

Exploring the Effect of Increasing the Percentage of Healthy Products in the Assortment of a School Canteen on Self-Reported Purchase Behavior, Purchase Frequencies, Assortment Perceptions and Canteen Evaluation

A Quasi-Experiment in three intermediate vocational schools in the center of the Netherlands



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Netherlands*

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Abstract

Childhood obesity is a growing concern since 10% of the world's school-aged children carry excess body fat of which a quarter is obese. Due to both the social and physical consequences of childhood obesity, governments aim to design interventions, which will prevent obesity early in life. In the Netherlands, the government designed an intervention, called: the Healthy School Canteen program in cooperation with the Dutch Nutrition center. The aim of this intervention is to make the assortment of school canteens at both secondary schools and intermediate vocational schools predominantly healthy (75% of the products in the assortment is healthy). Existing literature questions the effectiveness of such interventions because results of previous studies show contradictory results. A possible explanation for the contradictory results is found in reactance theory. Reactance theory assumes that a restriction in the freedom to choose will lead to rebellious behavior also known as: the boomerang effect. Since the effectiveness of the Healthy School Canteen program is still left unexplored, this study aims to find out what will be the effect of increasing the percentage of healthy products in the assortment of school canteens on self-reported purchase behavior, purchase frequencies, assortment perceptions and canteen evaluation. We hypothesize that the intervention will lead to boomerang effects, meaning that that we expect students to buy fewer products in the school canteen, to buy less frequent in the school canteen and more frequent at places outside school, and to be less satisfied with the assortment and the canteen in general. In order to test the hypotheses, a quasi-experiment in three intermediate vocational schools in the center of the Netherlands is conducted. The results of this quasi-experiment indicate that increasing the percentage of healthy products in the assortment of a school canteen by 4 to 15% leads to rationalization instead of reactance. Increasing the percentage of healthy products in a school canteen by 4 to 15% has a positive effect on student's perceptions regarding attractiveness, diversity and healthiness of the assortment. Moreover, the intervention did not seem to have changed the opinion of students regarding satisfaction with the canteen in general. Although, sales data are needed to prove the effect of the intervention on consumption behavior, our study proves that increasing the number of healthy products in the assortment of a school canteen does not per se scare students away.

Keywords: childhood obesity, environmental intervention, Healthy School Canteen program, self-reported purchase behavior, purchase frequencies, assortment perceptions, canteen evaluation, reactance, boomerang effect

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1. Introduction

According to Lobstein et al. (2004), 10% of the world's school-aged children carry excess body fat of which a quarter is obese. Overweight is often associated with all kinds of negative personality characteristics such as: lazy, ugly, dirty, and stupid (Lobstein, Baur & Uauy, 2004). Therefore, obese children are often bullied for their excess body fat. Although childhood obesity became far more common, this social reaction to an obese child does not appear to have softened (Lobstein et al., 2004).

Besides the consequences related to social realms, overweight shows to have quite a lot of physical consequences. Lobstein et al. (2004) indicate a list containing 23 diseases, which are all possible consequences of childhood obesity. As a result, experts indicate that rising obesity among children puts a heavy burden on a nation's health services (Lobstein et al., 2004).

Due to both the social and physical consequences of childhood obesity, obesity is an important public health concern in the Netherlands as well as in other western countries (van der Horst, Oenema, van de Looij-Jansen & Brug, 2008). The most realistic and cost efficient approach in order to tackle the obesity problem is prevention (Lobstein et al., 2004; Singh, Paw, Kremers, Visscher, Brug & van Mechelen, 2006). Children and adolescents are important target groups for prevention because it has been shown that overweight and obesity in childhood and adolescence is the main predictor for obesity throughout adulthood (Singh et al., 2006; Van der Horst et al., 2008). Therefore, it is important to develop interventions that prevent children and adolescents from gaining excess weight.

Schools provide an excellent setting for preventing childhood obesity and are recently the target of the Dutch Nutrition Centre (Voedingscentrum, 2015). Research done by the Dutch Nutrition Centre in 2013 showed that of all the schools in the Netherlands only 10% had a healthy assortment in their canteen according to the guidelines for healthiness of the Dutch Nutrition Centre (Voedingscentrum, n.d.). Therefore, the Dutch Nutrition Centre developed a programme called "*the Healthy School Canteen*" in cooperation with the Ministry of Health, Welfare and Sport (Voedingscentrum, 2015). One aspect of this program indicates the guidelines, which are applied in order to evaluate whether the assortment of a school canteen is healthy. According to these guidelines, called "Guidelines Healthy School Canteen", a school canteen needs to consist of a minimum of 75% healthy products (like fruit, sandwiches and salads) and a maximum of 25% unhealthy options (like candy and snacks) (Voedingscentrum, 2015). Moreover, the Dutch Nutrition Centre developed an action plan in order to implement these guidelines in as many Dutch schools as possible.

The program developed by the Dutch Nutrition Centre raises an important question: What will be the impact of the Guidelines Healthy School Canteen on purchase behavior and perceptions of students? Will such an intervention lead to a structural behavior change? Or will students search for alternative ways in order to eat unhealthy food again? Therefore, this study will conduct a quasi-experiment, which aims to answer the following question:

What is the effect of increasing the percentage of healthy products in the assortment of school canteens on self-reported purchase behavior, purchase frequencies, assortment perceptions, and canteen evaluations?

A first step to take is to indicate the actual change of the ratio of healthy to unhealthy products in the assortments of the school canteens under study. In order to do

this the canteen scan of the Dutch Nutrition Center will be used. Moreover, questionnaires will be distributed among students of the three intermediate vocational schools in order to measure purchase behavior, purchase frequencies, assortment perceptions, and canteen evaluations.

The subsequent chapter of this report will start elaborating on the theoretical background of the problem this study is dealing with. This section will explore the relation between obesity and the environment. Moreover, this section will provide information on nudging and its effectiveness in terms of lasting behavioral change. In addition reactance theory and the consequences of this motivational state are explored. The third chapter of this report will provide a comprehensive explanation of the methodology used. Afterwards, the results of the research will be explained. The final part of this report will provide a discussion including limitations and suggestions for future research.

2. Theoretical Background and Hypotheses

2.1 The importance of the environment in preventing obesity

In order to be able to tackle the obesity problem, one needs to understand the driving forces that are affecting the equilibrium of fat storage. Fat storage is depending on the balance between energy intake and energy expenditure (Egger & Swinburn, 1997). An individual will gain weight when that person eats more calories on a certain day (energy intake) than he/she burns on that same day (energy expenditure). On the contrary, an individual will loss weight whenever that person eats less calories on a certain day (energy intake) than he/she burns on that same day (energy expenditure). According to Egger and Swinburn (1997), individuals are able to control the relationship between energy intake and energy expenditure through physiological adjustments. Individuals consciously make physiological adjustments in order to restore an imbalance between energy intake and energy expenditure, examples of physiological adjustments are increased physical activity and nutrient partitioning (Swinburn, Egger & Raza, 1999).

In addition, Egger and Swinburn (1997) indicate three factors that influence the forces affecting body weight. First of all, biological factors such as age, sex and genetics explain much of the differing body fat levels between individuals. Unfortunately these factors are considered to be unchangeable. Second, certain behavioral factors, such as voracity, have shown to influence the potential for willful control over energy expenditure and energy intake; therefore, affect the willingness of individuals for making physiological adjustments (Egger & Swinburn, 1997). Both biological and behavioral factors explain the differences between individuals from the inside out (Swinburn et al., 1999). In addition to these factors, Egger and Swinburn (1997) add a third external factor, namely: the environment. Swinburn et al. (1999) split environmental influences into two concepts: "*obesogenic environments*" and "*leptogenic environments*". The distinction between these two concepts is quite easy to understand, whereas obesogenic environments are surroundings that promote obesity in individuals and populations, leptogenic environments are surroundings that promote healthy food choices and encourage physical activity (Swinburn et al., 1999).

Egger and Swinburn (1997) emphasize the power of obesogenic environments. They claim that an intervention program that is focused on influencing individual behavior only will probably fail or have only a limited effect in an obesogenic environment. As a consequence, Egger and Swinburn (1997) emphasize that reductions in population levels of obesity seem unlikely until the environments, which facilitate its development, are modified. Therefore, the challenge is to identify obesogenic environments and intervene in such a way that healthier choices are easy to make. However, "*environment*" is a rather broad concept; therefore, it is useful to distinguish between the influence of the eating environment and the food environment.

2.2 The eating environment

The eating environment comprises the ambient factors that are independent of the food itself (Wansink & Sobal, 2007). The eating environment consists of four important consumption drivers: eating atmospherics, eating effort, eating with others, and eating distractions (Wansink, 2004). First of all, atmospherics such as light, odor and noise have the power to increase consumption by making the environment comfortable (Wansink, 2004). For example, soft or warm lightning makes a person feel comfortable to spend more time eating. During this extra time, a person will consume more than he or she would have normally done.

Second, the effort it takes for people to obtain their food determines what and how much they consume (Wansink, 2004). For example, people drank more water when a dispenser was placed at their table instead of further away. Moreover, Morland and Evenson (2009) found that the absence of fast food restaurants in a neighborhood is associated with lower obesity rates in that neighborhood.

Third, the presence of other people at the dinner table can increase food consumption (Wansink, 2004). Eating with familiar people increases food intake because it makes the meal more enjoyable; therefore, longer. Another reason for the increase in food intake is that eating with familiar people makes it harder for individuals to monitor their own eating behavior.

Finally, distractions such as watching television during dinner can increase food intake because such distractions obscure the ability of an individual to monitor consumption behavior (Wansink, 2004). For example, a study by Wansink and Park (2001) showed that when people paid more attention to a movie in a cinema, they ate more popcorn than the people who claimed to pay less attention.

The effect of the eating environment on behavior is large, however, it only encompasses the factors that are not directly related to the food in front of us. Therefore, the food environment is also important when it comes to the influence that the environment can have on consumption behavior.

2.3 The food environment

The food environment encompasses the factors that are directly related to the way our food is presented to us (Wansink & Sobal, 2007). These factors are identified as the Five S's of the food environment: salience, structure, size, whether it is stockpiled, and how it is served (Wansink, 2004). First of all, salience serves as a consumption reminder because seeing or smelling food can possibly stimulate unplanned consumption (Wansink, 2004). For example, people who were given sandwich quarters wrapped in transparent wrap ate more than those who were given sandwiches in nontransparent wrap.

Second, perceived variety influences food intake (Wansink, 2004). In a study by Kahn and Wansink (2004), participants were given either seven or ten different colors of M&M's. While the flavor of all colors was the same, the participants with 10 different colors consumed 43% more than the ones with seven different colors. Another study showed that offering people three varieties of yogurt will make them consume more yogurt than if offered only one flavor (Rolls et al., 1981).

Third, large packages and portions increase food intake because size determines the consumption norm (Wansink, 2004). A study by Wansink (1996) showed that when the sizes of packages are doubled, food intake increased by 18% to 25% for meal-related food, and 30% to 45% for snacks. This effect tends to be so strong that it even holds for unfavorable food. Participants were given 14-day old popcorn in either large or medium buckets. It turned out that people with the large buckets ate considerably more than people with a medium-sized bucket even though the popcorn was old (Wansink & Kim, 2005).

Fourth, large stockpiles contributed to excessive food intake because it makes food visually salient (Wansink, 2004). Chandon and Wansink (2002) found that stockpiled food was eaten 112% faster than non-stockpiled food.

Finally, the size of plates, bowls, glasses or utensils is often used as an indication of how much one should serve and consume (Wansink, 2004). If we take the example of drinking glasses, Wansink and Van Ittersum (2003) showed that participants in their study consumed 88% more from short, wide glasses than from small, large glasses. This is due to a visual bias, which states that people are tended to focus on height instead of width when they decide how much soda they are going to pour into a glass.

2.4 Mindless decision-making

It has been shown that both the eating environment and the food environment influences our food intake and consumption volume (Wansink, 2004). The influence of both environments is particularly strong because the environment impacts our behavior through automatic pathways (Skov, Lourenco, Hansen, Mikkelsen & Schofield, 2013). Kahneman (2003) indicates that mental processes can be assigned to one of the following two systems. Kahneman (2003) describes the operations of System 1 as: *“fast, automatic, effortless, associative, and often emotionally charged; they are also governed by habit, and are therefore difficult to control or modify”* (p. 1451). On the contrary, System 2 is defined by Kahneman (2003) as: *“slower, serial, effortful, and deliberately controlled; they are also relatively flexible and potentially rule-governed”* (p. 1451). A main difference between these two systems is that the mental effort that is needed in System 1 processing is less than the effort needed in System 2 processing. Since the total capacity of mental effort is limited, people tend to engage a lot in System 1 processing in which the decisions made appear to be *“mindless”* (Kahneman, 2003).

Wansink and Sobal (2007) argue that food decisions appear to be mindless decisions as well. In one of their studies, Wansink and Sobal (2007) found that people make way more food decisions during a day than they are aware of. These decisions relate both to what we eat as well as to how much we eat. This insight forms the core of *“mindless eating”* because the decisions were found to be *“automatic”* food choices where people did not consider what or how much food they consume. According to Wansink (2010), environmental cues such as the size of a package or the variety of food are often used as rules-of-thumb regarding how much food is normal to consume. As a consequence, these environmental cues cause people to ignore their internal cues of satiety. In the studies done by Wansink and Sobal (2007), people seemed to be unaware or unwilling to acknowledge that the environment influenced their food decisions. Wansink and Sobal (2007) argue that this is also due to *“mindless eating”* because if people will be more aware about their food decisions they would probably be more alert of how their environment is influencing them.

2.5 Choice architecture

So, due to the fact that food decisions seem to be automatic, environmental cues can have a great impact on our actual food intake (Wansink, 2010). On the one hand, the environment can work against us because it might contribute to overconsumption when internal cues of satiety are being ignored (Wansink & Sobal, 2007). However, it is possible to design the environment in which consumers make their food choices, in such a way that people can be stirred towards healthier options (Wansink, 2010; Skov et al., 2013; Thaler, Sunstein and Balz, 2014). According to Thaler et al. (2014), choice architects bear the responsibility for organizing the context in which people make decisions. They have the power to nudge people towards a certain choice, for example by changing the default option, providing feedback or structuring complex choices. Thaler (2008) describes a nudge as: *“any aspect of the choice architecture that alters people’s behavior in a predictable way without forbidding any options or significantly changing their economic incentives”*. Nudging can be used to create healthy heuristics and behavioral rules-of-thumb (Wansink, 2010). By nudging, choice architects can create leptogenic environments, which encourage people to make better food choices (Thaler, 2008; Thaler et al., 2014). According to Wansink (2010), nudging has the power to turn *“mindless overeating”* into *“mindless better eating”*.

2.6 Nudging children towards healthier choices in school canteens

Currently, nudging is recognized by policy makers as an inexpensive tool to accomplish behavioral change (Singh et al., 2006). In order to tackle growing obesity rates, the

government initiates interventions to change the choice architecture in school canteens in order to nudge students towards healthier food choices (Singh et al., 2006; Sallis & Glanz, 2009; Just & Wansink, 2009; Mensink, Schwinghammer & Smeets, 2012). A large environmental intervention that is executed in the Netherlands is the *“Healthy School Canteen program”*, which aims to create a healthy food environment and promote healthy food choices, at both secondary schools and schools for intermediate vocational schools (Mensink et al., 2012). The Dutch government and the Dutch nutrition centre are the initiators of the program. At the core of this intervention lies the idea that when the assortment of a school canteen is predominantly healthy and healthy food is made more attractive, food consumption of students will become healthier (Mensink et al., 2012). Therefore, the intervention aims to change the ratio of healthy products to unhealthy products in the assortments of school canteens. As a guideline, the program aims at a minimum of 75% healthy products (like fruit, sandwiches and salads) and a maximum of 25% unhealthy options (like candy and snacks) in a school canteen assortment (Voedingscentrum, 2015). However, interventions such as the Healthy School Canteen Programme have not been evaluated for their ability to achieve persistent change, which is needed to improve public health in the long run (Marteau et al., 2011).

The effectiveness of nudges is questionable because results of previous studies are contradictory. On the one hand, there are several studies, which presume that environmental interventions, like the Healthy School Canteen program, are promising. Such as the study done by van Kleef, Otten and van Trijp (2012), which concluded that consumers in a hospital canteen were 2.9 times more likely to select a healthy snack when they were exposed to a shelf with 75% of the assortment consisting of healthy snacks compared to participants who were exposed to a shelf where 25% of the assortment was healthy. Moreover, van Kleef et al. (2012) found that daily sales of healthy snacks increased when a shelf contained 75% instead of 25% healthy snacks. The results of this study indicate that a relative large assortment of healthy snacks in hospital canteens can nudge consumers' choice in a more healthy direction. Hanks, Just, Smith and Wansink (2012) also support the idea that making healthy products more convenient will lead to more healthy food choices. They found that introducing a convenience line in a school canteen with only healthy food made the sales of healthy products increase by 18%, while sales of unhealthy food decreased by 27,9%.

On the other hand, there are also studies done, which indicate that nudges are not always effective enough. Hanks et al. (2012) found that even though the quantities of healthy food that students bought in the canteen increased, the actual consumption of healthy products among students did not increase. Therefore, Hanks et al. (2012) conclude that making healthy products more convenient did succeed as a nudge to lead students towards healthier food choices, however, food preferences retained students from consuming the healthy products. A similar result was found in a study done by Just and Wansink (2009). In this study, Just and Wansink (2009) tried to make the lunch of students healthier by replacing French fries with apple fries. Apple fries became the new default option and students were asked whether they wanted to trade them for French fries. It turned out that 96% of the students that came to buy the meal that day wanted to switch to French fries. Just and Wansink (2009) argue that the default option was being overruled by a strong preference for French fries. All in all, the contradictory results of the studies explained above show that it is questionable whether nudging is truly effective.

2.7 Reactance theory

A possible explanation for the contradictory results regarding the effectiveness of nudges described previously might be found in reactance theory. According to Brehm and Mann (1975), reactance theory assumes that individuals are attached to certain behavioral

freedoms. Whenever a person feels that its freedom is threatened or eliminated, reactance theory suggests that people are motivated to restore those restricted freedoms, and respond negatively to others' attempts to constrain their freedoms (Laurin, Kay & Fitzsimons, 2012). The antonym of the motivational state "*reactance*" is "*rationalization*", which means that people respond positively to a restriction of freedom and accept intervention.

The rebellious behavior that is triggered by reactance is also known as the boomerang effect. Boomerang effects were observed for interventions in all kinds of different contexts. Ringold (2002) focused on alcohol and drug interventions such as alcoholic beverage warnings and drug and alcohol education programs. Their study concludes that drug and alcohol warnings made people consume more drugs and alcohol instead of less. Especially people who enjoyed alcohol and drugs the most lapsed into contradictory behavior. Similar results were found regarding people's desire for fatty foods. A study by Bushman (1998) found that warning people about the harmful effects of fatty products only made them want to eat the fatty product more. Ringold (2002) emphasizes that these results are all boomerang effects, which are produced by psychological reactance.

It is important to explore when interventions trigger reactance in people because reactance causes boomerang effects. Bos et al. (2015) argue that a low level of acceptance towards an intervention causes people to lapse into reactance. In order to examine the differences in acceptance of interventions, Bos et al. (2015) focus on the relationship between consumer acceptance and consumers' individual perceived freedom of choice i.e. the level of intrusiveness of interventions. Nuffield's intervention ladder is used to relate different levels of intrusiveness to different kinds of interventions. According to the intervention ladder of Nuffield, interventions that provide information only are of low intrusiveness, whereas interventions aimed at guiding choice by providing incentives or disincentives are of medium intrusiveness, and interventions that are restricting choice are of the highest level of intrusiveness. Bos et al. (2015) conclude that interventions that are more intrusive according to Nuffield's ladder were less likely to be accepted by consumers and more likely to cause reactance and related boomerang effects.

2.8 Psychological reactance as personality trait of adolescents

Previously we treated psychological reactance as a state of being in response to situations where perceived freedom is threatened (Brehm & Mann, 1975). However, more recent research argues that reactance can also be seen as a personality trait associated with certain characteristics, such as the need for autonomy and independence, nonconformity, rebelliousness, and rejection of authority (Miller & Quick, 2010). Miller and Quick (2010) proved that psychological reactance, as a trait is a predictor of risk behavior such as risky sexual activities, especially for the emerging adult population. Moreover, they found that psychological reactance appears to peak during adolescents (ages 12-18 years) and remain high during emerging adulthood (ages 18-25 years). Miller and Quick (2010) identify emerging adulthood as a time that is characterized by identity exploration, instability and self-focus. It is the period in which adolescents aim to explore all kind of hedonically relevant behaviors such as tobacco use, drug use, and sexual activity. On the other hand, it is also the age group which governments target to discourage such behaviors. The fact that adolescents are highly sensitive to restricted personal freedoms makes it extra hard for governments to let health risk prevention program targeted at this age group succeed. Miller and Quick (2010) argue that reactance not only motivates the restoration of threatened freedoms, but it also acts to increase the attractiveness of the adverse behavior. As a consequence, restricting the freedom to choose of adolescents through interventions is likely to result in a boomerang effect, which stirs behavior in the adverse direction and makes the situation even worse than it was before the intervention.

2.9 Hypotheses

Since the effectiveness of the Healthy School Canteen Program is still unexplored, this study aims to find out what will be the effect of increasing the percentage of healthy products in the assortment of school canteens on self-reported purchase behavior, purchase frequencies, assortment perceptions and canteen evaluation. Since the Healthy School Canteen Program is an environmental intervention, which partly restricts choice it is expected that it will induce a high level of intrusiveness (Bos et al., 2015). We expect students to feel restricted in their freedom to choose what they like, which will eventually result in reactance. In addition, the Healthy School Canteen Program is targeted at students who are aged 17- 25. According to the literature, this age group is extremely likely to lapse into reactance due to an urge for autonomy, individuality, and a tendency to reject authority (Miller & Quick, 2010). Therefore, we expect to observe a boomerang effect regarding self-reported purchase behavior, purchase frequencies, assortment perceptions and canteen evaluation when the Healthy School Canteen Program is executed. This means that we expect students to buy fewer products in the school canteen, to buy less frequent in the school canteen and more frequent at places outside school, and to be less satisfied with the assortment and the canteen in general. We, therefore, conducted four hypotheses, which relate to the four dependent measures under study:

H1: *Compared to a canteen with 50% of healthy products in the assortment, the same canteen with a substantial higher percentage of healthy products in the assortment causes:*

- a. *less self-reported purchases of lunch products in the canteen,*
- b. *less self-reported purchases of drinks in the canteen;*
- c. *less self-reported purchases of snacks in the canteen.*

H2: *Compared to a canteen with 50% of healthy products in the assortment, the same canteen with a substantial higher percentage of healthy products in the assortment causes:*

- a. *a decline in purchase frequencies in the school canteen,*
- b. *a decline in purchase frequencies in vending machines at school,*
- c. *an increase in purchase frequencies at snackbars close to school;*
- d. *an increase in purchase frequencies at supermarkets close to school.*

H3: *Compared to a canteen with 50% of healthy products in the assortment, the same canteen with a substantial higher percentage of healthy products in the assortment causes students to perceive the assortment to be:*

- a. *less attractive,*
- b. *less varied,*
- c. *healthier;*
- d. *less affordable.*

H4: *Compared to a canteen with 50% of healthy products in the assortment, the same canteen with a substantial higher percentage of healthy products in the assortment causes students to perceive:*

- a. *less satisfaction with the school canteen in general,*
- b. *the school canteen to be healthier;*
- c. *a threat towards their freedom to choose what they like.*

3. Methodology

3.1 Research design

In order to test the hypotheses, a quasi-experiment at three intermediate vocational schools in the Netherlands was conducted. Remler and Ryzin (2010) describe quasi experiments as studies of planned or intentional treatments that resemble randomized field experiments but lack full random assignment. A quasi-experiment is often confused with a natural experiment since the two research designs are very similar. However, there is one important difference between the two types of research design. Remler and Ryzin (2010) indicate that in a quasi-experiment the program or treatment is consciously implemented to produce some change in the world, whereas in a natural experiment the event studied happens naturally and was not planned or intended to influence the outcome of interest. In the light of these definitions this study should be seen as a quasi-experiment since the implementation of a healthier assortment in school canteens is performed consciously in order to tackle rising childhood obesity rates.

According to Remler and Ryzin (2010), there are different types of quasi experiments. Since the aim of this study is to investigate the effect of a shift towards a healthier assortment, a before-after study was carried out for three intermediate vocational schools: ROC Bovenbuurtseweg Ede, ROC Reehorsterweg Ede and ROC Gruttostraat Velp. The results obtained by Kleinherenbrink (2015) in June 2015 serve as the before intervention data, whereas the data obtained in November/December 2015 serve as the posttest. Eventually, a comparison between the results at these two points in time was made, which is also known as a pre-post comparison (Remler & Ryzin, 2010).

3.2 Independent variable: degree of healthiness

In this quasi-experiment the degree of healthiness of the assortment in the school canteens is the independent variable. In order to measure how the intervention influenced the independent variable, the canteen scan developed by the Dutch Nutrition Centre was used. The canteen scan was done at all three intermediate vocational schools: ROC Bovenbuurtseweg Ede, ROC Reehorsterweg Ede, and ROC Gruttostraat Velp. The scans took place at the following moments:

Canteen	Date on which scan took place	
	<i>Before-Intervention (period 1)</i>	<i>After-Intervention (period 2)</i>
ROC Bovenbuurtseweg, Ede	June 2015	01-12-2015
ROC Reehorsterweg, Ede	June 2015	01-12-2015
ROC Velp	June 2015	30-11-2015

The scan was obtained from the website of the Dutch nutrition center. For each canteen two copies of the scan were filled out. One scan represented the assortment in the canteen whereas the other one represented the assortment in the vending machines. A copy of the scan (in Dutch) can be found in Appendix I. The scan consists of 10 categories:

1. Drinks
2. Dairy produce
3. Vegetables and fruit
4. Savory snacks
5. Bread and spreads
6. Soup
7. Chips and pretzels

8. Cake, candy bars and candy
9. Sauces
10. Ice cream

Each of these categories consists of multiple subcategories. For example, the category “drinks” consists of: “low calorie soda”, “fruit- and vegetable juices” and “sugar sweetened soft drinks”. In order to fill out the scan, each product in the canteen and vending machines was scored as being part of one of the categories in the scan. For example, suppose a canteen sold strawberry smoothie, banana smoothie, orange juice, Coca Cola and Fanta zero. In this case, the two smoothies and the orange juice would be put in the category of fruit- and vegetable juices. Since there are two sorts of smoothies and orange juice we have assigned three points to this category. Notice, that we assigned a point for each variety of a certain product, not for every facing. Coca cola belongs to the category of sugar-sweetened soft drinks and Fanta zero belongs to the category of low calorie soda; therefore, one point was assigned to each category.

After all the products from the canteen and the vending machines were evaluated and filled out in the scan, pictures of the assortments were taken. These pictures served as back up because they made it possible to evaluate the assortment again after the visit at the schools ended. An overview of the pictures taken in the canteens can be found in Appendix II.

The canteen scan of the Dutch nutrition center is meant to measure the ratio of healthy to unhealthy products in an assortment. In the end the scan provided us with a percentage, indicating the proportion of healthy products in the assortment. The scan measures the amount of healthy vs. unhealthy products within the assortment; therefore, each variant of a certain product is scored separately. The number of facings of a particular product is not taken into account. So, whether a canteen had 35 apples or 2 apples in their assortment, in both cases, only one point was assigned to the category of “vegetables and fruit”. The fact that the number of facings is excluded may result in certain biases related to the perceptions of students regarding the appearance of the canteen. It might be possible that the number of facings unconsciously influences the perception of the degree of healthiness of the canteen or it might even steer their choices. However, this drawback is not problematic for this study because the scan is only used to indicate the difference in the ratio of healthy to unhealthy products before and after the intervention.

In order to determine the ratio of healthy to unhealthy products, the scans were analyzed by use of the website of the Dutch Nutrition centre. At the website of the Healthy School Canteen program, an account was made in order to get access to the tool for calculating the ratio. The analysis is just a matter of filling in the quantities for the different categories in the scan, and eventually the program calculated the ratio by itself.

3.3 Setting

ROC A12 is a Regional Training Centre offering approximately 100 vocational training courses. More than 6000 students attend courses at ROC A12 (ROC A12, n.d.). ROC A12 consists of 10 locations in 7 different cities in the centre of the Netherlands. Three locations of ROC A12 form the setting for our quasi-experiment: Bovenbuurtweg Ede, Reehorsterweg Ede, and Gruttostraat Velp. All three schools agreed to participate in the Healthy School Canteen program of the Dutch Nutrition center. Before the intervention, all schools had the same caterer: Albron. However, the intervention is combined with a switch to a new caterer: Cormet, this applies to all three schools. The intervention as well as the shift to the new caterer was carried out during the summer holiday in 2015.

3.4 Participants

The students who were asked to fill out the survey engage in different study programs. Seven main study directions were identified in order to make the division of studies more clear:

1. Care & Welfare
2. Trade, Economy & Administration
3. Safety & Sport
4. Media, ICT, Vision & Sound
5. Hospitality, Tourism, Leisure & Wellness
6. Engineering & Technology
7. Voortgezet Algemeen Volwassenen Onderwijs (VAVO)

An extensive overview of the courses that are part of the categories stated above is provided in Appendix III.

Surveys were handed out during lunchtime at the same day at which the canteen scan took place:

Canteen	Date of surveys	
	<i>Before-Intervention (period 1)</i>	<i>After-Intervention (period 2)</i>
ROC Bovenbuurtseweg, Ede	June 2015	01-12-2015
ROC Reehorsterweg, Ede	June 2015	01-12-2015
ROC Velp	June 2015	30-11-2015

A convenience sample from all the students present in the canteen during lunch was taken. This means that all students present in the canteen were asked whether they wanted to participate or not. Students were free to refuse participation. Moreover, not only students who bought food from the canteen were asked but also students who were studying or hanging out with friends were approached.

Our survey is a self-administered survey because the surveys were given to students in order to be completed. After students had a couple of minutes to fill in the survey, the researcher came by again to collect the completed surveys. Approximately 110 students per canteen per period filled out the survey.

3.5 Key dependent measures

The survey aims to measure four key dependent variables: self-reported purchase behavior, purchase frequencies, assortment perceptions, and canteen evaluation. First of all, this study aims to measure self-reported purchase behavior by asking students where they obtain their lunch, drinks, and snacks. In order to do so, the survey contains three items in which students need to indicate whether they buy their lunch, drinks and snacks entirely at school, partly at school, entirely from home/somewhere else.

Second, this study aims to measure purchase frequencies at the following places: school canteen, vendingmachines, snackbars in the neighborhood, and supermarkets in the neighborhood. For each of these places, participants needed to choose from one of the following 5 options: once a month or less, two to three times a month, once a week, two to three times a week, or every day.

Third, this study aims to measure whether students perceived the assortment to be unattractive, limited, healthy and unaffordable. Attractiveness was measured by two items: "the assortment is attractive" and "the assortment is tasty" ($\alpha=0,73$). Perceptions of the variety of the assortment were measured by two items as well: "the assortment is varied" and "the assortment is limited" ($\alpha=0,63$). In addition, students were asked to respond to the items: "the assortment is healthy" and "the assortment is payable". All items were scored on a scale from 1 ("strongly disagree") to 5 ("strongly agree").

Fourth, this study aims to measure how students evaluate the school canteen regarding their satisfaction with the canteen, their perceived health image of the school canteen and the student's perceived freedom to choose. Satisfaction was measured by two items: "It is nice to go to this canteen" and "I am satisfied about this canteen" ($\alpha=0,79$). Perceptions related to the degree of health were measured by two items as well: "the canteen has a healthy appearance" and "making a healthy choice in this canteen is easy" ($\alpha=0,66$). Scores were averaged into a single health perception scale. In addition, students were asked to respond to the item: "I feel free to choose what I like". All items were scored on a scale from 1 ("strongly disagree") to 5 ("strongly agree").

Furthermore, three items in the survey aimed at indicating personal data about gender, age and study. Finally, the survey ends with some open space in which participants can write down additional comments for the researchers. The complete survey can be found in Appendix IV.

3.6 Data analysis

Before the analysis took place, the data set has been cleaned up in order to correct for students who did not fill out the survey seriously. The researcher could do this because the survey contains two antonyms in the question regarding assortment perception, namely: the assortment is varied, and the assortment is limited. Participants who rated these questions in the same manner, meaning that they either agreed or disagreed with both statements, were left out of the analysis. In addition, participants left some questions blank, these questions were treated as missing values and were also left out of the analysis. Furthermore, when there were non-realistic values filled in by participants, researchers left these variables blank as well.

Statistical analysis of the dependent variables under study (self-reported purchase behavior, purchase frequencies, assortment perceptions; canteen evaluation) was performed using two-way ANOVA analysis with period and canteen location as between-subject factors. This analysis enables the researcher to study the main effects of period and canteen location as well as an interaction effect between period and canteen location. Data were analyzed using IBM SPSS Statistics Version 20.0.0. A significance level of $P < 0.05$ was used.

4. Results

4.1 Canteen scan Bovenbuurtweg Ede

Before the intervention, **47%** of the assortment in the school canteen at Bovenbuurtweg consisted of basic products that are necessary for a good health. When looking at the counter purchases and vending machine purchases separately, the counter contained 71% of basic products and the vending machine contained 13% of basic products (Kleinherenbrink, 2015). The canteen scan executed after the intervention indicated that **62%** of the assortment in the school canteen at Bovenbuurtweg consisted of healthy products, which is an increase of 15%. When we look at the difference between the assortment in the canteen and the assortment in the vendingmachines, the counter contained 70% of basic products whereas the vendingmachines contained 26% of basic products.

4.2 Canteen scan Reehorsterweg Ede

Before the intervention, **58%** of the assortment in the school canteen at Reehorsterweg consisted of basic products that are necessary for a good health. When looking at the counter purchases and vending machine purchases separately, the counter contained 79% of basic products and the vending machine contained 16% of basic products (Kleinherenbrink, 2015). The canteen scan executed after the intervention indicated that **62%** of the assortment in the school canteen at Reehorsterweg consisted of healthy products, which is an increase of 4%. When we look at the difference between the assortment in the canteen and the assortment in the vendingmachines, the counter contained 70% of basic products whereas the vendingmachines contained 24% of basic products.

4.3 Canteen scan Gruttostraat Velp

Before the intervention, **52%** of the assortment in the school canteen at Gruttostraat consisted of basic products that are necessary for a good health. When looking at the counter purchases and vending machine purchases separately, the counter contained 76% of basic products and the vending machine contained 12% of basic products (Kleinherenbrink, 2015). The canteen scan executed after the intervention indicated that **60%** of the assortment in the school canteen at Gruttostraat consisted of healthy products, which is an increase of 8%. When we look at the difference between the assortment in the canteen and the assortment in the vendingmachines, the counter contained 67% of basic products whereas the vendingmachines contained 29% of basic products.

4.4 Results survey

Participants of the survey were all students. In total 595 students participated, of which 265 females and 323 males, 7 of them did not fill in their gender. The students' age varied from 16 to 30 years and had a mean of 18.32 (SD = 2.044). ANOVA was used to compare results between periods and canteens; Table 1 indicates the results of the analysis. A more extensive explanation of the results regarding self-reported purchase behavior, purchase frequencies, assortment perceptions and canteen evaluation is provided in the sections below.

Table 1. Self-reported purchase behavior, purchase frequencies, assortment perceptions and canteen evaluation as a function of period and canteen location among students from three intermediate vocational schools in the center of the Netherlands.

	Periode 1 (June 2015)				Periode 2 (November/December 2015)				P-value of main effect period	P-value of main effect Canteen location	P-value for Interaction effect
	Bovenbuurtweg 7 te Ede	Reehorsterweg 80 te Ede	Gruttostraat 10 te Velp	% of healthy products in assortment	Bovenbuurtweg 7 te Ede	Reehorsterweg 80 te Ede	Gruttostraat 10 te Velp	% of healthy products in assortment			
Self-reported purchase behavior											
Where do you obtain your lunch?	2,6	2,3	2,5	0,5	2,5	2,3	2,6	0,6	0,582	<0,001	0,043
Where do you obtain your drinks?	2,6	2,6	2,6	0,6	2,5	2,4	2,5	0,6	0,002	0,675	0,862
Where do you obtain your snacks?	2,6	2,4	2,5	0,6	2,4	2,3	2,6	0,6	0,384	0,008	0,196
Purchase frequencies											
How often do you buy in the canteen?	1,8	2,3	2,4	1,1	2,6	3,1	2,3	1,2	<0,001	0,001	<0,001
How often do you buy from vending machines in school?	1,5	1,9	1,9	0,9	1,6	1,7	1,6	1,0	0,136	0,062	0,221
How often do you buy in a snackbar near school?	1,4	1,4	1,4	0,9	1,3	1,2	1,3	0,8	0,159	0,503	0,94
How often do you buy in a supermarket near school?	2,1	2,0	3,2	1,2	1,9	2,2	3,1	1,3	0,764	<0,001	0,117
Assortment perceptions											
Attractiveness-scale	3,5	3,6	2,9	0,8	3,6	3,8	3,3	0,6	<0,001	<0,001	0,158
Variety-scale	3,2	3,1	2,8	0,8	3,4	3,3	3,2	0,8	<0,001	0,002	0,492
The assortment is healthy	2,8	3,1	3,1	0,9	3,1	3,2	3,2	0,8	0,02	0,055	0,737
The assortment is payable	2,3	2,4	2,0	0,9	1,6	1,9	1,8	0,8	<0,001	0,034	0,023
Canteen evaluation											
Satisfaction-scale	3,2	3,4	2,8	0,9	3,2	3,3	2,9	0,8	0,815	<0,001	0,646
Health perception-scale	2,8	3,0	2,9	0,8	3,1	3,1	3,0	0,6	0,009	0,103	0,671
I feel free to choose what I like	3,5	3,6	3,4	1,0	3,8	3,8	3,6	0,8	0,002	0,035	0,694

4.4.1 Self-reported purchase behavior

Hypothesis 1a posits that the intervention caused less self-reported purchases of lunch products in the school canteen. ANOVA analysis revealed a significant main effect of canteen location on the places where students obtain their lunch from ($p < 0.001$) and a significant interaction effect between period and canteen location ($p = 0.043$). However, no main effect has been found for the period ($p = 0.582$). So, students of the three canteens differed regarding whether they changed their behavior in period 2, when it comes to obtaining their lunches from school, partly from school or entirely from home/somewhere else. At the Bovenbuurtweg, the mean dropped from 2.6 to 2.5. At the Reehorsterweg, no changes were observed since the mean stayed constant at 2.3. At the Gruttostraat, the mean increased from 2.5 to 2.6. Therefore, we reject hypothesis 1a.

A main effect of the period ($p = 0.002$) on places where students obtain their drinks was found. In period 1, most of the drinks were partly bought at school or entirely brought from home (means 2.6; 2.6; 2.6 respectively), whereas in period 2 more drinks were bought at school (means 2.5; 2.4; 2.5 respectively). Since hypothesis 1b assumes that the intervention would result in less self-reported purchases of drinks in the school canteen, we reject hypothesis 1b. In addition, no main effect of canteen location ($p = 0.675$) or interaction effect between period and canteen location ($p = 0.862$) on the places where students obtain their drinks from was observed.

Hypothesis 1c posits that the intervention caused less self-reported purchases of snacks in the school canteen. Only one significant effect was found, namely: canteen location ($p = 0.008$). At the Bovenbuurtweg, the mean dropped from 2.6 to 2.4 meaning that students bought slightly more snacks at school. For the Reehorsterweg, the mean also dropped from 2.4 to 2.3. At the Gruttostraat, the mean increased from 2.5 to 2.6 meaning that students took slightly more snacks from home or somewhere else. In addition, no main effect of period ($p = 0.384$) or interaction effect between period and canteen location ($p = 0.196$) on the places where students obtain their snacks from was observed. Therefore, we reject hypothesis 1c.

4.4.2 Purchase frequencies

Hypothesis 2a posits that the intervention caused a decline in the purchase frequencies in the school canteen. Significant main effects of period ($p < 0.001$) and canteen location ($p = 0.001$), and a significant interaction effect ($p < 0.001$), were found on the frequency at which students are buying their food and drinks directly from the canteen. In period 1, students at the Bovenbuurtweg and the Reehorsterweg tended to buy approximately two to 3 times a month in the canteen (means 1.8; 2.3 respectively). However, in period 2 students at the Bovenbuurtweg and the Reehorsterweg bought approximately once a week in the canteen (means 2.6; 3.1 respectively). Nonetheless, students at the Gruttostraat in Velp tended to buy less in the canteen when we compare the mean of period 1 (2.4) to the mean of period 2 (2.3). Therefore, we reject hypothesis 2a.

For the number of times at which students buy in a supermarket a significant main effect of canteen location ($p < 0.001$) was observed. At the Bovenbuurtweg, the mean dropped from 2.1 to 1.9 meaning that students bought at the supermarket 2 to three times a month and that there was a slight decrease in purchase frequency within this range. At the Reehorsterweg, the mean increased from 2.0 to 2.2 meaning that students bought at the supermarket 2 to three times a month and that there was a slight increase in purchase frequency within this range. At the Gruttostraat, the mean decreased from 3.2 to 3.1 meaning that students bought at the supermarket once a week and that there was a slight decrease in purchase frequency within this range. No significant main effect of period ($p = 0.764$) or interaction effect ($p = 0.117$) was found. Hypothesis 2b is rejected because we

did not find a significant effect of the intervention on the purchase frequencies in a supermarket nearby school.

Finally, no significant main effects of period and canteen location or interaction effect were observed for the purchase frequencies from vending machines, nor for the purchase frequencies from a snackbar near school. Therefore, we reject hypothesis 2c and 2d.

4.4.3 Assortment perceptions

ANOVA with period and canteen location as independent variables and the attractiveness-scale as dependent variable revealed a significant main effect of period ($p < 0.001$) and a main effect of canteen location ($p < 0.001$). In period 1, students of all three canteens perceived the assortment in the school canteen to be less attractive (means 3.5; 3.6; 2.9 respectively) than in period 2 (means 3.6; 3.8; 3.3 respectively). In addition, no significant interaction effect was observed ($p = 0.158$). These results indicate that students of all three canteens believed that the assortment was more attractive after the intervention; therefore, we reject hypothesis 3a.

Significant main effects of period ($p < 0.001$) and canteen location ($p = 0.002$) were found on the perception of students regarding the variety of the assortment. In period 2, students of all three canteens perceived the assortment to be more varied (means 3.4; 3.3; 3.2 respectively) than in period 1 (means 3.2; 3.1; 2.8 respectively), thus we reject hypothesis 3b. No significant interaction effect ($p = 0.492$) was observed.

ANOVA analysis revealed a significant main effect of period ($p = 0.020$) for the perception of health. In period 2, students believed that the assortment was healthier (means 3.1; 3.2; 3.2 respectively) than in period 1 (means 2.8; 3.1; 3.1 respectively). No significant main effect for canteen location ($p = 0.055$) or significant interaction effect ($p = 0.737$) was observed. Hypothesis 3c is confirmed, because students perceived the assortment as healthier after the intervention took place.

Significant main effects of period ($p < 0.001$) and canteen location ($p = 0.034$), and a significant interaction effect ($p = 0.023$), were found for the perception of students whether the assortment is payable. In period 1, the affordability of the assortment was already rated low (means 2.3; 2.4; 2.0 respectively), however, in period 2 the rating dropped even further (means 1.6; 1.9; 1.8 respectively). Moreover, lots of students indicated that the assortment was too expensive in the open space at the end of the survey, thereby confirming hypothesis 3d.

4.4.4 Canteen evaluation

ANOVA with period and canteen location as independent variables and the satisfaction-scale as dependent variable revealed a significant main effect of canteen location ($p < 0.001$). No change was found for students at the Bovenbuurtweg because the mean stayed constant at 3.2. Students at the Reehorsterweg were slightly less satisfied as the mean dropped from 3.4 to 3.3. Students at the Gruttostraat were slightly more satisfied as the mean increased from 2.8 to 2.9. There was no significant main effect of period ($p = 0.815$) and significant interaction effect ($p = 0.646$) observed. From these results we can conclude that students are not necessarily less satisfied with the school canteens after the intervention; therefore, we reject hypothesis 4a.

ANOVA with period and canteen location as independent variables and the health perception-scale as dependent variable revealed a significant main effect of period ($p = 0.009$). Students of all three canteens perceived the canteen to be healthier in period 2 (means 3.1; 3.1; 3.0 respectively) than in period 1 (means 2.8; 3.0; 2.9 respectively); thereby confirming hypothesis 4b. No significant main effect of canteen location ($p = 0.103$) and significant interaction effect ($p = 0.671$) was observed.

Finally, ANOVA analysis revealed a significant main effect of period ($p=0.002$) and a significant main effect of canteen location ($p=0.035$) regarding the statement: "*I feel free to choose what I like*". Students agreed more with this statement in period 2 (means 3.8; 3.8; 3.6 respectively) than in period 1 (means 3.5; 3.6; 3.4 respectively). No significant interaction effect ($p=0.694$) was observed. These results indicate that students did not feel constrained when it comes to making choices in the school canteen after the intervention; therefore, we reject hypothesis 4c.

5. Discussion

5.1 The effect of the intervention

The aim of this study was to find out what will be the effect of increasing the percentage of healthy products in the assortment of school canteens on self-reported purchase behavior, purchase frequencies, assortment perceptions and canteen evaluation. We hypothesized that we would find a boomerang effect, meaning that we expected students to buy fewer products in the school canteen, to buy less frequent in the school canteen and more frequent at places outside school, and to be less satisfied with the assortment and the canteen in general. However, our results do not show such boomerang effects. We found that increasing the percentage of healthy products in a school canteen has a positive effect on student's perceptions regarding attractiveness, diversity and healthiness of the assortment, even though students believe that the assortments of all three canteens are less affordable after the intervention. Moreover, the intervention did not seem to have changed the opinion of students regarding satisfaction with the canteen in general. These results are in line with the intended behavioral change of the Healthy School Canteen Program; therefore, no boomerang effects were found.

A possible explanation for the absence of boomerang effects might be found in the level of intrusiveness that students perceived. Our results indicate that students did not feel restricted in their freedom to choose what they like after the intervention took place. In fact, the results indicate that students even perceived to have more freedom to choose what they like after the intervention than before. It might be possible that students did not feel restricted in their choice because they perceived their freedom to be of minimal importance or because they did believe that the threat of the intervention was not severe (Ringold, 2002). The fact that students did not experienced a restriction of freedom signals that the level of intrusiveness that students perceived was low (Bos et al., 2015). According to Bos et al. (2015), an intervention with a low level of intrusiveness is more likely to be accepted. Moreover, acceptance leads to rationalization of an intervention instead of reactance, meaning that students will respond positively to the intervention (Laurin et al., 2012).

Findings regarding self-reported purchase behavior and purchase frequencies were not persistent across all three canteens. First of all, when it comes to obtaining lunch or snacks, differing results across schools were found. Whereas students at the Bovenbuurtweg and Reehorsterweg tended to buy more lunch products/snacks at school, students at the Gruttostraat took lunch products/snacks from home or some place else. These results might suggest that there are other factors in the eating environment besides the degree of healthiness that drive whether students buy at school or take their lunch and/or snacks from home/somewhere else. An example of such a factor is the price difference between buying at school or taking lunch/snacks from home. Our results show that students perceived the assortment of the school canteen to be expensive. According to Bos et al. (2013), students are highly sensitive to price variations because most students have only limited budgets. Moreover, it might be possible that the effort of obtaining alternatives is lowest for students at the Gruttostraat; therefore, students at this location bought more outside the school canteen (Wansink, 2004). Since this study conducted a quasi experiment, such factors could not be controlled. However, the interaction of different aspects from the eating environment in relation to a health intervention might be interesting to explore in future research.

Second, increasing the percentage of healthy products in the canteen had only significant effect on the purchase frequencies in the school canteen itself. Students at the

Bovenbuurtweg and Reehorsterweg bought substantially more (from 2/3 times a month to once a week) in the canteen after the intervention took place, whereas students at the Gruttostraat bought slightly less. Results for buying at a supermarket near school differed per canteen as well. At the Bovenbuurtweg and Gruttostraat, students bought slightly less in the supermarket. However, students at the Reehorsterweg bought slightly more at the supermarket. The differences between the Bovenbuurtweg and Reehorsterweg versus the Gruttostraat might be due to the fact that students at the Gruttostraat have to put in less effort to reach a supermarket (Wansink, 2004). Both the Aldi and the Coop are only 350 meters away from the Gruttostraat, while the closest supermarket for both Bovenbuurtweg and Reehorsterweg is 1.1 kilometers away. Therefore, a roundtrip to the supermarket will cost students of the Bovenbuurtweg and Reehorsterweg approximately 20 minutes more than students at the Gruttostraat. The difference in the effort that students have to take in order to get to the supermarket might explain the difference in results between the locations.

5.2 Strengths and limitations

The fact that we conducted a quasi-experiment has the benefit that results reflect real-life. However, a large drawback of this research design is that the researcher cannot control all the factors in the environment. For example, it might be that the increase in healthiness correlated with some other factor and together brought forth the effect. However, it can also be that a certain environmental factor is stronger than the increase in healthiness; therefore, overrules the intervention. For example, the effort that students have to put into obtaining food from the supermarket or the variety of the assortment might be responsible for the differences between the canteens that we found in our study (Wansink, 2004). Such relationships are valuable because they might indicate environmental factors that are able to influence the effectiveness of an intervention. Our study did not cover such relationships between different environmental factors; therefore, this might be a valuable direction for future research.

Second, the effect that this study found might result from the switch to the new caterer. For all three canteens, the intervention was associated with a switch to a new caterer. There is a possibility that the positive results are found, because the new caterer is performing better.

Third, the canteen scan of the Dutch Nutrition center enabled us to arrive at a measurement for the degree of healthiness of the assortment. However, the scan was only done once for each canteen; therefore, it represents a snapshot. In order to increase the representativeness of the scan, it might be better to execute multiple scans at the same location during one or multiple week(s). Furthermore, the results of our canteen scan indicate that the growth rate of the degree of healthiness in the assortments differs. Bovenbuurtweg increased its percentage of healthy products in the assortment with 15% (47% before intervention; 62% after intervention), whereas the Reehorsterweg increased its percentage of healthy products in the assortment with only 4% (58% before intervention; 62% after intervention). Furthermore, Gruttostraat increased its percentage of healthy products in the assortment with 8% (52% before intervention; 60% after intervention). This means that the increase in our independent variable ranges from 4 to 15%. It would have been nicer if the increase were consistent for all three canteens because this would allow us to formulate our conclusions in the light of a particular ratio of healthy to unhealthy products. Doing research to the effects of differing ratios of healthy to unhealthy products in the assortment of a school canteen regarding their effects on self-reported purchase behavior, purchase frequencies, assortment perceptions and canteen evaluation, would allow researcher to indicate the tilting point at which the intervention causes boomerang effects. So, if our results had been related to a specific ratio of healthy to

unhealthy products in the assortment, it would have been a nice starting point for further examination.

Finally, self-administrated surveys were used to measure purchase behavior and perceptions. The researcher handed out these surveys during the lunch break. A disadvantage of this tactic is that students were often sitting together when they filled out the survey. Therefore, students might have influenced each other's answers. Moreover, a more solid measure of "purchase behavior" might be taken by obtaining sales data. The data that we gathered on purchase behavior for this study were self-reported because the researcher had no permission to look into the sales data of the canteens.

5.3 Implications

The present study serves as an initial proof that an intervention such as the Healthy School Canteen Program can succeed. Increasing the percentage of healthy products in the assortment of a school canteen by 4 to 15% leads to rationalization instead of reactance. Our results indicate that increasing the percentage of healthy products in a school canteen has a positive effect on student's perceptions regarding attractiveness, diversity and healthiness of the assortment. Moreover, the intervention did not seem to have changed the opinion of students regarding satisfaction with the canteen in general. Although, sales data are needed to prove the effect of the intervention on consumption behavior, our study proves that increasing the number of healthy products in the assortment of a school canteen does not per se scare students away. Although results differed across canteens, we did not find prove for the tendency of students to buy more frequently outside the school canteen. However, it might be interesting for future research to search for the boundary at which the results turn around. In other words, future research should investigate how high the ratio of healthy to unhealthy products needs to be in order for students to buy more outside the canteen and perceive the assortment and canteen to be worse. Such a study will be valuable because it can help caterers and schools to determine how far they can go in making their assortment healthier without losing sales. Nonetheless, for now we know that increasing the percentage of healthy products in the assortment by 4 to 15% will lead to rationalization instead of reactance.

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Appendices

Appendix I: Canteen Scan

DRANKEN

<p>Laagcalorische (fris)drank met ≤ 30 kcal/100 ml én ≤ 110 kcal/portie Bijvoorbeeld: water, koffie, thee, flesjes mineraalwater (zoals Spa rood of blauw), light frisdranken (zoals Cola Cola Light/Zero, Fanta Zero) en andere</p>	
<p>Vruchtensap en groentesap Bijvoorbeeld: Alle dranken waar de naam 'sap' op staat (zoals sinaasappelsap, appelsap, groentesap), smoothies van minimaal 70% (Verhoeven et al.) fruit/vruchtensap. Vruchtenlimonades zoals Dubbeldranken vallen hier NIET onder. Zij vallen onder de met suiker gezoete (fris) dranken.</p>	
<p>Gewone met suiker gezoete (fris)dranken met > 30 kcal/100 ml of > 110 kcal/portie) Bijvoorbeeld: gewone frisdrank (zoals Coca Cola, Fanta), energiedrankjes (zoals RedBull of Monster), gewone ijsthee (zoals Ice Tea), veel soorten sportdranken (zoals AA High Energy), Dubbeldrank, meeste soorten CapriSun en Wicky.</p>	

ZUIVELPRODUCTEN

Melkproducten

<p>Melk mager Als je naast gewone magere melk ook biologische magere melk verkoopt, dan telt dit als twee soorten producten.</p>	
<p>Melk halfvol Bijvoorbeeld: halfvolle melk, halfvolle chocolademelk met zoetstof (zoals Chocomel Light). Als je naast gewone halfvolle melk ook biologische halfvolle melk verkoopt, dan telt dit als twee soorten producten.</p>	
<p>Melk vol Bijvoorbeeld: volle melk, chocolademelk (zoals Chocomel en Chocomel halfvol). Twijfel je waar je een product moet indelen, bel dan de Schoolkantine Brigade op 070-3068875.</p>	
<p>Karnemelk Als je naast gewone karnemelk ook biologische karnemelk verkoopt, dan telt dit als twee soorten producten.</p>	

Zuiveldesserts

<p>Magere zuiveldesserts Bijvoorbeeld: magere yoghurt, magere kwark, magere vruchtenyoghurt/vla/kwark zonder toegevoegde suiker (eventueel met zoetstof zoals Optimel). Als je naast bijvoorbeeld magere yoghurt ook biologische magere yoghurt verkoopt, dan telt dit als twee soorten producten.</p>	
<p>Halfvolle zuiveldesserts Bijvoorbeeld: halfvolle yoghurt, halfvolle vla met zoetstof. Als je bijvoorbeeld naast gewone halfvolle yoghurt ook biologische halfvolle yoghurt verkoopt, dan telt dit als twee soorten producten.</p>	
<p>Volle zuiveldesserts Bijvoorbeeld: Volle yoghurt, volle vla, volle vruchtenyoghurt, roomyoghurt met vruchten, volle kwark, pudding op basis van zuivel. Als je naast bijvoorbeeld gewone volle yoghurt ook biologische volle yoghurt verkoopt, dan telt dit als twee soorten producten.</p>	

<p>Drinkyoghurt light/minder suiker Bijvoorbeeld: Optimel, Vifit, Milk & Fruit light, Fristi (Kaphingst & French). Het gaat om producten waar geen of weinig suiker in zit. Van de ontbijtdranken valt alleen GoedeMorgen! Light in deze categorie. Alle verschillende smaken mag je apart tellen als verschillende producten. Twijfel je waar je een product moet indelen, bel dan de Schoolkantine Brigade op 070-3068875.</p>	
<p>Drinkyoghurt normaal Bijvoorbeeld: Yomild Drink , Milk & Fruit, GoedeMorgen! Original en Fruit. Alle verschillende smaken mag je apart tellen als verschillende producten. Twijfel je waar je een product moet indelen, bel dan de Schoolkantine Brigade op 070-</p>	
<p>Knijpyoghurt light Een knijpyoghurt is een combinatie van yoghurt en fruit in een knijpverpakking. Er bestaan globaal drie verschillende varianten van: Knijpyoghurt Original, Knijpyoghurt Light en Knijpyoghurt Ontbijt. In deze subgroep valt alleen de</p>	
<p>Knijpyoghurt Een knijpyoghurt is een combinatie van yoghurt en fruit in een knijpverpakking. Er bestaan globaal drie verschillende varianten van: Knijpyoghurt Original, Knijpyoghurt Light en Knijpyoghurt Ontbijt. In deze subgroep vallen de Knijpyoghurt Original en Ontbijt.</p>	

GROENTE EN FRUIT

<p>Handfruit Bijvoorbeeld: appel, mandarijn, banaan, peer, bakje aardbeien of kersen</p>	
<p>Stukjes fruit Bijvoorbeeld: bakje gemengd fruit, stukjes appel of ananas (dit is gesneden fruit), gedroogd fruit zoals rozijnen, abrikozen, pruimen (maar geen fruit-</p>	
<p>Handgroente Bijvoorbeeld: zakjes of bakjes met snoeptomaatjes, kleine komkommertjes of paprikaatjes of worteltjes. Deze kunnen ook in de automaat worden</p>	
<p>Rauwkost Bijvoorbeeld: elke soort groente die je op broodjes serveert, mag je hier eenmalig turven. Dus heb je broodjes met komkommer en tomaat, dan scoor je 2. Ook losse rauwkostsalades tellen hier mee.</p>	

HARTIGE SNACKS

Warme snackproducten

<p>Producten op basis van brooddeeg Bijvoorbeeld: bapao, Turkse pizza, worstenbroodje, pizzapunt, pizzabroodje</p>	
<p>Producten op basis van bladerdeeg Bijvoorbeeld: saucijzenbroodje, frikadelbroodje, kaasbroodje, kaascroissant, ham/kaascroissant, hartige taart van bladerdeeg</p>	

Gefrituurde producten

<p>Gefrituurde- of ovensnacks met broodje Hieronder worden producten verstaan die doorgaans in de frituur worden bereid, zoals (broodje) kroket, (broodje) frikandel speciaal, (broodje) kipcorn. Ook ovenvarianten van deze snacks vallen in deze categorie, omdat deze in de fabriek al zijn voorgefrituurd.</p>	
<p>Gefrituurde- of ovensnacks zonder broodje Hieronder worden producten verstaan die doorgaans in de frituur worden bereid, zoals kroket, frikandel, kaassoufflé, portie frites, berenklaauw, bamischijf. Ook ovenvarianten van deze snacks vallen in deze categorie, omdat deze in de fabriek al zijn voorgefrituurd.</p>	

BROOD EN BELEG

Broodsoorten

<p>Volkoren Bijvoorbeeld: volkoren harde en zachte broodjes, volkoren boterhammen, volkoren krentenbollen/- krentenbrood. Serveer je volkoren varianten van tosti's, panini's, pitabroodjes of wraps dan mag je hier voor elke variant een punt scoren. Het beleg score je apart.</p>	
<p>Bruin Bijvoorbeeld: bruine zachte en harde broodjes, bruine boterhammen, krentenbol, muesli met vruchten, boerenmuesli. Serveer je bruine varianten van tosti's, panini's, pitabroodjes of wraps dan mag je hier voor elke variant een punt scoren. Het beleg score je apart.</p>	
<p>Wit Bijvoorbeeld: witte zachte en harde broodjes, witte boterhammen, krokante muesli (als Cruesli). Serveer je witte varianten van tosti's, panini's, pitabroodjes of wraps dan mag je hier voor elke variant een punt scoren. Het beleg score je</p>	
<p>Luxe broodjes Bijvoorbeeld: croissant (alleen naturel hier scoren)</p>	

Smeersel

Halvarine	JA/NEE
Margarine	JA/NEE
Roomboter	JA/NEE

Kaas

<p>Minder vette en laag in zout Bijvoorbeeld: 10+, 30+ kaas, 20+ kaas natriumarm, Mozzarella, cottagecheese, zachte geitenkaas, zuivelspread (gewoon en light), Kees-kaas</p>	
<p>Vettere en/of hoger in zout Bijvoorbeeld: alle soorten 40+ en 48+ kaas, roombrie 60+, roomkaas, smeerkaas</p>	

Vleeswaren

Mager en laag in zout Bijvoorbeeld: kipfilet, kalkoenfilet, beenham, fricandeau, rosbief, magere	
Vetter en/of hoger in zout Bijvoorbeeld: hamsoorten (buiten beenham), filet americain, smeerleverworst, casselerrib, meeste soorten worst. Soms komen ze in deze categorie uit vanwege het zoutgehalte.	
Warm vlees Bijvoorbeeld: hamburger, shoarma, gehaktbal, rookworst, hotdog. Magere of gewone knakworst kun je ook hier scoren en is binnen deze categorie de beste keuze.	

Ei

Gebakken ei/roerei	JA/NEE
Gekookt ei	JA/NEE

Vis

Vis voor op brood Bijvoorbeeld: gerookte zalm, tonijn uit blik, zoute en zure haring, gestoomde makreel, garnalen	
---	--

Overige belegsoorten

Zoet beleg Bijvoorbeeld: appelstroop, jam, pindakaas, chocopasta, honing	
Hartig beleg Bijvoorbeeld: tonijnsalade, eiersalade, kipkerriesalade, selleriesalade, hummus, sandwichspread, vegetarische paté	

SOEP

Heldere soep Bijvoorbeeld: kippensoep, bouillon, tomatensoep	
Gebonden soep Bijvoorbeeld: tomaten-crème soep, champignonsoep, koninginnesoep, kerriesoep	
Maaltijdsoep Bijvoorbeeld: erwtensoep, bruinebonensoep, minestrone-soep	

CHIPS EN ZOUTJES

Chips en zoutjes met ≤ 110 kcal/verpakking Bijvoorbeeld: rijstwafel, klein zakje popcorn, zakje zonnebloempitten of mais-snack, Lu Pocket, Nibb it. Zie ook andere voorbeelden in tabel van inspiratielijst.	
Chips en zoutjes met > 110 kcal/verpakking Bijvoorbeeld: bijna alle soorten zoutjes in zakjes horecaformaat, light chips, pinda's, noten	

KOEK, CANDYBARS EN SNOEP

Koeken

Koeken met ≤ 110 kcal/verpakking Bijvoorbeeld: kleine mueslireep, plakje ontbijtkoek. Zie ook andere voorbeelden in tabel van inspiratielijst.	
Koeken met > 110 kcal/verpakking Bijvoorbeeld: roze koek, stroopwafel, gevulde koek, appel flap, appelkoek, suikerwafel, Btween Big, cake, brownie, muffin, mergpijp maar ook grote eierkoeken, grote mueslirepen (als Eat Naturel), grote koekrepen (als Snelle Jelle), meeste soorten granen- en fruitbiscuits (als MilkBreak) doordat ze per meerdere stuks verpakt zijn	

Candybars

Candybars met ≤ 110 kcal/verpakking Bijvoorbeeld: mini-candybar, KitKat Single, kleine chocolade/graanreepjes (diverse soorten Kellogs). Zie ook andere voorbeelden in tabel van	
Candybars met > 110 kcal/verpakking Bijvoorbeeld: Mars, Snickers, Milky Way, Twix, KitKat(Chunky), Lion, Bros, Smarties, Rolo, Milka, Balisto, M&M's, Malteser, Nuts	

Overige snoepproducten

Snoep met ≤ 110 kcal/verpakking Bijvoorbeeld: zakje fruitchips, suikervrij snoep, lolly, mini-verpakkingen snoep met suiker, klein zakje zoete popcorn. Zie ook andere voorbeelden in tabel van inspiratielijst.	
Snoep met > 110 kcal/verpakking Bijvoorbeeld: zakjes/rollen met snoep met suiker (als drop, pepermint, winegums, toffees, spekkies, zuurtjes), caramel- of nougatrepen	

SAUZEN

Zakjes saus Scoor hier het aantal soorten saus waarvan er zakjes aanwezig zijn. Ook zakjes mosterd, sambal tellen mee. Als er op broodjes tapenade of pesto wordt gesmeerd in een kleine hoeveelheid dan mag dit ook hier worden gescoord	
Flessen saus Scoor hier het aantal soorten saus waarvan er flessen aanwezig zijn	

IJS

Ijs met ≤ 110 kcal/portie Bijvoorbeeld: Waterijs (als Raket, Calippo, Festini), Split of Solero	
Ijs met > 110 kcal/portie Bijvoorbeeld: Magnum, Cornetto, hoorntjes met softijs of roomijs	

Appendix II: Pictures of the assortments

Bovenbuurtweg Ede



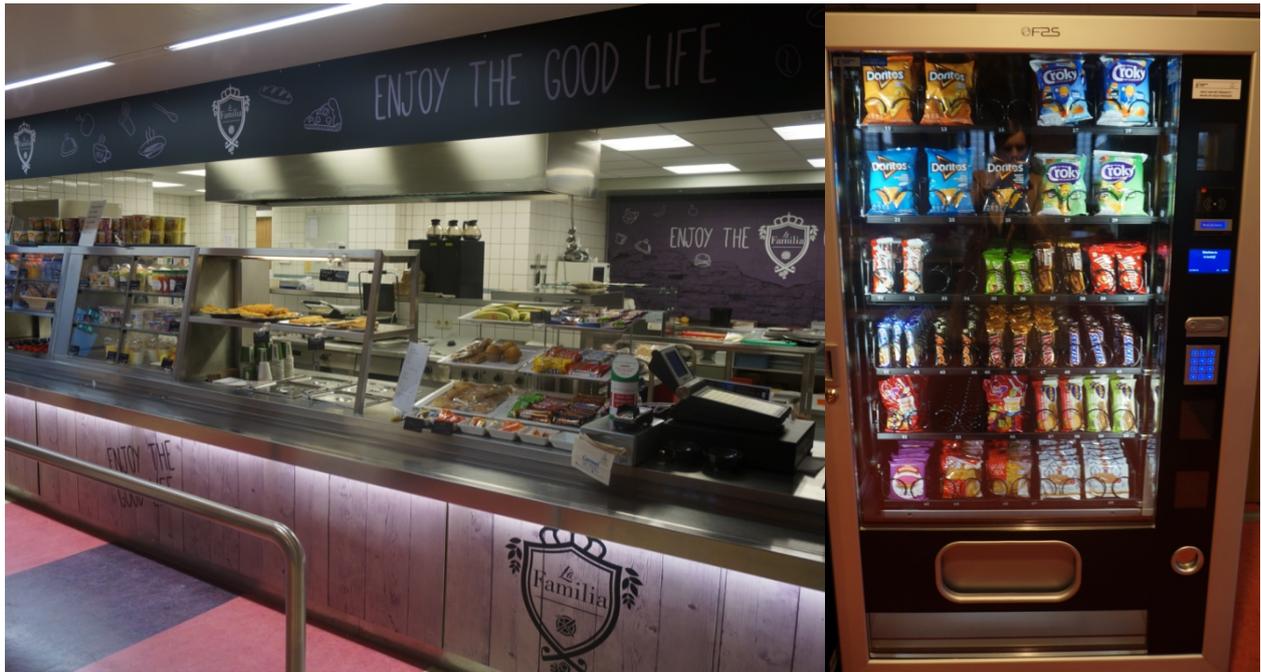


Reehorsterweg Ede





Gruttostraat Velp





Appendix III: Division of courses (in Dutch)*

*Source: <https://a12.nl/mboopleidingen>

Zorg en Welzijn (SPSS variable = 1)

- Entreeopleiding / AKA
 - Assistent zorg & welzijn
- Onderwijs & welzijn
 - Medewerker maatschappelijke zorg
 - Onderwijsassistent
 - Pedagogisch werker
 - Persoonlijk begeleider gehandicapten zorg
 - Begeleider specifieke doelgroepen
 - Pedagogisch medewerker kinderopvang
 - Medewerker jeugdzorg
- Verpleging & verzorging
 - Helpende zorg & welzijn
 - Verpleegkundige
 - Verzorgende

Handel, economie & administratie (SPSS variable = 2)

- Commerciële dienstverlening
 - Commercieel medewerker
 - International business & communication
 - Junior accountmanager
 - Medewerker Marketing & communicatie
 - Medewerker Evenementenorganisatie
- Financiële beroepen
 - Bedrijfsadministrateur
 - Financieel administratief medewerker
 - Medewerker financiële administratie
 - Junior assistent accountant
- Handel
 - Manager retail
 - Ondernemer retail
 - Verkoopspecialist
 - Verkoper
 - Hotel manager
- Recht & arbeid
 - Juridisch administratief dienstverlener
 - Medewerker Human Resource Management
- Secretariële beroepen
 - Managementassistent / directiesecretaresse
 - Medewerker secretariaat & receptie
 - Secretaresse
 - Telefonist / receptionist

- Transport & logistiek
 - Logistiek medewerker
 - Logistiek teamleider
 - Manager transport & logistiek

Veiligheid & sport (SPSS variable = 3)

- Orde & veiligheid
 - Aankomend medewerker grondoptreden
 - Aankomend onderofficier grondoptreden
 - Allround vakkracht onderhoud- en klussenbedrijf (VEVA)
 - Servicemedewerker gebouwen (VEVA)
 - Beveiliger
 - Coördinator beveiliging
 - Handhaver toezicht & veiligheid
- Sport & bewegen
 - Medewerker sport & recreatie
 - Sport- & bewegingscoördinator
 - Sport- & bewegingsleider

Media, ICT, beeld & geluid (SPSS variable = 4)

- Beeld & geluid
 - Audiovisueel specialist
 - Fotograaf
 - Junior producer/mediamanager
 - Medewerker fotografie
 - Podium- & evenemententechnicus
 - Mediaredactie medewerker
- Media & ICT
 - Allround DTP'er
 - Applicatie- & mediaontwikkelaar
 - Gamedeveloper
 - ICT-beheerder
 - Medewerker beheer ICT
 - Medewerker ICT
 - Mediavormgever

Horeca, toerisme, recreatie & wellness (SPSS variable = 5)

- Horeca
 - Leidinggevende bediening
 - Leidinggevende keuken
 - Manager/ondernemer Horeca
 - Medewerker Facilitaire dienstverlening
 - Meewerkend horeca ondernemer
 - Zelfstandig werkend gastheer/-vrouw
 - Zelfstandig werkend kok
- Recreatie

- Leidinggevende leisure & hospitality
- Medewerker sport & recreatie
- Zelfstandig medewerker leisure & hospitality
- Toerisme
 - Leidinggevende travel & hospitality
 - Zelfstandig medewerker travel & hospitality
- Wellness
 - Schoonheidsspecialist
 - Allround schoonheidsspecialist

Techniek & technologie (SPSS variable = 6)

- Bouwkunde
 - Allround machinaal houtbewerker
 - Allround metselaar
 - Allround meubelmaker/ interieurbouwer
 - Allround montage medewerker
 - Allround timmerman
 - Metselaar
 - Middenkaderfunctionaris bouw
 - Timmerman
 - Montagemedewerker timmerindustrie
 - Uitvoerder bouw & infra
- Mechatronica
 - Allround constructiewerker
 - Allround plaatwerker
 - Allround verspaner
 - Constructiewerker
 - Eerste monteur elektronische industriële installaties
 - Eerste monteur mechatronica
 - Engineer automotive
 - Mechatronicus
- Motorvoertuigentechniek
 - Autotechnicus
 - Bedrijfsautotechnicus
 - Engineer automotive
 - Technisch specialist bedrijfsvoertuigen

Voortgezet Algemeen Volwassenen Onderwijs (VAVO) (SPSS variable = 7)

Appendix IV: Survey

Wat vind je van deze kantine?

Graag vragen we jouw medewerking aan een studie van Wageningen Universiteit. Jouw mening over deze kantine is belangrijk, dus doe mee! Al je antwoorden worden anoniem verwerkt.

Heb je vragen, mail dan naar Ellen.vanKleef@wur.nl. Bedankt alvast!

Geef aan wie je bent:

- Leerling / student
 Medewerker
 Anders, namelijk: _____

Hoeveel dagen van de week ben je in dit gebouw? _____ dagen

Kruis aan waar je je lunch, dranken en snacks vandaan haalt

	Volledig op school gekocht (in kantine of uit automaten)	Gedeeltelijk op school gekocht (in kantine of uit automaten)	Volledig van thuis meegenomen of ergens anders gekocht
Mijn lunch (zoals brood, soep, kroket, melk)			
Mijn dranken (zoals koffie, thee, frisdrank)			
Mijn snacks (zoals koek, fruit, snoep, chips)			

Kruis aan hoe vaak je iets te eten of drinken koopt om direct te gebruiken als je op school bent

	1 keer per maand of	2 tot 3 keer per	1 keer per week	2 tot 3 keer per	elke dag
In deze <i>kantine</i> ?					
Uit de <i>snackautomaten</i> hier op school?					
In een <i>snackbar</i> dichtbij school?					
In een <i>supermarkt</i> dichtbij school?					
Op een andere plaats, namelijk: _____					

Wat vind je van het aanbod in deze kantine?

	Helemaal mee oneens	Mee oneens	neutraal	Mee eens	Helemaal mee eens
Het aanbod is ...					
... aantrekkelijk	0	0	0	0	0
... gevarieerd	0	0	0	0	0
... gezond	0	0	0	0	0
... betaalbaar	0	0	0	0	0
... lekker	0	0	0	0	0
... beperkt	0	0	0	0	0

Geef aan of je het eens bent met de volgende stellingen over deze kantine.

	Helemaal mee oneens	Mee oneens	neutraal	Mee eens	Helemaal mee eens
Het is fijn om naar deze kantine te gaan	0	0	0	0	0
Ik ben tevreden over deze kantine	0	0	0	0	0
De kantine heeft een gezonde uitstraling	0	0	0	0	0
Ik voel me vrij om te kiezen wat ik lekker vind	0	0	0	0	0
Een gezonde keuze maken in deze kantine is makkelijk	0	0	0	0	0

Wat is je geslacht?

Vrouw

Man

Wat is je leeftijd? _____jaar

Welke opleiding volg je? _____

Als je verder nog opmerkingen hebt voor de onderzoekers, schrijf ze dan hieronder.

Dit is het einde van de vragenlijst.

Al je antwoorden worden anoniem verwerkt.

Bedankt!