

Packaged vs. Unpackaged

To what extent is there an effect of presenting unpackaged foods on the quantity consumers select?



Bachelor Thesis

Name student: Florine Kremer
Registration number: 950310477090
Date: Period 5 and 6 (March-June 2016)
BSc Programme: Management and Consumer Studies
Major: Consumer studies
Supervisor: Dr. Ir. Ellen van Kleef, MCB
Second reviewer: Dr. Ir. Erica van Herpen, MCB
Course Code: YSS-82312

Table of Contents

Abstract.....	2
Background and aim.....	3
Theoretical framework.....	6
Functions of packaging.....	6
Factors determining quantity estimation of food.....	6
Bias in portion size perceptions: why larger portions increase consumption.....	7
Quantity estimation: using social norms and package labels as cues.....	7
Motivation: consumer involvement.....	10
Cooking experience and uncertainty.....	11
Hypotheses and conceptual model.....	12
Method.....	13
Design.....	13
Participants.....	13
Choice of materials.....	14
Procedure.....	15
Measures.....	15
Data analysis.....	16
Results.....	17
Hypotheses testing.....	18
H1: The effect of condition on selected quantity.....	18
H2: The effect of experience on selected quantity.....	19
Moderation between experience and packaging condition.....	19
Discussion and conclusion.....	20
The influence of packaging.....	20
Results in comparison to dietary guidelines.....	21
Choosing the middle option.....	22
Limitations and future implementations.....	23
References.....	25
Appendix.....	29
Experiment details and questionnaire.....	29

Abstract

Objective

The aim of this research was to discover the effect of presenting unpackaged foods to consumers. Products are sold without any packaging in so-called package free supermarkets. These package free stores are a relatively new and unexplored phenomenon and served as a starting point for this research. The main aim of this research was to explore whether consumers selected larger or smaller quantities when given the choice to select their own amount of food free of any packaging. By leaving out the packaging, less waste is produced which can have a positive effect on the environment. By giving consumers the opportunity to choose the exact amount they need, the possibility exists that they will select less, causing less food to be wasted. The following problem statement was explored:

To what extent is there an effect of presenting unpackaged foods on the quantity consumers select?

Method

A within-subjects experiment was conducted with 56 participants from the Wageningen University. In one condition, participants were asked to select ingredients for meal preparation with a choice of packaged foods. In the other condition, participants could select the same ingredients, but without any packaging. They were asked to fill a small container with as much food as they thought would be necessary for a dinner for four people. At the end of the experiments, participants filled in a short questionnaire about their cooking experience and feelings of hunger.

Results

By using a General Linear Model, a significant influence of condition was found on the amount of food selected. Participants selected significantly smaller quantities of macaroni, cheese and paprikas in the unpackaged condition compared to the packaged condition. For onions, no significant difference was found. Cooking experience was found to have no significant main effect on the amount of food selected. However, there was a significant interaction effect of cooking experience and condition. Experienced cooks selected significantly more units of paprika in the unpackaged situation than participants with a low level of cooking experience.

Discussion and conclusion

This study suggests that providing food without a packaging significantly influences the amount of food that consumers select. Participants were found to select significantly smaller quantities of macaroni, cheese and paprika in the unpackaged condition compared to the packaged condition. A possible explanation could be that consumers have the tendency to eat all the food that is given to them, known as completion compulsion. As packaging sizes have increased over the years, the possibility exists that they are no longer a good indication of how much food people need. People only finish the package because of this completion compulsion, not because they really need as much food. When given the chance to select food without a packaging, they select smaller quantities, indicating that they are actually overeating when they eat from a package.

In comparison to dietary guidelines and average consumption, it can be seen the participants selected much more pasta and a fewer vegetables. In the packaged condition they selected much more than advised or normal, but in the unpackaged condition, they selected less than advised or average. This shows that governments could use unpackaged supermarkets to stimulate customers to select less unhealthy foods, but using this for healthy foods such as vegetables would not have the desired effect on the population health.

Future research can be conducted regarding different food products and a more varied group of participants. Furthermore, some insight on quality perception for food products without packaging would be an interesting topic.

Background and aim

Food waste is a global problem. One-third of the products made to feed consumers is lost or wasted before or after it reaches the consumer (Gustavsson, 2011). Even though enough food is produced to feed the entire world population, a billion people are underfed (Foley et al., 2011). An important reason for consumers to waste food is their lacking knowledge on what amount of rice or pasta to cook (Westerhoven and Steenhuisen, 2010). When food is wasted, not only the food itself is wasted. Resources to produce the food are lost, as well as packaging (Parfitt et al., 2010). With this wastage comes a waste of a quarter of all freshwater and 300 million barrels of oil. In the United States of America, food waste has increased by 50% since 1974 and in 2009, 1400 kcal were wasted per person per day (Hall et al., 2009).

Food packaging accounts for 23-50% of all household waste (Brisson, 1993; Marsh and Bugusu, 2007). Of all packaging waste produced, half is derived from households. The other half is generated by the industry and the commercial sector (Brisson, 1993). The production and breakdown of packaging costs energy and material costs. To protect human health and the environment, and to preserve natural resources, waste management is necessary. If waste is not broken down properly, this carries the risk of contaminating air and ground water, thereby harming the environment.

When looking at waste, three categories of packaging are defined. Primary packaging or sales packaging is the package that protects the product, e.g. cartons. Secondary packaging is not clearly defined but is known as the package that prevents theft or is used for extra advertising, e.g. the cardboard box where toothpaste or cosmetics come in. Tertiary packaging is the packaging necessary for transport, e.g. pallets. Half of all packaging waste is domestic: most primary packaging waste is found in households. The commercial sector is responsible for secondary and tertiary packaging waste, a total of 30% of all waste, and the remaining 20% is found in the industrial sector. Packaging is 23-34% of all waste produced by households. However, packaging is only 1.6% of all waste produced in the Netherlands, but some of that waste can be reused for e.g. agricultural purposes, and packaging is about 14% of all waste that cannot be reused for any other purpose than landfill.

The environmental impact of packaging depends on the material of the packaging (Marsh & Bugusu, 2007). If packages are reused or recycled, the overall environmental impact of packaging reduces (Ross & Evans, 2003). Arguably the most important aspect to keep in mind is that removal of packaging is only beneficial for the environment if it results in less food waste. Depending on the product type (food with a high impact such as cheese, or high losses such as bread), food waste can be much more harmful to the environment than the loss of packaging (Marsh & Bugusu, 2007; Verghese et al., 2015; Williams and Wikström, 2011). An estimated 20% of *food waste* in household is because of packaging (Williams et al., 2012)

Consumer involvement in waste is quite high (Brisson, 1993). First of all, public interest in sustainability has increased and consumers generally have a positive attitude towards sustainability (Vermeir & Verbeke, 2006). The attention that package waste receives can also be explained by its visibility and actionability. Household waste is something people see and produce every day, so they are often more involved in the matter. They feel guilty when throwing things away and thereby harming the environment, which explains the popularity of recycling as a policy (Brisson, 1993).

Recycling is only one option used to dispose of packaging waste. Marsh and Bugusu (2007) list other possible disposal methods: source reduction, recycling, composting, combustion, landfilling and some other disposal methods. The first method, source reduction or waste prevention, has one main downside: waste prevention and convenience do not go well together. The packaging features consumers perceive as convenient, such as unit packages, dispensability,

and microwavability typically require additional packaging. Recycling is an easier option for policy makers, but waste prevention is sometimes more beneficial (Ackerman, 1997). This prevention is done in package free supermarkets, where primary and secondary packaging is not used, which can be beneficial for the environment (Prendergast and Pitt, 1996).

In recent years, various stores have been founded with a new concept: presenting unpackaged foods. Examples of stores without packaging are Original Unverpackt in Berlin, Germany (Borromeo, 2014); Robuust in Antwerp (Belgium) and In.gredients in Austin, Texas (USA). A new package free shop called Løs is also planned to open in Denmark in summer 2016¹. There used to be one in the Netherlands (Bag&Buy in Utrecht) and in England (Unpackaged, London based 2007-2012), but these stores no longer exist. Consumers bring or buy their own reusable trays, jars, bags etc. to the shops and fill these with the exact amount they need. Motivations for opening these shops differs per founder. Some shops are founded with the idea that consumers can select the exact amount of food they need. When people are free to select their own amount of food, chances are they will not buy more than they need, thereby reducing food waste. This is a relevant consideration, seeing that food scraps are the fourth largest contributor to household waste; around 12% of all domestic waste are leftover foods (Marsh and Bugusu, 2007). Bag&Buy is an example of such a shop, as the owner states:

I spent years thinking about the idea of opening a foodshop where people could buy their own selected amount of foods. – Wim van Dijk, founder Bag & Buy in Utrecht²

As mentioned above, a way of handling package waste is by preventing waste in the first place. Marsh and Bugusu (2007) called this source reduction, while Robuust in Antwerp uses the term precycling:

The idea? Precycling! Robuust addresses the problem of waste and pollution at the source, avoiding the need for recycling by leaving out packaging altogether. This saves natural resources, reduces CO2 emissions, food surpluses and the increasing pile of trash. It also stimulates the local economy, because local products always receive priority! – Translated from Robuust! The Zero Waste Shop³

This is described as the anti-packaging movement and supporters of this movement are trying to eliminate waste altogether (Ball, 2016). Yet other founders want to make organic food more accessible for people on low incomes by removing the packaging (Borromeo, 2014).

As pointed out, these new shops entail a new way of shopping. Using less or no packaging means there will be fewer package features, even though these are often perceived as convenient. Consumers find unit packages and packages that can go in the microwave very useful (Marsh and Bugusu, 2007). Since some form of convenience is lost, most package free shops describe their way of shopping as perhaps less practical, but it is considered a lifestyle, aiming to reduce the impact on the environment. Bag&Buy calls this 'slow shopping', acknowledging that shopping package free is more time consuming and takes some more planning than 'normal' shopping. In a short interview with Bag&Buy owner Wim van Dijk, he stated that most of his customers visit his store more often, to buy smaller portions compared to regular supermarket customers.

Although less convenient at times, consumers have a free choice in selecting their amount of food and they can touch all products directly. Peck and Childers (2006) conducted a research on the effect of being able to touch a product on the impulse buying decisions from consumers.

¹ <http://www.loes-market.dk/in-english/>

² <http://bagandbuy.nl/over-bagbuy/>

³ <http://www.berobuust.com/#!over-ons/c1enr>

They found that touching products evoked a feeling of freshness, which at point-of-purchase increased the impulse-purchasing behaviour. Underhill (1999) also wrote that impulse buying results from hearing, touching, smelling or tasting something in the store. In a package free supermarket, touching and smelling products is easier than in a normal store. Furthermore, the perceived environmental impact is lower than in a normal shop (van Herpen, in press).

Research has been done on how consumers behave with respect to portion size estimation (e.g. Geier et al., 2006; Chandon, 2012) and packaging (Becker et al., 2011; Vranešević et al., 2003; Wang, 2013), but package free supermarkets are a relatively unexplored phenomenon. Van Herpen, Immink, and Puttelaar (in press) conducted a research about consumer behaviour when there is no packaging at all. Their article is about the influence of packaging on the choice for organic fruits and vegetables. In their experiments, respondents were presented with organic and non-organic fruits and vegetables to test if unpacking organic fruits and vegetables will increase the choice likelihood. The results show that presenting fruit and vegetables without packaging increases choice. This is in line with the study by van der Pol and Ryan (1996), who showed that consumers think that ideally, fruit and vegetables are unpackaged. These studies are a good sign for the package free supermarkets, indicating that consumers appreciate package free products. Besides preference, an important aspect that can determine the success or failure of these shops is how good consumers are at making the required quantity estimations. How do consumers react when one of their most useful cues for necessary portion size, namely packaging, disappears?

In this study, the aim was to discover the effect of presenting unpackaged foods on the amount consumer select. This led to the following research question:

To what extent is there an effect of presenting unpackaged foods on the quantity consumers select?

This study aimed to give insights on how consumers make decisions in a package free store and whether they select a larger or smaller quantity than in a 'normal' store with packaging. The study is relevant because package and its required resources are a large contributor to waste, which is, in turn, harming the environment. By not creating packaging and thus waste in the first place, the problem of waste disposal can be eliminated. The research is relevant for science, governments, and companies. For both science and companies, it is interesting to know how consumers make decisions in a package free store. Research has been done about how consumers make decisions about portion sizes when packaging is available, but few studies have been done on how consumers decide without packaging. Companies can make use of these results by learning about the effect of presenting unpackaged foods in their shops on consumer perception and behaviour. Other managerial implications are for the government since a solution to the wastage problem is a valuable addition to environmental policies.

In order to answer the research question, an experiment was conducted where consumers had to select ingredients to prepare a meal. In one condition, respondents could choose from a selection of packaged products. In the other condition, the package free supermarket was replicated. Respondents selected a container and chose their quantities from a large container, giving them free choice of their estimated required amount. Pasta (macaroni) was chosen as the main ingredient, because together with rice, this is the food that is most often wasted instead of stored (Ventour, 2008). Since pasta increases a lot when cooked (about 2,5 times), consumers find it difficult to estimate the right amount (Westerhoven and Steenhuisen, 2010). This experiment showed how much food consumers selected in a situation without packaging.

Theoretical framework

Functions of packaging

The functions of the packaging of products are useful to know because in this study a comparison was made between a shopping situation with packaging to a situation without packages. It is important to know what functions packages serve, to assess what the impact will be of removing these packages. Packaging serves multiple functions (Brody, 1978; Lockhart, 1997; Marsh and Bugusu, 2007; Prendergast and Pitt, 1996). Overall, the most common categorization is that there are three main functions of packaging, although the names may differ: protection, utility, and communication.

Protection

In essence, packaging protects the product from the environment and the environment from the product (Lockhart, 1997). Packaging plays an important role in food or product safety; it contains and protects the product, as well as maintaining the sanitary integrity of the contained product (Brody, 1978). In Third World countries, where packages are less developed, around 30-50% of food decays before it reaches the consumer. This is only 2-3% in the First World (Brisson, 1993; Marsh and Bugusu, 2007).

Utility

The second objective of packaging is its utility. Packaging makes the product more useful and easier to use, by assuring containment (handling, storage, transport) and easier packaging operations (filling, closing, packing).

Communication

The third and last function of packaging is communication. Packaging is very useful for giving information convincing consumers to buy the product, explain how to use the product safely. This can be done by providing text, pictures, colours, warnings, shape and instructions. This last function is increasingly important for sales and branding, since many consumers make their buying decision at the point of sale, where packaging influences decisions greatly (Chandon, 2012; Silayoi & Speece, 2007). Research by Clement (2007) even shows that 90% of the consumers do not look at the product itself, but make a purchase after only seeing the front of a package. The packaging also functions as a criterion to evaluate the quality of a product (Wang, 2013). Wang (2013) states that a positive attitude towards a visual packaging design generates positive product and brand evaluations. Other researchers prove that packaging is not the only criterion of importance when evaluating a product. To assess quality, consumers use both intrinsic (e.g. taste and colour) and extrinsic quality cues (e.g. price and brand) (Grunert, 2005; Lee and Lou, 1996; Olson and Jacoby, 1972; Teas and Agerwal, 2000).

As explained in the introduction, besides having these useful functions, packaging has its downsides. It leads to waste, thereby contributing to environmental problems (Brisson, 1993).

Factors determining quantity estimation of food

In order to decide which amount of food to select, consumers can use a number of cues. Some are more direct and straightforward than others. Consumers can consciously look at labels and quantity information, but they are influenced by more abstract information, such as social norms (Chandon, 2013). The first part will be about how consumers are influenced and biased by package design and portion size. In the second part, social norms and trends will be discussed, followed by how consumers react to nutritional labels. The third part explains the personal and situational factors that influence consumers, such as time constraints, mood and cooking experience. Experience shall be used as a moderator in this research, since it is positively linked to uncertainty (Heiman, McWilliams and Zilberman, 2001). It is important to understand how

consumers make decisions when packaging is available; this is a starting point in assessing how consumers make decisions *without* packaging.

Bias in portion size perceptions: why larger portions increase consumption

Up to a certain threshold, people will eat more as portion sizes increase. Equally, reducing portion sizes significantly reduces consumption (Chandon, 2013; McConahy et al., 2002; Nielsen and Popkins, 2003, Zlatevska et al., 2014). An example of this reduction in consumption with smaller portion sizes is that when a cookie or candy bar is split in two, consumption lessens. As mentioned earlier, portion sizes have increased over the years, resulting in an increase in consumption. There are several explanations why consumers overeat when portion sizes increase (Chandon, 2013).

Underestimation of portion sizes and changes in portion size

Chandon and Wansink (2007a) conducted a study on the estimation of portion size. In three US cities, they asked fast food restaurants customers to estimate the number of calories in a meal. Their results showed that consumers strongly underestimate the size of meals in calories. The underestimation was the biggest for large meals: customers underestimated the caloric content by 40%. This means that a meal containing 744 calories was estimated to have 546 calories. For small meals, the underestimation was 11%. Chandon (2013) confirms consumers underestimate large quantities. Consumers do not realize how big today's packages have become. When eating in a restaurant or at home without cooking yourself, caloric information and other information about the volume and quantity is not available. Chandon states that consumers judge food more on its volume than caloric content.

Besides underestimating portion size, consumers are also found to strongly underestimate a *change* in portion size. If the size of the quantity is doubled, the perceived increase is only 50-70% (Chandon, 2013). This underestimation is largest when the product changes in multiple dimensions. Dimensionality is about the number of dimensions that change when portion size changes. Size increases appear smaller in 3D than in 1D. So when a portion increases in only one dimension (e.g. widens), consumers perceive this as a larger change than when the product would increase in all three dimensions. This means that the size of a bowl, glass or cup has a stronger effect than plates, making it even more important that in this experiment, multiple bowls will be used. Chandon and Ordabayeva (2009) conducted a study where they asked 112 students to estimate the size change in popcorn boxes. There was a 1D condition, where the popcorn box increased in height by 67%. In the 3D condition, the popcorn boxes expanded with 19% in all three dimensions proportionally.

Quantity estimation: using social norms and package labels as cues

Norms in portion size selection: what is the normal amount?

Increased package sizes

Consumption norms are one of the most important explanations for the effect of package size (Wansink and van Ittersum, 2007). When looking at what portion size is perceived as normal, a trend can be observed. Since the 1970's, portion sizes have increased drastically. In their study, Nielsen and Popkin (2003) show that in only 20 years, portions of salty snacks have increased by 60% and soft drinks by 52%. This trend of supersizing packaging is particularly common in the United States, although also observable in other parts of the developed world (Chandon, 2013). At the time of their research 2003, Nielsen and Popkin found that the majority of all packages exceed the recommended portion size determined by United States Department of Agriculture. The largest increase in portion size was in fast food restaurants, but retailers have increased their portion sizes as well (Zlatevska, Dubelaar and Holden, 2014). This is named as a cause for the worldwide increase in obesity (e.g. Chandon and Wansink, 2007a; Young and Nestle, 2002), along with the fact that consumers have difficulty in realizing that larger portion sizes contain more calories (Nestle, 2003). For producers, increasing their portion sizes means a

lower unit price and packaging costs are lower. As will be talked about later, consumers have a preference for supersized packages, making it even more profitable for marketers to increase package and portion sizes (Chandon, 2013).

Unit bias and visibility

When making decisions under uncertainty, consumers tend to stay close to an anchor. In this study, the unit bias will play a role when selecting products, as will the size of utensils and serving spoons. Some products are units in itself, for example, onions and paprika. For other products, such as pasta, the packaging is the unit size and it will be examined what will happen if the unit size is removed.

Anchors can be many things, but Madharov and Block (2010) describe it as a salient but uninformative number where consumers stay close to when making decisions or estimations. An example of an anchor can be packaging. A situation where consumers use the anchoring heuristic is when they have to decide how much to eat. As people find it difficult or time-consuming to estimate how much they should eat, they use the size of a portion or package as a norm (Lennard et al., 2001; Geier et al., 2006; Wansink and van Ittersum, 2007). A unit suggests a consumption norm, which can be used as an anchor when deciding what quantity is 'normal' and thus an appropriate and optimal amount. Lennard et al. (2001) have done a UK based research about how consumers estimate quantity. Their study focuses on why consumers do not use quantity indicators well enough. They have used multiple methods to approach their research question, namely simulated tasks, and an in-store questionnaire. Their study shows difficulties that consumers have when trying to estimate quantity. One of their results is that consumers use the package as a unit heuristic. 38% of the respondents says to use package size as an estimation for the required quantity.

Authors Geier, Rozin and Doros (2006) proposed this unit bias heuristic to help explain the effect of portion size on food intake. The unit bias can simply be explained by the fact that people think a unit of some entity is the appropriate and optimal amount. Van Kleef, Kavvouris, and van Trijp (2014) conducted a research on the influence of unit size. In their study, they presented respondents with either one large unit of chocolate or five smaller units. Although the amount of chocolate was the same, respondents felt eating five pieces of chocolate was more impulsive and excessive than one big unit of chocolate. This shows that consumers feel more impulsive if they eat many units and one unit feels more appropriate. Therefore, smaller units will make them consume less. About 23% less chocolate is eaten in the smaller unit size condition compared to the one with the large unit size. In short, the unit size of food influences intake, because it affects how consumers perceive impulsiveness and the optimal amount.

To look at the unit size on a larger scale, there is also an example of the effect of unit size in France and the United States. In France, obesity rates are around 8-9%, whereas this is 30% in the United States (Schneider, Dietrich, and Venetz, 2010). Geier et al. think that unit bias is an explanation for this. In the US, a portion of yogurt is 227g in supermarkets, whereas this is only 125g in France. Because the French do not eat more portions because of this smaller size, it seems that the norm of the unit is influencing them. One unit is perceived as the proper portion in that culture. To predict the influence of the unit size on total consumption, Geier et al. have conducted three experiments, involving snacks (Tootsie Rolls, Pretzels and M&M's) in real-world situations (office or apartment building). Their results show that people select larger quantities of food when the unit size is large as opposed to small.

Closely related to unit size, are the number of units of a product displayed on a package. By showing more products on the package, consumption and perception of size will increase. Madzharov and Block (2010) show this anchoring heuristic in their study on the effect of product unit image on consumption on snack foods. In one of their studies, 59 students received a bag containing 25 pretzels. In one condition, the package displayed three pretzels. In the other

condition, fifteen pretzels were displayed. In their study, it becomes clear that consumer involvement is very important. If consumers are not paying a lot of attention and the level of visual processing is low, the difference between showing three or fifteen pretzels on the package is not very large. But if they do pay attention, they consume more than seven times as much.

Besides package and unit size, serving devices matters as well. In their experiment, Geier et al. found that people consume substantially more M&M's when the serving spoon is large than when it is small. Similar to Geier and his colleagues, various studies have established the influence of utensils, serving devices and tableware (dishes, bowls etc.). A very relevant research for this study is the study by Marchiori, Corneille, and Klein in 2012. They gave Belgian students M&M's while they could watch TV in a cubicle. They had three conditions: a medium portion in a small container, a medium portion in a large container or a large portion in a large container. A medium portion size is 20 grams vs. 60 grams for the large portion. A small container is 250ml vs. 750ml for a large container. Participants consumed a lot more when their container was larger, even though the portion size was the same as for those with a small container. The larger container increased intake by 129%. Wansink, van Ittersum and Painter (2006) did a comparable study, looking at the influence of bowls and serving spoons on the consumption of ice cream. In their study, respondents consumed 31% more ice cream when given a 34oz. (964g) bowl than people with a 17oz. (482g) bowl without being aware of it. A larger serving spoon (3oz. or 85g vs. 2 oz. or 57g) led to an increase in consumption of 14.5%. Their participants were nutritional experts, so this shows that even experts do not realize this effect.

These studies show the importance of the size of serving devices or tableware. It is important that in this study, respondents are given many choices in their size of the container and serving spoon, to prevent this from influencing their feeling of what is a standard and appropriate size (Geier et al., 2006; Marchiori et al., 2012; Wansink et al., 2006).

Visibility is about how well a consumer can tell how much will be in a package. Consumers often believe that the size of the package is a reliable indication of the amount of food inside. The research by Lennard et al. (2001) shows almost half of all respondents say they do not need to use quality indications because the physical size of the package is a reliable indicator to how much it contains. The authors Wansink, Painter and North (2005) state that people count the number of calories in a portion by looking, not by feeling how saturated they are. They conducted an experiment where participants were given either a normal bowl of soup or one that refilled itself, thereby giving a biased visual cue. Participants who ate from the self-filling bowl consumed 73% more but did not believe they had consumed more and were not more satiated than people who ate from the normal bowl. This study once again proves the importance of portion size and how people use this as an anchor for what portion size will be optimal.

Labelling

For packaged foods, consumers can retrieve information about the quantity from the label, package size or total package price. Although this sounds straightforward, there are a number of reasons why consumers cannot or do not always estimate quantity correctly for packaged foods. Consumers often rely more on their memory or visual estimates than concrete quantity information. To estimate quantity, consumers can judge based on experience, usage or knowledge. In the research conducted by Lennard et al. (2001), more than half of the respondents did not know the weights or quantities for the packaged products they bought. Among other explanations for this phenomenon, Lennard et al. (2001) and Chandon (2010) name that consumers often do not read or understand labels or measurement systems. To give an indication of how many people have trouble estimating quantity, Lennard et al. (2001) have done a UK based research about how consumers estimate quantity. Their study focuses on why consumers do not use quantity indicators well enough. They have used multiple methods to approach their research question, namely simulated tasks, and an in-store questionnaire. Their study shows difficulties that consumers have when trying to estimate quantity: More than half

of the respondents experienced difficulty finding or reading quantity information on labels. 33% of the respondents did not know ml means millilitre, which shows consumers are sometimes confused by abbreviations or terms used on package labels. Some consumers do not have the arithmetic skills needed to calculate how much the unit price of a product is. This is shown because 65% of the respondents could not tell what the price per 100ml is when a product of 500mls costs 60 cents.

Package claims and health halo's

In this study, one condition was without packaging. What is the influence of leaving away package claims and health labels? Health haloes are so-called associative effects. Consumers associate certain products with a value when that value is promoted on package claims. For instance, if a restaurant or brand claims to serve healthy food, consumers believe their products are more healthy than the same products served by a brand or restaurant that does not claim to be healthy. Chandon and Wansink (2007b) did a study on this subject in the United States because they wondered how it is possible that a country with so many health claims has such a high-calorie intake. They discovered that consumers underestimate the caloric content of dishes when restaurants claim to be healthy. Their four studies show that consumers choose higher-calorie side dishes, drinks or desserts when the restaurants claim to be healthy like Subway does.

Motivation: consumer involvement

Social-economic factors influencing quality selected

The social-economic factors surrounding the consumer when making decisions, influence the consumers attention and motivation when selecting portion sizes. This can have an effect on the amount they select. Not only social norms, which were mentioned earlier, play a role here. Besides social norms, there are other social factors, such as the direct influence of others. Birch et al. (1987), found that the social norm in the United States is to "clean your plate". This is confirmed by Wansink and Chaney (2005), whose results show that people eat an estimated 92% of what they serve themselves. Chandon (2013) lists some social factors that strongly influence food intake. For example, when eating with multiple people, people will imitate others around them. If others (especially people without obesity) eat a lot, most people will copy their behaviour and eat more themselves. If people are distracted during their meal, they eat more because they are absent minded and not focused on their food (Wansink, 2004). Consumers perceive larger portions as having a higher economic and environmental value. The economic value is because larger portion sizes often have a lower unit price, and people respond to a cheaper price of food by increasing consumption. Larger portions are also perceived as having a higher social status (Chandon, 2013).

Consumer involvement in grocery decisions and cooking

Personal factors such as feelings of hunger, memory and time constraints play a role. These will be discussed in the method section since it is important that these factors are taken into consideration while doing the experiment. Besides memory and hunger, other factors such as time constraints, intentions, and interest play a role. All these factors are described by Lennard et al. (2001), in their UK research mentioned earlier. Their results show why consumers have difficulty estimating quantity. 54-69% of the respondents said it was not worth their time to locate and calculate various weights and find the optimal purchase for a group of products, and 64% said their good intentions weakened while shopping. Almost 70% of the consumers indicated they do not care about small differences in weight or price. This has also to do with time constraints that 33% the people said to experience during shopping. 37% of the respondents finds their time too valuable to select the best buy. More than half of the respondents indicate they have an information overload during shopping, which they say is confusing. This overload makes it difficult to process all information. Furthermore, age and social class have an influence: some consumers do not want to use weight indicators because

there are social and age-related stigmas attached to the use of measurement systems. Lennard and his colleagues conclude with the statement that consumers find quantity information so difficult, they would rather use total package price or visual impressions of the package size. 47% of their respondents think that physical size of the package is an adequate quantity indicator.

Cooking experience and uncertainty

With the loss of package as an anchor, comes uncertainty. Without packaging, the consumer has to visually predict the required portion size from an undefined and larger quantity of the product compared to packaged foods. The unit heuristic is lost (Chandon, 2010; Geier et al., 2006). Frequently, however, consumers do not always use quantity information on labels of packaging. Lennard et al. (2001) found that the majority of consumers do not make quantity estimations based on objective labels or cues, but by other means. The second most frequently used way is experience. The authors stated that the majority of consumers prefers to make quantity decisions based on package size (38%), previous experience (22%) or the number of people consuming a product (15%). This shows that experience is an important variable within consumers since it can be assumed that an experienced consumer has less difficulty selecting portion sizes than consumers who hardly ever cook. However, in the same study by Lennard and his colleagues, it was shown that shopping experience had an insignificant effect. In a study by Ovaskainen et al. (2008) on how well consumers could estimate food portions against the portions in food photographs, experience in food shopping and cooking did have a significant effect on their estimation ability. This was a study with Finnish participants.

Cooking experience can be positively linked to uncertainty: gaining experience reduces uncertainty (Heiman et al., 2001). Heirman and his colleagues describe how the level of uncertainty depends on the purchasing situation and the individual and product characteristics. Individuals with more experience than others about a product or product group will have different concerns and uncertainty about the product characteristics.

In the present research, it is assumed experienced cooks are more likely to be less uncertain when selecting quantities. Therefore, experience shall be used as a moderator variable. This moderator is needed because a difference in experience affects the causal relationship between package situation and uncertainty. The packaged situation is associated with an increase in uncertainty for participants with little cooking experience, but the packaged situation will not lead to uncertainty for participants with a lot of experience.

The assumption is that consumers will be more uncertain in an unfamiliar situation such as the unpackaged condition. Janssen (2010) states that uncertainty leads to the selection of larger portion sizes because of the fear that consumers experience at the thought of serving too little food when cooking for fellow eaters. The respondents in his research indicated they usually throw away leftover food.

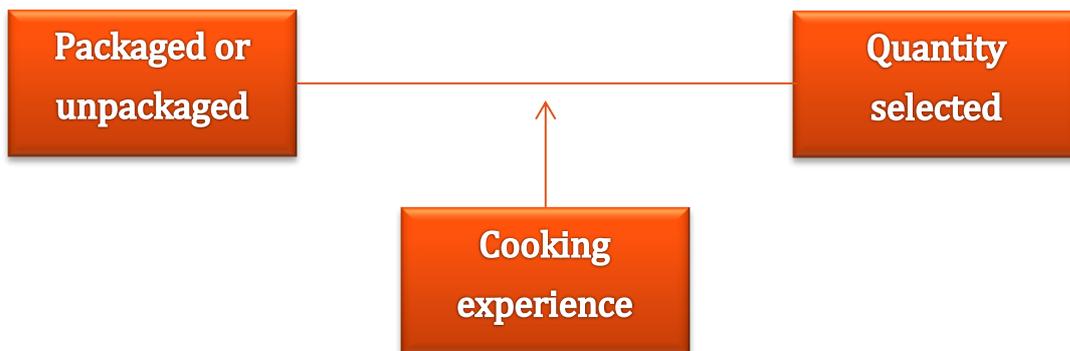
Hypotheses and conceptual model

Based on the literature, the following hypotheses were tested. Since removing the packaging is assumed to increase uncertainty, and uncertainty increases selected portion size, it is assumed that consumers in the package free condition will select larger quantities than consumers in the packaged condition. Cooking experience is used as a moderator. It was tested whether cooking experience had a significant effect on the amount selected in both conditions. It is assumed that participants with a lot of cooking experience will select smaller portions than consumers a low level of experience.

*H1: Compared to a shopping situation with packaging, consumers will select **larger quantities** in the unpackaged condition.*

*H2: Cooking experience will have a **significant effect** on the amount of food selected.*

*Moderator: Consumers with a lot of cooking experience will select **smaller quantities** compared to consumers with little cooking experience in the unpackaged situation.*



Method

Design

An experiment was designed to test the hypotheses based on the literature review. In the experiment, the most important goal was to test whether participants selected larger or smaller quantities in the unpackaged condition compared to the packaged condition. This experiment had two conditions: packaged vs. unpackaged. Both conditions had the same ingredients: pasta, cheese, onions and paprika. Participants did both conditions. The participants were asked to select as much food as they thought they would need to cook for four people (two males, two females). This specification of gender prevented interpretation errors, because males on average eat more than females, which could lead to confusion within participants.

The within subjects design solved the problem of varieties within subjects (experience, hunger). If all subjects in Condition 1 turned out to be experienced but not hungry, and Condition 2 is the other way around, the results would not be valid. The order in which they did the experiment, depended on their participant number, to guarantee randomisation across condition order. The experiment was conducted in May 2016 at the Forum building at Wageningen University.

As for time constraints, participants were clearly instructed before starting the experiment that they would have unlimited time to complete the tasks. Since they joined the experiment voluntarily, it was assumed that the participants did not experience any time pressure.

The packaged condition looked approximately similar to a normal supermarket. As in a normal supermarket, there were different choices of packages with different quantities. Since the packaged situation was the counterpart of the unpackaged situation, it was important to realize that the packages influence the perception of both situations. Van Herpen and her colleagues (in press) used plastic packages in the packaged situation. However, plastic is perceived as very bad for the environment. The unpackaged situation would then seem very good for the environment, especially compared to a situation with the 'worst' packaging option.

To decide which packages to use in the packaged situation, the transparency of some materials of packaging were taken into account. Besides plastic's perceived large impact on the environment, a transparent packaging influences consumption. The advantage or disadvantage of plastic packages is that the product is clearly visible. Transparent packages can both increase or decrease consumption. Deng and Srinivasan (2013) describe the two possible effects of transparent packaging: salience effects and monitoring effects. The salience effect means that the object itself becomes more noticeable or important because consumers can see it. This effect is most prevalent for small and visually attractive foods. The monitoring effect means that consumers can see how much is in the package. The monitoring effect decreases consumption for large foods and vegetables. This is because consumers eat vegetables mainly for their health benefits, not because they enjoy them a lot. If the package is transparent, they can see how much they've eaten and quickly think it's enough. Because of the combination of these two effects, Deng and Srinivasan (2013), advise transparent packages for small foods and opaque packages for large foods and vegetables to increase sales and consumption. In the present study, the packaged condition contained pasta in a cardboard box and cheese in a plastic bag. These are the most commonly used packaging materials in supermarkets. As the goal was to let the packaged condition look as much alike to a supermarket as possible, this selection seemed sensible.

Participants

56 respondents were recruited. Participants were students from Wageningen University. Students were both Dutch and international, but this was not taken into consideration for this research. The participants were randomly assigned to starting with one of the two conditions: packaged vs. unpackaged.

To control for differences within subjects, participants were asked how experienced they were in cooking, how hungry they were and how much they liked the food they had to select. This was done after completing the task in both conditions.

Choice of materials

The recipe used in this experiment was a simple pasta recipe. Pasta was chosen because it is the second most thrown away type of food (Ventour, 2008). Rice is even more often thrown away. However, rice recipes are less common and easy to prepare for students, thereby unnecessarily increasing uncertainty. The participants were asked to select as much food as they thought they would need to cook for four people (two males, two females). The other ingredients were paprika and onion. These items are often consumed in the Netherlands. Paprika is the fourth most sold vegetable in the Netherlands (Voedingscentrum, 2016). When looking at weight, onion is also in the top 10 of most sold vegetables in the Netherlands. Furthermore, because these vegetables are sold per unit, and not per gram, this was closely related to the unit size heuristic (Geier et al., 2006; van Kleef et al., 2014). Consumers are likely to assume that one unit is the appropriate size to select.

Various research papers prove the influence and importance of serving utensils on food intake (Geier et al., 2006; Marchiori et al., 2012; Wansink et al., 2006). Although not all packages are removed in a package free supermarket (there are still large containers), the packages are large enough and will not affect consumer choice (Zlatevska et al., 2014). Chandon and Ordabayeva (2009) show that the size of a container has an even larger influence than a plate, because containers change size three-dimensionally, whereas plates only change in one or two dimensions. Therefore, for this study, it was important to give participants in the unpackaged condition a free choice in which container they wanted to use to serve themselves. Because a larger serving container usually leads to a larger food intake, it was assumed that in the unpackaged condition, participants who take a larger container were more likely to select a larger quantity. By giving the participants the choice between three sizes of containers and two sizes of spoons, this was controlled for. The three containers were immediately next to the large container from which they can select the food.

To determine which container sizes to use, the mean of a portion of pasta was used. Dietary guidelines in the Netherlands (Voedingscentrum) advise between 75 to 100 grams uncooked pasta per person. Pasta becomes approximately 2,5 times larger when cooked. The Dutch National Food Consumption Survey shows guidelines for males and females aged 19 to 50 years. For males, the advice is 250 grams cooked pasta per portion and for women 200 grams (van Rossum et al., 2011). This is approximately the same advice as the Voedingscentrum gives, when taking the increase in size due to cooking into consideration. As for this experiment, respondents will cook for two males and two females. The expected average is 200 grams uncooked pasta for males and 160 grams uncooked pasta for females. This makes 360 grams uncooked pasta in total.

Ideally, the middle container would contain the exact normal amount for four people, the large one twice as much and the small one twice as little. However, this was not available in store. Therefore, the small container was 500 grams, the middle one 750 grams and the large one 1000gr.

The same goes for cheese. The Dutch National Food Consumption Survey shows that the guideline for cheese is 30 grams per day, for both males and females (aged 19-50). The middle container was able to contain 500 grams, the large one 750 grams and the small one 250 grams.

The serving spoons for pasta were small (20 grams) or normal (50 grams). A normal serving spoon contains 50 grams (van Assema et al., 2002). The serving spoon for cheese 20 grams or 10 grams.

Procedure

The experiment took place on the sixth floor of the Forum building. Upon entrance, the participants were welcomed and given some short information about the experiment and research. This created informed consent because the participants was then aware of the fact that participation was voluntary; their input was registered anonymously; and they could stop at any desired time. After that, they were given the short instruction that they would be shopping for their dinner tonight. The instruction included the recipe for four persons, of which two males and two females to avoid confusion and mistakes in interpretation. Tomato sauce was assumed to already be at home. The participants were told they could take all the time they need. This was done to avoid time constraints. The participants were randomly assigned to an order with which condition they would start, depending on their participant number (even vs. odd).

The participant, depending on which condition to start with, filled his or her shopping basket with packaged or unpackaged products. An amount of pasta, paprika, onion and cheese was chosen in the first condition, and then they moved on to the second condition. In the unpackaged condition, participants filled their small container. Once finished, the consumer brought his or her small containers to the researcher, who weighted the containers to see how much food was selected by the participants. The participant could then do the other condition. When finished, the participant was asked to fill in the short questionnaire (Appendix 2.2).

Figure 1 and Figure 2 show what the conditions looked like. The packaged conditions had different quantities of pasta (250 grams, 50 grams and 625 grams). Participants were instructed not to take brand or related price into consideration when making their decision. There were two packages of cheese (175 grams and 300 grams). The packaged condition contained two packages of onions, each containing two onions. There were two sizes of paprika, either one separate paprika or three units in one package. The unpackaged condition consists of four containers, each containing a large quantity of food (1 kilogram pasta, 475 grams cheese, 6 onions and 5 paprikas).



FIGURE 1 - CONDITION 1: PACKAGED



FIGURE 2 - CONDITION 2: UNPACKAGED

Measures

As participants may differ in their personal conditions such as hunger and taste, the factors hunger and preference for the recipe were taken into consideration. People do not only eat to satisfy their hunger. It is a form of enjoyment, so even if their appetite is satisfied, they will not stop if they still enjoy the meal (Chandon, 2013). Besides emotions such as enjoyment, physical states such as hunger play a role as well. Hunger and memory play an important role in selecting the amount of food (Brunstrom et al., 2008; Oldham-Cooper et al., 2011). Hunger is positively correlated to the prediction of portion size. A hungry feeling can distort memories of previous

occasions where a meal was consumed, and influences prediction of the right size. Consumers rely on memory when determining what portion size to select and how much to eat from it. Feelings of saturation after a meal are stored in memory, so when a person eats a lot during one meal where he is distracted, next time he thinks he needs a large portion (Brunstrom and Mitchell, 2006). To take these factors into consideration while doing the experiment, participants were asked in a questionnaire at the end of the experiment how hungry they were.

The questionnaire at the end of the experiment consisted of multiple questions (Appendix). First, to get an idea of the sample, gender and age were asked. Secondly, there was a question measuring hunger and one about whether participants like the recipe, thereby showing their preference and taste. Cooking experience was measured in the questionnaire using multiple questions. First, it was asked whether the participants often prepare this kind of dish for four people. To measure cooking ability, literature was consulted. Hertzler and Bruce (2002) measure cooking ability by asking the participants if they would describe their cooking ability as little or none; enough to get by, but not how to prepare a great variety of food; can prepare a simple meal without much problem; or can prepare many dishes and like to experiment with new recipes. At the end of the questionnaire, there was some room for feedback or comments.

The amount of food selected (quantity) served as the dependent variable. The independent variable was the condition: the packaged or unpackaged situation. Cooking experience was used as a moderator. Control variables were the factors age, gender, hunger and container and spoon size. Participants were free in selecting their own container and spoon. The effect of container size had a significant influence on the amount of cheese selected: $F(52)=6.23$ with $p=.00$. Participants who chose a larger container, served themselves significantly more cheese than those who used a small container. On the other hand, there was no significant influence of the size of the container on the amount of macaroni selected, nor was there a significant effect of spoon size.

Data analysis

All data was transported and combined into the statistical programme SPSS. At first, the participants were described. Secondly, to test the hypotheses, a General Linear Model and various tables were created to compare the two conditions. The effect of condition on the four food products were shown, to see whether participants select smaller quantities in the packaged condition. Furthermore, a test was done to analyse if experience had a significant effect on the selected amount. Finally, to test if the moderator had a significant influence, a General Linear Model was used.

Results

The experiment included 56 participants, aged between eighteen and 28. The mean of age was 21.5 years old, with a standard deviation of 2.1. Of these participants, eighteen were male (32%) and 39 female (68%). For one participant, four values were missing (satisfaction, difficulty, hunger, experience). Therefore, it was chosen to exclude this participant (respondent 12) from the research. Consequently, the research included 55 valid participants. Furthermore, there were four missing values regarding the cooking experience.

Since a within subjects was used, no randomization across conditions was needed. Still, a small test was conducted to see if the participants were equally distributed across the order with which condition they started. A chi-square test and Analysis of Variance (ANOVA) were conducted on a random distribution in the starting order of the variables gender, age, cooking ability, the frequency of preparing this kind of dish and hunger. In gender, a significant difference was found between the different orders. For the other variables, no significant differences were found. This means that not significantly more experienced or hunger participants started with condition 1 than with condition 2.

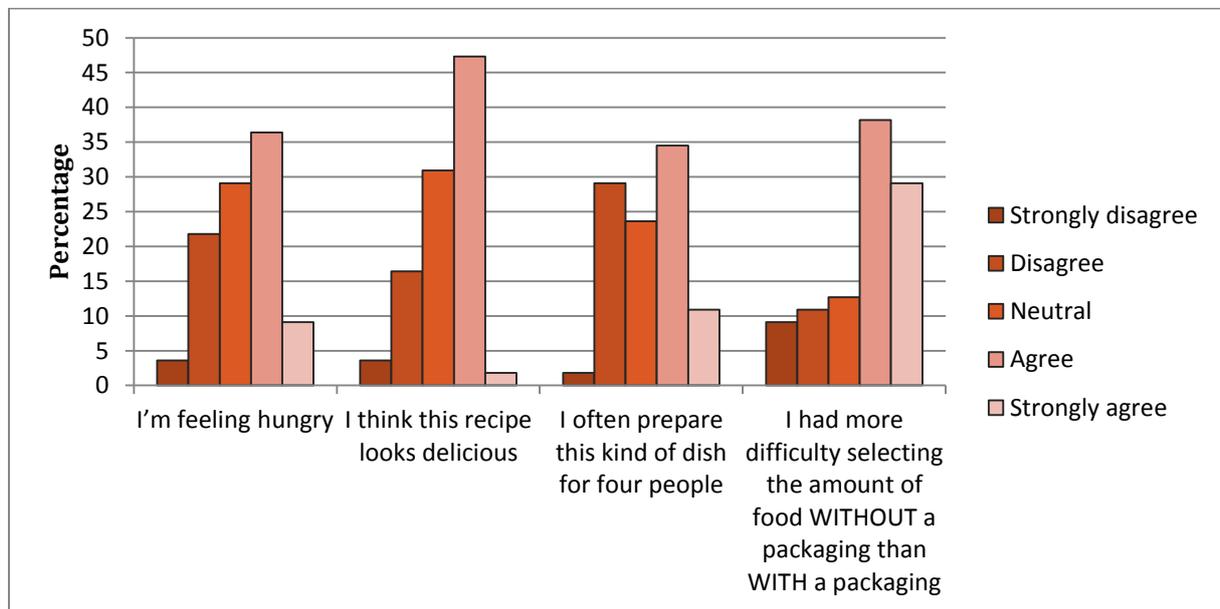


FIGURE 3 – PARTICIPANTS' STATE OF BEING

Figure 3 gives some insight on how the participants were feeling during the experiment. When looking at this table, it can be seen that 46% of the participants were feeling hungry and 29% were neutral (mean=3.3, std. dev.=1.0). The majority of the participants (49%) liked the recipe. Another 31% felt neutral about the recipe, the rest did not think the recipe looked delicious (mean=3.3, std. dev.=.9). Most participants had prepared the dish often (45%) but 31% disagreed with this statement (mean=3.2, std. dev.=1.1). Last of all, the figure shows how the participants experienced the difficulty in selecting the food in both conditions. This shows a majority of 67% of the participants experienced more difficulty selecting food without packaging than food with packaging (mean=3.7, std. dev.=1.3).

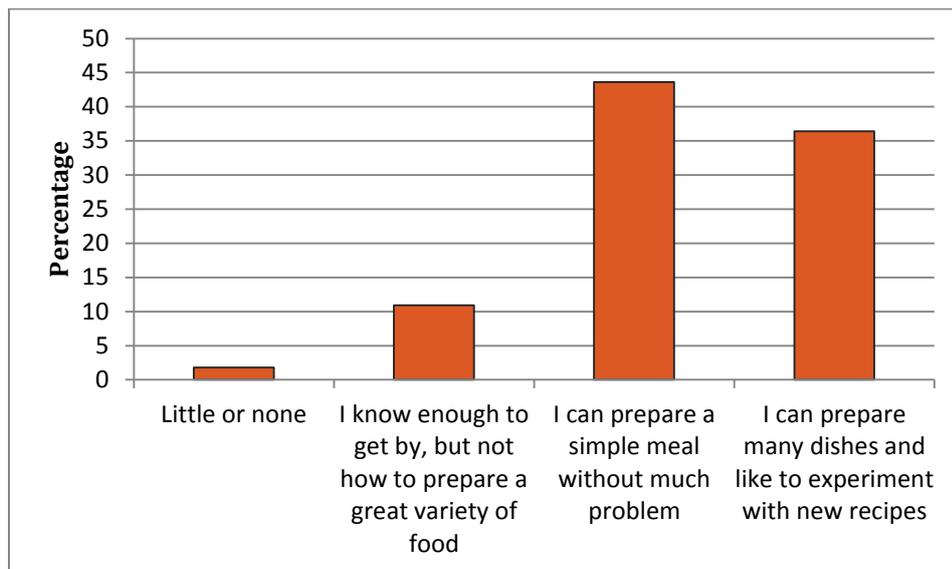


FIGURE 4 - COOKING ABILITY

Figure 4 shows the cooking experience of participants. The majority of the participants (86%) could prepare a simple meal without much problem or could even prepare many dishes (mean=3.2, std. dev.=.7). This shows that there is little diversity between the participants.

Hypotheses testing

H1: The effect of condition on selected quantity

In order to test this hypothesis, SPSS was used to generate a General Linear Model cross table.

TABLE 1 - QUANTITIES PACKAGED VS. UNPACKAGED CONDITION

	Packaged		Unpackaged		Sig.
	Mean	Std. dev.	Mean	Std. dev.	
Macaroni (grams)	504.9	78.9	403.7	121.2	.06
Cheese (grams)	224.0	61.6	108.5	40.7	.00
Onion (units)	2.1	0.4	1.6	0.6	.10
Paprika (units)	3.0	0.6	2.7	0.8	.01

Table 1 shows the quantities participants selected in the packaged and unpackaged condition. Participants selected significantly less macaroni, cheese and paprika in the unpackaged condition compared to the packaged condition. Although the effect was only marginal for macaroni, the difference in the quantity selected was especially large and clearly significant for paprika and cheese.

For macaroni, $F(1)=3.60$ and $p=.06$. This shows there is a marginal significant effect of condition on the amount of macaroni selected. For cheese, $F(1)=25.57$ with $p=.00$, meaning the difference between conditions is significant for cheese. This shows a clearly significant effect of condition on the quantity of cheese selected. For onions, $F(1)=2.80$ with $p=0.10$, meaning there is no significant difference in quantity for onions across conditions. This means that the participants did not select a different amount of onions in the packaged situation than in the unpackaged condition. Finally, for paprika, $F(1)=8.17$ with $p=.01$. As for cheese, this means participants selected significantly smaller quantities in the unpackaged condition than in the packaged condition.

H2: The effect of experience on selected quantity

Cooking experience was used as a moderator. To test the main effect of experience on the selected quantity of food not depending on condition, a General Linear Model was used. Here it is found that experience does not significantly influence the amount of food that participants selected. The values show that for macaroni, $F(1)=.13$ with $p=.73$. For cheese, this value is also not significant: $F(1)=1.13$ with $p=.29$. The same goes for onions, with $F(1)=.95$ with $p=.33$. For paprika, $F(1)=1.73$ with $p=.20$. These figures show that participants with a lot of experience did not take significantly more or less food than participants with a low level of experience.

Moderation between experience and packaging condition

To see if cooking experience had a significant interaction effect on the condition a General Linear Model was used. This showed there was a significant effect of cooking experience on quantity of paprika selected, with $F(1)=4.52$ and $p=.04$. The moderator showed no significant effect on other food products. For macaroni, $F(1)=.26$ with $p=.62$. For cheese, this was $F(1)=2.50$ with $p=.12$ and for onions $F(1)=0.22$ with $p=.64$. This shows that paprika is the only food product for which a high level of experience leads to a difference in selection of food than a low level of experience. For the other food products, the level of experience did not have a significant effect.

As could be seen in Figure 4, the division of participants across the four levels of cooking experience was not equally distributed. The majority of the participants indicated they can prepare at least a simple meal (86%). When dividing experience between high and low, it is chosen to take the first three scores (little cooking experience up to simple meals) as 'low experience'. 61% of the participants meet this definition. The other 39% of the participants, described themselves as highly experienced cooks.



FIGURE 5: UNITS OF PAPRIKA SELECTED

Figure 5 shows the units of paprika selected in both conditions. As can be seen, participants with a low level of cooking experience selected fewer units of paprika than participants with a high level of experience. This is especially the case for the unpackaged condition. In the packaged condition, the mean number of units selected is 3.05 for highly experienced cooks and 2.97 for inexperienced cooks. In the unpackaged condition, highly experienced cooks select 2.95 units on average, whereas participants with little experience select 2.55 units.

Discussion and conclusion

The aim of this study was to find out whether presenting foods unpackaged had a significant influence on the amount of food selected. By conducting an experiment, it was shown that this was indeed the case. Participants selected significantly less macaroni, cheese and paprikas in the unpackaged condition compared to the packaged condition. No significant effect was found for the amount of units of onion selected. Although it was assumed consumers would select larger quantities in uncertain situations, such as in the unpackaged condition, the contrary is proven to be true. The participants selected significantly less in the unpackaged condition.

The influence of packaging

As the results show, packaging has a significant influence on the amount of food selected. Participants select significantly smaller quantities of food without packaging. Packaging has this large influence on consumers' buying behaviour because it gives an indication of what a normal or necessary amount of food should be (Lennard et al., 2001; Geier et al., 2006; Wansink and van Ittersum, 2007). People simply find it too difficult or time-consuming to decide for themselves how much food they need, so they use packaging as an indication (Lennard et al., 2001).

A unit does not only indicate how much is normal to eat, it also triggers the so-called 'completion compulsion', a mechanism first described by Siegel (1957). People are found to have the tendency to consume all food that is given to them. This same effect is shown in the study by Wansink et al. (2005). Participants in his study ate until they finished all the food given to them, even if they had a bowl that refilled itself. They then ate 73% more than participant without such a plate, without even realising so. Consequently, it seems consistent that they would want to finish all food in a package. Leaving just a little bit in the package seems useless, so you might as well prepare that little bit too. This could be a reason why packaging can lead to overeating, and it could also explain why consumers select smaller quantities in an unpackaged condition.

Starting in the 1970's, packaging sizes have increased drastically over the years (Zlatevska, Dubelaar and Holden, 2014). For marketers, increasing portion sizes is an attractive opportunity. Generally, selling a larger package (thereby a larger quantity) leads to an increase in profit compared to selling a small quantity. Therefore, it makes sense that the industry keeps increasing their portion sizes. After all, consumers think they benefit from it as well. They have a preference for super-sized portions and the unit price is lower for a larger product, making it economically interesting for a consumer to buy a large package (Chandon, 2013).

When looking at this study, the results could imply that packaging sizes have increased so much that they are no longer a valid indication for what quantity people really need. When given the choice to select their food without packaging, participants selected smaller quantities. It is possible that portion sizes have increased so much over the years, that people now think a normal portion is much larger than the portion size they would actually need.

The present experiment does not shed any light on what consumers do with the possible leftovers they have from their large portions. This could be interesting for future research. Of course, the experiment conducted in this study was only about the selection of food, not its preparation. However, it can be assumed that participants selected only the food they were planning to prepare, as that described was in the instruction sheet. There are various options for a consumer, once he or she has any leftovers left from their meal. They can either save the food for later use, overeat themselves or do they simply throw it away. Various researchers have found that the most frequently chosen option is the latter one. The majority of their respondents throw their leftovers away (Janssen, 2010; Ventour, 2008). If this is indeed the case, that would be harmful to the environment. By not using any packaging, consumers select smaller portions and have fewer leftovers than when packages are present.

Results in comparison to dietary guidelines

Compared to Dutch dietary guidelines, it can be seen that participants selected larger portions than recommended for pasta and cheese, and smaller quantities of vegetables. In the following table (Table 2), a comparison is made between Dutch dietary guidelines (Voedingscentrum), the average consumption (van Rossum et al., 2011) and the portions selected in the experiment. All quantities are in grams and for two males and two females aged 19-30 years.

TABLE 2 - GUIDELINES VS. EXPERIMENT (IN GRAMS)

Product	Guideline	Average consumption	Packaged condition	Unpackaged condition
Pasta	360	312	505	404
Cheese	120	120	224	109
Vegetables	1000	1116	618	533

Pasta

For pasta, the Voedingscentrum advises selecting between 75-100 grams uncooked pasta per person. The Dutch National Food Consumption Survey advises 250 grams cooked pasta for males and 200 grams for females aged 19-30 years (van Rossum et al., 2011). The Dutch National Food Consumption Survey bases their guidelines on the records of the Voedingscentrum. Taking into consideration that pasta increases 2,5 times when cooked, this advice is the same as given by Voedingscentrum. As this experiment included two males and two females, the advised quantity would be 360 grams uncooked pasta in total. The average consumption of Dutch males aged 19-30 years is 230 gram. For females, this is 160 gram. As this pasta is cooked, it needs to be divided by 2.5 to compare it to uncooked pasta. Taking this into consideration, a group of two women and two men consume 312 gram pasta on average. The participants in this study on average selected 504.9 grams in the packaged condition and 403.7 grams in the unpackaged condition.

It is clear there is a large difference between the guidelines, the average consumption and the experiment. Participants in the experiment selected 40% more than the guidelines advice. Comparing this to the average consumption in the Netherlands, this is 62% more. However, it should be taken into consideration that the quantity mentioned for the experiment is the selected quantity, not the consumed quantity. It is possible that participants if they were to really cook this food, would not eat everything. Some participants indeed mentioned that they usually cook pasta for multiple days or often throw away some leftovers. In the unpackaged condition, the participants selected 12% more than the advice and 30% more than the average consumption.

Cheese

For cheese, a similar pattern as for pasta can be observed for the packaged condition. Participants selected a much larger portion in the packaged condition than the guidelines advice (87% more). In the unpackaged condition, however, the participants selected a smaller quantity than advised by the Voedingscentrum. It is difficult to make a comparison with the average consumption of cheese in the Netherlands. A 19 to 30-year-old male eats 109 gram cheese on a daily basis, a woman the same age 95 gram. However, cheese and other dairy products are consumed throughout the whole day. Dinner accounts for 29% of the daily dairy consumption. Taking 29% of the 109 and 95 gram cheese consumed during the day, it can be stated that men eat 32 gram cheese during dinner and women 28 gram. For a group of two males and two females, this sums up to 120 gram.

This shows the significant influence of packaging condition on the consumption of cheese. Participants select 87% more cheese than advised in the packaged condition, but 9% less than recommended in the unpackaged condition.

Vegetables

In order to compare the consumption of vegetables in the experiment to the dietary guidelines, the units of paprikas and onions were converted to grams. This was based on the average weight of a middle sized onion (80 gram) and a middle sized paprika without seeds and other non-edible parts (150 gram)⁴. As there is only a dietary advice on how many vegetables to consume in total, not specified on paprika and onion, these two food products were combined into one group by adding the quantities together.

It can be seen in Table 2 that participants select a much smaller quantity of vegetables than advised or average in the Netherlands. However, in the experiment participants could only select two types of vegetables. In the supermarket, this choice is much larger. Therefore, this comparison is not very reasonable to make. It can be assumed that participants would have selected additional vegetables if they would have had the option.

Preference and quantity

It is interesting to find that although participants selected larger quantities of pasta and cheese compared to the packaged condition, they selected smaller quantities of vegetables. In the Netherlands, only 28% of the population comply with the dietary guidelines of 200 gram of vegetables a day (CBS, 2016). The dietary guideline has recently been upgraded to 250 gram, so an even smaller percentage of the population will probably meet these standards. Taking these figures into consideration, it makes sense that participants did not select more vegetables in the unpackaged condition. But as mentioned, they could only select two types of vegetables. Apparently, they have a preference for cheese and pasta over vegetables. This is an interesting finding. If unpackaged supermarkets were to flourish, would it be beneficial to the consumer health? Although consumers would select fewer starch products and dairy, they would select even fewer vegetables. Purely looking at consumer health, perhaps the ideal supermarket would have unpackaged unhealthy products and packaged healthy products.

Choosing the middle option

In this study, the majority of participants in the packaged condition selected the middle sized packaged, containing 500 gram. An explanation for this result is the consumer preference to select the middle option (Simonson and Nowlis, 2000). This middle option is perceived as a safe choice and a compromise between the other options. This could be a reason why so many participants (78%) selected the middle size of packaged macaroni. For cheese, only two options were given, so no compromise option was present there. For cheese, the majority of the participants selected the small option (60%). As can be seen, this was more equally distributed than in pasta.

An explanation for the fact that no significant difference was found for the selection of onions could be that the packaged alternative for onions did not deviate a lot from the unpackaged condition. For paprikas for instance, in the packaged condition, participants could select one, three or four paprikas. For onions, they could select two or four onions. Since participants selected two onions in the unpackaged situation, this could imply that if they are free to choose, they would choose two onions. This option is given to them in both the packaged and unpackaged condition.

⁴ www.hoeveelweegtijts.nl

It can be seen that cooking experience has no significant main effect on the amount of food selected. However, it does significantly influence the amount of units of paprikas that participants select in the unpackaged condition (interaction effect). Participants with a high level of experience select a significantly larger quantity of paprika than participants with a low level of experience.

Limitations and future implementations

Various limitations can be found in this study. Future research is necessary, to see if the effect found in this study is also valid for different food products and different groups of participants.

When looking at the selected food products, it is important to take into consideration that participants could now only chose the quantity they wanted to select. They had no choice in product type. Furthermore, they had only four products in total. This gives no indication of what their consumption would be for a complete meal, or if other or additional products were present. Some participants indicated they did not like or frequently consumed some of the foods present in this experiment (e.g. green paprikas or cheese). There is also the possibility that participants would usually not select these products because of dietary requirements or ideological motivations. Furthermore, although verbally explained to the participants, the brands of the products could still have influenced their decision making in the packaged condition. For these reasons, a study with a (more) complete and diverse supermarket assortment would be required. Future research could investigate whether these results are also valid for other food products.

Another interesting topic for further research could be the quality perception of products without a package. Packaging is known to have a large influence on the perception of quality of a product (Steenkamp, 1990). Although quality perception was too complicated to take into consideration in this study, it would be a very appealing study.

In this research, only students from the Wageningen University participated. As these participants are all part of the same age group and educational level, they are not a valid representation of society. They also have less cooking experience than the average level of experience of society. Furthermore, it can be assumed that students from this university have a higher chance of being more involved in food or consumer decision making. Additionally, cultural differences were not taken into account in this study.

Another restraint of this study is the setting. Although efforts were made, it did not look like a very realistic or fancy supermarket. It would be better to do this study in an environment more similar to a supermarket setting.

The information obtained in this study could be useful for both governments and supermarkets. If consumers were to select smaller portions, this could have a positive effect on their weight. Governments could use this method as a policy tool against the increasing obesity epidemic. As mentioned before, this is only valid for unhealthy products. If unpackaged shops would result in a decrease in the consumption of healthy products, such as vegetables, this would not be a positive development.

For this effect to be substantial for an entire population, it is important supermarkets are willing to present their goods in an unpackaged fashion. If a large supermarket chain would implement this type of shopping for a selection of products, this could have a large influence on the quantities consumers select. In this study, it was found participants select smaller quantities in the unpackaged condition compared to the packaged condition. Of course, supermarkets might not want to implement this system, because smaller quantities of the products will be sold. However, this does not need to mean that fewer profits will be made. If quality perception studies are conducted, it can be found if consumers appreciate food in an unpackaged situation.

If they do, it would be possible that supermarkets could sell these products at the same prices they now sell expensive brands. Purchasing costs could be low and revenues high.

In an unpackaged condition, consumers are found to select smaller quantities. It can be assumed they will not only consume less food, they will also throw away less leftover food. Fewer packages will be wasted either. These developments could be an important step towards sustainable consumption and a better and healthier environment.

References

- Ackerman, F. (1997). *Why do we recycle? Markets, Values, and Public Policy*. Island Press, Washington DC.
- van Assema, P., Brug, J., Ronda, G., Steenhuis, I., & Oenema, A. (2002). A short Dutch questionnaire to measure fruit and vegetable intake: relative validity among adults and adolescents. *Nutrition and Health, 16*(2), 85-106.
- Ball, A. L. (2016). The Anti-Packaging Movement. *The New York Times Style Magazine*. Retrieved on 04-04-16, from http://www.nytimes.com/2016/03/14/t-magazine/food/precycling-food-packaging.html?_r=1
- Becker, L., Rompay, van J. L., Schifferstein, N. J. & Galetzka, M (2011). Tough package, strong taste: The influence of packaging design on taste impressions and product evaluations. *Food Quality and Preference, 22* (1), 17-23.
- Birch, L. L., McPhee, L., Shoba, B. C., Steinberg, L. & Krehbiel, R. (1987). 'Clean Up Your Plate': Effects of Child Feeding Practices on the Conditioning of Meal Size. *Learning and Motivation, 18*(3): 301-317.
- Borromeo, L. (2014). Berlin duo launch a supermarket with no packaging. *The Guardian*. Retrieved on 24-03-2016, from <http://www.theguardian.com/sustainable-business/2014/sep/16/berlin-duo-supermarket-no-packaging-food-waste>.
- Brisson, I. (1993). Packaging waste and the environment: economics and policy. *Resources, Conservation and Recycling, 8* (3-4), 183-292.
- Brody, A. L. (1978). Functions of Packaging. *League Int Food Educ*, 1-4. Retrieved on 24-03-2016 from <http://agris.fao.org/agris-search/search.do?recordID=US201302470586>
- Brunstrom, J. M., & Mitchell, G. (2006). Effects of distraction on the development of satiety. *British J Nutr, 96*, 761-769.
- Brunstrom, J. M., Rogers, P. J., Pothos, E. M., Calitri, R., & Tapper, K. (2008). Estimating everyday portion size using a 'method of constant stimuli': In a student sample, portion size is predicted by gender, dietary behaviour, and hunger, but not BMI. *Appetite, 51*(2), 296-301.
- Centraal Bureau voor de Statistiek StatLine, 2016. *Leefstijl en (preventief) gezondheidsonderzoek; persoonskenmerken*. Retrieved on 8-6-2016, from <http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=83021ned>.
- Chandon, P. & Ordabayeva, N. (2009). Downsize in 3D, supersize in 1D: Effects of dimensionality of package and portion size changes on size estimations, consumption, and quantity discount expectations. *Journal of Marketing Research, 46* (6), 725-738.
- Chandon, P. & Wansink, B. (2007a). Is Obesity Caused by Calorie Underestimation? A Psychophysical Model of Meal Size Estimation. *Journal of Marketing Research, 44* (1), 84-99.
- Chandon, P. & Wansink, B. (2007b). The Biasing Health Halos of Fast-Food Restaurant Health Claims: Lower Calorie Estimates and Higher Side-Dish Consumption Intentions. *Journal of Consumer Research, 34* (3), 301-314.
- Chandon, P. (2010). Estimating Food Quantity: Biases and Remedies. In A. Krishna (Ed.), *Sensory marketing: Research on the sensuality of products*: 169 -182. New York: Routledge.

- Chandon, P. (2013). How Package Design and Packaged-based Marketing Claims Lead to Overeating. *Appl. Econ. Perspect. Pol.*, 35 (1): 7-31.
- Clement, J. (2007). Visual influence on in-store buying decisions: an eye-track experiment on the visual influence of packaging design. *Journal of Marketing Management*, 23 (9-10), 917-928.
- Deng, X. & Srinivasan, R. (2013). When Do Transparent Packages Increase (or Decrease) Food Consumption? *Journal of Marketing*, 77 (4), 104-117.
- Foley, J. A. et al., (2011). Solutions for a cultivated planet. *Nature*, 478 (7369), 337-342.
- Geier, A. B., Rozin, P., & Doros, G. (2006). Unit Bias: a new heuristic that helps explain the effect of portion size on food intake. *Psychological Science*, 17(6), 521-525.
- Grunert, K. G. (2005). Food quality and safety: consumer perception and demand. *European Review of Agricultural Economics*, 32 (3), 369-391.
- Gustavsson, J., Cederberg, C., Sonesson, U., & Emanuelsson, A. (2013). The methodology of the FAO study: "Global Food Losses and Food Waste—extent, causes and prevention"—FAO, 2011. *SIK The Swedish Institute for Food and Biotechnology, report No, 857*.
- Hall, K. D., Guo, J., Dore, M., Chow, C.C. (2009). The Progressive Increase of Food Waste in America and Its Environmental Impact. *PLoS ONE* 4(11): e7940.
- Heirman, A., McWilliams, B. & Zilberman, D. (2001). Demonstrations and money-back guarantees: market mechanisms to reduce uncertainty. *Journal of Business Research*, 54 (1), 71-84.
- van Herpen, E., Immink, V. & van den Puttelaar, J. (in press). Organics Unpacked: The Influence of Packaging on the Choice for Organic Fruits and Vegetables.
- Hertzler, A. A. & Bruce, F. A. (2002). Cooking, recipe use and food habits of college students and nutrition educators. *International Journal of Consumer Studies*, 26, 340-345.
- Janssen, E. (2010). Voedselverspilling in huishoudens: determinantenonderzoek. Amsterdam: ResCon, research & consultancy, projectnummer: 09/26.
- van Kleef, E., Kavvouris, C., & van Trijp, H. C. (2014). The unit size effect of indulgent food: How eating smaller sized items signals impulsivity and makes consumers eat less. *Psychology & health*, 29(9), 1081-1103.
- Lee, M., & Lou, C.-C. (1996). Consumer reliance on intrinsic and extrinsic cues in product evaluations: A conjoint approach. *Journal of Applied Business Research*, 12 (1), 21-30
- Lennard, D., Mitchell, V.W., McGoldrick, P. & Betts, E. (2001). Why consumers under-use food quantity indicators. *International Review of Retail, Distribution & Consumer Research*, 11 (2), 177-199.
- Lenth, R.V. (2001). Some Practical Guidelines for Effective Sample Size Determination. *The American Statistician*, 55 (3), 187-193.
- Lockhart, H. (1997). A paradigm for packaging. *Packaging Technology and Science*, 10, 237-252.
- Madzharov, A. V. & Block, L. G. (2010). Effects of product unit image on consumption of snack foods. *Journal of Consumer Psychology*, 20 (4), 398-409.
- Marchiori, D., Corneille, O. & Klein, O. (2012). Container size influences snack food intake independently of portion size. *Appetite*, 58 (3), 814-817.

- Marsh, K. & Bugusu, B. (2007). Food packaging - roles, materials, and environmental issues. *Journal of Food Science*, 72 (3), R39-R55.
- McConahy, K. L., Smiciklas-Wright, H., Birch, L. L., Mitchell, D. C., & Picciano, M. F. (2002). Food portions are positively related to energy intake and body weight in early childhood. *The Journal of paediatrics*, 140(3), 340-347.
- Nestle, M. (2003). "Increasing Portion Sizes in American Diets: More Calories, More Obesity." *Journal of the American Dietetic Association*, 103 (1), 39-40.
- Nielsen, S. J., & Popkin, B. M. (2003). Patterns and trends in food portion sizes, 1977-1998. *Jama*, 289(4), 450-453.
- Oldham-Cooper, R., Hardman, C., Nicoll, C., Rogers, P., & Brunstrom, J. (2015). Playing a computer game during lunch affects fullness, memory for lunch, and later snack intake. *Am J Clin Nutr*, 93, 308-313.
- Olson, J. C. and Jacoby, J. (1972). Cue utilization in the quality perception process. *Third Annual Conference of the Association for Consumer Research*, Chicago, IL. 167-179.
- Ordabayeva, N. & Chandon, P. (2015). In the eye of the beholder: Visual biases in package and portion size perceptions. *Appetite*, online since October 23 2015, in press.
- Ovaskainen, M. L., Paturi, M., Reinivuo, H., Hannila, M. L., Sinkko, H., Lehtisalo, J., Pynnönen-Polari, O. & Männistö, S. (2008). Accuracy in the estimation of food servings against the portions in food photographs. *European Journal of Clinical Nutrition*, 62, 674-681.
- Parfitt, J., Barthel, M., & Macnaughton, S. (2010). Food waste within food supply chains: quantification and potential for change to 2050. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 365(1554), 3065-3081.
- Peck, J., & Childers, T. L. (2006). If I touch it I have to have it: Individual and environmental influences on impulse purchasing. *Journal of Business Research*, 59(6), 765-769.
- van der Pol, M., & Ryan, M. (1996). Using conjoint analysis to establish consumer preferences for fruit and vegetables. *British Food Journal*, 98(8), 5-12.
- Prendergast, G. & Pitt, L. (1996). Packaging, marketing, logistics and the environment: are there trade-offs?. *International Journal of Physical Distribution & Logistics Management*, 26(6), 60-72.
- Ross, S. & Evans, D. (2003). The environmental effect of reusing and recycling a plastic-based packaging system. *Journal of Cleaner production*. 11 (5), 561-571.
- van Rossum, C. T. M., Fransen, H. P., Verkaik-Kloosterman, J., Buurma-Rethans, E. J. M. & Ocké, M. C. (2011). Dutch National Food Consumption Survey 2007-2010: Diet of children and adults aged 7 to 69 years. *RIVM rapport 350050006*.
- Schneider, H., Dietrich, E. S. & Venetz, W. P. (2010). Trends and Stabilization up to 2022 in Overweight and Obesity in Switzerland, Comparison to France, UK, US and Australia. *Int. J. Environ. Res. Public Health*, 7(2), 460-472.
- Siegel, P. S. (1957). The completion compulsion in human eating. *Psychological Reports*, 3, 15-16.
- Silayoi, P. & Speece, M. (2007) "The importance of packaging attributes: a conjoint analysis approach", *European Journal of Marketing*, 41 (11/12), 1495 - 1517.

- Simonson, I., & Nowlis, S. M. (2000). The role of explanations and need for uniqueness in consumer decision making: Unconventional choices based on reasons. *Journal of Consumer Research*, 27(1), 49-68.
- Steenkamp, J. B. E. (1990). Conceptual model of the quality perception process. *Journal of Business research*, 21(4), 309-333.
- Teas, K. R., & Agarwal, S. (2000). The Effects of Extrinsic Product Cues on Consumer's Perceptions of Quality, Sacrifice and Value. *Journal of the Academy of Marketing Science*, 28 (2), 278-291.
- Ventour, L. (2008). *The food we waste* (Vol. 237). Banbury/Oxon: WRAP.
- Vermeir, I. & Verbeke, W. (2006). Sustainable Food Consumption: Exploring the Consumer "Attitude – Behavioral Intention" Gap. *Journal of Agricultural and Environmental Ethics*, 19 (2), 169.
- Voedingscentrum encyclopedie, pasta. Retrieved on 1-5-2016, from <http://www.voedingscentrum.nl/encyclopedie/pasta.aspx#blok7>.
- Voedingscentrum, Groente. Retrieved on 6-6-2016, from <http://www.voedingscentrum.nl/encyclopedie/groente.aspx#blok7>.
- Vranešević, T. & Stančec, R. (2003) "The effect of the brand on perceived quality of food products", *British Food Journal*, 105 (11), 811– 825.
- Wang, E. S. T. (2013) "The influence of visual packaging design on perceived food product quality, value, and brand preference", *International Journal of Retail & Distribution Management*, 41 (10), 805-816.
- Wansink, B. & Cheney, M. M. (2005). Super bowls: serving bowl size and food consumption. *JAMA*, 293, 1727–1728.
- Wansink, B. & Van Ittersum, K. (2007). Portion Size Me: Downsizing Our Consumption Norms. *Journal Of The American Dietetic Association*, 107(7), 1103-1106.
- Wansink, B. (2004). Environmental Factors That Increase the Food Intake and Consumption Volume of Unknowing Consumers*. *Annu. Rev. Nutr.*, 24, 455-479.
- Wansink, B., Painter, J. E. & North, J. (2005). Bottomless bowls: why visual cues of portion size may influence intake. *Obesity research*, 13 (1), 93-100.
- Wansink, B., van Ittersum, K. & Painter, J. E. (2006). Ice Cream Illusions: Bowls, Spoons, and Self-Served Portion Sizes. *American Journal of Preventive Medicine*, 31 (3), 240-243.
- van Westerhoven, M. & Steenhuisen, F. (2010). *Bepaling voedselverliezen bij huishoudens en bedrijfscatering in Nederland*. Amsterdam: CREM.
- Williams, H., Wikström, F., Otterbring, T., Löfgren, M. & Gustafsson, A. (2012). Reasons for household food waste with special attention to packaging. *J. Clean. Prod.*, 24, 141–148.
- Young, L. R., Nestle, M. (2002) The contribution of expanding portion sizes to the US obesity epidemic. *Am J Public Health*, 92, 246–249.
- Zlatevska, N., Dubelaar, C., & Holden, S. S. (2014). Sizing up the effect of portion size on consumption: A meta-analytic review. *Journal of Marketing*, 78(3), 140-154.

Appendix

Experiment details and questionnaire

Dear participant,

Thank you for joining this research for my Bachelor thesis. It will take approximately 10 minutes. First, you will shop for your ingredients for dinner tonight in one supermarket. Then, you will do the same, but in a different version of a supermarket. At the end, there will be a short questionnaire. Your responses will be anonymous. Participation is completely voluntary, so you can stop at any time you like. By signing the participation list, you will agree to participate in this research. If you have any further questions, you can contact me or Ellen van Kleef (MCB group).

In this experiment, you will be cooking pasta for dinner. You will be cooking for four people in total, of which two women and two men. You already have the tomato sauce at home. You need to shop for:

- Pasta (macaroni)
- Onions
- Paprika
- Cheese

You will go to two different supermarkets, but the recipe remains the same. Once you have selected your items, leave them on the table and move to the computer to fill in the questionnaire.

Thank you for participation!
Florine

 **WAGENINGUR**
For quality of life

Thank you for your participation. This questionnaire is the last part of the experiment and will take approximately 5 minutes. Please answer all questions honestly, there are no wrong answers.

Participant number:

What is your gender?

Male

Female

What is your age?

0% 100%

>>

Survey Powered By [Qualtrics](#)

Questions about the selection of food

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
I'm satisfied with the amount of food I selected for four people	<input type="radio"/>				
I found it difficult to estimate how much food I would need for four people	<input type="radio"/>				
I had more difficulty selecting the amount of food WITHOUT a packaging than WITH a packaging	<input type="radio"/>				

Personal questions

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I'm feeling hungry.	<input type="radio"/>				
I think this recipe looks delicious	<input type="radio"/>				
I often prepare this kind of dish for four people	<input type="radio"/>				

I would describe my cooking ability as...

Little or none	Know enough to get by, but not how to prepare a great variety of food	Can prepare a simple meal without much problem	Can prepare many dishes and like to experiment with new recipes
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Do you have any comments or feedback?

May we approach you to participate in other scientific studies from the Marketing and Consumer Behaviour Group? These will mostly be online questionnaires which can be filled in at home. Please write your email address below: