

**THE EFFECT OF UNIT SIZE AND  
PACKAGING ON CONSUMPTION**

**An approach using the unit size bias**

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## Abstract

One reason for the growing epidemic of obesity is the increase of portion sizes during the past decades. Continuous exposure to large portion sizes influences the perception of what an appropriate portion size is. In deciding how much to eat people are influenced by environmental cues. People presented with larger portions tend to eat more. This is called the “portion size effect”. This study uses the unit size bias – the phenomenon that small units of food reduce food consumption because of the norm that a unit is the appropriate amount to consume – in order to shed more light in snack consumption. The aim of this study is to examine whether unit size and the presence (vs. absence) of packaging have an impact on consumption of indulgent snack food. Furthermore, the perceived impulsivity of the participants as well as their perception of what is an appropriate portion size are central.

Participants (n=165) were told to eat as much as they want in a supposed taste study. They were randomly assigned to one the four conditions in a 2 (unit size: large vs. small) x 2 (package: yes vs. no) between-subjects experiment. The provided amounts of food were equal but the unit size differed (15 small chocolates versus 3 large chocolates). Package was absent or present requiring each participant to unwrap the snack before consumption.

The results indicate a main effect of unit size on consumption. Approximately 23% less consumption in small unit size conditions has been observed. An interaction effect between unit size and package showed that the most chocolate was eaten in large unit size unpacked condition, and the least in small unit size unpacked condition; a difference of 38% (93kcal). Nearly half of the large condition participants consumed in units. It was also found that given equal amounts of food, smaller unit size is perceived as more impulsive.

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# 1. Introduction

A plethora of scientific and news articles nowadays deals with the growing epidemic of obesity. The phenomenon of obesity started around the 1980s but it has increased sharply in the two past decades (Young & Nestle, 2002; Friedman, 2003; James 2008). It has been formally framed as a major public health problem from the World Health Organization (WHO) in 1997 (James, 2008). According to Hedley at al. (2004) nearly two thirds of the American population are classified as overweight or obese, which is also supported by Flegal and colleagues (2002) who report that almost one third is obese. Even though the problem is more eminent in the U.S., increasing obesity is a worldwide phenomenon which not only threatens obese peoples' lives, but it is also a big burden for the health sector. The limited opportunities for energy expenditure, especially in Western societies is also a factor contributing to this (Steenhuis & Vermeer, 2009). In the U.S., nearly 10% increase of obesity was observed in the period 1991-2000, plus an increase of the weight of the average American from 7 to 10 pounds (BMI from 26.7 to 28.1) in that same period (Friedman, 2003). Another point of concern is that this phenomenon is also to be found in children, not only adults (Young & Nestle, 2002). In a similar vein, total energy intake has increased approximately 200kcal per day since 1977 (Devitt & Mates, 2004). In Western societies people tend to eat around 2.5 snacks per day (Stroebele et al., 2009). Moreover, snacks have increased in energy density, frequency of consumption, and contribution to daily energy intake in the U.S. since the 1970s (Marchiori et al., 2011).

Even though a big body of literature has been dedicated to the physiological mechanisms that influence food choice, less has been done to examine how and why the environment influences consumption volumes (Wansink, 2004). Wansink (2004) distinguishes two main environments that influence consumption: the eating environment and the food environment. In the environmental part he identifies factors associated with eating but independent of the food itself such as atmospheric, the effort required to obtain the food, the social side of it and the distractions that occur. In food environment he identifies factors directly related to the provision and presentation of food, such as its salience, structure, package/portion size, way of presentation (stockpiling), and way of serving it. He argues that even though people acknowledge and are aware of the existence of environmental factors influencing their consumption, in many cases they wrongly believe they are unaffected. This phenomenon is defined by Wansink and Sobal (2007) as "hesitancy", meaning that people hesitate to acknowledge being influenced by an external cue – or they look for alternative explanations - even in cases when they are presented with tangible evidence of being biased by it (Wansink & Sobal, 2007; Vartanian et al., 2008). For example, in that study only 4% of the participants acknowledge being influenced by a specifically named environmental cue.

This study will focus on packaging/portion size as an influencing factor on food consumption. The reason is that during the same period, thus from around 1980 till now the portion sizes in both the marketplaces (packaged foods) and in out-of-home consumption – e.g. restaurants, fast foods - have increased as well (Young & Nestle, 2002; Steenhuis & Vermeer, 2009). Let's take the U.S as an example: people engage increasingly - about 14% - in out-of-home consumption compared to the 1970's, where it is possible that they are being exposed to larger portions (Ledikwe et al., 2005). Furthermore, the US food supply provides 500kcal/day per capita more than what was supplied in the 1970s (Young & Nestle, 2002). The results of Young and Nestle (2002) show that the vast majority of food in the current marketplace exceeds the sizes of those in the past. Thus, large food portion sizes may be a contributing factor on the problem of obesity (Raynor et al., 2009). Furthermore, larger sizes in food products are

used by companies nowadays as selling points, in order to increase their market share as it has been found that not only do large packages attract more attention but the profit from food products rises consistently when the size of the product increases (Young & Nestle, 2002). The same holds for portion sizes in Europe; even though they are smaller in comparison with the ones provided in the US, they have been also increased during the past decades (Steenhuis & Vermeer, 2009). All the aforementioned circumstances have created an 'obesogenic' environment because of the easily accessible, abundantly available, high energy density foods (van Strien et al., 2009).

Steenhuis and Vermeer (2009), argue that there are two main reasons why people buy and consume larger portion sizes: the 'value for money' and the 'portion distortion'. The first, is the relatively lower price of the larger sizes in comparison with the smaller ones mainly because of lower packaging costs. Thus, they offer to the consumer more value for money. The second, refers to the perception that larger portion sizes are 'normal' or 'appropriate' to consume. This way an implicit suggestion or consumption norm is provided to the consumers as to how much one is appropriate to consume (Steenhuis & Vermeer, 2009; Wansink, 2004; Wansink et al., 2011; Geier et al., 2006; Geier et al., 2012; Herman & Polivy, 2005). Thus, this continuous exposure to large portion sizes, have rendered large portions to be perceived as standard in the minds of the consumers (Steenhuis & Vermeer, 2009), a dangerous phenomenon provided their activity levels (Young & Nestle, 2002).

According to Geier and colleagues (2006), portion size consists of two variables: unit size and amount of food. Thus, portion size and unit size are not the same. Actually, portion size includes unit size. For example, if a product is packaged in five small units vs. one large unit containing equal amount of food with the five small ones put together, then unit size changes but total amount of food stays the same.

Geier and colleagues (2006) have introduced another concept, which provides an interesting perspective in the field of consumption and unit size. It is a new heuristic and it is called the 'Unit bias'. According to their line of thinking, "*a single entity is the appropriate amount to engage, consume or consider*", provided that the size of the entity is within a reasonable range of sizes. They use this bias as a conceptual basis for understanding why portion size has an influence on food intake and more specifically why smaller portions may produce lower food intake (Geier et al., 2006). Furthermore, they define two possible reasons as to why people stop after eating one entity. The first one, social influence, refers to the social environment at the moment of choice as people do not want to look greedy for free food and more importantly they don't want to be eating too much in front of others. The second one, cultural norms and learning, refers to the consumption norm discussed above; things are packaged in consumption units by culture – e.g. as a mothers typically tell their children to "clean your plate". Thus, people assume that when they are served a portion of food, that portion 'represents an authoritative judgment as to what one ought to eat' as Herman and Polivy (2005) suggest. This second reason is backed up by the contamination of a product from the person once the package is open and the person began to consume it, coupled with the culturally induced expectation that the person has to complete consumption of the entity which discourages wasting food (Geier et al., 2006). This holds true also for children as it has been found that cultural consumption norms are internalized and can impede awareness of physiological cues already from around the age of 4 (Marchiori et al., 2012). Research available to date on the unit size bias is limited and this study will try to shed some more light on its effect on consumption.

People tend to rely to consumption stereotypes and norms set by their social environment on how much one should consume in a certain situation. More particularly, Vartanian and colleagues (2007) in their research review on consumption stereotypes and impression management, report that results from the studies they examined show that people make inferences about others based on food intake, especially when they get no other information except a written description of a situation. The authors

believe that people refer to such stereotypes in order to judge others on their intake. This shows the symbolic value of food and its role in social life, identity expression, communication, status and gender roles (Vartanian et al., 2007). Furthermore, they argue that those stereotypes may not only reflect people's beliefs but they may also drive behavior and their actual consumption. Such stereotypes are created in societies through time and they are part of social norms which people use as source of information as to how to behave appropriately (Roth et al., 2001). In most cases people are not aware that they adhere to social norms. The results of Roth and colleagues (2001) show that both dieters and non-dieters were motivated to behave like everyone else had, and no participant identified the influence of the norm on the amount of food they ate. The influence of social norms, thus, is both on making judgments on others but also on suggesting how much one is appropriate to eat. If one exceeds those limits set by social norms, then one may be perceived as impulsive. The term 'impulsivity' has been defined by Mukhopadhyay et al. (2008) as *'experiencing a sudden and unplanned urge to behave in a hedonically pleasing manner that is immediately gratifying'*. Thus, perceived impulsivity of the participants will be central in this study, as in different conditions it may have a mediating role on consumption. The aim in this case is to examine in which case participants feel more impulsive and to discover whether the existence of such feelings has an effect on consumption. This study will try to shed more light on the interplay between the unit size bias and perceived impulsivity and their impact on consumption. Note that perceived impulsivity is treated in this study as an attribution, meaning that the interest lies on how participants infer the causes of their own behavior and of the behavior of others.

Another reason for taking into account participants' perceptions of impulsivity is the conflict one experiences when exposed to a hedonically tempting but unhealthy food item (Mukhopadhyay et al., 2008). The chocolate bars used in this study are an example of such a hedonic food item. The authors argue that in such situations (especially impulsive) people struggle between opposing forces or goals. This study will focus on the feelings of impulsivity for own consumption as well as for the consumption of an imaginary individual, in order to examine whether differences when judging others (on the same consumption amount) exist, which leads us to the consumption stereotypes analyzed above.

A third factor that will be taken into account in this study, is the existence or absence of a package. It has been suggested in existing literature that visual cues such as an empty package create a natural pause moment and call attention to the act of eating. Thus, it attracts the attention of the person in eating again (assuming that by being busy with screen media, one will be in a low-control condition). In this way an empty package interrupts 'mindless eating' and may help consumers to control their intake (Geier et al., 2012).

The work of van Kleef et al., (submitted) has addressed to the impact of the aforementioned factors on consumption, but it was requiring from the subjects to consume the whole quantity of food provided and did not examine the impact of the existence of a package.

## **1.1 Problem statement**

The increasing obesity worldwide but mainly in the Western societies is influenced by many factors and has deep roots even in culture and norms. A contributing factor for increasing obesity may be the increase of portion sizes. Moreover, the majority of the people are used to eat in units (e.g. one piece per occasion) and finish what they started eating. In many cases this is the appropriate way of consumption. Adding to this, culture packages things in units suggesting people to "clean their plate" or

“finish what they started eating”. Thus, what people perceive as ‘a unit’ may have significant impact on their intake. Here is where the unit size bias comes into play.

The environment influences people without them being aware or they are hesitant to acknowledge being influenced. Younger people spend a lot of time in front of screen media such (e.g. TV or PC), while at the same time lunching, dining or having a snack. Furthermore, people eating alone - which is common when they sit in front of screen media - may eat a different amount than those eating with others (Wansink et al., 2005). This because, in such an occasion people may refer to what they perceive to be an appropriate unit to eat due to been distracted or to external cues such as an empty package. In essence, the resulting amount of consumption can be significantly influenced by those two factors.

The perceived impulsivity of people in such situations may also have mediating impact on their consumption. For many reasons, such feelings may differ between individuals and it is important to examine to what extent they play a role on consumption.

## **1.2 Aim of the study**

The aim of this study is to examine whether the unit size bias and the existence (or absence) of packaging have an impact on consumption and evaluation of indulgent snack food. In particular, it is interesting to examine whether people tend to eat more when food is offered in larger units instead of smaller ones, but also whether there is a difference between food offered with or without a package. Finally, it will try to uncover the precise role of the feelings of impulsiveness and of the appropriateness of the portion size and whether they mediate in order to affect consumption.

## **1.3 Research questions**

The main research question of this study is:

*‘Given equal caloric provision of snacks in all conditions; does the unit size and/or the (non)existence of a package influence consumption and/or feelings of impulsiveness?’*

In order to answer this research question, the following sub-questions should be answered first:

1. *What is the effect of unit size on intake if the food items are offered with or without their package?*
2. *To what extent do participants feel impulsive after consuming snack food differing in unit size?*
3. *To what extent are participants able to estimate their own intake afterwards?*

## 2. Theoretical framework

### 2.1 Influence of the environment on food consumption

Empirical evidence shows that people make more food-related decisions than they think they do, and if they were more conscious of the number of such decisions they make in a day, they could be more aware of how their environment is influencing them (Wansink & Sobal, 2007).

In an attempt to shed light to why portion size has impact on consumption Wansink and colleagues (2005) developed a model where norms and expectations may mediate or explain some part of the impact of portion size on consumption. In many cases people are biased in their estimates about how much was eaten due to environmental factors (e.g. portion size) and thus they have problems reducing the discrepancies between perceived and actual consumption. Hence, they may rely more heavily on easy-to-monitor visual cues that are related to their consumption expectations because they are not able to effectively monitor how much they consume due to the environmental factors in play (Wansink et al., 2005). An example can be the overreliance of people in visual cues to determine when to stop eating (e.g. relying on how much is left on their plate or bowl). In essence, their attention is distracted from actual intake and satiety and is more focused on their visual cues. All these visual cues (i.e. portion size, how much food remains, size of food container) constitute the environment of eating and are very convenient as they lessen the need of continuously monitoring one's level of satiety (Wansink et al., 2005).

The results of the study of Wansink et al. (2005) serving normal bowls in half of the respondents and self-refilling bowls in the other half, show that in both conditions subjects believed they ate less than they actually did, but in the self-refilling the effect was stronger. More specifically, the subjects eating from normal bowls thought they had eaten 32.3 kcal fewer than in reality, while the subjects eating from self-refilling bowls thought they had eaten 140.5 kcal fewer than what they actually ate. This result shows that their eyes have tricked their stomachs, and that overreliance on visual cues may result in increased intake. The point here is clear: biased visual cues of how much has been eaten (estimated by how much is left) influenced consumption volume but had no impact on the respondents' estimated consumption and on their reported satiety (Wansink et al., 2005). The same was found in the sandwich study of Rolls and colleagues (2004), where there was no difference in ratings of hunger and fullness following consumption despite the significant differences in intake (6, 8, 10, 12-inch conditions).

Rolls and colleagues (2002) in their macaroni and cheese study, posit that larger portions of food offered may alter peoples' expectations about the amount they could eat. This in turn may affect their ratings of hunger, fullness and pleasantness of food (Rolls et al., 2002). This is also in line with the findings of Raghbir & Krishna (1999) who argued that subjects when initially presented with a food portion (reasonable size, not extreme) they may have an approximate expectation of how much they intend to eat.

Van Strien and colleagues (2009) in their study on overeating, use the term "external eating" to describe cases where consumption is influenced by external food-related cues such as the sight or smell of the food itself. They further argue that people who rely on such cues from the environment, may pay less attention to feelings of fullness, hunger and satiety and may develop emotional eating (i.e. impulsive eating).

## 2.2 Increasing portion sizes in society

A trend of increasing portion sizes of food products and meals in restaurants during the past decades has been observed in the both in the U.S and Europe (Young & Nestle, 2002; Matthiessen et al., 2003; Steenhuis & Vermeer, 2009). Nielsen and Popkin (2003) tried to determine trends in food portion sizes consumed in the U.S. and found an increase in both portion sizes and energy intake in the period 1977-1996 for all their respondents. They argue that this portion size increase led to an energy intake increase. Their main finding was that during that period, portion sizes both inside and outside home have increased for many categories of products such as salty snacks, soft drinks, french fries, desserts and more. They further argue that such portion size increases as well as their impact on obesity were substantial.

In support of this finding, Young and Nestle (2002) reported that portion size increases were most evident in fast-food restaurants where the meals have been estimated to be two to five times larger than two decades ago (Young & Nestle, 2003). Additionally, in their second study they compared the sizes of food products when first introduced in the market by their manufacturers with the sizes now available. They found that in all cases the sizes now are larger or equal with the ones introduced in the past.

In Europe during the past decades the portion sizes have also increased, even though the sizes are smaller in comparison with the sizes in the U.S. (Steenhuis & Vermeer, 2009). For example, Rozin and colleagues (2003) found that portion sizes in the U.S. are 25% larger than in France, where obesity rates are lower. Matthiessen and colleagues (2003) in their second study about the size of the commercial foods where they obtained information from selected food manufacturers and fast food chains, found out that the increase in portion sizes of sugar-sweetened beverages and confectionary (i.e. sweets, chocolate bars, ice creams) since the 1960's was 20-100%. Moreover, the biggest increases were observed during the 1990's.

Larger portion sizes have been marketed as "value for money" solution to consumers whose food purchases are influenced by pricing, as they have to pay relatively less for what they pay (Wansink, 1996; Matthiessen et al., 2003; Young & Nestle, 2003; Ledikwe et al., 2005). What is more, larger portion sizes are more profitable for food producing companies and restaurants (Young & Nestle, 2002). This is the reason why both companies and restaurants use large portions at a low cost per unit as a marketing strategy (Ledikwe et al., 2005). Moneywise this is also profitable for consumers.

Nowadays, there seems to be confusion on what is an appropriate portion size or serving. Because of the increasing portion sizes over the years and the continuous exposure to them, authors argue that a consumption norm has been created which suggests that larger portion sizes are 'normal' or 'appropriate' to consume (Steenhuis & Vermeer, 2009; Wansink, 2004; Wansink et al., 2011; Geier et al., 2006; Geier et al., 2012; Herman & Polivy, 2005). Hogbin and colleagues (1999) give an additional explanation for this phenomenon, arguing that there is variation between the guidelines given by governments about appropriate portion sizes and the existing offers in the market, which results in information conflict about appropriate portion sizes. More particularly, consumers have difficulties recognizing the appropriate amount to consume for their weight and activity levels (Young & Nestle, 2003). Note that Young and Nestle (2003) also found that the size of the marketplace portions exceed the standard portion size set by the government in a varying degree for all foods except sliced bread.

### 2.3 Portion size effect

There has been a significant body of literature on the effect of portion size on consumption, examining its effect with different food products ranging from snacks to actual food and from distinct shape food items to amorphous food. The increased availability of bigger portion sizes has a strong influence on how much people generally consume. This phenomenon is called the “portion size effect”, which basically assumes that people eat more when confronted with larger portion sizes. Examining the findings of the literature available on the “portion size effect” will give a first picture on the effects of different portion sizes in consumption.

Rolls et al. (2004) in their study on the effect of portion sizes in intake found that for both males and females, sandwich intake increased significantly as the portion size of the sandwich increased (6, 8, 10, 12-inch conditions), which in turn also significantly influenced total energy intake at lunch. More specifically, a 100% portion increase resulted in a 31% increased energy consumption in females and a 56% increase in men. A 50% increase in portion size resulted in a 12% and a 23% increase in energy respectively.

This trend has been also found in the study of Rolls et al., (2002) using dishes of macaroni and cheese (500g, 625g, 750g, and 1000g conditions) where subjects – men and women, normal-weight and overweight, restrained and unrestrained eaters - consumed 30% more food in the 1000g portion condition in comparison with the 500g one. The trend was evident also in the two middle-portion conditions. Also interesting is the finding that in both serving conditions (dishes served to the respondents or they serve themselves) consumption increased with portion increase, meaning that in the self-serving condition respondents took a significantly greater amount per serving spoonful (Rolls et al., 2002).

In a similar vein, consumers at a cinema ate an average of 53% more popcorn from a large container than from a smaller one (Wansink and Park, 2001). The authors further argue that it is more difficult for consumers to monitor their consumption when eating from larger containers. What is more, customers who received the 100% portion rated the appropriateness of the portion and the amount of food they consumed similar to those who received the 150% portion, which is a sign of difficulty in monitoring and estimating the amount of food portions (Diliberti et al., 2004).

The strong impact of the “portion size effect” has been proven by the finding that portion size results in higher consumption even though the taste of the food item is not favorable (Wansink and Park, 2001). In this study perceived taste has been taken into account and the findings have questioned the common sense saying that what tastes better will be more consumed. The authors offered two different types of popcorn: one with favorable taste and one with an unfavorable taste. The results have shown that the average volume consumed was not significantly different between those two groups. Thus, it is argued that even though increases in perceived taste make eating a more pleasant experience, they do not always relate to significant increases in consumption volume (Wansink & Park, 2001). Note that the effect of portion size on consumption is the same between the two groups even if one of them does not like the taste, but find it merely adequate (Wansink & Park, 2001).

### 2.4 Unit size bias

The “unit size bias” provides another explanation for the portion size effect. Geier and colleagues (2006) use it as a conceptual basis in order to understand why portion size has an influence on food intake and more specifically why smaller portions may produce lower food intake. The unit size bias is the tendency of people to think of a single entity as the appropriate amount to consume, provided that the size of the

entity is within a reasonable range of sizes (Geier et al., 2006). The majority of people consume – and actually complete – entire “units” when eating snacks or a meal. This is supported by the underlying tendency of packaging things in natural consumption units by culture. The following section will provide empirical evidence for the impact the unit size bias has on intake.

#### *2.4.1 Empirical evidence*

Interesting results have been found in the study by Chang et al. (2012), where subjects had to deal with three different conditions: distinct large rice balls, distinct small rice balls, and amorphous rice. The results showed that in the distinct large rice balls - amorphous rice comparison, subjects ate significantly less (243.5g, 412kcal) of distinct large rice balls than of amorphous rice (317.2g, 536.7kcal). Furthermore, in the distinct small-distinct large rice balls comparison, subjects ate significantly less (190.6g, 322.5kcal) of the small rice balls than of the large ones (243.5g, 412kcal). Moreover, the eating rate was lower for distinct rice balls than for amorphous rice (Chang et al., 2012). Thus, it has been found that the subjects, despite of consuming more of the amorphous rice, felt similar satiety and hunger from amorphous and distinct food (Chang et al., 2012). They were unable to monitor the difference in intake.

Marchiori and colleagues (2011) in their study with candies found out that smaller unit size led to 60kcal less consumption. Participants received either normal sized candies or the same candies cut in half and unit size had this effect, and the authors found out that despite the variation in unit size, participants served the smaller candies did not compensate by consuming more in numbers. Similarly to the previous study of Chang et al. (2012), no significant differences across conditions in ratings of hunger have been found.

The aforementioned findings are also applicable to children being served 126 grams of cookies, either 18 normal sized cookies, or 36 half-sized cookies. The results show that children in the large item condition consumed 25% (68kcal) more cookies (in grams) than the children in the small item condition, even though small item condition children consumer greater number of cookies (14.6 vs 9.2) (Marchiori et al., 2012).

In support of the aforementioned findings, Stroebele et al. (2009) found that participants consumed an average of 186.9g less in snacks per week when they received 100kcal snack packs, in comparison with standard size packages of snacks. This study has been done in two weeks with two groups of people. The first group received 100kcal packages of snacks in the 1<sup>st</sup> week and standard size packages in the second, and the second group received them the other way around. It has been reported that the first group during week 2 consumed an average of only 486.7g (only 113.5g more than the 1<sup>st</sup> week) from the standard size packages, compared to the 675.5g consumed by the other group when they received the standard size in week 1.

Raynor et al. (2009) provided participants with single-serve packages or standard packages of food to consume at breakfast as part of an 8-week behavioral weight control intervention. The result was that participants who received foods in single-serving packages consumed about 15% less energy as compared to participants which received these same foods in non-portioned packages. It is important here to note that amorphous food (i.e. cereal and applesauce) was less consumed in the single-serving condition, while there were no significant differences for distinct shape food (i.e. peaches).

In the study of Wansink et al. (2011), subjects were given either one large 400-calorie package of crackers or four smaller 100-calorie sub packaged crackers while watching a television comedy. After watching the show, the leftovers were measured and participants completed a background questionnaire. In this case, smaller unit size led to 25.2% less consumption. Especially overweight

participants ate more crackers when eating from one large package than when eating from four smaller packages.

Dividers in big packages may also have the same effect as smaller portion sizes (i.e. decreasing intake) (Geier et al., 2006). In this study by using red potato chips as dividers, Geier and colleagues (2006) have found that dividers significantly decreased how many chips a person ate. They reported that the dividers had an effect of approximately 50% reduced intake and their use also helped subjects in being more accurate in their estimates of how much they ate. On the other hand, king size packages of chocolate where two pieces are included in one package may not help reducing consumption. Vermeer et al. (2010) in a study with such king size chocolate bars, have found that the 92.9% of the respondents intended to consume both pieces of a king size chocolate bar within the same day.

According to do Vale and colleagues (2008), package may have an impact on the consumption eaten, as they found that large packages of potato chips were significantly less opened than small packages (38.9% vs 66.2%). Thus, they are questioning the belief of consumers that smaller quantities of tempting (hedonic) products are 'acceptable' and the consideration of single-serving packages as helpful tools for self-control. Especially when self-regulatory concerns were activated this effect resulted in less consumption. This happened because the small package size acted as a consumption norm irrespective of self-regulation activation. Participants with activated self-regulatory concerns were twice as likely to start consuming from small packages and in case they did consume, they consumed twice as much.

The differences in intake and behavior between restrained and unrestrained eaters have also been examined. Scott et al. (2008) have found that restrained eaters consumed more calories from the mini-M&Ms offered in small packages than from the regular M&Ms offered in large packages. On the other hand, unrestrained eaters consumed more calories in the large condition than in small condition. The results were the same when cookies were used instead of M&Ms. In the study of Argo and White (2012), participants were given either a bowl which contained five small packages of four candies or a bowl contained 20 candies without package. The authors found that participants of the 'low appearance/self-esteem' group consumed significantly more candy when the small package was present than when it was absent, while no differences were found among the participants of the 'high appearance/self-esteem' group despite the (non)existence of package.

An interesting approach is that of Mishra et al. (2012) with their 'fork size' studies. In two studies they examined the influence of fork size to intake in a restaurant environment. Participants have been assigned in two condition groups: small fork size and large fork size. In their first study they found out that the subjects consumed more food from a small rather than from a large fork and that those being offered bigger servings ate more. In the second study though, subjects assigned to the large fork condition consumed more pasta than those assigned to the small fork condition. Thus, the method/medium of eating also has an impact on consumption.

#### *2.4.2 Explanations given*

Different authors offer different explanations on the unit size bias. When it comes to food shape, amorphous food impedes one's ability to visually determine appropriate amount to eat, because it is difficult to monitor how much one consumes of such food. People need an 'appropriate' unit to rely to, thus food unit size is the important determinant of how much one will consume. This explanation has been given by Chang and colleagues (2012) in order to explain their findings in their study on distinct shape and amorphous foods (3 conditions: small and large distinct shape rice balls, and amorphous rice).

In support of the explanation above, it has been argued that when one unit (one piece of the food product) is not enough, the decision on how much to eat is based on food characteristics, norms and

cognitive bias. Furthermore, when it comes to food characterized by distinct parts, one unit corresponds to a number of food items rather than to gram weight. The above explanation is given by Marchiori et al. (2011) and Marchiori et al. (2012) for their study with candies and they mean that in such a case, a possible norm for candies, for example, would be to consume 5 to 10 candies (handful). Thus, the subjects in their study focused on consuming an 'appropriate' number of food items and did not pay attention to their size, this is why reducing the size of the cookies decreased food intake. So, the difference found in numbers is related with the 'unit size bias' and has an unconscious influence on people. Another example of 'appropriate' unit to consume comes from the study of Vermeer et al. (2010) where the two pieces of chocolate included in the king size package are perceived as one unit. This happened because consumers perceive the entire package as a unit instead of perceiving one piece of it as a unit.

The third explanation given is complementary to the above: People are unable to monitor through their body, so they rely on cultural and visual cues. It may be more related to cultural dictates on 'appropriate' food unit size than a physiological regulatory system. This is the argument used by Devitt and Mates (2004) and they further suggest that energy density is not closely monitored within the body and that food volume is more tightly regulated.

Sub-packaging influences the unconscious of the participants, as in the study of Wansink et al. (2011) across conditions, all of them grossly underestimated the number of calories consumed. Furthermore, it has been found that there was no significant difference between how much people believed they ate, feelings of fullness or calorie estimation. It is notable that participants who consumed from the smaller packages claimed that they would eat less for their next meal.

People especially when visiting restaurants, are setting a goal in their minds. This goal is to satiate their hunger so they are willing to invest effort and resources to reach the goal. This so-called "goal setting" is another explanation brought forward by Mishra et al., (2012) to explain the contrasting results of their studies. This is the reason why participants in the small fork condition (in the first study) because of the size of the fork, have been 'provided' with a medium which would make it more difficult to reach their goal, which resulted in more consumption compared to the large fork condition. In their second study where the large fork group ate more, the authors suggest that because a well-defined hunger satiation goal was absent, people become anchored on the fork size as the 'appropriate' bite size. Thus, also in this case 'appropriate' unit size is in play.

Stroebele and colleagues (2009) argue, that the consumption of portion-controlled food first and of standard-size portion in the next occasion, raises the awareness of portion size for the people of that group and thus they tend to reduce the amount eaten later from standard size packages because of their increased awareness,. In a similar vein, single-serving packaged portions may limit the amount of food available for consumption, but more importantly they may also influence consumption norms by altering perceptions of the appropriate amount of food to consume (Raynor et al., 2009). Furthermore, the visual cues provided by these packages improve awareness and monitoring, making people more aware of the appropriate portion sizes. However, do Vale and colleagues (2008) argue that when temptations appear small, vigilance when making consumption decisions may be reduced. That is why tempting products in large package formats may increase consumer vigilance, attract attention in the act of eating and enhance self-control (do Vale et al., 2008). Note that in real-life situations inventory also plays an important role. Such results may be different depending on the inventory consumers have in their homes, plus the possibility of buying multipacks of single-serve (do Vale et al., 2008).

Restrained eaters are consciously and continuously aware of their eating behavior, thus they place considerably more emphasis on factors beyond their biological need for food. They may be hypersensitive to external cues because they have chronically suppressed their internal physiological

hunger indicators in order to decrease intake with the ultimate goal to lose weight. This is the argument of Scott et al. (2008) used to explain the differences found in intake and behavior between restrained and unrestrained eaters. The same holds for 'low appearance/self-esteem' people as Argo and White (2012) call them. This category of people is more sensitive to external control properties of packages. As a result, they transfer regulatory responsibility to the package, offering them a respite from self-regulation of food intake.

Overreliance in external stimuli may backfire. This can happen because in some cases people may believe they are exerting self-control, but in reality they are lead to self-control failure, thus the opposite result (do Vale et al., 2008). Such an example is when people use products with 'low-fat' labels on the package: in such cases they may underestimate the number of kcal per serving and thus consume more of them, just because they relied on the label (an external cue).

Last but not least, when a stimulus is divided into more numerous segments, people tend to overestimate the quantity (Scott et al., 2008). Furthermore, consumers characterize smaller food in smaller packages as "diet food" because such a package size is the opposite of the larger food packages and portions that have become the societal norm and the 'appropriate' portion to eat.

## **2.5 Differences between different groups of people**

The results of the sandwich study by Rolls and colleagues (2004) showed that as portions increased the rate of increase in intake was twice as large in males as it was for females (females ate 70% of the amount that males did). In a similar vein, the study of Rolls et al. (2002) showed that females ate a mean 30% less food than males did, even though the portion size effect was the same for both genders. Furthermore, Wansink and Park (2001) have found that men eat more than women which is a logical assumption but still has to be taken into account when considering numbers and results.

In examining a representative sample of the Dutch population, van Strien et al. (2009) found that high overconsumers are more often overweight, have higher degrees of dietary restraint, and higher degrees of external eating (i.e. in response to external food-related cues). Note that participants were classified as high overconsumers if they reported overconsuming more than once per month. What is of even bigger importance is that high overconsumers are more often (well educated) females. The differences in consumption between restrained and unrestrained people have to do with their awareness of their eating behavior and their vulnerability to external cues due to suppressing their physiological hunger indicators as Scott et al. (2008) suggests, and they have to be taken into account when considering consumption results.

What has been found by van Strien and colleagues (2009) in their study about the use of screen media also holds for children, as in a previous study it has been found that there is a positive association between spending time with screen media and emotional eating (van Strien & Oosterveld, 2008).

## **2.6 Judgments of quantity**

People tend to judge amounts on the basis of number of units while on the same time ignoring the size of the units. Pelham and colleagues (1994) posit that people have the tendency to correlate the number of units into which a stimulus is divided (numerosity) and the total area, weight, or amount of a stimulus (quantity), which has as a result to infer quantity directly from numerosity (Pelham et al., 1994). They call this the "numerosity heuristic" and they argue that it is an adaptive procedure in that "more pieces of something are usually more of that something". Furthermore, using numerosity to infer quantity is a

relatively effortless process and thus difficult to resist, thus people may resort to it when they are unable to use a lot of cognitive resources, but also as a first resort or “default strategy” in making judgments required in daily life (Pelham et al., 1994).

The work of Teghtsoonian (1965) about the judgment of size is also relevant to the judgment of quantity. In a series of experiments, Teghtsoonian (1965) found out that there are differences between judgments of physical area and judgments of physical size. People can accurately judge physical areas but when it comes to apparent size, they always judge it less. For example, something that is 10 times bigger than something else looks 6 times bigger. The author argues that judged size is related to physical size by a power function, the exponent of which is less than unity. For three-dimensional figures, for example, it was reported to be 0.7.

## 2.7 Conceptual framework

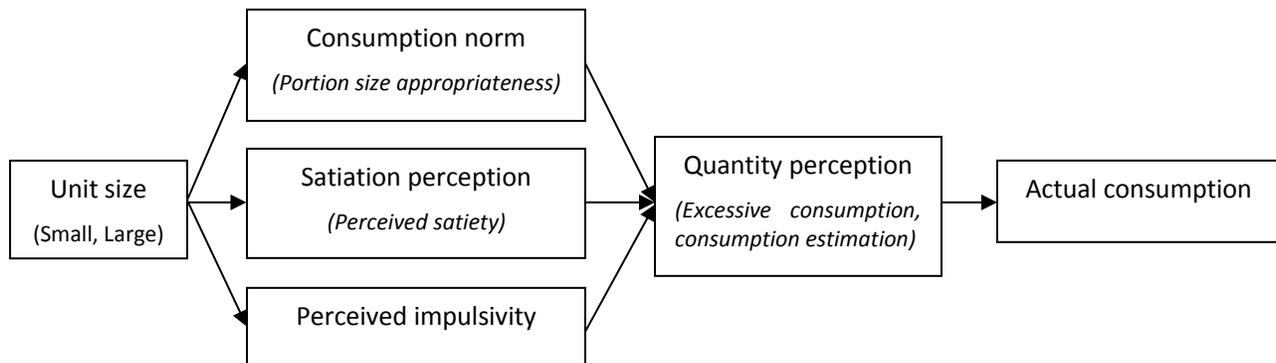
There are various studies dealing with the unit size bias (Devitt & Mattes, 2004; Geier et al., 2006; Do Vale et al., 2008; Raynor et al., 2009; Scott et al., 2008; Stroebele et al., 2009; Vermeer et al., 2010; Marchiori et al., 2011; Wansink et al., 2011; Argo & White, 2012; Chang et al., 2012; Marchiori et al., 2012; Mishra et al., 2012), all trying to examine its effect on consumption. Some of them are using two different versions of the same product (a large and a small one) and have shown that people eat less grams/calories when consuming small units. On the other hand, there is evidence that in certain circumstances one can get the opposite result, like in the study of do Vale and colleagues (2008), where it was found that large packages of potato chips were significantly less opened than small packages, which led to less consumption especially when self-regulatory concerns were activated. However, most of the studies show a trend that smaller unit size translates to less consumption. Thus, unit size is the first independent variable which will be manipulated in order to examine its effect on consumption.

As discussed in the preceding sections, the package itself plays an important role on consumption. Its size determines the size of the food product but it may also dictate what an ‘appropriate’ portion size to be consumed in one occasion is. Furthermore, the mere existence (or absence) of a package may have an impact on how much people will consume. For this reason, the existence or absence of package will be treated as an independent controlling factor in this study, meaning that the interest lies in manipulating it and examining whether it influences consumption, which is the key dependent variable of this study.

In this study three additional factors will be taken into account. Those are the perceived impulsivity of the participants, the appropriateness of the unit size which is set by culture and norms, and perceived satiety of the participants. All three factors may have a mediating role on the impact of the two independent variables on consumption and are not universal. They are more or less individual, thus every person may differ in this aspect. This is a reason why it is important to include them. Note that perceived impulsivity is treated in this study as an attribution, not as a personality trait. This means that the interest lies on how participants infer the causes of their own behavior and of the behavior of others.

This study posits that portion size appropriateness, perceived satiety and perceived impulsivity have an impact on how participants perceive quantity and the aim is to uncover the process by which this occurs. This is why participants have to estimate the quantity they consumed and this in turn will be compared to their actual consumption.

To make things simpler, the following figure visually represents the model that this study will use:



Note that package does not appear in the model, but its effect is taken into account as a controlling factor on consumption.

The main research question of this research is formulated as: *'Given equal caloric provision of snacks in all conditions; does the unit size and/or the (non)existence of a package influence consumption and/or feelings of impulsiveness?'*

Thus, the following hypotheses stem logically from the above:

*H: Compared to participants presented with large unit size snacks, participants presented with small unit size snacks will*

- a) consume less (in grams and calories)*
- b) perceive themselves and others as more impulsive*
- c) perceive the quantity consumed as higher*
- d) perceive the portion size consumed as less appropriate and more excessive*

Hypothesis (a) is based on previous empirical evidence suggesting that providing smaller portions/units leads to decrease in consumption in comparison with larger ones (Wansink & Park, 2001; Rolls et al., 2002; Rolls et al., 2004; Scott et al, 2008; Stroebele et al., 2009; Marchiori et al., 2011; Wansink et al., 2011; Marchiori et al., 2012).

The hypotheses (b),(c), and (d) are based on the results of the study of van Kleef et al., (submitted) on impulsivity, showing that the same amount of chocolate divided in more units is perceived as more impulsive and less appropriate. Furthermore, literature on quantity and size estimation support that on the one hand people judge amount on the basis of number of units and ignore the size of the units, while on the other they have problems in accurately predicting size, in that they have the tendency to underestimate the difference between the size of a large object in relation to smaller ones (Teghtsoonian, 1965; Pelham et al., 1994).

Note that the size and shape of the food item itself (without the package) will have a ratio of 1:5 between the conditions; thus five small size snacks equal one large size snack both in grams but also in caloric value. More information is provided in the following chapter.

## 3. Methodology

### 3.1 Design & procedure

This experiment is a 2 (unit size: large vs. small) x 2 (package: yes vs. no) between-subjects design in which participants – males and females – were randomly assigned to one of those four conditions. More analytically, the conditions were the following: large and small conditions when the snacks are offered in their original package and large and small conditions when the snacks are provided without their package.

Picture 1: the Mars bars used in this study



The aim has been to manipulate the two independent variables (existence or absence of package and unit size) in order to examine their impact on consumption and on the key variables.

The study was carried out in morning and afternoon sessions, in order to avoid getting biased results due to the time the measurements have been done. For this reason, the study was planned in such a way that all conditions would have measurements both in mornings and afternoons, in order to get a balanced study design.

Note that the original package of the large Mars bar offered nutritional information (i.e. grams and calories) in the front side, and even though participants were not aware that the study would be on consumption, there may be a chance that they paid attention to it.

In the first stage the participants had to give their informed consent for participating in the study. Then, they had to answer some questions about appetite, satiety, and hunger in that specific moment. In

order to avoid giving away the true purpose of the study, participants were told that it is about two short studies: one on humorous advertising of non-food products and another on the taste of Mars chocolate. Thus in the first part, the participants had to watch three humorous advertisements and answer questions concerning the use of humor in advertising. On the same time they were allowed to eat as much as they liked from the chocolate offered. The short video section has been also used in order to attract attention from the act of eating and give them enough time to consume. Moreover, it would provide helpful for simulating a familiar environment of the everyday life of a student, where distractors may exist during eating.

After the first part was over – the subjects had 10-15 minutes to consume to that point – they were asked to raise their hand and call the researcher. Then, the chocolates were collected together with the yellow post-it. On the one hand, that gave away the true purpose of the study, but on the other this would not affect their consumption considering that the chocolates were collected at the point in time.

### **3.2 Stimuli**

Participants were randomly assigned to one of the four different groups (i.e. four different conditions). Each participant had to sit in front of a computer, where three Mars chocolate bars (of 51 gram each) in the two large conditions were offered. In the small conditions 15 Mars miniatures (10 gram each) were offered. In all four conditions water was provided to each respondent. The respondents had to type a link in order to reach the questionnaire. The link was provided in a yellow post-it in front of them, together with a code which they had to type in at a later stage. Note that the quantity of chocolate offered was in purpose more than the subjects would typically consume, in order to avoid limiting their consumption because of limited inventory. The size, weight and caloric value of the food item itself (without the package) had a ratio of 1:5 between the conditions; thus 5 small size snacks equal 1 large size snack both in grams but also in caloric value. In all conditions the participants were asked to eat as much as they wish. Concluding, the total amount offered was almost similar; 3 normal sized Mars chocolate bars (153gr, 684kcal), 15 Mars miniatures (150gr, 672kcal).

### **3.3 Participants**

In order to test the hypotheses, a sample of 165 Dutch students (61 males and 104 females) has been reached. The main reason that only students could participate in this research is their increasing time expenditure in front of screen media like the television and the computer. Furthermore, the sample had to consist of Dutch students only, in order to avoid getting mixed results due to different lifestyles, eating behavior and cultural norms in case an international sample would be used.

### **3.4 Measures**

This section provides an overview of the measures used in this study along with the reliability of the scales used (groups of items in some questions). Participants self-reported their gender, age and also their height and weight, which were used to calculate Body Mass Index (BMI).

### *3.4.1 Hunger, satiety and satiation*

Before the first part of the study, the participants have been informed for the structure of the study and they had to answer some questions. In that introductory part, the feelings of hunger and satiety of the participants were measured by five items (100mm visual analogue scales). The questions were the following: “How hungry are you at this moment?”, “How full do you feel at this moment”, “How satiated are you at this moment?”, “How strong is your desire to eat?” all anchored by the terms “not at all” to “extremely” and the question “How much do you think you could eat right now?” anchored by the terms “not at all” to “a very large amount” (Blundell et al., 2010). Participants answered those same five items before and after consumption. After re-scaling (i.e. reversing on the opposite direction) the items “how hungry are you?”, “How much do you think you could eat right now?” and “How strong is your desire to eat?”, a reliability analysis has been run for before consumption ( $\alpha=0.87$ ) and after ( $\alpha=0.91$ ). Afterwards, the scores of those five items have been added up into a single hunger index ranging from 0 to 500.

### *3.4.2 Snack evaluation and expected satiety*

After the first part (with the humorous advertising) was over, participants were asked to evaluate the chocolate offered to them. They responded to various items: “looks delicious”, “looks powerful”, “gives energy”, “contains a lot of sugar”, “is a spoil”, “is a cheap snack”, “makes you full”, “is very tasty”, “makes you satiated”, “is appropriate as a light snack”, “tastes delicious”, “gives fast a very full feeling”, “is calorie rich”, “will satisfy me for a long time”, “makes me fat”, “will give a full feeling until the next meal”, “is very unhealthy” anchored by “totally disagree” to “totally agree”.

From the aforementioned items, expected satiety was measured by two items: “the chocolate that is in front of me will satisfy me for a long time” and “will give me a full feeling” which had an Cronbach’s alpha of 0.84. Expected satiation was measured by a single item “the chocolate in front of me will give me a full feeling”. All the items were anchored from “strongly disagree” to “strongly agree” in a seven-point Likert scale.

### *3.4.3 Portion size appropriateness and consumption estimation*

After the collection of the leftovers by the researcher, the participants entered the second part of the study. The first items had to do with portion size appropriateness. This was assessed by the items ( $\alpha=0.66$ ): “I just ate a very appropriate portion size” and “I ate a typical single person portion size”. Their feelings about excessive consumption were measured by two additional items ( $\alpha=0.80$ ): “I clearly ate more than you would expect of a typical portion of chocolate during a break” and “I ate too much chocolate”. All the items were anchored in a seven-point Likert scale from “strongly disagree” to “strongly agree”.

After the portion size appropriateness items, three items were used to assess the degree to which participants were able to estimate how many grams and calories they just ate. They had to do that in a scale from 0 to 1500 in calories and from 0 to 300 in grams. In the third item they have been asked to estimate the percentage they ate out of the total quantity offered in the study (scale 0-100). They also have been asked how often they eat this sort of chocolate products.

### *3.4.4 Emotions and perceived impulsivity*

The participants’ emotions have been categorized and assessed in three different groups: positive hedonic emotions, negative hedonic emotions and negative self-conscious emotions. The scale used to

measure emotions in this study has been adapted from the scales developed by Ramanathan and Williams (2007) and all items were under the main question “How did you feel while consuming the chocolate?”. Participants had to answer on a seven-point scale (1- “totally disagree” to 7 “totally agree”).

Positive hedonic emotions have been assessed by five items ( $\alpha=0.83$ ): “fun”, “relaxed”, “happy”, “satisfied”, “pleased”. The negative hedonic emotions were assessed by four items ( $\alpha=0.85$ ): “depressed”, “stressed”, “angry”, “frustrated”, and the negative self-conscious emotions by three ( $\alpha=0.80$ ): “guilty”, “ashamed”, “regretful”.

Two groups of items were used in order to measure the perceived impulsiveness of the participants, as the aim was to measure their own impulsiveness but also the impulsiveness of others. The items used were based on previously developed scales measuring impulsivity and self-control (Puri, 1996). To assess the participants’ own perceived impulsivity, five items were used ( $\alpha=0.84$ ) under the question “Thinking back to the quantity of chocolate you just ate, what are you thinking? I think that I...: “was self-indulgent”, “could not resist the temptation of chocolate”, “had little self-discipline”, “could not say ‘no’ to chocolate” and “had trouble stopping to eat chocolate”. To assess the participants’ perceived impulsivity of others, the same five items were used but under the question “What do you think about a participant who ate one third (1/3) from the total chocolate offered? I think that this participant is....” followed by the aforementioned five items. The reliability was  $\alpha=0.93$ .

It is important here to note that for both emotions and impulsiveness, all items have been answered on a seven-point Likert scale. Thus, all the items were anchored from “strongly disagree” to “strongly agree”.

### *3.4.5 Restrained eating*

In order to assess the dietary restraint of the participants, the restrained eating subscale of the Dutch Eating Behavior Questionnaire (DEBQ) has been used (van Strien et al., 1986). This subscale consisted of 10 items and the participants had to choose to which degree they do what was stated. They could choose from a five-point scale: “never”, “rarely”, “sometimes”, “often”, “very often”. The statements were the following:

- When you get a bit heavier, do you eat then less than usual?
- Do you try to eat less than you would like during meals?
- How often do you refuse eating or drinking because you are afraid that you put on weight?
- Do you keep track of what you eat?
- Do you eat on purpose products which help you lose weight?
- If you have eaten more, do you then eat less the next days?
- How often do you try to avoid snacks because you pay attention to your weight?
- How often do you try to avoid eating in the evening because you pay attention to your weight?
- Do you take your weight into account when you eat?

The aforementioned items have a high reliability, with a Cronbach’s alpha of 0.90. The restraint scores ranged from 10 to 46 with a sum of 22.3 (SD=7.79).

## **3.5 Data analysis**

In order to analyze the collected data from this study, IBM SPSS statistics 19 was used. Rating scales in some items have been reversed in order to bring them in the same direction with the other items (e.g.

re-scaling hunger items on the same direction as satiety items). Furthermore, mean scores on scales have been calculated. To calculate the participants' BMI the standard formula of weight (kg)/height (m<sup>2</sup>) has been used.

Analyses of covariance (ANCOVAs) were used in order to check whether there were differences between conditions in age, BMI and dietary restraint. As for gender, chi-square analysis has been used.

## 4. Results

### 4.1 Randomization checks

Gender was equally balanced across conditions: ( $\chi^2(1, 165)=0.691, P=.40$ ) for the unit size, and ( $\chi^2(1, 165)=0.394, P=.53$ ) for the package. This means that males and females have been equally distributed to all conditions. Furthermore, the mean age of the participants was 21.04 (SD=2.36) ranging from 17 to 30 years of age. They were not evenly distributed across the package conditions regarding their age ( $F(1,161)=32.05, P=.00$ ) for package. Thus, the variable of age has been used as a covariate later in the analysis.

The mean BMI for this study was 21.58 kg/m<sup>2</sup> (SD= 2.36, range 16.9-30.35). Also in this case, participants were not equally distributed across the package conditions ( $F(1,161)=6.02, P=.02$ ). Thus, also BMI has been used as a covariate in later analysis. Of all participants, 11 were overweight (BMI > 25).

There were no significant differences in mean restrained eating scores across conditions ( $F(1,159)=0.734, P=.39$ ) for unit size and ( $F(1,159)=0.067, P=.796$ ) for package. Furthermore, participants were equally distributed across all conditions regarding their hunger and satiety levels in the pre-consumption (unit size: ( $F(1,159)=0.21, P=.65$ ), package: ( $F(1,159)=0.05, P=.95$ )) as well as the post-consumption ratings ( $F(1,159)=1.64, P=.20$  and  $F(1,159)=0.77, P=.38$  respectively). Smokers and non-smokers were equally balanced across conditions: ( $\chi^2(1,165)=0.66, P=.42$ ) for unit size, and ( $\chi^2(1,165)=0.01, P=.93$ ) for package.

Note that there were three outliers in this study. Those participants – two in the large-unpacked condition and one in the large-packed – did not consume any chocolate but they filled in the questionnaire. However, considering their zero consumption, it has been decided that they had to be excluded from the analysis.

### 4.2 Consumption

#### 4.2.1 Consuming in consumption units

Before analyzing the results of the mean consumption per condition, it is important to mention whether or not units played their role. Starting with small unit size conditions, all 85 participants in the two small unit size conditions ate in units. This means that no participant started eating a small chocolate bar and did not finish it. But considering that these bars are small enough to be considered one bite (10 grams), taking a look at what happened in large conditions would be a better indicator on whether or not participants consumed in units. Out of the 77 large condition participants, 27 participants consumed one bar and 7 consumed two bars. More analytically, in the packed condition 11 participants consumed one bar and 3 consumed two bars, while on the unpacked condition the results were 16 and 4 respectively.

Thus, in total 34 participants, 44.2% of the participants in large condition, consumed according to the consumption in units notion. The remaining 43 participants did not consume in units. The aforementioned results demonstrate a strong tendency of the participants to consume in units. Thus they have the belief that a unit is the appropriate amount to eat – considering that the unit is not too small or too big – and if they continue to the second one, they tend to complete consumption of that unit.

#### 4.2.2 Mean of snack consumption across four conditions

The main aim of this study is to examine whether the unit size and the existence (or absence) of a package have an effect in consumption. Thus, the most important part of the analysis is that of the mean consumption results and the comparison between the different conditions. They are all summarized in Table 1. Figure 1 gives a visual depiction of the same results in all conditions, in order to make differences more clear.

**Table 1: mean consumption in grams (SD)**

	Small		Large		P-value		
	Packed	Unpacked	Packed	Unpacked	Unit size	Package	Interaction effect
<b>Consumption (grams)</b>							
<i>Participants</i>	n=44	n=41	n=39	n=38			
Mean	41.4 (21.7)	34.2 (20.2)	43.9 (26.4)	55.0 (24.2)	<.01	.44	.01

The mean consumption for both small conditions was 37.9 grams (SD=21.2) which is translated in 169.5 calories (SD=95). There were no outliers in the small unit size conditions. When it comes to the large conditions the mean consumption was 49.3 grams (SD=25.8) or 220.8 calories (SD=115.4).

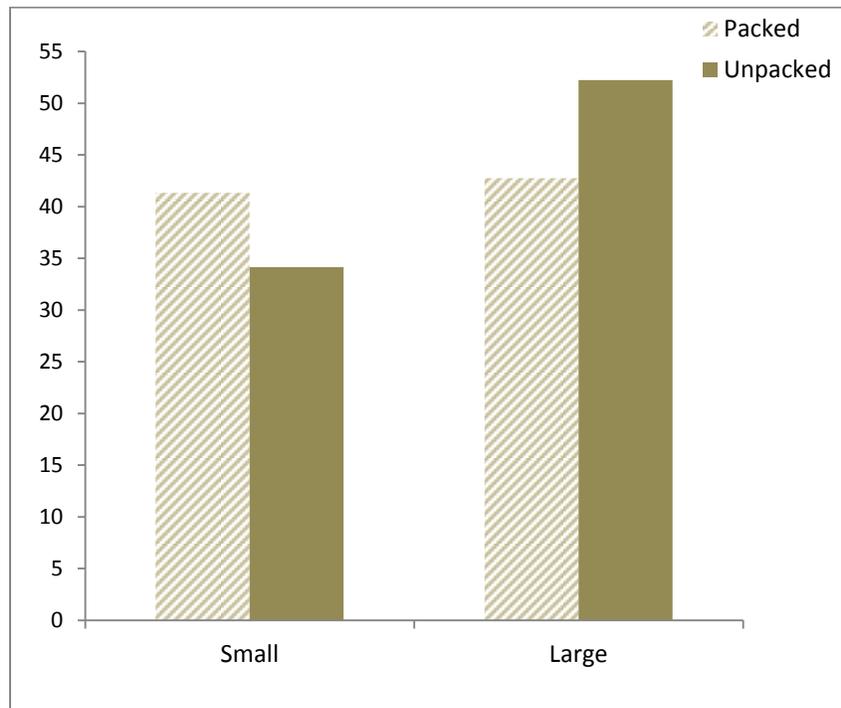
The results show that there has been a main effect of unit size on consumption ( $F(1,156)=9.31$ ,  $P<0.01$ ). This means that participants in the large unit size conditions ate more than participants in the small unit size conditions. Considering the above and the mean consumption results, it is evident that participants in the small unit size conditions ate approximately 23% less chocolate.

Thus, to answer one part of the main research question of this study, unit size indeed has an influence on consumption and more specifically larger unit size results in increased consumption.

There is, however, an interaction effect between unit size and package ( $F(1,156)=6.4$ ,  $P=0.01$ ). This shows that consumption was highest in large unpacked condition and lowest in small unpacked. In other words, participants ate (on average) the most when confronted with large unpacked chocolate bars, and the least when offered small unpacked chocolate bars. They consumed about 38% less in the small unpacked condition in comparison with the large unpacked condition.

Thus, except from the finding that there is a main effect of unit size on consumption, meaning that people will consume more when presented with larger unit size, solid findings for the effect of the package are not evident (all  $P_s>.44$ ) if one compares packed with unpacked conditions. However, if one examines the differences in consumption between the two unpacked conditions, it appears that there is an interaction between unit size and package. This means that the effect of the unit size is particularly there for the unpacked chocolates. When the chocolates are packed it does not seem to matter as the consumption differences there are small. Figure 1 offers a graphical depiction of the results.

Figure 1: mean consumption in grams:



Numerically speaking, the difference in the means between the two unpacked conditions is 20.8 grams which translates to 93.2 calories, while the one between the two packed conditions is only 2.5 grams (11.1 kcal). This is an interesting finding considering that the quantity of chocolate offered was the same in all four conditions.

The reported results of consumption confirm the hypothesis H(a), that participants presented with small unit size snacks will consume less. Furthermore, the results show that this effect of unit size is particularly there when the package is absent.

#### 4.2.3 Consumption estimation

Participants were unable to accurately estimate the amount of chocolate they consumed during the study. Across all conditions, they consumed on average 193.9 calories but estimated to have consumed on average 288 calories. This indicates that they overestimated their caloric consumption with 48.5%. In a similar vein, they overestimated their consumption in grams as well, as it can be seen in table 2.

There is a marginal effect of unit size on calorie estimation difference ( $F(1,156) = 3.33, P = 0.07$ ) in that even though participants overestimated in large conditions as well, they did it in a lesser degree both in packed and unpacked large conditions. No other main or interaction effects have been observed.

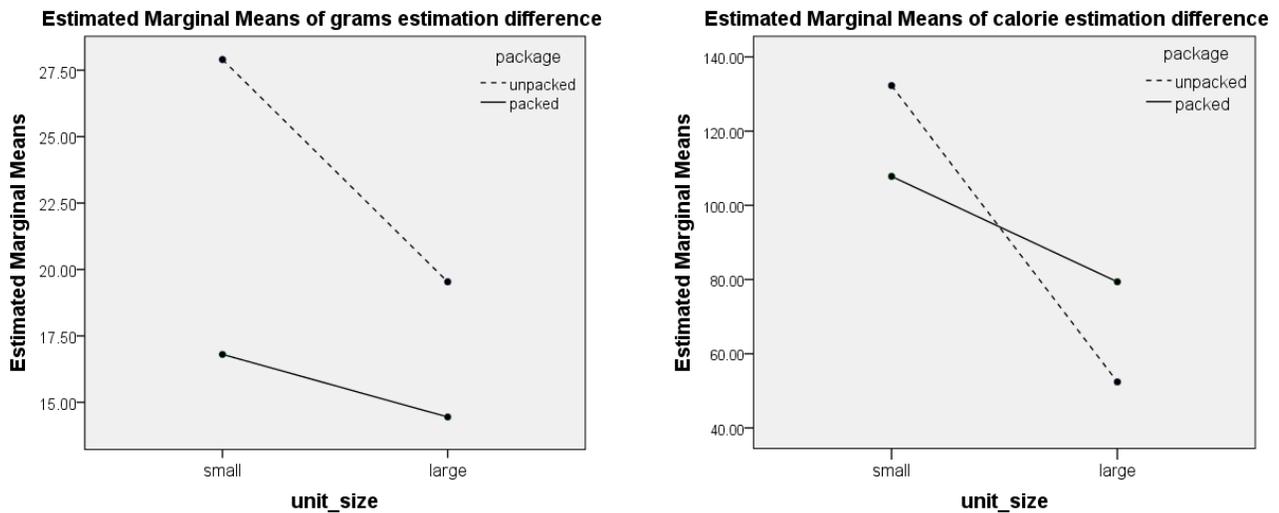
This finding partly confirms the hypothesis H(c) that participants presented with small unit size snacks will perceive the quantity consumed as higher in comparison with the participants presented with large unit size snacks. This is the case in the calorie estimation (with a marginal effect of unit size) but not in the gram estimation. It may not be safe though to draw conclusions on this as there is no effect of unit size in estimation of grams but only of calories.

**Table 2: Mean overestimation of grams and calories consumed (SD)**

	Small		Large		P-value		
	Packed (n=44)	Unpacked (n=41)	Packed (n=39)	Unpacked (n=38)	Unit size	Package	Interaction effect
<b>Overestimation</b>							
Grams	+16.8 (27.8)	+27.7 (33.6)	+14.3 (27.9)	+20.0 (43.9)	.32	.17	.58
Calories	+108.4 (185.8)	+130.7 (186.3)	+80.5 (168.3)	+52.3 (197.7)	.07	.97	.38

It is interesting that even though participants overestimated their consumption in both grams and calories, Figure 2 makes clear that whereas the existence of package plays a role in more accurate estimation in grams, in calories there is no such effect. Note that these are post-consumption measurements. However, the statistical analysis did not show any package or interaction of unit size and package effects in estimation differences.

**Figure 2: Comparison of grams and calories overestimation across conditions**



### 4.3 Portion size appropriateness

What participants consider as an appropriate portion size is of interest to this study, because it may have a mediating effect on consumption. Table 3 summarizes the mean of their responses to the statements “I just ate a very appropriate portion size” and “I ate a typical single person portion size” under “Portion size appropriateness”. No main or interaction effects have been observed.

Table 3 also provides the mean ratings of participants on two statements about excessively consuming. Also in this case there are no main or interaction effects.

The results here reject the hypothesis H(d), that participants presented with small unit size snacks will perceive the portion size consumed as less appropriate and more excessive in comparison with the participants presented with large unit size snacks.

**Table 3: Means of perceived appropriateness of portion and excess consumption (SD)**

	Small		Large		P-value		
	Packed (n=44)	Unpacked (n=41)	Packed (n=39)	Unpacked (n=38)	Unit size	Package	Interaction effect
Portion size appropriateness	4.6 (1.4)	4.9 (1.2)	4.6 (1.3)	4.5 (1.5)	.31	.54	.41
Excessive consumption perception	3.5 (1.6)	3.2 (1.5)	3.3 (1.7)	3.5 (1.7)	.82	.67	.27

#### 4.4 Perceived impulsivity

Perceived impulsivity is the second factor that has been introduced in this study as possibly having a mediating role on consumption. Perceived impulsivity consists of two different ratings in this study: own perceived impulsivity and perceived impulsivity of a supposed other participant (who eats 1/3 of the provided chocolate). The first part of table 4 gives a clear message: contrasting ratings in small vs. large condition. When it comes to the own perceived impulsivity ratings, they are more or less the same across conditions and as it can be seen in table 4 there are no main or interaction effects.

However, there is a main effect of unit size ( $F(1,156)=111.0$ ,  $P<.001$ ) on the perceived impulsivity of others (i.e. judging). Furthermore, perceived impulsivity of others is higher in both small unit size conditions in comparison with the large ones. This means that participants perceived that a supposed participant who ate 1/3 of the total provided chocolate in the small unit size was more impulsive than in the large size condition. No main effect of package ( $F(1,156)=1.76$ ,  $P=0.19$ ) or interaction effect between unit size and package ( $F(1,156)=0.90$ ,  $P=0.35$ ) has been observed.

This partly confirms hypothesis H(b) that compared to participants presented with large unit size snacks, participants presented with small unit size snacks would perceive themselves and others as more impulsive. Perceived impulsivity was higher in small unit size conditions but this is only applicable in the case of judging others and not own consumption. Note here that participants in both cases gave their ratings concerning the consumption of the same quantity of chocolate (one third of the total offered).

**Table 4: Means of impulsivity and emotions (SD)**

	Small		Large		P-value		
	Packed (n=44)	Unpacked (n=41)	Packed (n=39)	Unpacked (n=38)	Unit size	Package	Interaction effect
<b>Perceived impulsivity</b>							
Own	3.4 (1.5)	3.0 (1.4)	3.3 (1.3)	3.2 (1.2)	.82	.38	.69
Others	4.6 (1.4)	4.1 (1.4)	2.4 (1.1)	2.3 (0.7)	.00	.19	.35
<b>Emotions</b>							
Positive hedonic	5.1 (0.7)	5.2 (1.0)	5.3 (0.7)	5.2 (0.7)	.30	.90	.41
Negative hedonic	2.1 (1.1)	2.0 (0.9)	1.8 (0.7)	1.8 (0.9)	.06	.80	.70
Negative self-conscious	2.9 (1.2)	2.8 (1.3)	2.6 (1.3)	2.4 (1.2)	.11	.59	.82

When it comes to emotional status, participants have strong positive emotions from the consumption of chocolate and in general they scored low on the two types of negative emotions, meaning that they feelings as guilt, anger, unhappiness and more are not present. Secondly, there is a slight difference

between unit size conditions in negative feelings. While in positive feelings participants provide similar ratings, the ratings on the negative feelings show a trend of feeling more negatively in the small unit size condition. More specifically, there is a marginal effect of the unit size ( $F(1,156)=3.68$ ,  $P=0.06$ ) on negative hedonic emotions in that people feel slightly more negatively after consumption of small size bars. This is not the case for negative self-conscious emotions where no effects have been observed (all  $P_s>0.11$ )

#### 4.5 Snack evaluation, satiation and satiety

Participants have been asked to evaluate the chocolate in front of them by giving their opinion about it in several statements. Interesting here is the role of the package that seems to have a slight influence on the ratings of the participants. More specifically as it can be seen in Table 5, participants rate unpacked chocolates as more fatty in comparison with packed ones. This is to be seen in both small (6.3 vs. 5.9) and large (6.0 vs. 5.5) conditions, but there is no main ( $F(1,156)=2.14$ ,  $P=0.15$ ) or interaction effect ( $F(1,156)=0.04$ ,  $P=0.84$ ) of package.

Participants expect to get more satiated in the unpacked conditions rather than in the packed ones. When it comes to satiety though, even though the trend is the same for the small unit size, this is not applicable to the large one. This means that they do not expect to become more satiated from the unpacked large bars in comparison with the packed ones. Moreover, the ratings of expected satiation concerning the large condition are higher than those concerning the small one (5.0-5.2 vs. 4.3-4.9), meaning that in general the participants expected to get more satiated with large bars than with small ones. Additionally, there seems to be an effect of the unit size on expected satiation ( $F(1,156)=3.90$ ,  $P=0.05$ ) in that participants think they will become more satiated from the large bars than from the small ones.

**Table 5: Means of chocolate evaluation and satiety (SD)**

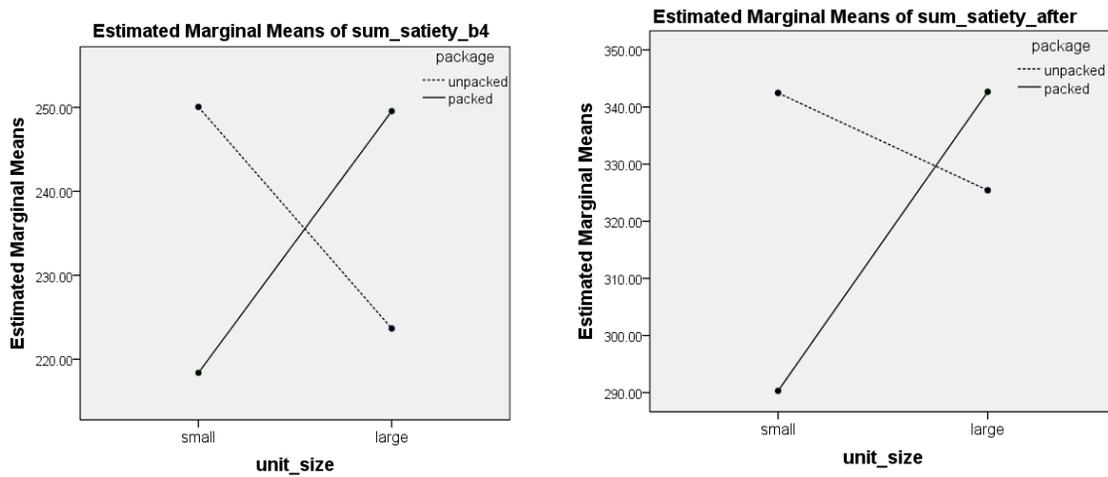
	Small		Large		P-value		
	Packed (n=44)	Unpacked (n=41)	Packed (n=39)	Unpacked (n=38)	Unit size	Package	Interaction effect
<b>The chocolate in front of me is...</b>							
Fattening	5.9 (1.0)	6.3 (1.0)	5.5 (1.4)	6.0 (1.0)	.16	.15	.84
Very unhealthy	5.5 (1.0)	5.3 (1.6)	5.5 (1.0)	5.4 (1.4)	.92	.67	.66
Very calorie-rich	6.2 (0.7)	6.4 (0.8)	6.2 (0.8)	6.3 (0.9)	.83	.25	.68
Very tasty	5.7 (1.1)	5.5 (1.1)	5.8 (0.9)	5.8 (0.8)	.30	.77	.45
Expected satiation	4.3 (1.5)	4.9 (1.8)	5.0 (1.4)	5.2 (1.6)	.05	.18	.38
Expected satiety	3.3 (1.4)	3.6 (1.7)	3.7 (1.6)	3.6 (1.6)	.43	.85	.27
<b>Experienced satiety (range= 0-500)</b>							
Pre-consumption	215.8 (72.5)	257.0 (96.5)	244.4 (93.9)	224.5 (72.9)	.86	.84	.03
Post-consumption	287.9 (94.6)	348.7 (86.6)	337.6 (90.4)	326.7 (77.8)	.21	.25	.01

In this study the satiety of the participants has been measured in the beginning of the study (pre-consumption) and after collecting the leftovers by the researcher (post-consumption). Table 5 summarizes the mean ratings participants provided before and after consumption of the chocolate. Both satiety scales consist of five items rated from 0 to 100 in a 100mm visual analogue scale, so in total

0-500. In both pre- and post-consumption ratings there are no main effects but there is an interaction effect between unit size and package: ( $F(1,156)=4.75, P=0.03$ ) and ( $F(1,156)=6.31, P=0.01$ ) respectively. Note that the covariate BMI in this case had a significant effect on pre-consumption satiety ratings ( $F=1,156, P=0.02$ ) and a marginal effect on post-consumption satiety ratings ( $F=1,156, P=0.08$ ). Comparing the difference between pre- and post-consumption satiety levels per condition, it is evident that the participants of the large unpacked condition were on average the most satiated ones after consumption, while the participants of the small packed condition were on average the least satiated ones. In the large unpacked condition, participants consumed the most and the satiety ratings reported were also the highest. However, even though the participants of the small unpacked condition consumed the least, they were not the ones with the lowest post-consumption satiety levels.

Figure 3 provides a visual depiction of the pre- and post-consumption ratings.

**Figure 3: Comparison of pre- and post-consumption sum satiety ratings**



## 5. Discussion

The aim of this study was to get an insight on the effect of unit size as well as package on consumption, while taking into account the perceived portion size appropriateness of the participants as well as perceived impulsivity both for their own consumption but also for the consumption of others.

It has been found that participants presented with small unit size chocolate bars ate about 23% less chocolate than participants presented with large unit size chocolate bars. In a similar vein, they ate approximately 38% less chocolate when offered small unpacked bars in comparison to large unpacked bars. Thus, unit size influences consumption, in that smaller unit size results in less consumption. Furthermore, the combination of small unit size and absence of package results in the least consumption.

The phenomenon of culture packaging things in natural consumption units which influences people to consume in units as well as the “clean your plate” principle, have both been confirmed in this study. It is notable that nearly half (44.2%) of the large unit participants stopped while consuming a unit or two, both in packed and unpacked conditions. An important reason why people stop is that they believe that a unit is the appropriate amount to eat and they have the tendency to complete consumption of the unit they started consuming. This resulted in higher consumption in the large condition leading to people subconsciously eating more in order to finish the unit they started. Taking into account all of the above, and the theoretical background of other unit size bias related studies (Devitt & Mates, 2004; Geier et al., 2006; do Vale et al., 2008; Scott et al., 2008; Raynor et al., 2009; Stroebele et al., 2009; Vermeer et al., 2010; Marchiori et al., 2011; Wansink et al., 2011; Argo & White, 2012; Chang et al., 2012; Marchiori et al., 2012; Mishra et al., 2012), the results of this study confirm the unit size bias principle.

A view on the results of the estimation of the quantity consumed shows that there seems to be a difficulty in estimating quantity. An explanation on why this is happening can be given by the numerosity heuristic of Pelham and colleagues (1994). They posit that people have the tendency to infer quantity from numerosity (e.g. what is more in numbers is usually more in quantity), which as the authors argue may be a strategy of first resort - or a “default strategy” as they call it - as it is cognitively less demanding than systematic reasoning strategies. People rely on heuristics because they provide rapid answers which frequently prove to be correct (Pelham et al., 1994). Furthermore, another reason can be judged size. Judged size is related to physical size by a power function of less than unity Teghtsoonian (1965). This means that, something that is X times bigger than something else looks less than X times bigger.

This study found that given equal amounts of food, smaller unit size is being perceived as more impulsive. Furthermore, people are mild when judging their own consumption but they are strict when judging the consumption of others, even though they were asked to judge based on the same quantity consumed. Note that the original package of the large Mars bar offers nutritional information (i.e. grams and calories) in the front side, while this is not the case with the small unit size Mars bars. Also, the main effect of package was found to have no impact on estimation.

It is important to note that this study has been done in a university setting with limited facilities and this may have had some implications on the results. For example, a special room with cubicles would be the best option in order to prevent participants in contacting each other, even though in this study participants have been put away from each other. Nevertheless, it is not wise to argue that any contact at all has been prevented. For the same reason only students have been included in the research, because it was more convenient to reach them and because a big scale study with different age groups would require exponentially more time as well as facilities.

Note that this study did not check for compensation during the same day or the next days. Only one measurement has been done per participant and no data later in the day were collected in order to check whether any compensation has been done in the participants' consumption. Simply put, it is possible that unit size reductions in food consumption lead only to short-term reductions in intake. In the literature examined neither any significant effect on prospective consumption, desire to eat, or hunger ratings, nor on compensation by consuming more in numbers was found (Devitt & Mates, 2004; Marchiori et al., 2011; Chang et al., 2012). Still, there is a possibility that this consumption reduction may be compensated later in the same day. Future research on the possibility of compensation is needed in order to shed light to food consumption responses in portion size manipulations. An example could be a longitudinal study on the same topic including different age groups, and could provide an interesting insight in snack consumption and the possibility of compensation. Some examples of different age groups could be: kids, young students and non-students, people with more than average sport activity, and more. The aforementioned groups could provide interesting outcomes especially when participating in a longitudinal study separately or all together in a comparative study.

This study used a unit size ratio of 1:5. Different ratios may yield different results. Think of smaller ratios, where small unit size could possibly have the "flying under the radar" effect which do Vale and colleagues (2008) describe, leading to increased consumption. Further research is needed in order to shed more light in the effect of different unit size ratios between portions on consumption as well as the limits to which those effects apply.

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# Appendix

## A. Questionnaire

Beste deelnemer,

Fijn dat je mee wilt doen aan deze twee korte studies. Als eerste willen we je mening weten over een aantal commercials en dan met name over hun aantrekkelijkheid en humor. Daarna volgt een korte smaaktest voor Mars. Het invullen van alle vragenlijsten zal ongeveer 15 minuten duren. Er zijn geen goede of foute antwoorden, wil je invullen wat als eerste bij je opkomt? Als deelnemer aan dit onderzoek blijf je geheel anoniem. Als je allergisch bent voor Mars chocolade kun je niet meedoen met de studie. Verder zijn er geen risico's of voordelen verbonden aan het invullen van de vragenlijst. Je kunt op ieder moment beslissen om te stoppen met invullen. Door op 'ja' te klikken geef je aan dat je bovenstaande hebt gelezen en ermee instemt:

ja, ik doe mee aan dit onderzoek

---

Hoe hongerig voel je je op dit moment?

0 (helemaal niet hongerig) \_\_\_\_\_ 100 (extreem hongerig)

Hoe vol voel je je op dit moment?

0 (helemaal niet vol) \_\_\_\_\_ 100 (extreem vol)

Hoeveel denk je nu te kunnen eten?

0 (helemaal niets) \_\_\_\_\_ 100 (een enorme hoeveelheid)

Hoe verzadigd voel je je op dit moment?

0 (helemaal niet) \_\_\_\_\_ 100 (extreem)

In hoeverre verlang je nu naar eten?

0 (helemaal niet) \_\_\_\_\_ 100 (extreem)

Straks volgen een aantal vragen voor een smaaktest naar Marsproducten. Proef alvast van de chocolade die voor je ligt tijdens het volgende gedeelte van de vragenlijst.

Eet gerust zoveel of weinig als je wilt.



Nu volgen een aantal vragen over commercials. We willen graag weten wat je vindt van deze commercials. Bekijk de commercials rustig en beantwoord daarna de vragen.

-

Bekijk deze Miele commercial.

...

Wat zegt de advertentie over het product? Waar in de commercial zie je, hoor je of voel je dat? Licht je antwoord kort toe.

Hieronder staan verschillende concepten of gevoelens. Kies het gevoel of concept dat je het meest associeert met de commercial (slechts 1 keuze maken).

- iets bereiken en succes hebben
- een actief en vol leven leiden
- slimme keuzes maken
- de vrijheid om jezelf te zijn
- zelfstandig zijn
- geaccepteerd worden door anderen
- voor anderen zorgen, vooral voor de zwakkeren
- jezelf jong voelen en er jong uitzien
- persoonlijke zekerheid
- een goede ouder zijn
- een betere wereld maken
- een comfortabel en tevreden leven leiden

De volgende stellingen gaan over de commercial. Geef aan in hoeverre je het met de stelling eens bent.

	helemaal mee oneens (1)	mee oneens (2)	neutraal (3)	mee eens (4)	helemaal mee eens (5)
Dit was een grappige commercial	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ik wil minder eten tijdens mijn volgende maaltijd	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Het aangeboden product is zeer aantrekkelijk	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Deze commercial was saai	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Bekijk deze iPad commercial.

...

Wat zegt de advertentie over het product? Waar in de commercial zie je, hoor je of voel je dat? Licht je antwoord kort toe.

Hieronder staan verschillende concepten of gevoelens. Kies het gevoel of concept dat je het meest associeert met de commercial (slechts 1 keuze maken).

- iets bereiken en succes hebben
- een actief en vol leven leiden
- slimme keuzes maken
- de vrijheid om jezelf te zijn
- zelfstandig zijn
- geaccepteerd worden door anderen
- voor anderen zorgen, vooral voor de zwakkeren
- jezelf jong voelen en er jong uitzien
- persoonlijke zekerheid
- een goede ouder zijn
- een betere wereld maken
- een comfortabel en tevreden leven leiden

De volgende stellingen gaan over de commercial. Geef aan in hoeverre je het met de stelling eens bent.

	helemaal mee oneens (1)	mee oneens (2)	neutraal (3)	mee eens (4)	helemaal mee eens (5)
Dit was een grappige commercial	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ik wil minder eten tijdens mijn volgende maaltijd	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Het aangeboden product is zeer aantrekkelijk	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Deze commercial was saai	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Bekijk deze Statoil commercial.

...

Wat zegt de advertentie over het product? Waar in de commercial zie je, hoor je of voel je dat? Licht je antwoord kort toe.

Hieronder staan verschillende concepten of gevoelens. Kies het gevoel of concept dat je het meest associeert met de commercial (slechts 1 keuze maken).

- iets bereiken en succes hebben
- een actief en vol leven leiden
- slimme keuzes maken
- de vrijheid om jezelf te zijn
- zelfstandig zijn
- geaccepteerd worden door anderen
- voor anderen zorgen, vooral voor de zwakkeren
- jezelf jong voelen en er jong uitzien
- persoonlijke zekerheid
- een goede ouder zijn
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De volgende stellingen gaan over de commercial. Geef aan in hoeverre je het met de stelling eens bent.

	helemaal mee oneens (1)	mee oneens (2)	neutraal (3)	mee eens (4)	helemaal mee eens (5)
Dit was een grappige commercial	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ik wil minder eten tijdens mijn volgende maaltijd	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Het aangeboden product is zeer aantrekkelijk	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Deze commercial was saai	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Bedankt voor je antwoorden bij de commercials-test.

Nu volgen een aantal vragen van de Mars smaaktest. Proef de chocolade die voor je ligt zodat je de vragen goed kunt beantwoorden.



Heb je in de afgelopen vier weken gerookt?

- ja
- nee

Geef aan in hoeverre je het eens bent met de volgende beweringen. De Mars chocolade die nu (nog) voor me ligt....

	Helemaal mee oneens (1)	Mee oneens (2)	Een beetje mee oneens (3)	Neutraal (4)	Een beetje mee eens (5)	Mee eens (6)	Helemaal mee eens (7)
ziet er heerlijk uit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
is machtig	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
geeft energie	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
bevat te veel suiker	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
is een verwennerij	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
is een goedkope snack	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
is volmakend	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
is erg lekker	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
is verzadigend	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Geef aan in hoeverre je het eens bent met de volgende beweringen. Deze Mars chocolade....

	Helemaal mee oneens (1)	Mee oneens (2)	Een beetje mee oneens (3)	Neutraal (4)	Een beetje mee eens (5)	Mee eens (6)	Helemaal mee eens (7)
is geschikt als lichte snack	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
smaakt heerlijk	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
geeft snel een zeer vol gevoel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
is zeer calorierijk	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
zal voor lange tijd verzadigen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
is dikmakend	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
zal een vol gevoel geven tot aan de volgende maaltijd	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
is zeer ongezond	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Belangrijk: Schrijf nu hieronder de volledige code over die op het gele post-it papiertje staat.

Je bent aan het einde van het eerste deel van het smaakonderzoek gekomen. Roep de onderzoeker.

Laat de eventuele overgebleven chocolade liggen. NIETS ETEN OF MEENEMEN, ALSJEBLIEFT!

Ga pas verder met de vragenlijst als de onderzoeker bij je is geweest.

---

Stel je zou de chocolade die voor je lag aan het begin van het experiment willen kopen in de kantine van het FORUM. Geef aan hoeveel je bereid bent om te betalen.

0€ \_\_\_\_\_ 7€

Geef aan in hoeverre je het eens bent met de volgende beweringen.

	Helemaal mee oneens (1)	Mee oneens (2)	Een beetje mee oneens (3)	Neutraal (4)	Een beetje mee eens (5)	Mee eens (6)	Helemaal mee eens (7)
Ik at net een zeer geschikte portie chocolade	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ik at een typische eenpersoons portie chocolade	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ik at duidelijk meer dan wat je zou verwachten bij een typische portie chocolade tijdens een pauze	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ik at te veel chocolade	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ik at net een gepaste hoeveelheid chocolade	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Wat vond je van de hoeveelheid chocolade die je net gegeten hebt?

0 (veel te weinig) \_\_\_\_\_ 100 (veel te veel)

Hoeveel calorieën denk je dat je gegeten hebt? Maak een inschatting.

0 \_\_\_\_\_ 1500 (calorieën)

Hoeveel grammen chocolade denk je dat je gegeten hebt? Maak een inschatting.

0 \_\_\_\_\_ 300 (grammen)

Hoe voelde jij je tijdens het eten van de chocolade?

	Helemaal mee oneens (1)	Mee oneens (2)	Een beetje mee oneens (3)	Neutraal (4)	Een beetje mee eens (5)	Mee eens (6)	Helemaal mee eens (7)
plezierig	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
teneergeslagen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
gestrest	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ontspannen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
tevreden	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
boos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
voldaan	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
gefrustreerd	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
blij	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
schuldig	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
schaamte	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
spijt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
genietend	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Voor dit onderzoek werd je gevraagd om chocolade te eten. Terugdenkend op de hoeveelheid chocolade die je net gegeten hebt, hoe denk je daarover? Ik vind dat IK....

	Helemaal mee oneens (1)	Mee oneens (2)	Een beetje mee oneens (3)	Neutraal (4)	Een beetje mee eens (5)	Mee eens (6)	Helemaal mee eens (7)
gulzig was	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
de verleiding van chocolade niet kon weerstaan	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
over weinig zelfdiscipline beschikte	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
geen 'nee' kon zeggen tegen chocolade	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
moeite had om te stoppen met het eten van chocolade	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Wat vind je van een deelnemer die een derde (1/3) van de totaal gekregen portie op eet tijdens deze studie? Ik vind dat deze deelnemer.....

	Helemaal mee oneens (1)	Mee oneens (2)	Een beetje mee oneens (3)	Neutraal (4)	Een beetje mee eens (5)	Mee eens (6)	Helemaal mee eens (7)
gulzig is	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
de verleiding van chocolade niet kon weerstaan	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
over weinig zelfdiscipline beschikt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
geen 'nee' kan zeggen tegen chocolade	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
moeite heeft om te stoppen met het eten van chocolade	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Hoe hongerig voel je je op dit moment?

0 (helemaal niet hongerig) \_\_\_\_\_ 100 (extreem hongerig)

Hoe vol voel je je op dit moment?

0 (helemaal niet vol) \_\_\_\_\_ 100 (extreem vol)

Hoeveel denk je nu te kunnen eten?

0 (helemaal niets) \_\_\_\_\_ 100 (een enorme hoeveelheid)

Hoe verzadigd voel je je op dit moment?

0 (helemaal niet) \_\_\_\_\_ 100 (extreem)

In hoeverre verlang je nu naar eten?

0 (helemaal niet) \_\_\_\_\_ 100 (extreem)

Hoe vaak eet je Mars chocolade of soortgelijke chocoladerepen?

- nooit (1)
- minder dan 1 keer per maand (2)
- 1 keer per maand (3)
- 2-3 keer per maand (4)
- 1 keer per week (5)
- 2-3 keer per week (6)
- dagelijks (7)

Hoeveel heb je opgegeten van de totale portie Mars die je kreeg aangeboden? Maak een inschatting

0% \_\_\_\_\_ 100%

De volgende vragen gaan over voedingsgedrag. In hoeverre ben je het met de volgende stellingen eens?

	nooit (1)	zelden (2)	soms (3)	vaak (4)	heel vaak (5)
Wanneer je iets zwaarder bent geworden, eet je dan minder dan gewoonlijk?	<input type="radio"/>				
Probeer je minder te eten tijdens maaltijden dan dat je eigenlijk zou willen?	<input type="radio"/>				
Hoe vaak weiger je eten of drinken omdat je bang bent dat je zwaarder wordt?	<input type="radio"/>				
Houd je exact bij wat je eet?	<input type="radio"/>				
Eet je opzettelijk producten waarvan je afvalt?	<input type="radio"/>				
Wanneer je teveel hebt gegeten, eet je dan de daarop volgende dagen minder?	<input type="radio"/>				
Eet je opzettelijk minder om te voorkomen dat je zwaarder wordt?	<input type="radio"/>				
Hoe vaak probeer je geen tussendoortjes te nemen omdat je op je gewicht let?	<input type="radio"/>				
Hoe vaak probeer je 's avonds niet te eten omdat je op je gewicht let?	<input type="radio"/>				
Hou je rekening met je gewicht wanneer je eet?	<input type="radio"/>				

Wat is je geslacht?

- Man
- Vrouw

Wat is je lengte in centimeters?

\_\_\_\_\_ Lengte

Wat is je leeftijd in jaren?

\_\_\_\_\_ Leeftijd

Wat is je gewicht in kilo's?

\_\_\_\_\_ Gewicht

Wat denk jij dat het doel van deze studie is?

Je bent bijna aan het einde gekomen van de vragenlijst. Is je nog iets opgevallen tijdens het onderzoek of heb je nog andere opmerkingen?

Aan Wageningen Universiteit worden vaker studies verricht waarvoor wij op zoek zijn naar deelnemers. Mogen wij je hiervoor af en toe (maximaal 1 keer per maand) benaderen per e-mail? Zo ja, schrijf hieronder je e-mailadres (alleen als je nog niet in bestand staat, niet-wur adres is ook ok):

Hartelijk dank voor je deelname aan het onderzoek!

Klik op het pijltje naar rechts om de vragenlijst in te sturen.