sugars (source: pastaficio.com). These same differences can be found in rice product, breads and various other food products.

You are standing in front of the refrigerator looking for a healthy option. A ready-to-eat salad is easy

and healthy, at least that's what many people think. However, this is not quite true, because of the dressing, cheese pieces, nuts, avocados, croutons and sometimes pieces of meat that are in such a salad, it can be full of calories. Next to that, they also contain lots of sugars and salt. Most ready-to-eat salads are about as unhealthy as a pizza, not really a healthy choice right? (Source: drogespieren.nl)

Attention check What is the most healthy option?

- White rice (1)
- Whole wheat rice (2)
- Ready-to-eat salad (3)

End of Block: Stage 4

Start of Block: Stage 5

Q69 Finally, I would like to ask you some general questions.

Q4 What is your gender?

- Male (1)
- Female (2)
- Other (3)
- Prefer not to say (4)

Q5 What is your highest or current level of education attainment?

- ○ Primary school (1)
- ○ VMBO (2)
- ○ HAVO (3)
- ○ VWO (4)
- ○ MBO (5)
- ○ HBO (6)
- ○ WO bachelor (7)
- ○ WO master (8)

Q6 What is your age?

_____

End of Block: Stage 5