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The role of edutainment in childhood obesity prevention: can a Nutri Ventures series containing only healthy food influence children´s preferences and food choices?

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THE ROLE OF EDUTAINMENT IN CHILDHOOD OBESITY PREVENTION: CAN A NUTRI VENTURES SERIES CONTAINING ONLY HEALTHY FOOD INFLUENCE CHILDREN´S PREFERENCES AND FOOD CHOICES?

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Abstract

Childhood obesity is one of the biggest public health problems of the 21st century, therefore, any studies that may contribute to fight it are important.

In this study, we wanted to see if edutainment containing only healthy food can change children´s preferences and food choices towards healthy eating, especially in overweight or obese children, and if the children´s self-regulation, emotional overeating and parents that use food as a reward would influence those changes. Thus, we conducted a study in two public schools (total 189 children) with a between-subjects experimental design (control vs. experimental group), where children in experimental group watched an episode of Nutri Ventures series without unhealthy foods.

The results showed no differences in both children´s preferences and children´s food choices between the control and experimental group, with exception of older children, where we saw children in the experimental group chose more unhealthy food than children in the control group. We also saw differences in food choices between "emotional overeating" groups, where the children in "high" group tended to choose less heathy food items, especially to children who watched the episode.

In conclusion, our results lead us to believe that isolated edutainment may not be enough to change preferences and food choices, instead it might even have an opposite effect.

Resumo

A obesidade infantil é um dos maiores problemas de saúde pública do século XXI, e por isso, todos os estudos que possam contribuir para o seu combate são importantes.

Neste estudo, quisemos perceber se o *edutainment,* contendo apenas alimentos saudáveis, pode influenciar as preferências e escolhas alimentares das crianças em direção a uma alimentação mais saudável, em especial para crianças com excesso de peso ou obesidade. Queríamos também perceber se essa mudança pode ser influenciada por alguns fatores tais como, a autorregulação e o *"emotional overeating"* das crianças e a utilização dos alimentos como recompensa por parte dos pais. Neste sentido, realizámos um estudo experimental (*between-subjects:* um grupo controlo e um experimental) em duas escolas públicas (total 189 crianças), onde as crianças do grupo experimental assistiram a um episódio da série Nutri Ventures, onde apenas aparecem alimentos saudáveis.

Os resultados não mostraram diferenças nas preferências e escolhas alimentares das crianças entre o grupo experimental e o grupo controlo, com exceção das crianças mais velhas, onde vimos que as crianças no grupo experimental escolheram mais alimentos não saudáveis do que as crianças no grupo controlo. Encontrámos também diferenças nas escolhas alimentares entre os grupos do fator "*emotional overeating*", onde as crianças do grupo mais elevado tenderam a escolher menos alimentos saudáveis, especialmente nas crianças que viram o episódio.

Concluindo, os nossos resultados levam-nos a acreditar que uma experiência isolada de *edutainment* pode não ser suficiente para mudar as preferência e escolhas alimentares das crianças, podendo até ter um efeito contrário.

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INTRODUCTION

Childhood obesity is one of the biggest public health problems of the 21st century, one in ten young people aged 5-17 years in the world is overweight or obese (World Health Organization, 2017).

In Europe the numbers are also very worrying, one in three boys and one in five girls aged 6-9 years is now obese, with prevalence generally higher in southern European countries, including Portugal (Ahrens et al., 2014; Wijnhoven et al., 2014). The last Report from the COSI[1] Portugal indicates that almost one in three Portuguese children aged 6-8 years are overweight or obese and 11,7% are even obese (Rito, Sousa, Mendes, & Graça, 2017).

Childhood obesity could result from several causes or a combination of causes, namely, unhealthy eating, insufficient energy expenditure, endocrine problems, genetic abnormalities and obesogenic environment (family, school, industry, media, government) (Parlesak & Krömker, 2008; Procter, 2007). The problems that may arise from childhood obesity are very serious, in other words, *"obese children are at greater risk of type 2 diabetes, asthma, sleep difficulties, musculoskeletal problems and future cardiovascular disease, as well as school absence, psychological problems and social isolation*" (World Health Organization, 2017: p8).

To be more effective, the entities responsible for developing and implementing healthy lifestyle promotion programs need access to more and more scientific knowledge. Most of these programs which aimed at preventing and controlling childhood obesity in Portugal provide no data regarding its theoretical and empirical basis, or detailed information on the activities performed and their evaluation. Thus, it is difficult to realize what is the best path to fight childhood obesity (Filipe, Godinho, & Graça, 2016). Moreover, some content aimed at educating children for healthy eating may be counterproductive regarding already overweight and obese children if it contains healthy and unhealthy food (Agante, 2018). In fact, scientific evidence shows that overweight and obese children may have less control over their motivational responses toward unhealthy foods cues (van Meer et al., 2016). So, this leads us to believe that programs aimed at educating children for healthy eating can be more effective if they do not have any unhealthy foods cues, especially for

[1] *Childhood Obesity Surveillance Initiativ*e – a surveillance system that produces comparable data among countries of Europe which allow monitoring of Childhood obesity every 2-3 years.

overweight and obese children. To our knowledge, there is no study where it has been assessed and, therefore, there is the need for the present study.

The aim of this research is to test if edutainment containing only healthy food can change preferences and food choices of children, especially overweight and obesity children, towards healthy eating. We conducted an experiment with children from a public school (pre-school and primary school), using an episode from Nutri Ventures[2] series which has only healthy food.

This study is thus another contribution for "solution" to fight childhood obesity, so important at this time and for the future of our children.

[2] Nutri Ventures is a tv series that promote healthy eating. It was launched in 2009 and currently is aired in 36 countries. This series got the endorsement of Michelle Obama through the Partnership for a Healthier America. (http://nutriventurescorporation.com)

1. LITERATURE REVIEW

1.1 Consumer Socialization of Children

Scott Ward was the first author to devote himself to studying children and their socialization into the consumer role. According to him, consumer socialization is a learning process *"by which young people acquire skills, knowledge, and attitudes relevant to their functioning as consumers in marketplace"* (Ward, 1974 p2).

Later, John presented a conceptual framework based on the theories of cognitive and social development, *"for understanding consumer socialization as a series of stages with transitions between stages occurring as children grow older and mature in cognitive and social terms*" (John, 1999 p183). In the different phases of childhood, children develop the knowledge, skills and values which they will use in making and influencing purchases now and in the future. The author proposes that consumer socialization can be seen as a developmental process that proceeds through three stages as children mature into adult consumers: the perceptual stage, the analytical stage, and the reflective stage.

In perceptual stage (3-7 years) children's knowledge is characterized by perceptual features and distinctions that represented concrete details from their own observations. Children at this age are familiar with concepts in the marketplace, such as brands or retail stores but they don't understand what is behind all this. Moreover, from 2 years old children are commonly allowed to select sweets, express desire for food or indicate preferences for toys. In this stage, decisions of children are frequently made on the basis of very limited information, generally a single perceptual dimension, for example, to make choices based solely on size. (John, 1999).

The next stage (analytical, 7-11 years) is characterized by enormous changes, both cognitively and socially. In this stage it is observed the shift from perceptual thought to more symbolic thought (a more abstract level) with an incredible increase in information processing abilities. In this period, children's thinking is developed in terms of functional or underlying dimensions, considering more than one dimension or attributes. The way they try to influence and negotiate for desired items is also more adaptive due to their new ability to think from the other person's perspective (example parent, friend) (John, 1999).

In the last stage (reflective 11 – 16 years) occurs a further development in dimensions of cognitive and social development, where the majority of the change is more a matter of degree than kind. The children´s knowledge becomes even more nuanced and more

complex, as well as their way of thinking and reasoning becomes more reflective. "*A heightened awareness of other people's perspectives along with a need to shape their own identity and conform to group expectations, results in more attention to the social aspects of being a consumer, making choices, and consuming brands."* (John, 1999: p187).

The John' conceptual framework (1999) is focused on age as the primary factor determining the transition from one stage to the next. However, children grow up surrounded by social environment. Thus, there are other factors that play an important role in the consumer socialization as well, namely family, peers, culture and mass media (John, 1999; Ward, 1974).

The family´s influence on consumer socialization is done more through subtle social interaction than purposive educational efforts, where the typology of family communication appears to be most influential (Cheon, Fraser, & Nguyen, 2017; John, 1999). Peers are an important influence socialization mostly when children move to adolescence (the reflective stage) and the parents' influence decreases. Different cultures and countries will present different influences on the child development as consumers. In the case of mass media and marketing, namely the advertising is clearly established that influences children's preferences and choices for products (Cheon et al., 2017; John, 1999; Ward, 1974).

The school is another important social agent that can influence consumer socialization as well. The availability and promotion of healthy food at school also play an important role on children's preferences and food choices (Carrete, Arroyo, & Villaseñor, 2017; Rexha, Mizerski, & Mizerski, 2010).

A healthy diet and physical exercise are personal decisions that depend on a number of external conditions (Carrete et al., 2017). Thus, the programs for fighting childhood obesity will be more effective by using the entire socioecological environment through the various socialization agents.

1.2 Edutainment

"Edutainment is the fusion of education and entertainment offerings, particularly popular or mass culture entertainments that take an educating function or invoke a pretense of having such functions." (Creighton, 1994: p35). In other words, edutainment is the convergence of education and entertainment to help children learn thought play (Barrey, Baudrin, & Cochoy, 2010; Creighton, 1994; Feenstra, Muzellec, de Faultrier, & Boulay, 2015).

The edutainment experience is different from any other form of consumption because the object is different, *"a message has replaced the object in the general interactive scheme, and this message has both an educational and an entertaining content. The subject, i.e. the consumer, expresses his own personality adding, there and then, his subjective responses to the experience"* (Addis, 2005 p730). The new technologies bring multimedia applications, connectivity and interactivity that enrich the experience and reinforce the convergence between education and entertainment (Addis, 2005).

According to the edutainment logic, the experience has to be playful, pleasant and fun to involve the commitment of children in the learning process (Barrey et al., 2010; Feenstra et al., 2015; Mathiot, 2010).

Previous research showed that children already have a sufficient knowledge on nutrition and understanding of what are 'good' and 'bad' foods for their health, but children might not employ it when selecting snacks (Dias & Agante, 2011). However, once edutainment uses immersive experience, it can change behavior through engaging "implicit attitudes", which are triggered by more intrinsic associations and not deliberated stimuli, in contrast to 'explicit attitudes' that are deliberate evaluations (Addis, 2005; Gawronski & Bodenhausen, 2006).

In the literature we can find a few studies that have shown the efficacy of edutainment tools in social marketing. Kara & Yeşilyurt (2008) investigated the effects of tutorial and edutainment design of instructional software programs related to the "cell division" topic on student achievements, misconceptions and attitudes. They observed in both experimental groups an increase in achievement in CAT (cell division achievement test) and in the experimental group who were using edutainment software program a significant change in students' attitudes towards biology. In other study Aoki et al. (2004) developed three different games designed to educate type-1 diabetic children about relationships among food (carbohydrate), plasma glucose level, exercise and insulin dose. The testers' opinions were that the games provide fun and entertainment with learning and were easy to use and intuitive. Thus, according to the authors the edutainment systems could have significant potential for healthcare education especially for children.

Recently, Rosi et al. (2015) carried out a nutritional program they called The "5 a day" game (edutainment technological platform), that includes lessons and educational videogames, with the aim of encouraging children towards a higher and more conscientious consumption of fruit and vegetables. The program lasted 3 months and involved 76 Italian

children with ages between 8-10 years old. Although this study had some limitations, among other, the small number of participants and there was no control group, the authors concluded that the interactive nutritional information and the action games have shown to be an excellent tool for edutainment (the average amount of fruit and juice consumed by the subjects increased, but not significantly, and the vegetable intake significantly increased).

Even more recently, Agante (2018) conducted a study, that provides the basis of this work, with 77 children from a public school where they were divided in two groups: experimental group that visualized a resumed episode of 10 minutes of Nutri Ventures series and the control group who did not see the episode. The results suggest a change in attitudes toward healthy eating and even in behaviors in experimental group. However, these changes were more pronounced in children with a normal BMI [3] or underweight. Moreover, overweight or obese children tended to like sweets more and chose less healthy items after viewing the edutainment episode than those from the control group, although no significant differences were seen.

1.3 Media and Obesity

It is recognized that the media influences children's product preferences and choices (John, 1999; Ward, 1974) where television plays an important role. Throughout the years, scientific research points to a relationship between television viewing and childhood obesity. In 1999, Robinson presented a study with students from public elementary schools (mean age 8,9 years), where were demonstrated a direct association between television, videotape and video game use and increased children's adiposity (Robinson, 1999). Most recently, a longitudinal study reinforces the relationship between obesity and TV-viewing, where they observed a decrease in BMI when they reduced the amount of media exposure of children from four hours or more to less than 30 minutes a day (Cheon et al., 2017).

Harris & Bargh (2009) suggest that the relationship between television viewing and childhood obesity results from endorsement of the messages presented in children's food advertising, for example the great taste seen in unhealthy food adverts (that are high in fat and sugar). In this study it is suggested that parents who teach their children to question the messages they see on television can reduce the influence of media on children. In this way, parents can contribute to building their children´s healthy eating.

[3] Body Mass Index

Contrary to the study of Harris & Bargh (2009), Cheon *et al.* (2017) found no significant difference in BMI of tweens (6- 12 years) when advertising message and brand were blocked by their parents (for example, they provided foods in unmarked containers to prevent brand exposure). This is probably due to the lower influence of parents in tweens and an increase in the influence of peers. So, the control that the parents exercise over food advertising message aimed at their children exists only for early stages.

A laboratory study (Bodenlos & Wormuth, 2013), which analyzed the effect of a cooking program on eating behavior of psychology students, between the ages of 18-22, suggest that watching this type of program (food-related program) leads to an increased consumption of sweet foods. According to the authors, these results are connected with activation of mental representation of "sweet foods" when the participants look at video with a fruit tart dessert. In this study, the students fell into the normal and overweight BMI categories and so, it could not be analyzed the effect of cooking program on the eating behavior of obese people. This only strengthens the idea that the presence of unhealthy food in media promotes unhealthy choices at all ages, leading to an increase on obesity.

As we saw earlier, the media has the power to influence the food choices, preferences and attitudes of children from an early age (Agante, 2018; Harris & Bargh, 2009; John, 1999; Nairn & Fine, 2008; Robinson, 1999; Ward, 1974). Thus, we are interested to see, with this study, if it is possible to use the media to promote heathy foods, consistent with recommendations by the Institute of Medicine (2006).

1.4 Childhood obesity and self-regulation

In the global world of today, where we are surrounded by many processed products with a high sugar and fat content, is very difficult for us to escape from temptations. All the more because *"humans possess an innate preference for sweet, high-fat and salty foods, and reluctance to try unfamiliar foods"* (Harris & Bargh, 2009 p1-2).

The homeostatic system of humans allows to regulate our appetite and food intake. This system comprises hormonal regulators of hunger, satiety and adiposity levels (example, leptin, ghrelin and insulin), "*which act on hypothalamic and brainstem circuits to stimulate or inhibit feeding in order to maintain appropriate levels of energy balance*" (Kenny, 2011 p664). However, same external (example cue exposure) and internal factors (example emotional characteristics) could affect the homeostatic signals. Palatable food generates pleasurable effects in such a way that in some individuals can overlap homeostatic signals and lead to excessive food

energy intake (Macedo, Freitas, & Torres, 2016). This may occur in the presence of food images used in advertising that increases both conscious and nonconscious craving, in particular among individuals who are hypersensitive to these cues, such as obese people (Shomaker et al., 2010; Stoeckel et al., 2017).

A recent study (van Meer et al., 2016) examined potential developmental differences in children's and adults' brain responses to food cues (unhealthy food and healthy food) to determine how these responses relate to weight status. The authors collected functional magnetic resonance imaging data during a food viewing task where unhealthy and healthy food pictures were presented. Results shows that unhealthy foods might elicit more attention when compared to healthy food in both children and adults. Children appear to have strong activation in areas involved in reward, motivation and memory while viewing unhealthy foods in comparison with healthy foods. The authors also found a negative correlation in children between BMI and the brain response to unhealthy foods compared with healthy foods in the bilateral dorsolateral prefrontal cortex, a brain area involved in top-down and cognitive control, self-control, appetite regulation and response inhibition. This correlation was not found in adults. Resuming, this study suggests that children with a higher BMI may have less control over their motivational responses toward foods, and therefore they may be more susceptible to tempting food cues, namely unhealthy foods cues.

Eating in response to emotions rather than homeostatic signals of hunger, called emotional eating, seems to be also associated to many maladaptive patterns of eating that contribute to weight gain and obesity and is commonly linked to an increase in consumption of sweets, high fat and energy dense foods (E. M. Powell, Frankel, & Hernandez, 2017). Additionally, overweight and obese people appear to be the ones who eat the most in the absence of hunger (Shomaker et al., 2010). The emotional eating is not uncommon in children, and one study found that 25% of 5 year-old girls reported emotional overeating (Carper, Orlet Fisher, & Birch, 2000).

Powell et al. (2017) studied if parental feeding practices like using food as a reward is the factor impacting children's propensity to emotionally overeat. The findings suggest that the parental feeding practice of using food as a reward over time is related to a reduction on child self-regulatory abilities, thus leading to increased emotional over eating. The lowering of self-regulation of eating and emotional overeating can be a risk factor for childhood obesity and for development of other eating disorders.

According to some studies, the changes in eating patterns that have occurred in recent decades with excessive consumption of palatable food may trigger neuroadaptive responses in brain reward circuits similar to drugs of abuse (Kenny, 2011; Macedo et al., 2016; Reichelt, Westbrook, & Morris, 2015; Temple, 2016). The dopaminergic system, that mediates brain stimulation reward, is responsible for sensitization ("*a process by which repeated exposure to the same stimulus results in greater responses over time"* [Temple, 2016 p90]) and responds to a broad range of reinforcing stimuli, including drugs, food, alcohol, access to a sexual partner, etc. The authors see the behavioral sensitization of the reinforcing value of food like a possible cause from overconsumption as in drugs abuse, due to some similar characteristics in both phenomena. Such as, 1) the effect is dose dependent; 2) the effect does not generalize to all foods, only high calorie density foods (food high in fat or/and sugars) triggers the strongest dopaminergic response; 3) not all individuals who repeatedly consume high calorie density foods present an increased motivational response, supporting the view that only some individuals with more susceptibility are at high risk for behavioral sensitization; and lastly, 4) sensitization was found for motivation to obtain food, ("wanting"), but not for hedonic ratings of food ("liking") (Temple, 2016).

Temple (2016) showed a strong relationship among sensitization of the reinforcing value of food, weight status and weight gain overtime, where overweight and obese people are more likely to present behavioral sensitization. In addition, individuals who show behavioral sensitization are more likely to gain weight over time.

According to this information, we believe that the content of programs to combat childhood obesity with only healthy food can be more efficient in changing preferences, attitudes and behaviors of overweight and obesity children.

2. HYPOTHESES

Based on previous research (Agante, 2018; Temple, 2016; van Meer et al., 2016), we believe that the edutainment containing only healthy food can be more effective in changing children´s preferences and spontaneous food selection towards healthy eating, namely overweight and obesity children. Thus, our main hypothesis is:

H1 Children who watch the edutainment stimulus containing only healthy food will have:

H1.1 a higher preference for the healthy food which are present in episode.

H1.2 a higher spontaneous food selection for the healthy food and a lower spontaneous food selection for the unhealthy food.

Children with low self-regulation, emotional overeating and with parents who use food as a reward appear to be more susceptible to tempting food cues (E. M. Powell et al., 2017; van Meer et al., 2016) and therefore, they may be more resistant to change towards healthy eating. So, we also want to see if children's self-regulation, emotional eating and parental feeding practice of using food as a reward are moderators in changing children´s preferences and spontaneous food selection towards healthy eating:

H2 Children with low self-regulation, emotional overeating and with parents who use food as a reward will have less changes after the edutainment stimulus on their preferences and spontaneous food selection toward healthy food.

3. METHODOLOGY

3.1 Ethics

Once the target of this study are school-age children, the required authorization forms were collected from three entities: (i)the Portuguese Education Ministry approving the study in elementary schools; (ii) the Schools approving the study and (iii) parents authorizing their child to participate (see appendix I). These requests were accompanied by an explanation of the aim and methodology of study according to the UNICEF rules by Graham, Powell, Taylor, Anderson, & Fitzgerald (2013).

Moreover, all the steps of an ethical research with children were followed (Graham et al., 2013; Greig, Taylor, & MacKay, 2007). The children were also informed about the dynamic of the activities and its methods, and their freedom not to participate if they do not wish, even if their parents have consented.

3.2 Sample

For the study, we recruited 217 children from 2 public schools in the municipality of Pombal (offering pre-school and primary school), of which 189 have actually participated (response rate = 87%).

The sample was composed by children between 4 and 11 years old, of which 38,5% are in the perceptual stage (< 7 years) and 61,5% are in the analytical stage (≥ 7 years). The number of girls (49,2%) is similar to the number of boys (50,8%).

Only 135 parents reported their children's height/weight for the purpose of calculating the BMI. The majority of children (65,2%) had a normal BMI, 20% were overweight, 3% underweight and finally 11,9% were obese. For the characterization of the BMI[4] we used the z-scores tables of the World Health Organization Child Growth Standards for 0-5 years and World Health Organization Reference 2007 for 5-19 years[5] (de Onis et al., 2007; World Health Organization, 2006).

The sample was distributed between both treatment conditions: control group and experimental group. See complete sample composition on Table 1.

[4] Body Mass Index = weight/height^2 (kg/m^2)

[5] Available on the website http://www.who.int/childgrowth/standards/en/

Table 1 *Sample constitution per gender, age, group condition and BMI*

	Ages		Group		BMI		
	< 7 years	≥7 years	Control	Experimental	Normal or Underweight	Overweight or Obese	**Total**
Girl	38	53	51	42	48	23	93 (49,2%)
Boy	32	59	37	59	44	20	96 (50,8%)
Total	70 (38,5%)	112 (61,5%)	88 (46,6%)	101 (53,4%)	92 (68,1%)	43 (31,9%)	**189**

The majority of parents don't have a degree (67,2%), however a higher percentage of the parents of young children (< 7 years) has a degree (44,3%) (vs. 24,3% of parents of older children).

3.3 Design

We conducted a study with a between-subjects experimental design (control vs. experimental groups) where children in experimental group were exposed to an edutainment experience. The aim is to compare the results between the two groups and validating or not our hypotheses. The same experimental model was already used by Agante (2018).

As we saw earlier, our sample was constituted by children between 4 and 11 years old, and for that reason, we decided to use a questionnaire composed of pictorial cues and imagens to assess their preferences and food choices in order to minimize a child's dependence on the spoken language in understanding the researcher's questions (Macklin, 1985).

The construction of the methodology and the materials of the study (namely the questionnaires) had the collaboration of the specialist in nutrition Cláudia Marques and the specialist of psychology Ana Costa.

3.4 Treatment condition

In this study, we used an episode of Nutri Ventures (edutainment), a tv series that promotes healthy eating. We have established contact with the responsible of Nutri Ventures Rodrigo Carvalho, to request a mini episode that promotes heathy eating but without appearing unhealthy food (foods high in sugar, fat and salt). However, it was not possible for them to build a new mini episode but they sent us some episodes, that are part of their

recent seasons, and where no unhealthy food appears. After analyzing every episode carefully, we chose the episode 45.

This episode lasts 22 minutes and it is part of the green kingdom (the vegetables kingdom) where the main characters use the "power" of vegetables (for example tomato) to win the veggie games. Throughout the episode, the main characters refer to the importance of a healthy diet (fish, eggs, water, milk, vegetables) to be strong, and on the other hand this episode never shows unhealthy food, a pre-requisite of this study.

3.5 Procedure

The entire experiment took place in classrooms with the assistance and supervision of the professor.

Classes were randomly assigned to one of the groups (control and experimental groups) to facilitate the process in school. Children in experimental group watched the episode (the whole class at the same time) and afterwards they responded to the questionnaire. Children in control group only responded to the same questionnaire (without the questions about the episode). In the young children's classes, children were divided into small groups (5-7 children) to answer the questionnaires, and in these classes, we had the help of the professors and assistants.

At the beginning of the experiment, the confidentiality was guaranteed, as well as, it was ensured that there are no right or wrong answers (so they can be as honest as possible), in order to reduce the probability of the children to answer the desired and correct regarding their "supposed" eating behaviors (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

Parents also replied to a questionnaire which had been sent with the parental consent prior to the main study.

3.6 Measures

Food Liking

We used the food liking scale to evaluate children´s food preferences levels, where children were asked to indicate how much they liked each food. This measure has already been used in other studies in children (Cooke & Wardle, 2005; Edwards & Hartwell, 2002; Wardle, Herrera, Cooke, & Gibson, 2003), namely in a study with Portuguese children (Dias & Agante, 2011), therefore we can consider a reliable measure.

Although the majority of these studies have used a five-point smiley Likert scale (Cooke & Wardle, 2005; Edwards & Hartwell, 2002; Wardle et al., 2003), we used a four-point smiley Likert scale, the same used by Dias & Agante (2011). So, children could choose from the four options: 1= I hate it; 2 = I don't like it; 3 = I like it; 4 = I love it, but could also indicate if they had never tasted the product, which was further coded as 0 = I never tasted (see Figure 1). Most of the healthy foods which appeared in the episode were analyzed in this question, such as: eggs, fish, milk, water, tomato, cabbage, pumpkin and carrot.

Figure 1 – "Smiles" s*cale to evaluate food liking levels.*

Food Choice

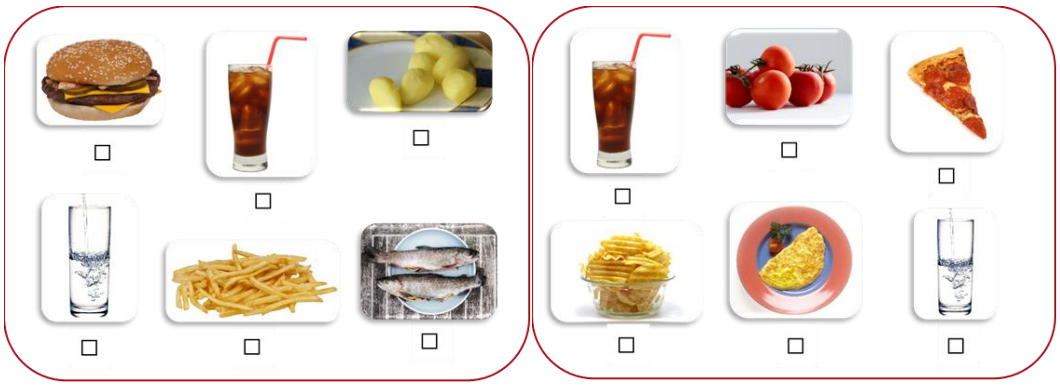
A food choice task (choice between healthy food vs unhealthy food) was used to evaluate the children´s spontaneous food selection. This procedure has already been used by Goldberg, Gorn, & Gibson (1978), Mallinckrodt & Mizerski (2007), Dias & Agante (2011), Agante (2018).

The food selection for this task was made with the cooperation of nutritionist Cláudia Marques and was adapted to the Portuguese culture and eating habits, in particular lunch and dinner. Thus, in the end twelve foods were chosen (6 healthy foods and 6 unhealthy foods). All healthy foods in this choice task appear in the episode.

Pictures of the selected foods were divided into two 3 x 2 cards (3 healthy food and 3 unhealthy food). In the first card are the following foods: hamburger, soda, boiled potatoes, water, fries and fish. In the second card are the refrigerant, tomato, pizza, fries, eggs and water (see Figure 2).

Following the procedure used by Goldberg et al. (1978), Agante (2018) and Dias & Agante (2011) we asked children to imagine a hypothesized situation: *"Now, let's pretend that your parents went to work and they asked me to take care of you while they are out. But I don't know the kind of foods you would like to eat for lunch. So, suppose I said "here are six snacks, you can choose three to eat".* Next, we asked the same thing but now for dinner.

Figure 2 – *The two cards of food choice task.*



Emotional overeating

Parents were asked to indicate the emotional overeating level of your child. For this, we used the emotional overeating subscale of the Child Eating Behaviour Questionnaire (Wardle, Guthrie, Sanderson, & Rapoport, 2001). This measure has already been used in the other studies, for example by Escobar et al. (2014), Messerli-Bürgy et al. (2018), Herle, Fildes, Steinsbekk, Rijsdijk, & Llewellyn (2017)

The emotional overeating subscale is a composite measure that considers the scores of 4 questions that have been translated into Portuguese: "My child eats more when worried"; "My child eats more when annoyed"; "My child eats more when anxious"; "My child eats more when she/he has nothing else to do". These questions were rated along a 5-point Likert scale ("never"; "rarely"; "sometimes"; "often"; "always") (scored 1–5) and mean scores were calculated for each participant The Cronbach's alpha for this dimension was 0.815.

Self-regulation

In order to measure the child's self-regulation, we asked parents to answer the Child Self-Regulation in Eating Questionnaire (Tan & Holub, 2011). This scale was used by Taylor et al. (2017), Daniels et al. (2015) and Cin Cin Tan & Chow (2014), in the latter case it was adapted to young adults.

This scale is comprised by 8 items that have been translated into Portuguese: "My child knows how much food s/he should eat", "My child stops eating when s/he is full", "My child knows when s/he should stop eating", "If my child is full, s/he will not eat snacks", "My child eats even when s/he is not hungry" (reversed), "If my child is full, s/he

will not ask for more food", "My child knows when s/he is full", "My child eats even when s/he is already full" (reversed). Parents respond to these items using a 5-point Likert scale (disagree, slightly disagree, neutral, slightly agree, agree) (scored 1–5) and mean scores were calculated for each participant. The Cronbach's alpha for this dimension was 0,750.

Food as a reward

In order to evaluate whether the parents used the food as a reward, we asked parents to answer the subscale of the Comprehensive Feeding Practices Questionnaire (Musher-Eizenman & Holub, 2007). This questionnaire has already been used in the other studies on children food behavior (Foster, Aquino, Mejia, Turner, & Singhal, 2018; Powell, Farrow, Meyer, & Haycraft, 2018; Saltzman et al., 2016).

The "food as a reward" subscale consists of 3 items that have been translated into Portuguese: "I offer sweets (candy, ice cream, cake, pastries) to my child as a reward for good behavior"; "I withhold sweets/dessert from my child in response to bad behavior", "I offer my child his/her favorite foods in exchange for good behavior". Parents respond to these items using a 5-point Likert scale (disagree, slightly disagree, neutral, slightly agree, agree) (scored 1–5) and mean scores were calculated for each participant. The Cronbach's alpha for this dimension was 0,696.

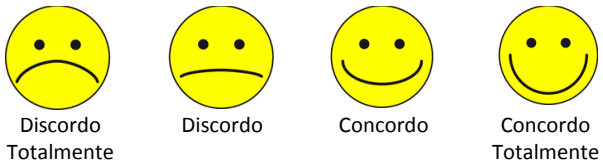
Other measures

Children in the experimental group were asked to rate the episode (attitude towards the episode (4 items[6] with Cronbach's alpha = 0,64); if it was appropriate to children their own age; if the child would recommend the video to other children; if the child wanted to watch the next episode with a "smiley" 4-point Likert-type scales (1= totally disagree; 2= disagree; 3= agree; 4= totally agree) (see Figure 3). The children' awareness (yes or no answer) and frequency of viewing (never; sometimes; many times; almost always) of Nutri Ventures series were also evaluated. These scales had been used in prior studies with children (Hota, Cáceres, & Cousin, 2010; Rozendaal, Slot, van Reijmersdal, & Buijzen, 2013), including in Portugal (Agante, 2018). However, we included a new item "I would like to watch the next episode" because this episode has continuation. Finally, we removed the item "It was a

[6] "I like the episode" / "It was a fantastic episode" / "It was a beautiful episode" / "I would like to watch it again".

boring episode" because in Agante (2018) it was suggested that it was reducing the reliability of the attitude scale.

Figure 3 – "Smiles" *4-point Likert-type scales to evaluate the episode.*



Parents were asked to indicate some information about children, namely gender, month and year of birth, height and weight (to calculate BMI) and also the level of parents' education. Parents were also asked to indicate the children´s frequency of consumption for each food that appeared in children´s questionnaire. For this, we used a 5-point food frequency scale (1=never, 2= < 1x a month, 3= 1 a 3 x a month, 4= 2 a 4x a week, 5=every day) that was developed for this research and adapted from Food Frequency Questionnaire (Lopes, Aro, Azevedo, Ramos, & Barros, 2007).

3.7 Questionnaires

The questionnaires (for children and parents) are in appendix II.

The specialist of psychology suggested that we make two versions of children's questionnaire to see if the order of tasks influences the results. So, we made the version A where "liking food" appears first and second "food choices" and version B where "food choices" appears first and second "food liking". The two versions were randomly distributed by the children.

All image in children's questionnaire provided by free images of Pixabay's website[7].

3.8 Statistical analyses

Statistical analyses were conducted using SPSS version 24 software. Descriptive statistics are presented using frequencies and percentages (including gender, age, group condition, BMI).

[7] https://www.freeimages.com https://pixabay.com

In accordance with the central limit theorem, we used parametric tests for analysis of the data (when applicable) once the sample size is reasonable (>25-30) (Marôco, 2014).

The "I never tasted" (coded as zero) were removed to make all the food liking analysis. Moreover, we created another variable to account for the food liking of all healthy foods, by grouping all evaluations into one only variable (the average of all healthy food "liking": egg, fish, milk, water, tomato, cabbage, pumpkin and carrot).

A new variable was also created (Health Index) to evaluate children´s food choices. This variable corresponds to the sum of the healthy selected items (on a scale of 0 to 6).

Prior to analyzing our hypotheses, we wanted to see if there were any bias in our sample that would influence the results (children's preferences and spontaneous food selection). Therefore, we analyzed if the eating habits according to parents' report, namely for the food that appear on the children's questionnaire, are similar for the experimental and control groups. Thus, independent Student´s t-tests and Chi-squared tests were used to establish if any significant difference in children's frequency of food intake existed between control and experimental group.

Next, we wanted to understand if the different versions of children's questionnaire (A: liking food/choices food and B: Choices food/liking food) influenced the results. In order to do this, we used independent Student's t-tests and Chi-squared tests to establish if any significant difference existed between version A and B concerning the children's food liking (for healthy food together and for each food) and food choices (for Health Index and for each food).

To test hypotheses H1.1 *"Children who watch the edutainment stimulus containing only healthy food will have a higher preference for the healthy food which are present in episode"* independent Student's t-tests (for mean of food together and for each food) and Chi-squared tests (for each food) were used comparing the control and experimental groups.

To test hypotheses H1.2 "*Children who watch the edutainment stimulus containing only healthy food will have a higher spontaneous food selection for the healthy food and a lower spontaneous food selection for the unhealthy food"* first we used independent Student's t-tests and Chi-squared tests to verify if there were differences in Health Index between control and experimental group and then, we used a Chi-squared test for each food that appears in the task of choice to verify if there were associations between food choices and group condition.

The hypothesis H2 "*Children with low self-regulation, emotional overeating and with parents who use food as a reward will have less changes after the edutainment stimulus on their preferences and*

spontaneous food selection toward healthy food" was conditional on the validation of the previous two (H1.1 and H1.2), which did not happen as we shall see further. Thus, it was not possible to analyze hypothesis H2. However, we analyzed if the "self-regulation", "emotional overeating" and "use of food as a reward" influenced children's preferences and spontaneous food selection.

First, to evaluate the influence of these factors on children´s food preferences, we used the correlations coefficient of Pearson between the mean of food liking (healthy food together) and the mean scoring of "self-regulation", "emotional overeating", "food as a reward". Then, two groups were created from mean scoring of each factor. First, we considered using the same cut-of-point for all scales, the 2.5 score that would separate between low vs high. But After analyzing the sample distribution and percentiles for each factor, we decided to use different cut-off points because the distributions were very different between factors and we would not have enough participants in some groups. Therefore, we used as cut-of-points the value corresponding to the 30/70 percentile, which resulted in the following cut-off points: "self-regulation" 3,6; "emotional overeating" 2,0; "food as a reward" 2,3. Next, t-tests were used to evaluate if there were differences in the means of food linking between the group (low and high) of each factor.

To evaluated the influence of these factors on food choices we used the same tests but now with the Health Index instead of the mean of food liking. Moreover, we also used Chi-squared tests to evaluate if there were associations between the healthy index and the groups of each factor. Both in food liking and food choices, the analyses were done for the whole sample and for control and experimental group separately.

Whenever it was not possible to use Chi-squared tests we used the exact Chi-squared of Monte Carlo (Marôco, 2014).

The internal consistency of the scales and subscales was evaluated by the Cronbach's alpha coefficient.

Significance level was defined as $p < 0.05$ for all tests, but also highlighted when we had a significance of 10%.

4.RESULTS

Preliminary analysis of the sample

The Student's t-test showed significant differences in children´s average frequency of food intake between control and experimental group for some foods, such as, egg (t=2,640; p=0,009) pizza (t=2,302; p= 0,022), soda (t=2,157; p=0,032) and hamburger (t=2,008; p=0,046). In these foods, the average was higher in the experimental group. However, when testing for the same bias using the chi-square test, no statistically significant associations were found between frequency of food intake and group conditions, except for some associations with a 10% significance level on the egg, pizza and hamburger (see Table 2).

Table 2 *Frequency of food intake average on two group: control and experimental and results of the Chi-squared test: frequency of food intake per group condition.*

		Mean for each group		**Chi-squared tests**
		Control group	Experimental group	Frequency of food intake vs. group condition
Healthy food	Fish	3,76	3,86	χ^2 = 5,757; p = 0,203
	Carrot	3,57	3,73	χ^2 = 5,859; p = 0,210
	Milk	4,85	4,82	χ^2 = 2,153; p = 0,654
	Pumpkin	2,17	2,33	χ^2 = 4,980; p = 0,297
	Egg	**3,18****	**3,45****	χ^2 = 8,465; p = **0,060**
	Boiled potato	3,74	3,80	χ^2 = 0,509; p = 0,945
	Water	4,98	4,94	χ^2 = 4,040; p = 0,276
	Tomato	2,82	2,83	χ^2 = 0,654; p = 0,957
	Cabbage	3,50	3,42	χ^2 = 4,094; p = 0,411
Unheal-thy food	Fries	2,60	2,72	χ^2 = 2,909; p = 0,260
	Pizza	**2,07***	**2,27***	χ^2 = 6,305; p = **0,080**
	Soda	**2,58***	**2,89***	χ^2 = 6,580; p = 0,161
	Hamburger	**1,74***	**1,92***	χ^2 = 6,928; p = **0,053**

There was a statistically significant difference on the student's t-test with *p< 0,05; **p< 0,01

After this result, we used the Chi-squared test and Student's t-tests to evaluate the relationships between the children's frequency of food intake, in particular egg, pizza, soda, hamburger and the children´s choices of same food. In the case of egg, we also evaluated the relationship between frequency of egg intake and the "liking" for egg (in this case with Anova *one-way*).

According to the results of Chi-squared tests, Student's t-tests and Anova presented in Table 3, we can see that children who eat egg (t=-3,149; p=0,002|χ^2 = 10,100; p= 0,028), soda ("l*unch" t*=-3,669; p=0,000|χ^2= 15,674; p= 0,003 *"dinner" t*=-2,894; p=0,004|χ^2= 10,524; p

=0,031) and hamburger (t=-2,342; p=0,020|χ^2= 7,477; p=0,039) more often tend to choose these foods more and to prefer more in the case of the egg (F = 11,694; p =0,000 |χ^2 = 63,640; p=0,001). No statistically significant differences were found for pizza (t=0,565; p=0,573|χ^2=3,408; p=0,353). The SPSS output of the Chi-squared tests for foods with statistical significance are in the appendix III.

Table 3 *Frequency of food intake average on four groups of food liking and on two group of food choices. Results of the Chi-squared test: frequency of food intake per food choice and per food liking.*

	Anova ** *Food liking*				**Student's t-tests *Food choices***		**Chi-squared tests**
	"Hate"	*"Don't like"*	*"Like"*	*"Love"*	*"yes"*	*"no"*	*Frequency of food intake vs. food choice*
	Mean	*Mean*	*Mean*	*Mean*	*Mean*	*Mean*	
Egg	**2,22[1;2]**	**2,67[3]**	**3,35[1]**	**3,43[2;3]**	**3,49****	**3,18****	χ^2 = 10,100; p= **0,028***
Pizza	-	-	-	-	2,16	2,21	χ^2= 3,408; p= 0,353
Soda "lunch"	-	-	-	-	**3,04****	**2,52****	χ^2= 15,674; p= **0,003****
Soda "dinner"	-	-	-	-	**2,97****	**2,55****	χ^2= 10,524; p = **0,031***
Hamburger	-	-	-	-	**1,93***	**1,72***	χ^2= 7,477; p = **0,039***
							*Frequency of food intake vs. "**Egg**" liking*
							χ^2 = 63,640; ***p*=0,001*****

***p< 0,05; **p< 0,01|Tukey HSD: [1] p=0,00; [2] p=0,00; [3] p=0,028 (the numbers represent the groups with statistically significant differences);**

The previous results suggest the existence of some bias in the sample, namely a higher frequency of egg, pizza, soda and hamburger consumption among the children in the experimental group and, as we saw above, it could result mainly in more egg, soda and hamburger choices and preferences (in case of the egg) in experimental group by itself. So, we should be aware of that when we analyze our hypotheses.

In relation to different version of children's questionnaire, that is in relation to the order the questions of preference and choice were presented, it was observed that the mean of food preference is higher in version A (liking/choice) in all cases except for the water. However, in all cases, the difference is not statistically significant, as we can see in Table 4.

When we look at Chi-squared test results, we see that only the egg preference level is associated with the version (χ^2=9,153; p=0,024; N=187) (see Table 4). However, if we include the group condition (experimental and control group) in the analysis, we do not find statistically significant associations (experimental group: χ^2 =3,905; p=0,273; N=99|control group: χ^2=6,717; p=0,076; N=88), as we can see in the Table 5. These results lead us to

believe that the association between preference of eggs and version was an experimental accident.

The children's food choices are also not associated with questionnaire versions, as we can see in Table 1 of Appendix III. Thus, we could conclude that the order of the tasks did not influence children's preference and food choices.

Table 4 *Food liking averages per version.*

		Student's t-tests			Chi-squared tests
		Version A	Version B		Food liking per version
		Mean	*Mean*	*Sig.*	
Healthy food liking[1]		3,29	3,16	0,105	-
Food liking	Egg	3,59	3,47	0,285	χ^2 =9,153; ***p*=0,024***
	Fish	3,24	3,15	0,492	χ^2 =1,968; *p*=0,587
	Milk	3,66	3,59	0,450	χ^2 =2,237; *p*=0,522
	Water	3,83	3,85	0,809	χ^2 =3,233; *p*=0,381
	Tomato	3,01	2,79	0,220	χ^2 =1,772; *p*=0,630
	Cabbage	3,01	2,79	0,181	χ^2 =2,484; *p*=0,480
	Pumpkin	2,55	2,25	0,133	χ^2 =3,954; *p*=0,279
	Carrot	3,29	3,19	0,537	χ^2 =1,339; *p*=0,723

***p<0,05 | [1]All food together: egg, fish, milk, water, tomato cabbage, pumpkin, carrot.**

Table 5 *Liking for egg per version (A; B) and per each group condition.*

		Food Liking - Egg				
		"Hate"	*"Don't like"*	*"Like"*	*"Love"*	**Total**
Experimental group	Version A	1 (2%)	1 (2%)	8 (16,3%)	39 (79,6%)	49 (100%)
	Version B	2 (4%)	1 (2%)	16 (32%)	31 (62%)	50 (100%)
		(χ^2=3,905; *p*=0,273; *N*=99)				
Control Group	Version A	3 (6,5%)	4 (8,7%)	9 (19,6%)	30 (65,2%)	46 (100%)
	Version B	3 (7,1%)	0 (0%)	16 (38,1%)	23 (54,8%)	42 (100%)
		(χ^2=6,717; *p*=0,076; *N*=88)				
Total	Version A	4 (4,2%)	5 (5,3%)	17 (17,9%)	69 (72,6%)	95 (100%)
	Version B	5 (5,4%)	1 (1,1%)	32 (34,8%)	54 (58,7%)	92 (100%)
		(χ^2=9,153; *p*=0,024; *N*=187)				

Attitude towards the Episode

Most children had a positive attitude towards the episode of the Nutri Ventures series with a mean of 3,83 (average score for like of 3,98; fantastic 3,82; beautiful 3,83 would like to see it again 3,69). Children find the episode appropriate to the target (3,66); would recommend it (3,37); and would like to see the next episode (3,91).

The majority of children (82,2%) already knew the series and watch it with some frequency (26,5% almost always, 26,5% many times, 42,2% sometimes and 4,8% never).

H1.1 Children who watch the edutainment stimulus containing only healthy food will have a higher preference for the healthy food which are present in episode.

In order to check the validity of the first hypothesis, we compared the food preferences for healthy food, which was present in episode, between children who watched the episode and children who did not watch.

As can be seen in the Table 6, the mean preference for healthy food was high in both groups, being slightly higher for the control group (3,24 vs. 3,21 of experimental group), with these differences not being statistically significant (t=-0,368; p=0,713).

Once we did not observe differences for all healthy food together, we also analyzed each food individually. The pumpkin, cabbage and tomato are food that children like less (mean < 3,00). The mean of egg and fish preference are slightly higher for experimental group but the mean preference of milk, tomato, cabbage, pumpkin and carrot are higher for control group. Nevertheless, no statistically significant differences were found for any foods, although for the egg there was a difference with a significance of 10% (p=0,075) (see Table 6).

Table 6 *Food liking per group condition.*

		Student's t-tests			**Chi-squared tests**
		Control group	**Experimental group**		**Food liking per group condition**
		Mean	*Mean*	*Sig.*	
Food liking	Mean of food together	3,24	3,21	0,713	-
	Egg	3,42	3,63	**0,075**	χ^2 = 3,401; p =0,350
	Fish	3,13	3,26	0,305	χ^2 =10,806; ***p* =0,013***
	Milk	3,67	3,59	0,402	χ^2 =1,594; p =0,700
	Water	3,84	3,84	0,992	χ^2 =0,989; p =0,953
	Tomato	2,93	2,88	0,816	χ^2 =4,567; p =0,205
	Cabbage	2,92	2,89	0,851	χ^2 =4,569; p =0,213
	Pumpkin	2,49	2,34	0,442	χ^2 =4,108; p =0,260
	Carrot	3,28	3,20	0,638	χ^2 =6,463; ***p* =0,098**

***p< 0,05**

When we look at test Chi-squared test results, we see that the preference of fish is the only one that is associated with group condition (χ^2=10,806; p=0,013; N=187) and also Carrot, if we consider a 10% significance level (see Table 6). Observing the descriptive statistics on Table 7, we can see that children of experimental group "love" more fish (53%) than children of control group (35,6%). So, this result (together with the average of fish "liking" to be higher in experimental group although not statistically significant), leads us to conclude that children in the experimental group tend to prefer fish more than the children in control group.

Table 7 *Liking for fish per group condition.*

	Food Liking - Fish				
	"Hate"	***"Don't like"***	***"Like"***	***"Love"***	**Total**
Control group	6 (6,9%)	8 (9,2%)	42 (48,3%)	31 (35,6%)	87 (100%)
Experimental group	6 (6%)	15 (15%)	26 (26%)	53 (53%)	100 (100%)

(χ^2 = 10,806; p =0,013; N=187)

In conclusion, these results don't support the hypothesis *H1.1 Children who watch the edutainment stimulus containing only healthy food will have a higher preference for the healthy food which are present in episode.* Instead, the control group had the mean preference for healthy food slightly higher than experimental group, although without statistically significant differences. Only in the case of fish we saw a higher preference in experimental group.

As we have just seen, we rejected the hypothesis H1.1, but we have not yet seen whether BMI influences the children's food preference. So, the previous tests were performed again but now the children were divided into two groups: (i) children with underweight and normal BMI, (ii) overweight and obese children.

BMI groups

Contrary to what we saw in the whole sample, in children with underweight and normal BMI the mean preference for healthy food is slightly higher for experimental group (3,24 vs. 3,20) (see Table 8), but without statistically significant differences (t=0,318; p=0,751). When we analyzed the results for every single food product for this group, we can see that the mean of egg "liking" is higher in the experimental group (3,67 vs. 3,31) with statistically significant difference (t=2,245; p=0,028). When we look at Table 9, we see that children with underweight or normal BMI in experimental group "love" egg more (68,9%)

than in control group (53,3%). However, this result may have been influenced by the bias of sample, as we saw earlier (see page 21).

No statistically significant differences were found for the other food products between group condition in children with underweight or normal BMI (only fish preference had a *p-value* close to $p < 0,05$), as shown in the table 8 below.

In overweight or obese group, the mean preference for healthy food is slightly higher for control group (see Table 8), but also without statistically significant differences ($t = -0,217$; $p = 0,83$). Moreover, no statistically significant differences in mean of food preferences were found between group condition, nor any associations were found between children's food preferences and group condition in overweight and obese children (see Table 8).

Table 8 *Food liking per group condition in BMI group.*

		Student's t-tests			**Chi-squared tests**
		Control group	**Experimental group**		**Food liking per group condition**
		Mean	*Mean*	*Sig.*	
Food liking - **Underweight or normal BMI**	Mean of food together	3,20	3,24	0,751	-
	Egg	3,31	3,67	**0,028***	$\chi^2 = 5,367$; $p = 0,135$
	Fish	3,23	3,20	0,863	$\chi^2 = 7,200$; p **= 0,055**
	Milk	3,62	3,50	0,448	$\chi^2 = 1,569$; $p = 0,697$
	Water	3,80	3,87	0,469	$\chi^2 = 2,558$; $p = 0,462$
	Tomato	2,83	2,93	0,699	$\chi^2 = 2,926$; $p = 0,420$
	Cabbage	2,77	2,93	0,522	$\chi^2 = 0,741$; $p = 0,904$
	Pumpkin	2,52	2,46	0,853	$\chi^2 = 1,648$; $p = 0,679$
	Carrot	3,29	3,27	0,920	$\chi^2 = 2,640$; $p = 0,450$
Food liking - **Overweight or obese**	Mean of food together	3,34	3,31	0,830	-
	Egg	3,45	3,78	0,179	$\chi^2 = 3,961$; $p = 0,372$
	Fish	3,35	3,30	0,869	$\chi^2 = 1,140$; $p = 0,775$
	Milk	3,80	3,65	0,449	$\chi^2 = 2,061$; $p = 0,920$
	Water	3,85	3,78	0,691	$\chi^2 = 1,240$; $p = 0,819$
	Tomato	3,00	3,14	0,703	$\chi^2 = 1,475$; $p = 0,766$
	Cabbage	3,10	2,83	0,408	$\chi^2 = 2,479$; $p = 0,443$
	Pumpkin	2,38	2,62	0,567	$\chi^2 = 1,834$; $p = 0,688$
	Carrot	3,67	3,32	0,259	$\chi^2 = 1,760$; $p = 0,823$

***$p < 0,05$**

Table 9 *Liking for egg per group condition in underweight or normal BMI group.*

	Food Liking - Egg				
	"Hate"	***"Don't like"***	***"Like"***	***"Love"***	**Total**
Control group	4 (8,9%)	2 (4,4%)	15 (33,3%)	24 (53,3%)	45 (100%)
Experimental group	0 (0%)	1 (2,2%)	13 (28,9%)	31 (68,9%)	45 (100%)

(χ^2 = 5,367; p = 0,135; N=90)

When comparing BMI groups (see Tables 8), we can see that, in general, the mean of food preferences is slightly higher in overweight or obese children (for both control and experimental group), although in this group no significant differences were observed in either fish (as we saw in whole sample) or egg preferences (as we saw in children with underweight or normal BMI group).

In short, when we analyzed the preference for healthy food *per* BMI condition, in particular for the overweight and obese children, we still do not see differences between children that watched the episode and children who did not watch.

Other results found – Food Liking

As the hypothesis was rejected, we decided to explore even more the data and assess if children's preferences for healthy food which appear in episode can be influenced by gender and age. Thus, the children were divided according to gender (girls, boys) and age (< 7 years, ≥ 7 years). The same previous tests were performed in each group.

Gender

In girls, the mean of "egg liking" is higher in the experimental group, with statistically significance difference (3,71 vs 3,31) (t=2,626; p=0,01) (see Table 10). When we look at the descriptive statistics in Table 11, we see that in experimental group more girls "love" egg (73,2%) and less girls "hate" or "don't like" egg (0% and 2,4% respectively), compared to the control group (52,9% "love" egg; 7,8% "hate" egg; 5,9% "don't like egg"), but without association between "egg liking" and group condition (χ^2 =5,956; p=0,112; N=92).

In boys, the results show that the preference of carrot is associated with group condition (χ2=11,564; p=0,007; N=94), although the mean of carrot "liking" is equal (3,19) in both group (control and experimental) (see Table 10) and, as we can see in Table 12, the boys in experimental group are those who hate more carrot (17,2% vs. 2,8% control group)

but also who love more carrot (56,9% vs. 44,4% control group), therefore this result is not clear.

No statistically significant differences/associations were observed from the other tests in girls and boys (see Table 10).

Table 10 *Food liking per group condition in girls and boys.*

		Student's t-tests			Chi-squared tests
		Control group	Experimental group		Food liking per group condition
		Mean	*Mean*	*Sig.*	
Food liking **GIRLS**	Mean of food together	3,18	3,20	0,830	-
	Egg	3,31	3,71	**0,010***	χ^2 =5,956; p=0,112
	Fish	3,08	3,29	0,274	χ^2 =5,669; p=0,143
	Milk	3,61	3,59	0,881	χ^2 =0,880; p=0,849
	Water	3,82	3,9	0,370	χ^2 =0,997; p=0,863
	Tomato	2,80	2,89	0,718	χ^2 =3,939; p=0,294
	Cabbage	2,84	2,69	0,528	χ^2 =2,334; p=0,503
	Pumpkin	2,37	2,29	0,779	χ^2 =6,680; p=**0,086**
	Carrot	3,34	3,23	0,632	χ^2 =2,373; p=0,497
Food liking **BOYS**	Mean of food together	3,32	3,22	0,299	-
	Egg	3,57	5,57	0,993	χ^2 =0,172; p=1,000
	Fish	3,19	3,24	0,803	χ^2=5,014; p=0,175
	Milk	3,76	3,59	0,185	χ^2=1,820; p=0,665
	Water	3,86	3,80	0,502	χ^2=1,312; p=1,000
	Tomato	3,13	2,88	0,287	χ^2=4,690; p=0,206
	Cabbage	3,03	3,04	0,973	χ^2=7,292; ***p*=0,063**
	Pumpkin	2,65	2,37	0,326	χ^2 =3,308; p=0,371
	Carrot	3,19	3,19	0,983	χ^2=11,564; ***p*=0,007***

***p< 0,05**

Table 11 *Liking for egg per group condition in girls.*

	Food Liking - egg				
	"Hate"	***"Don't like"***	***"Like"***	***"Love"***	**Total**
Control group	4 (7,8%)	3 (5,9%)	17 (33,3%)	27 (52,9%)	51(100%)
Experimental group	0 (0%)	1 (2,4%)	10 (24,4%)	30 (73,2%)	41 (100%)

(χ^2=5,956; p=0,112; N=92)

Table 12 *Liking for carrot per group condition in boys.*

	Food Liking - carrot				
	"Hate"	***"Don't like"***	***"Like"***	***"Love"***	**Total**
Control group	1 (2,8%)	7 (19,4%)	12 (33,3%)	16 (44,4%)	36 (100%)
Experimental group	10 (17,2%)	2 (3,4%)	13 (22,4%)	33 (56,9%)	58 (100%)

(χ^2=11,564; p=0,007; N=94)

Age

In young children (< 7 years), as has happened with the entire sample, we just can see differences in the case of fish preferences (see Table 13). The preference of fish is associated with group condition ($\chi 2$ =10,079; p=0,013; N=69) with the younger children of experimental group "love" fish more (69,4%) than children of control group (33,3%) (see Table 14). The mean fish preference also is higher in experimental group (3,47 vs 3,06 of control group) but without statistically significant differences (p=0,068). Thus, it would appear that the younger children who watched the episode like fish more.

No statistically significant differences were found from the other tests in younger children (< 7 years) and older children (≥7 years) (see Table 2 of Appendix III).

Table 13 *Food liking per group condition in children under 7 years.*

		Student's t-tests			Chi-squared tests
		Control group	Experimental group		Food liking per group condition
		Mean	*Mean*	*Sig.*	
Food liking	Mean of food together	3,18	3,27	0,526	-
	Egg	3,42	3,69	0,207	χ^2=2,255; p=0,631
	Fish	3,06	3,47	**0,068**	χ^2=10,079; ***p*=0,013***
	Milk	3,55	3,46	0,675	χ^2=1,033; p=0,853
	Water	3,70	3,76	0,697	χ^2 =2,240; p=0,654
	Tomato	3,19	2,84	0,236	χ^2=6,032; p=0,112
	Cabbage	2,85	2,94	0,738	χ^2=5,640; p=0,136
	Pumpkin	2,38	2,57	0,567	χ^2=0,477; p=0,945
	Carrot	3,13	3,33	0,454	χ^2 =3,209; p=0,409

***p*< 0,05**

Table 14 *Liking for fish per group condition in children under 7 years.*

	Food Liking - fish				
	"Hate"	***"Don't like"***	***"Like"***	***"Love"***	**Total**
Control group	3 (9,1%)	3 (9,1%)	16 (48,5%)	11 (33,3%)	33 (100%)
Experimental group	3 (8,3%)	2 (5,6%)	6 (16,7%)	25 (69,4%)	36 (100%)

(χ^2=10,079; *p*=0,013; *N*=69)

In summary, when we analyzed the preference for healthy food (that appear in the episode) according to gender and age, we only see significant differences in the egg preferences of the girls and in fish preferences of the children under 7 years.

The following Table 15 provides a results summary of the analysis of children´s healthy food preferences. In all cases indicated, the children´s food preferences (egg and fish)

were higher in the experimental group. However, in particular case of the egg, we remember that this result may have been influenced by the bias of sample.

Table 15 *Table summary - Food liking*

		The whole sample	**BMI**		**Gender**		**Age**	
			Underweight and normal BMI	*Overweight and obese*	*Girls*	*Boys*	*<7 years*	*≥ 7 years*
Food liking	All food together	-	-	-	-	-	-	-
	Egg	-	**V**	-	**V**	-	-	-
	Fish	**V**	-	-	-	-	**V**	-

V = statistically significant results for children´s food preferences (experimental >control group).

H1.2 Children who watch the edutainment stimulus containing only healthy food will have a higher spontaneous food selection for the healthy food and a lower spontaneous food selection for the unhealthy food.

To test the second hypothesis H1.2, we compared the healthy index (sum of healthy selected items) between the children who watched the episode and the children who did not watch.

As can be seen in the Table 16, and contrary to our expectations, more than half of children in the experimental group (50,5%) selected only up to two healthy food (vs. 36,7% in the control group). However, no associations were found between the health index and the group condition ($\chi 2$=10,283; p=0,117; N= 188). Moreover, no statistically significant differences were found in mean of healthy index between control (2,92) and experimental groups (2,65) (t=-0,954; p=0,341).

Table 16 *Food Choice Frequencies.*

	Health Index *(sum of healthy selected items)*							
	0	**1**	**2**	**3**	**4**	**5**	**6**	**Total**
Control group	11 (12,6%)	11 (12,6%)	10 (11,5%)	19 (21,8%)	19 (21,8%)	12 (13,8%)	5 (5,7%)	87 (100%)
Experimental group	20 (19,8%)	18 (17,8%)	13 (12,9%)	13 (12,9%)	14 (13,9%)	9 (8,9%)	14 (13,9%)	101 (100%)

(χ^2=10,283; p=0,117; N= 188)

Due to the absence of significantly differences in previous test, Chi-squared tests were also performed to every single food product to better understand the results with respect to the children's food choices. The results show that the choice of soda – *lunch* (χ^2 =8,194; p=0,005; N=189) and water – *lunch* (χ^2 =8,194; p=0,005; N=189) are associated with group condition (see Table 17). The control group tend to choose more water (68,2%) and the experimental group tend to choose more soda (52,5%), a result contrary to our expectations again (see Table 17). However, this result may have been influenced by the bias of sample, because the frequency of soda intake was higher in experimental group and children who drank more soda selected more soda too (see pages 21).

Table 17 *Food choices per group condition (frequency and % of choice for each food).*

		Group condition		
		Control	*Experimental*	***Chi-squared tests***
Food choices - YES	Hamburger -lunch	44 (50,0%)	58 (57,4%)	χ^2 =1,044; p=0,380; N=189
	Boiled potato - lunch	36 (40,9%)	35 (34,7%)	χ^2 =0,785; p=0,452; N=189
	Soda - lunch	**28 (31,8%)**	**53 (52,5%)**	χ^2 =8,194; p=**0,005***; N=189
	Water - lunch	**60 (68,2%)**	**48 (47,5%)**	χ^2 =8,194; p=**0,005***; N=189
	Fries - lunch	51 (58,0%)	65 (64,4%)	χ^2 =0,813; p=0,374; N=189
	Fish - lunch	45 (51,1%)	44 (43,6%)	χ^2 =1,082; p=0,310; N=189
	Soda - dinner	36 (41,4%)	51 (50,5%)	χ^2 =1,562; p=0,242; N=188
	Tomato - dinner	26 (29,9%)	40 (39,6%)	χ^2 =1,983; p=0,172; N=188
	Pizza - dinner	60 (69,0%)	55 (54,5%)	χ^2 =4,143; p=**0,051**; N=188
	Fries - dinner	51 (58,6%)	55 (54,5%)	χ^2 =0,330; p=0,658; N=188
	Egg - dinner	37 (42,5%)	50 (49,5%)	χ^2 =0,915; p=0,380; N=188
	Water - dinner	51 (58,6%)	51 (50,5%)	χ^2 =1,243; p=0,305; N=188

***p< 0,01**

According to these results, the hypothesis *H1.2 Children who watch the edutainment stimulus containing only healthy food will have a higher spontaneous food selection for the healthy food and a lower spontaneous food selection for the unhealthy food* has been rejected. Instead, children who watched the episode tended to choose less healthy food items than children who did not watch, although without statistically significant differences.

The next step was to analyze the children's food choice taking into consideration children's BMI. Thus, the same tests were performed but now the children were divided into two groups: (i) children with underweight and normal BMI and (ii) overweight or obese children.

BMI groups

When we only analyzed the children with underweight or normal BMI, we can see that 51% of children in experimental group choose 2 or less healthy food, a higher percentage than in the control group (35,6%) (see Table 18). However, once again, without statistically significant associations between these two variables (χ2=8,950; p=0,178; N=92) or differences in mean of healthy index between control (2,87) and experimental groups (2,77) (t=-0,248; p=0,805).

In overweight or obesity children the result is very similar to the total sample and the children with underweight and normal BMI, or in other words, more than half of overweight or obesity children (56,5%) selected only up to two healthy food (vs 25% in the control group), without statistically significant associations between these two variables (χ^2=6,936; p=0,363; N= 43). No differences were also found in mean of healthy index between control (3,20) and experimental groups (2,30) (t=-1,473; p=0,148) (see Table 18).

Table 18 *Food Choice Frequencies - BMI*

	Health Index *(sum of healthy selected items)*							
	Underweight or normal BMI							
	0	**1**	**2**	**3**	**4**	**5**	**6**	**Total**
Control group	7 (15,6%)	4 (8,9%)	5 (11,1%)	10 (22,2%)	13 (28,9%)	3 (6,7%)	3 (6,7%)	45 (100%)
Experimental group	8 (17,0%)	9 (19,1%)	7 (14,9%)	5 (10,6%)	7 (14,9%)	2 (4,3%)	9 (19,1%)	47 (100%)

(χ^2=8,950; p=0,178; N= 92)

	Overweight or obese							**Total**
Control group	2 (10,0%)	2 (10,0%)	1 (5,0%)	6 (30,0%)	4 (20,0%)	4 (20,0%)	1 (5,0%)	20 (100%)
Experimental group	7 (30,4%)	4 (17,4%)	2 (8,7%)	3 (13,0%)	2 (8,7%)	2 (8,7%)	3 (13,0%)	23 (100%)

(χ^2=6,936; p=0,363; N= 43)

When we analyzed each food choice individually, no associations were found in children with underweight or normal BMI, as we can see in Table 3 of appendix III. However, in overweight or obese children the result was similar to the whole sample. The choice of soda – *lunch* (χ^2 =7,894; p=0,010; N=43) and water – *lunch* (χ^2 =7,894; p=0,010; N=43) are associated with group condition, with the soda being more chosen by the children in experimental group (56,5%) and the water by control group (85%) (see Table 19). Once

again, this result may have been influenced by the existence of bias in sample, in particular in choice of the soda (see pages 21).

Table 19 *Food choices per group condition (frequency and % of choice for each food) for overweight or obesity children.*

		Group condition		
		Control	*Experimental*	***Chi-squared tests***
Food choices - YES	Hamburger -lunch	7 (35,0%)	14 (60,9%)	χ^2 =2,865; *p*=0,129; *N*=43
	Boiled potato - lunch	9 (45,0%)	8 (34,8%)	χ^2 =0,467; *p*=0,545; *N*=43
	Soda - lunch	**3 (15,0%)**	**13 (56,5%)**	χ^2 =7,894; ***p*=0,010***; *N*=43
	Water - lunch	**17 (85,0%)**	**10 (43,5%)**	χ^2 =7,894; ***p*=0,010***; *N*=43
	Fries - lunch	10 (50,0%)	15 (65,2%)	χ^2 =1,018; *p*=0,365; *N*=43
	Fish - lunch	14 (70,0%)	9 (39,1%)	χ^2 =4,098; ***p*=0,067**; *N*=43
	Soda - dinner	9 (45,0%)	13 (56,5%)	χ^2 =0,568; *p*=0,547; *N*=43
	Tomato - dinner	4 (20,0%)	10 (43,5%)	χ^2 =2,686; *p*=0,119; *N*=43
	Pizza - dinner	15 (75,0%)	17 (73,9%)	χ^2 =0,007; *p*=1,000; *N*=43
	Fries - dinner	12 (60,0%)	13 (56,5%)	χ^2 =0,053; *p*=1,000; *N*=43
	Egg - dinner	9 (45,0%)	6 (26,1%)	χ^2 =1,685; *p*=0,219; *N*=43
	Water - dinner	11 (55,0%)	10 (43,5%)	χ^2 =0,568; *p*=0,547; *N*=43

***p*< 0,05**

In conclusion, when we analyzed the spontaneous food selection *per* BMI condition, we can see that only in overweight or obese children we found differences in water and soda choices between children in control and experimental group (as happened to the whole sample). Even not appearing in the episode, the overweight or obese children tend to choose more soda than water after watching the episode.

Other results found – Food Choice

Again, once the second hypothisis was not validated, we analysed if the gender and age influenced the children's food choice.

Gender

As with the previous results, girls in experimental group selected less healthy food items (up to 2 healthy food choices - 52,3%) than girls in control group (28%), although no association between these variables (χ^2=11,278; *p*=0,082; *N*= 92), nor differences in mean of healthy index between control (3,28) and experimental groups (2,67) (*t*=-1,540; *p*=0,127) were found (see Table 20).

In the case of boys, no differences were observed in food choices between boys in the experimental and control group (up to 2 healthy food choices - 49,1 % in experimental group vs. 48,6 in control group) (χ^2=5,847; p=0,454; N=96) (see Table 20). Unlike what happened with the whole sample, the average health index of the boys in experimental group (2,64) was higher than in control group (2,43), although without statistically significant (t=0,512; p=0,610).

Table 20 *Food Choice Frequencies - Gender*

	Health Index *(sum of healthy selected items)*							
	Girls							
	0	**1**	**2**	**3**	**4**	**5**	**6**	**Total**
Control group	5 (10,0%)	2 (4,0%)	7 (14,0%)	12 (24,0%)	12 (24,0%)	8 (16,0%)	4 (8,0%)	50 (100%)
Experimental group	8 (19,0%)	8 (19,0%)	6 (14,3%)	3 (7,1%)	7 (16,7%)	5 (11,9%)	5 (11,9%)	42 (100%)

(χ^2=11,278; p=0,082; N= 92)

	Boys							**Total**
Control group	6 (16,2%)	9 (24,3%)	3 (8,1%)	7 (18,9%)	7 (18,9%)	4 (10,8%)	1 (2,7%)	37 (100%)
Experimental group	12 (20,3%)	10 (16,9%)	6 (11,9%)	10 (16,9%)	7 (11,9%)	4 (6,8%)	9 (15,3%)	59 (100%)

(χ^2=5,847; p=0,454; N= 96)

When we analyzed each food items individually we see that in girls the choice of soda – *lunch* (χ^2 =7,050; p=0,010; N=93) and water – *lunch* (χ^2 =10,941; p=0,001; N=93) were associated with type of group (control or experimental). The results suggested that girls in control group selected more water (78,4% vs 45,2% in experimental group) and girls in experimental group selected more soda (50% vs. 23,5% in control group), which is the same result we observed in the whole sample (see Table 21).

In boys, no association was also observed when we analyzed each food items between the groups (control vs experimental), as we can see in Table 4 of appendix III.

Table 21 *Food choices per group condition (frequency and % of choice for each food) for girls.*

		Group condition		
		Control	*Experimental*	***Chi-squared tests***
Food choices - YES	Hamburger -lunch	21 (41,2%)	22 (52,4%)	χ^2 =1,163; *p*=0,303; *N*=93
	Boiled potato - lunch	23 (45,1%)	15 (35,7%)	χ^2 =0839; *p*=0,402; *N*=93
	Soda - lunch	**12 (23,5%)**	**21 (50,0%)**	χ^2 =7,050; ***p*=0,010***; *N*=93
	Water - lunch	**49 (78,4%)**	**19 (45,2%)**	χ^2 =10,941; ***p*=0,001****; *N*=93
	Fries - lunch	27 (52,9%)	29 (69,0%)	χ^2 =2,494; *p*=0,139; *N*=93
	Fish - lunch	30 (58,8%)	20 (47,6%)	χ^2 =1,163; *p*=0,303; *N*=93
	Soda - dinner	18 (36,0%)	18 (42,9%)	χ^2 =0,451; *p*=0,527; *N*=92
	Tomato - dinner	17 (34,0%)	14 (33,3%)	χ^2 =0,005; *p*=1,000; *N*=92
	Pizza - dinner	32 (64,0%)	23 (54,8%)	χ^2 =0,810; *p*=0,400; *N*=92
	Fries - dinner	28 (56,0%)	26 (61,9%)	χ^2 =0,328; *p*=0,672; *N*=92
	Egg - dinner	24 (48,0%)	19 (45,2%)	χ^2 =0,070; *p*=0,836; *N*=92
	Water - dinner	31 (62,0%)	25 (59,5%)	χ^2 =0,059; *p*=0,808; *N*=92

***p*< 0,05; ****p*< 0,01**

Age

The results in children under 7 years showed no association between food choices and type of group (up to 2 healthy food choices – 48,6% in experimental group vs. 42,5% in control group) (χ2=4,921; *p*=0,590; N=70) (see Table 22), even when we analyzed each food items separately (see Table 5 of appendix III). When we analyzed the average health index in young children, unlike the whole sample, we see that it was higher for experimental group (2,59) (control group 2,48) but without statistical significance (*t*=0,264; *p*=0,793).

The children with 7 years or older in experimental group seem to choose less healthy food items (53,4% chose up to 2 healthy food items) than in the control group (33,4%) with statistically significant association (χ^2=15,676; *p*=0,015; *N*=112) (see Table 22). The mean of health index also was higher in control group (3,19) than in experimental (2,71), although without statistically significant (*t*=-1,242; *p*=0,217). When we analyzed each food item separately, we saw a association between the choice of water - *lunch* and type of group (χ^2=4,598; *p*=0,037; *N*=112), with the older children in control group (66,7%) choosing more water than children in experimental group (46,6%) again. We can see that the older children in experimental group choose more soda (53,4%) than in control group (35,2%) but without significant association (though close to *p*< 0,05) (χ^2=3,774; *p*=0,059; *N*=112) (see Table 23).

Table 22 *Food Choice Frequencies - Age*

	Health Index *(sum of healthy selected items)*							
	Children under 7 years							
	0	**1**	**2**	**3**	**4**	**5**	**6**	**Total**
Control group	5 (15,2%)	6 (18,2%)	3 (9,1%)	9 (27,3%)	8 (24,2%)	1 (3,0%)	1 (3,0%)	33 (100%)
Experimental group	7 (18,9%)	4 (10,8%)	7 (18,9%)	6 (16,2%)	7 (18,9%)	4 (10,8%)	2 (5,4%)	37 (100%)

(χ^2=4,921; p=0,590; N=70)

	Children with 7 years or older							**Total**
Control group	6 (11,1%)	5 (9,3%)	7 (13,0%)	10 (18,5%)	11 (20,4%)	11 (20,4%)	4 (7,4%)	54 (100%)
Experimental group	12 (20,7%)	13 (22,4%)	6 (10,3%)	5 (8,6%)	5 (8,6%)	5 (8,6%)	12 (20,7%)	58 (100%)

(χ^2=15,676; p=0,015; N= 112)

Table 23 *Food choices per group condition (frequency and % of choice for each food) for children with 7 years or older.*

		Group condition		
		Control	*Experimental*	***Chi-squared tests***
Food choices - YES	Hamburger -lunch	22 (40,7%)	32 (55,2%)	χ^2=2,333; p=0,136; N=112
	Boiled potato - lunch	30 (55,6%)	22 (37,9%)	χ^2=3,429; **p=0,088**; N=112
	Soda - lunch	19 (35,2%)	31 (53,4%)	χ^2=3,774; **p=0,059**; N=112
	Water - lunch	36 (66,7%)	27 (46,6%)	χ^2=4,598; **p=0,037***; N=112
	Fries - lunch	26 (48,1%)	37 (63,8%)	χ^2=2,781; p=0,127; N=112
	Fish - lunch	29 (53,7%)	25 (43,1%)	χ^2=1,258; p=0,344; N=112
	Soda - dinner	21 (38,9%)	31 (53,4%)	χ^2=2,383; p=0,134; N=112
	Tomato - dinner	15 (27,8%)	23 (39,7%)	χ^2=1,760; p=0,232; N=112
	Pizza - dinner	33 (61,1%)	30 (51,7%)	χ^2=1,001; p=0,346; N=112
	Fries - dinner	31 (57,4%)	30 (51,7%)	χ^2=0,364; p=0,574; N=112
	Egg - dinner	25 (46,3%)	31 (53,4%)	χ^2=0,572 p=0,571; N=112
	Water - dinner	37 (68,5%)	29 (50,0%)	χ^2=3,962; **p=0,056**; N=112

*** p< 0,05**

In summary, when we analyzed the children´s food choices according to gender and age per group condition, we only see differences in soda and water choices for girls and children with 7 years or older (where the experimental group chose more soda and control group chose more water), the same result we saw for the whole sample. Moreover, only for older children we see a significant association between health index and group condition,

where children in control group tend to choose more heathy food items than children in experimental group.

Both in the case of boys and in case of children under 7 years, the mean of health index was higher in experimental group, unlike in the case of the whole sample. Moreover, in these two groups there were no significant differences for soda and water choices, as happened in the whole sample.

The following Table 24 provides a results summary of the analysis of children´s food choices. However, in particular case of the soda, we remember that this result may have been influenced by the bias of sample.

Table 24 *Table summary - Food Choices*

		The whole sample	**BMI**		**Gender**		**Age**	
			Underweight and normal BMI	*Overweight and obese*	*Girls*	*Boys*	*<7 years*	*≥ 7 years*
Food Choices	Health Index	**C^+**	**C^+**	**C^+**	**C^+**	**E^+**	**E^+**	**C^+ / V**
	Soda - *lunch*	**V**	**-**	**V**	**V**	**-**	**-**	**-**
	Water - *lunch*	**V**	**-**	**V**	**V**	**-**	**-**	**V**

V = Statistically significant results for children´s food choices. E^+= Mean of health index was higher in experimental group; C^+= Mean of health index was higher in control group.

H2 Children with low self-regulation, emotional overeating and with parents who use food as a reward will have less changes after the edutainment stimulus on their preferences and spontaneous food selection toward healthy food.

As we have seen before, this hypothesis (H2) was conditional on the validation of the previous two (H1.1 and H1.2), which did not happen. Thus, it will not be possible to validate the hypothesis H2. However, we analyzed if the self-regulation, emotional overeating and use of food as a reward influenced children's preferences and spontaneous food selection toward healthy food. This analysis was done for the whole sample and for control and experimental group separately.

Generally, children had a good level of self-regulation in relation to their diet (average of 4,047, values ranged from 1,8 to 5) and they had no emotional overeating behavior (average of 1,827, values ranged from 1 to 4). Parents in general did not use food as a reward (average of 2,184, values ranged from 1 to 5).

Food liking

The correlation coefficient of Pearson was initially used to test if there was a correlation between the children's preferences (mean of healthy food liking) and the mean scoring of "self- regulation", "emotional overeating", "food as a reward". As we can see in Table 25, no pair of variables is correlated, except for "self-regulation"/food liking in experimental group (r=0,205; p=0,049), a positive correlation but relatively low.

Next, we compared the mean of healthy food liking between the "self- regulation", "emotional overeating" and "use food as a reward" groups (low and high) and no differences were found, maybe because in this analysis there were only healthy foods (see Table 25).

Table 25 *Food liking - "self-regulation", "emotional overeating" and "food as a reward".*

		Student's t-tests			**Correlation of Pearson**	
		Low *Mean*	**High** *Mean*	*Sig.*	Factors *per* Food liking	Sig.
"Self-regulation"	**Whole sample**	3,094	3,239	0,115	*r*=0,127	**0,094**
	Experimental group	3,005	3,242	0,104	***r*=0,205**	**0,049***
	Control group	3,183	3,235	0,638	*r*=0,025	0,824
"Emotional overeating"	**Whole sample**	3,181	3,250	0,412	*r*=0,066	0,379
	Experimental group	3,190	3,158	0,815	*r*=0,018	0,863
	Control group	3,170	3,335	0,100	*r*=0,134	0,221
"Food as a reward"	**Whole sample**	3,175	3,246	0,367	*r*=0,029	0,700
	Experimental group	3,171	3,209	0,758	*r*= 0,026	0,802
	Control group	3,179	3,292	0,237	*r*=0,037	0,734

***p<0,05**

After this analysis, we could affirm that these factors, such as "self-regulation", "emotional overeating" and "food as a reward" did not seem to influence the children's healthy food preferences. However, we have seen that when children´s "self-regulation" increases, children´s preferences for healthy foods also increases but the correlation was relatively low.

Food Choice

As was done for the children's healthy food preferences, the correlation coefficient of Pearson was initially used to test if there was a correlation between the healthy food choices (Health Index: sum of healthy selected items) and the scoring of "self- regulation" "emotional overeating", "food as a reward". The results showed only a negative correlation

between emotional overeating and healthy food choices in the experimental group (r=-0,257; p=0,012) (see Table 26). In other words, when emotional overeating behavior increases, healthy food choices decrease for children in experimental group.

When we analyzed if there were differences in the average of health index between the "self- regulation", "emotional overeating" and "use food as a reward" groups (low and high), we saw statistically significant differences in "self-regulation" groups for experimental group (t=-2,115; p=0,037), where the average of health index was higher in children with more self-regulation. We also saw differences between "emotional overeating" groups for whole sample (t=2,553; p=0,012) and for experimental group (t=3,488; p=0,001), where the average of health index was higher in children of "low" group (see Table 26). Moreover, we only found a statistically significant association between healthy index and "emotional overeating" group (χ^2 =13,492; p=0,033; N=94) for experimental group (see Table 6 and 7 of appendix III: Chi-squared tests for "self-regulation" and "food as a reward"). In Table 27, we can see that children in "high emotional overeating" group choose less healthy items (76,6% choose up to 2 healthy items) than children in "low emotional overeating" group (40,6% choose up to 2 healthy items).

Thus, we can conclude that children, especially in the experimental group, with emotional overeating tend to choose less healthy items. The difference found in experimental group in the "self-regulation" groups and in "emotional overeating" groups can be connected, because children with emotional overeating behavior tend to have less self-regulation.

Table 26 *Food choices - "self-regulation", "emotional overeating" and "food as a reward".*

		Student's t-tests			**Correlation of Pearson**	
		Low *Mean*	**High** *Mean*	*Sig.*	Factors *per* Food liking	Sig.
"Self-regulation"	**Whole sample**	2,38	3,00	**0,068**	r=0,088	0,243
	Experimental group	**1,86**	**2,93**	**0,037***	r=0,187	**0,073**
	Control group	2,90	3,08	0,686	r=-0,026	0,813
"Emotional overeating"	**Whole sample**	**3,02**	**2,26**	**0,012***	r=-0,136	**0,069**
	Experimental group	**3,09**	**1,60**	**0,001****	***r*=-0,257**	**0,012***
	Control group	2,92	2,88	0,901	r=0,013	0,907
"Food as a reward"	**Whole sample**	2,72	2,85	0,636	r=0,003	0,969
	Experimental group	2,49	2,82	0,449	r= 0,084	0,415
	Control group	2,94	2,90	0,916	r=-0,74	0,497

***p<0,05; **p<0,01**

Table 27 *Food Choice Frequencies per "Emotional overeating" groups.*

		Health Index *(sum of healthy selected items)*							
		0	**1**	**2**	**3**	**4**	**5**	**6**	**Total**
Whole sample	**Low SR**	13 (11,1%)	19 (16,2%)	14 (12,0%)	20 (17,1%)	22 (18,8%)	16 (13,7%)	13 (11,1%)	117 (100%)
	High SR	16 (25,8%)	10 (16,1%)	9 (14,5%)	9 (14,5%)	9 (14,5%)	5 (8,1%)	4 (6,5%)	62 (100%)
(x^2=8,217; p=0,230; N=179)									
Experi-mental	**Low SR**	8 (12,5%)	11 (17,2%)	7 (10,9%)	8 (12,5%)	11 (17,2%)	9 (14,1%)	10 (15,6%)	64 (100%)
	High SR	10 (33,3%)	7 (23,3%)	6 (20,0%)	3 (10%)	2 (6,7%)	0 (0%)	2 (6,7%)	30 (100%)
(x^2=13,492; p=0,033; N=94)									
Control	**Low SR**	5 (9,4%)	8 (15,1%)	7 (13,2%)	12 (22,6%)	11 (20,8%)	7 (13,2%)	3 (5,7%)	53 (100%)
	High SR	6 (18,8%)	3 (9,4%)	3 (9,4%)	6 (18,8%)	7 (21,9%)	5 (15,6%)	2 (6,3%)	32 (100%)
(x^2=2,340; p=0,896; N=85)									

In conclusion, we could say that, in general, these factors ("self-regulation", "emotional overeating" and "the use of food as a reward" by parents) did not influence the children's food preferences. However, the emotional overeating seems to decrease the children´s healthy food choices especially in experimental group (see Table summary 28).

Table 28 *Table summary – Food liking /Food Choices and "self- regulation" group (SR), "emotional overeating" group (EOE), "parents who use food as a reward" group (FR).*

		The whole sample			Control group			Experimental group		
		1	*2*	*3*	1	2	3	*1*	*2*	*3*
Food Liking	SR	**V**	-		-	-		-	-	
	EOE	-	-		-	-		-	-	
	FR	-	-		-	-		-	-	
Food Choices	SR	-	-	-	-	**-**	-	-	**V**	-
	EOE	**-**	**V**	-	-	-	-	**V**	**V**	**V**
	FR	-	-		-	-	**-**	-	-	-

1 =*Correlation of Pearson; 2=Student t-test; 3=Chi-squared tests.*

V = statistically significant results.

5. DISCUSSION

The edutnainmente experience has to be playful, pleasant and fun in such a way that it is able to promote the children´s process of learning and change (Barrey et al., 2010; Feenstra et al., 2015; Mathiot, 2010). The presents results show that the majority of children liked the episode and thought it was fun. However, in general there were no significant changes in the children's preferences and spontaneous food selection toward healthy food after watching the episode of Nutri Ventures.

As seen previously, the message of edutainment has both an educational and an entertainment content (Addis, 2005). The episode 45 is part of the green kingdom series, and because of this, the educational content could be too subliminal that it has not reached the children. In this study we did not ask the children if they understood the message of the episode and we had no possibility to confirm this during the collection of data. This important issue should be considered in future studies.

Thus, after these results, we asked two children of our friends (6 and 8 years) to watch the episode and tell us what they understood of it. We asked them 3 questions: "Did you like the episode?", "What is the message of the episode?", "Where did the powers come from?". Both children liked the episode (as the children in the study) but they understood different messages which were not linked to food (the 6 years boy: *"they lost the game because a boy threw a tomato at his leg"*; the 8 years girl: *"We will get nowhere to cheat"*. However, both children identified food as the source of power (the 6 years boy: *"vegetables, fish, eggs";* the 8 years girl: *"vegetables, milk, fish, potatoes, eggs"*). It is still unclear whether the results could be different if children see another episode with a more assertive message or if children see all episodes of the green kingdom series.

The children´s development in consumer socialization depends on the environment and, in a general way, rural and urban populations have different cultures. For instance, in Chinese population was verified that children's perceptions of advertising and brands was different between children coming from the rural or urban areas (Chan, 2008). In Paula Castelo´s[8] master thesis also observed that children that live in the urban area were more influenced by the packaging (in the sensory evaluation done in terms of flavor and the purchase decision at the supermarket) than children that live on the rural area. Hence, we

[8] Paula Castelo (2013) "The influence of a fun packaging on children's sensory evaluation of a healthy product" Master's degree in Management from the NOVA School of Business and Economics / http://hdl.handle.net/10362/11620

may think that the region is another factor that could have contributed to our results. In Agante (2018)' study, which saw positive results in children´s attitudes and behaviors toward healthy food after they watch the video of Nutri Ventures, the sample comprised children from an urban area (Lisbon), while in the present study the sample comprised children from a rural area (Guia, Pombal).

Food Liking

Our results showed that, even before watching the episode, the children already liked the healthy food which appears in the episode, and maybe for this reason, no differences were generally observed in children's preferences toward healthy food between the control group and experimental group. In addition to the children already having knowledge about the foods that they should eat and the foods that they should avoid (Dias & Agante, 2011), they also already seem to like healthy food.

In some particular cases, there seems to be an exception for the fish preference and the egg preference. Children who watched the episode love fish more than children who did not watch it, especially younger children (<7 years). The children with underweight or normal BMI and girls who watched the episode also liked egg more than the others. However, these findings are not sufficiently clear and might have been influenced by bias in sample (egg in particular), thus no conclusions can be drawn from here.

The overweight or obese children, in general, had a slightly higher food preferences than children with underweight or normal BMI and in this group no significant differences were observed in either fish (as we saw in whole sample) or egg preferences (as we saw in children with underweight or normal BMI group). This can lead us to wonder if the overweight or obese children may have been influenced by social desirability effect (in both experimental and control groups).

Food Choices

Although the children liked the healthy food that appears in the episode, when they may choose between some of these foods and others less healthy, they do not always choose the healthier foods. Moreover, in general, children who watched the episode tended to choose less healthy food items than children who it did not watch, albeit without statistically significant difference.

Results also suggest that children who watch the episode of Nutri Ventures, choose more soda and less water, particularly overweight and obese children, girls and older children (≥7 years). Moreover, only in particular case of older children we had a statistically significant association between health index and group condition, where the children in experimental group chose less healthy food than children in control group. Thus, we might think that the episode leads to the older children to choose unhealthy eating as a form of rebellion like adolescents (Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007). However, no definitive conclusion could be drawn by these results once the consumption of some unhealthy foods (namely pizza, refrigerant and hamburger) was initially higher in children of experimental group than children of control group, as we saw earlier.

Self- regulation; Emotional overeating; Parents who use food as a reward

None of these factors (self-regulation, emotional overeating and food as a reward) had an influence on the children´s healthy food preferences, maybe because in this case there are only healthy foods. Hovever, the results show an influence of the emotional overeating factor on children's food choices. In other words, children who had emotional overeating tended to choose less healthy food and more unhealthy food, which is in line with the results of Powell, Frankel, & Hernandez (2017). Moreover, it happened mainly in children who watched the episode, where we also found diference for the self-regulation factor (children with less self-regulation chose less heathy items than children with more self-regulation). Thus, we may think that the episode, even containing only healthy food, has aroused some children's emotions (that also affects your self-regulation) which lead them to choose more unhealthy food.

In conclusion, our hypotheses have not been verified which leads us to believe that isolated edutainment may not be enough to change preferences and food choices, instead it might even have an opposite effect. Consequently, this study has strengthened the importance of a global approach in the food education programmes at schools.

6. LIMITATIONS AND INSIGHTS FOR FURTHER RESEARCH

Our study had limitations, one of which was the sample selection. We used a convenience sample that we randomly divided into two groups but which was found to be biased. Hence, the result might have been influenced by composition of sample. The solution for this limitation could involve changes in the procedure. Instead of comparing the two groups (experimental and control groups), we could use only one group that would be evaluated before and after the stimuli (watching the episode).

The selection of an isolated episode that is part of a series may have been a limitation for this study. As the action unfolds throughout the series, the isolated episode may not to be a fully edutainment experience. Maybe, if we use an episode with a beginning and an end or the whole series, it is to be more effective.

Another limitation was the short-term evaluation and the use of a single exposure. Long-term effects of edutainment on children's food preferences and children's food choices were not assessed in this study. It would also be interesting to understand the effect of continued exposure to edutainment and if this would change the children's behavior toward the healthy choices in future.

Future research could also hypothesize differences between children living in urban area and children living in rural area regarding their food choice and preferences. The objective would be to understand the role of the culture where children grow, in the way children respond to the edutainment.

To conclude, there is still a lot to investigate regarding social marketing strategies for fighting childhood obesity. In today's world, where children are constantly targeted by marketing campaigns which promote "obesogenic" environment, it is crucial to realize which strategy is most effective to fight this public health problem.

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APPENDIX I THE AUTHORIZATION FORMS

1. *The approval of the Portuguese Education Ministry.*

Monotorização de Inquéritos em Meio Escolar: Inquérito nº 0571400003

M mime-noreply@gepe.min-edu.pt
ter 27-03, 16:35
Você; lagante@gmail.com

Responder

Exmo(a)s. Sr(a)s.

O pedido de autorização do inquérito n.º 0571400003, com a designação *O papel do Edutainment na prevenção da obesidade infantil: pode um episódio da série Nutriventures contendo apenas alimentos saudáveis influenciar as preferências e escolhas de crianças com excesso de peso e obesidade?*, registado em 21-03-2018, foi aprovado.

Avaliação do inquérito:

> Exmo(a) Senhor(a) Diana Ereira Sintra
> Venho por este meio informar que o pedido de realização de inquérito em meio escolar é autorizado uma vez que, submetido a análise, cumpre os requisitos, devendo atender-se às observações aduzidas.
> Com os melhores cumprimentos
> José Vitor Pedroso
> Diretor-Geral
> DGE

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2. *The request for schools authorization.*

Exmo. Sr. Presidente do Conselho Diretivo, Dr. António Luís Araújo Duarte,

O presente email serve para formalizar o meu pedido de autorização para a realização da minha investigação nas escolas do ensino pré-escolar e 1º ciclo do Agrupamento de Escolas de Guia. Já submeti também o pedido de autorização ao Ministério da Educação e encontro-me a aguardar a sua resposta para poder avançar para a recolha de dados.

Sou aluna de mestrado em Marketing na Faculdade de Economia da Universidade do Porto, e estou a fazer a minha tese na área do comportamento do consumidor infantil.

O estudo é sobre a influência do conteúdo de animação nas preferências e escolhas alimentares das crianças entre os 4 e os 10 anos, cujo objetivo é perceber se a utilização de conteúdos sem imagens de alimentos não saudáveis pode ser mais eficaz na alteração de preferências e escolhas alimentares relativamente a alimentos saudáveis, principalmente nas crianças com excesso de peso e obesidade.

A investigação irá realizar-se em duas fases. Numa primeira, será entregue uma carta para os pais autorizarem a participação dos seus educandos no estudo, e com a qual vai seguir um pequeno questionário também para os pais (as crianças levam para casa, os pais preenchem em casa e voltam a trazer para a escola). Numa segunda fase, com as crianças que tiverem autorização, haverá dois procedimentos, consoante o grupo (a divisão nos dois grupos poderá ser por turma ou de outra forma, desde que garanta que há crianças da mesma idade e género em ambos os grupos). Num dos grupos as crianças vão ver um episódio da série Nutriventures e depois preencher um breve questionário. No outro grupo as crianças vão preencher apenas o questionário. Envio em anexo os questionários.

As cartas com o pedido de autorização aos encarregados de educação e os questionários para os pais preencherem serão entregues previamente na escola para que possam depois ser entregues às crianças e, por isso, precisava de saber quantos alunos têm por turma para poder proceder à sua impressão.

Quanto à aplicação dos questionários às crianças, se não houver nenhum inconveniente da vossa parte, será feita por mim em sala de aula acompanhada pelo professor em data a combinar. Para a visualização do episódio gostava só de saber se tem equipamento audiovisual para o efeito (um projetor, computador, colunas)? (podendo ser em sala de aula melhor, para perdermos menos tempo, caso nos tenhamos de deslocar também não terá problema).

Penso ter transmitido todas as informações necessárias, mas, caso seja necessária mais alguma informação ou surja alguma questão, encontro-me disponível através dos meus contactos para esclarecer.

Fico a aguardar a vossa resposta,
Grata pela atenção,
Com os melhores cumprimentos,

Diana Ereira Sintra
Email: diana-sintra@hotmail.com
Tel. 968412033

3. *The request for parental or tutorial authorization.*

Diana Ereira Sintra, aluna de Mestrado
FEP - Faculdade de Economia da Universidade do Porto
Rua Dr. Roberto Frias
4200-464 Porto

Assunto: Pedido de autorização para participação em estudo sobre os comportamentos alimentares.

Exmo. Sr. Encarregado de Educação,

Sou aluna de Mestrado da FEP em marketing, e estou a realizar a minha investigação na área do comportamento do consumidor infantil. Nesse sentido, estou a levar a cabo um estudo sobre a influência do conteúdo de animação nas preferências e escolhas alimentares das crianças, e para tal necessitava que o(a) Sr(a). respondessem a um breve questionário e o devolvessem na escola juntamente com esta folha de autorização assinada (por favor não separe as folhas e entregue ambas ao director da turma do(a) seu filho(a)). Na escola o(a) seu educando(a) irá visualizar um episódio da série Nutriventures e preencher um breve questionário.

Os dados recolhidos serão analisados por mim e a sua confidencialidade é total, sendo apenas publicados na tese os resultados do estudo sem a referência aos dados dos alunos, e sem a identificação das escolas onde o estudo foi realizado. Os resultados do estudo poderão também ser apresentados em conferências, artigos/livros ou notícias relacionadas com o tema, e serão enviados para as escolas que participam no estudo podendo ser consultados por todos os encarregados de educação.

Com os melhores cumprimentos,

.....

Autorizo o(a) meu filho(a) _____

do ___º ano, turma _____ a participar neste estudo.

Pombal, _____ de _____, de 2018

Assinatura do Encarregado de Educação:

_____

Contactos: Diana Sintra – diana-sintra@hotmail.com; +351 968412033

APPENDIX II QUESTIONNAIRES

1. *Questionnaires for children*

Obrigada por me ajudarem a concluir a minha tese de Mestrado em Marketing! Ao responderes a este questionário é importante que saibas que não há respostas certas, nem erradas!

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QUESTIONÁRIO – PARTE 1

Responde fazendo um círculo à volta da cara que corresponde à tua resposta ou com um X na tua respostas quando aparecer ☐.

1. Eu gostei do episódio	Discordo Totalmente	Discordo	Concordo	Concordo Totalmente
2. Achei o episódio espetacular	Discordo Totalmente	Discordo	Concordo	Concordo Totalmente
3. Achei o episódio giro	Discordo Totalmente	Discordo	Concordo	Concordo Totalmente
4. Gostava de ver este episódio outra vez	Discordo Totalmente	Discordo	Concordo	Concordo Totalmente
5. Este episódio é para crianças como eu	Discordo Totalmente	Discordo	Concordo	Concordo Totalmente
6. Eu gostaria de falar com os meus amigos sobre este episódio	Discordo Totalmente	Discordo	Concordo	Concordo Totalmente
7. Gostava de ver o episódio seguinte	Discordo Totalmente	Discordo	Concordo	Concordo Totalmente

8. Já conhecias a série Nutriventures? ☐Sim ☐Não

9. Se sim, quantas vezes costumas ver?	Nunca	Às vezes	Muitas vezes	Quase sempre
	☐	☐	☐	☐

QUESTIONÁRIO – PARTE 2

10. Gostas destes alimentos?

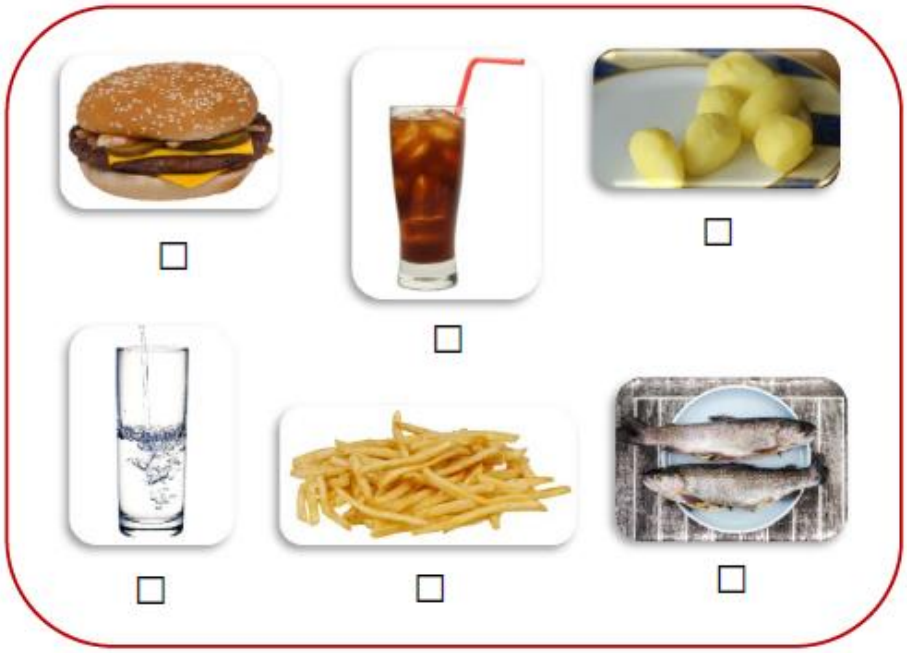
Responde fazendo um círculo à volta do número que corresponde à tua resposta. Se nunca provaste o alimento coloca um X no ☐.

☐ = Nunca provei | 1 = Detesto | 2 = Não gosto | 3 = Gosto | 4 = Adoro

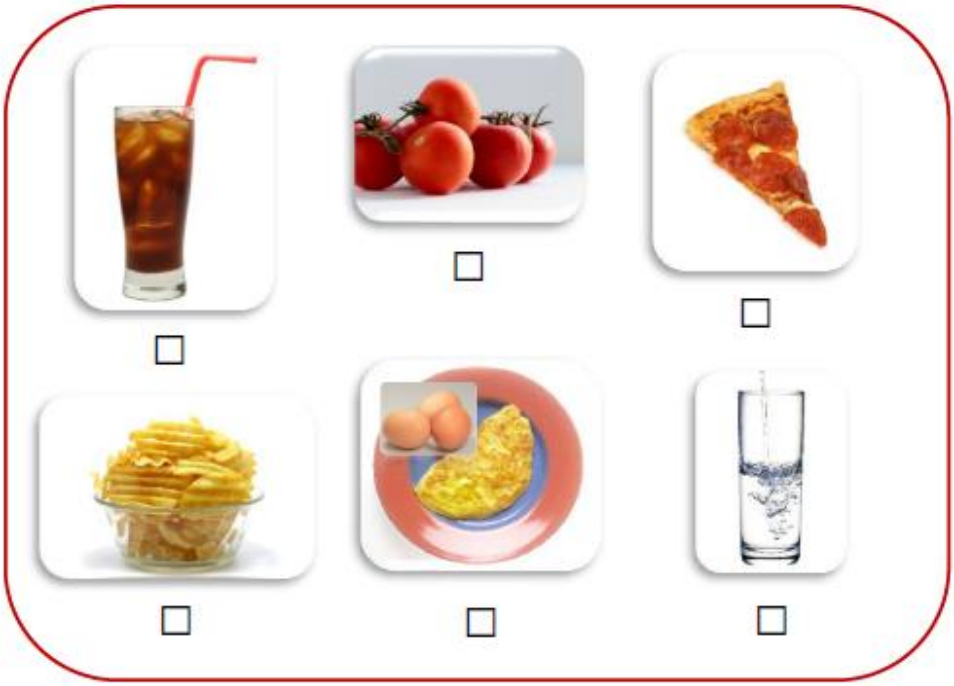
	Nunca Provei ☐	 1	2	3	4
	Nunca Provei ☐	 1	2	3	4
	Nunca Provei ☐	 1	2	3	4
	Nunca Provei ☐	 1	2	3	4
	Nunca Provei ☐	 1	2	3	4
	Nunca Provei ☐	 1	2	3	4
	Nunca Provei ☐	 1	2	3	4
	Nunca Provei ☐	 1	2	3	4

QUESTIONÁRIO – PARTE 3

11. Vamos fazer de conta que os teus pais foram trabalhar e pediram para eu tomar conta de ti. Mas eu não sei que tipo de alimentos podes querer comer. Então imagina que eu digo que destes 6 alimentos tu podes escolher 3 para comer ao almoço. Marca com um X as tuas escolhas.



Vamos fazer de conta que os teus pais ainda não chegaram para jantar. Então, vou pedir-te novamente para escolheres destes 6 novos alimentos que escolhas 3 para comer ao jantar.
Marca com um X as tuas escolhas.



Obrigada por participares!

2. *Questionnaires for parents*

Estou a realizar esta investigação no âmbito da minha tese de Mestrado em Marketing na Faculdade de Economia da Universidade do Porto. Desde já agradeço a sua colaboração! Tenha em consideração que não há respostas certas ou erradas, respostas melhores ou piores. Responda às questões em relação ao seu filho(a) que está a participar no estudo.

O meu filho(a) nasceu no mês ____ do ano _____	**Sexo do(a) filho(a): F ☐ M ☐**
Altura do(a) filho(a) _____ cm	**Peso do(a) filho(a) _____ kg**

Nível de Escolaridade dos Pais	**< 9ºano**	**9ºano**	**12ºano**	**Ensino Superior**
A mãe concluiu	☐	☐	☐	☐
O pai concluiu	☐	☐	☐	☐

→ Leia as seguintes afirmações e indique com um X a opção que mais se adequa ao seu caso.

	Nunca	**Raramente**	**Às vezes**	**Frequen-temente**	**Sempre**
O meu filho(a) come mais quando está preocupado(a)	☐	☐	☐	☐	☐
O meu filho(a) come mais quando está irritado(a)	☐	☐	☐	☐	☐
O meu filho(a) come mais quando está ansioso(a)	☐	☐	☐	☐	☐
O meu filho(a) come mais quando não tem nada para fazer	☐	☐	☐	☐	☐

	1 = *discordo*				**5 = *concordo***
O meu filho(a) sabe a quantidade de comida que deve comer	1☐	2☐	3☐	4☐	5☐
O meu filho(a) pára de comer quando está cheio	1☐	2☐	3☐	4☐	5☐
O meu filho(a) sabe quando deve parar de comer	1☐	2☐	3☐	4☐	5☐
Se o meu filho está cheio, ele(a) não vai comer *snacks*	1☐	2☐	3☐	4☐	5☐
O meu filho(a) come mesmo quando não tem fome	1☐	2☐	3☐	4☐	5☐
Se o meu filho(a) estiver cheio, ele(a) não pede mais comida	1☐	2☐	3☐	4☐	5☐
O meu filho(a) sabe quando está cheio	1☐	2☐	3☐	4☐	5☐
O meu filho(a) come mesmo quando já está cheio	1☐	2☐	3☐	4☐	5☐
Eu ofereço doces (rebuçados, gelados, bolos, pastéis) ao meu filho(a) como recompensa por bom comportamento	1☐	2☐	3☐	4☐	5☐
Eu retiro doces/sobremesas ao meu filho(a) em resposta ao mau comportamento	1☐	2☐	3☐	4☐	5☐
Eu ofereço ao meu filho(a) os seus alimentos preferidos em troca de bom comportamento	1☐	2☐	3☐	4☐	5☐

*** 1= discordo, 2= discordo parcialmente, 3 = nem concordo nem discordo, 4 = concordo parcialmente, 5 = concordo.**

Continua no verso na folha ...

→Da seguinte lista de alimentos indique com um X a opção que se adequa mais à frequência de consumo pelo seu filho.

	Nunca	< 1x por mês	1 a 3x por mês	2 a 4x por semana	Todos os dias
Peixe	☐	☐	☐	☐	☐
Batatas fritas	☐	☐	☐	☐	☐
Cenoura	☐	☐	☐	☐	☐
Leite	☐	☐	☐	☐	☐
Abóbora	☐	☐	☐	☐	☐
Pizza	☐	☐	☐	☐	☐
Ovos	☐	☐	☐	☐	☐
Batata cozida	☐	☐	☐	☐	☐
Água	☐	☐	☐	☐	☐
Refrigerantes (ex. coca cola, ice tea)	☐	☐	☐	☐	☐
Tomate	☐	☐	☐	☐	☐
Hambúrguer (ex. McDonald's,)	☐	☐	☐	☐	☐
Couve	☐	☐	☐	☐	☐

Diana Ereira Sintra | Obrigada pela sua ajuda.

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APPENDIX III *SPSS* OUTPUTS AND RESULTS TABLES

SPSS outputs – Qui-squared tests

Egg **-** Children's frequency of egg intake vs. food choices

Tabulação cruzada Escolheu ovos? jantar * Frequência de consumo de ovos

			Frequência de consumo de ovos					
			Nunca	Menos de 1x por mês	1 a 3x por mês	2 a 4 x por semana	Todos os dias	Total
Escolheu ovos? jantar	não	Contagem	6	5	56	33	1	101
		% em Escolheu ovos? jantar	5,9%	5,0%	55,4%	32,7%	1,0%	100,0%
	sim	Contagem	0	1	43	41	1	86
		% em Escolheu ovos? jantar	0,0%	1,2%	50,0%	47,7%	1,2%	100,0%
Total		Contagem	6	6	99	74	2	187
		% em Escolheu ovos? jantar	3,2%	3,2%	52,9%	39,6%	1,1%	100,0%

Testes qui-quadrado

				Sig. Monte Carlo (2 lados)			Sig. Monte Carlo (1 lado)		
					Intervalo de Confiança 99%			Intervalo de Confiança 99%	
	Valor	gl	Significância Assintótica (Bilateral)	Significância	Limite inferior	Limite superior	Significância	Limite inferior	Limite superior
Qui-quadrado de Pearson	10,100[a]	4	,039	,024[b]	,020	,028			
Razão de verossimilhança	12,603	4	,013	,022[b]	,018	,026			
Teste Exato de Fisher	10,193			,020[b]	,016	,024			
Associação Linear por Linear	8,961[c]	1	,003	,003[b]	,002	,004	,002[b]	,001	,002
Nº de Casos Válidos	187								

a. 6 células (60,0%) esperavam uma contagem menor que 5. A contagem mínima esperada é ,92.

b. Baseado em 10000 tabelas de amostra com a semente inicial 2000000.

c. A estatística padronizada é 2,993.

Egg **-** Children's frequency of egg intake vs. food liking (egg)

Tabulação cruzada Gostas de ovos? * Frequência de consumo de ovos

			Frequência de consumo de ovos					
			Nunca	Menos de 1x por mês	1 a 3x por mês	2 a 4 x por semana	Todos os dias	Total
Gostas de ovos?	Detesto	Contagem	4	0	4	1	0	9
		% em Gostas de ovos?	44,4%	0,0%	44,4%	11,1%	0,0%	100,0%
	Não gosto	Contagem	1	0	5	0	0	6
		% em Gostas de ovos?	16,7%	0,0%	83,3%	0,0%	0,0%	100,0%
	Gosto	Contagem	1	1	28	18	1	49
		% em Gostas de ovos?	2,0%	2,0%	57,1%	36,7%	2,0%	100,0%
	Adoro	Contagem	0	5	60	56	1	122
		% em Gostas de ovos?	0,0%	4,1%	49,2%	45,9%	0,8%	100,0%
Total		Contagem	6	6	97	75	2	186
		% em Gostas de ovos?	3,2%	3,2%	52,2%	40,3%	1,1%	100,0%

Testes qui-quadrado

	Valor	gl	Significância Assintótica (Bilateral)	Sig. Monte Carlo (2 lados)			Sig. Monte Carlo (1 lado)		
				Significância	Intervalo de Confiança 99% Limite inferior	Intervalo de Confiança 99% Limite superior	Significância	Intervalo de Confiança 99% Limite inferior	Intervalo de Confiança 99% Limite superior
Qui-quadrado de Pearson	63,640[a]	12	,000	,001[b]	,000	,001			
Razão de verossimilhança	35,642	12	,000	,000[b]	,000	,000			
Teste Exato de Fisher	34,315			,000[b]	,000	,000			
Associação Linear por Linear	24,054[c]	1	,000	,000[b]	,000	,000	,000[b]	,000	,000
Nº de Casos Válidos	186								

a. 16 células (80,0%) esperavam uma contagem menor que 5. A contagem mínima esperada é ,06.

b. Baseado em 10000 tabelas de amostra com a semente inicial 624387341.

c. A estatística padronizada é 4,905.

Soda - Children's frequency of soda intake vs. food choices (soda *"lunch"*)

Tabulação cruzada Escolheu refrigerante? almoço * Frequência de consumo de refrigerantes

			Frequência de consumo de refrigerantes					
			Nunca	Menos de 1x por mês	1 a 3x por mês	2 a 4 x por semana	Todos os dias	Total
Escolheu refrigerante? almoço	não	Contagem	17	36	37	15	2	107
		% em Escolheu refrigerante? almoço	15,9%	33,6%	34,6%	14,0%	1,9%	100,0%
	sim	Contagem	1	23	34	16	6	80
		% em Escolheu refrigerante? almoço	1,3%	28,8%	42,5%	20,0%	7,5%	100,0%
Total		Contagem	18	59	71	31	8	187
		% em Escolheu refrigerante? almoço	9,6%	31,6%	38,0%	16,6%	4,3%	100,0%

Testes qui-quadrado

	Valor	gl	Significância Assintótica (Bilateral)	Sig. Monte Carlo (2 lados)			Sig. Monte Carlo (1 lado)		
				Significância	Intervalo de Confiança 99% Limite inferior	Intervalo de Confiança 99% Limite superior	Significância	Intervalo de Confiança 99% Limite inferior	Intervalo de Confiança 99% Limite superior
Qui-quadrado de Pearson	15,674[a]	4	,003	,003[b]	,002	,004			
Razão de verossimilhança	18,457	4	,001	,002[b]	,001	,003			
Teste Exato de Fisher	16,943			,002[b]	,001	,003			
Associação Linear por Linear	12,388[c]	1	,000	,000[b]	,000	,001	,000[b]	,000	,001
Nº de Casos Válidos	187								

a. 2 células (20,0%) esperavam uma contagem menor que 5. A contagem mínima esperada é 3,42.

b. Baseado em 10000 tabelas de amostra com a semente inicial 957002199.

c. A estatística padronizada é 3,520.

Soda - Children's frequency of soda intake vs. food choices (soda *"dinner"*)

Tabulação cruzada Escolheu refrigerante? jantar * Frequência de consumo de refrigerantes

			Frequência de consumo de refrigerantes					
			Nunca	Menos de 1x por mês	1 a 3x por mês	2 a 4 x por semana	Todos os dias	Total
Escolheu refrigerante? jantar	não	Contagem	14	34	36	15	1	100
		% em Escolheu refrigerante? jantar	14,0%	34,0%	36,0%	15,0%	1,0%	100,0%
	sim	Contagem	4	25	34	16	7	86
		% em Escolheu refrigerante? jantar	4,7%	29,1%	39,5%	18,6%	8,1%	100,0%
Total		Contagem	18	59	70	31	8	186
		% em Escolheu refrigerante? jantar	9,7%	31,7%	37,6%	16,7%	4,3%	100,0%

Testes qui-quadrado

	Valor	gl	Significância Assintótica (Bilateral)	Sig. Monte Carlo (2 lados)			Sig. Monte Carlo (1 lado)		
				Significância	Intervalo de Confiança 99% Limite inferior	Intervalo de Confiança 99% Limite superior	Significância	Intervalo de Confiança 99% Limite inferior	Intervalo de Confiança 99% Limite superior
Qui-quadrado de Pearson	10,524[a]	4	,032	,031[b]	,027	,036			
Razão de verossimilhança	11,359	4	,023	,029[b]	,024	,033			
Teste Exato de Fisher	10,405			,033[b]	,028	,038			
Associação Linear por Linear	8,116[c]	1	,004	,006[b]	,004	,008	,004[b]	,002	,006
Nº de Casos Válidos	186								

a. 2 células (20,0%) esperavam uma contagem menor que 5. A contagem mínima esperada é 3,70.

b. Baseado em 10000 tabelas de amostra com a semente inicial 92208573.

c. A estatística padronizada é 2,849.

Hamburger - Children's frequency of hamburger intake vs. food choices (hamburger)

Tabulação cruzada Escolheu hambúrguer? almoço * Frequência de consumo de hambúrguer

			Frequência de consumo de hambúrguer				
			Nunca	Menos de 1x por mês	1 a 3x por mês	2 a 4 x por semana	Total
Escolheu hambúrguer? almoço	não	Contagem	32	46	8	0	86
		% em Escolheu hambúrguer? almoço	37,2%	53,5%	9,3%	0,0%	100,0%
	sim	Contagem	20	68	11	1	100
		% em Escolheu hambúrguer? almoço	20,0%	68,0%	11,0%	1,0%	100,0%
Total		Contagem	52	114	19	1	186
		% em Escolheu hambúrguer? almoço	28,0%	61,3%	10,2%	0,5%	100,0%

Testes qui-quadrado

	Valor	gl	Significância Assintótica (Bilateral)	Sig. Monte Carlo (2 lados)			Sig. Monte Carlo (1 lado)		
				Significância	Intervalo de Confiança 99% Limite inferior	Intervalo de Confiança 99% Limite superior	Significância	Intervalo de Confiança 99% Limite inferior	Intervalo de Confiança 99% Limite superior
Qui-quadrado de Pearson	7,477[a]	3	,058	,039[b]	,034	,044			
Razão de verossimilhança	7,874	3	,049	,042[b]	,037	,047			
Teste Exato de Fisher	7,367			,039[b]	,034	,044			
Associação Linear por Linear	5,354[c]	1	,021	,021[b]	,017	,024	,011[b]	,009	,014
Nº de Casos Válidos	186								

a. 2 células (25,0%) esperavam uma contagem menor que 5. A contagem mínima esperada é ,46.

b. Baseado em 10000 tabelas de amostra com a semente inicial 1993510611.

c. A estatística padronizada é 2,314.

Result tables

Table 1. *Food choices per version (frequency and % of choice for each food).*

		Version		
		A	*B*	***Chi-squared tests***
Food choices	Hamburger -lunch	55 (57,3%)	47 (50,5%)	χ^2 =0,867; *p*=0,770; *N*=189
	Boiled potato - lunch	35 (36,5%)	36 (38,7%)	χ^2 =0,102; *p*=0,766; *N*=189
	Soda - lunch	40 (41,7%)	41 (44,1%)	χ^2 =0,113; *p*=0,770; *N*=189
	Water - lunch	53 (55,2%)	55 (59,1%)	χ^2 =0,298; *p*=0,660; *N*=189
	Fries - lunch	63 (65,6%)	53 (57,0%)	χ^2 =1,486; *p*=0,236; *N*=189
	Fish - lunch	42 (43,8%)	47 (50,5%)	χ^2 =0,873; *p*=0,384; *N*=189
	Soda- dinner	44 (45,8%)	43 (46,7%)	χ^2 =0,016; *p*=1,000; *N*=188
	Tomato - dinner	34 (35,4%)	32 (34,8%)	χ^2 =0,008; *p*=1,000; *N*=188
	Pizza - dinner	62 (64,6%)	53 (57,6%)	χ^2 =0,962; *p*=0,370; *N*=188
	Fries - dinner	56 (58,3%)	50 (54,3%)	χ^2 =0,303; *p*=0,659; *N*=188
	Egg - dinner	42 (43,8%)	45 (48,9%)	χ^2 =0,504; *p*=0,559; *N*=188
	Water - dinner	49 (51,0%)	53 (57,6%)	χ^2 =0,816; *p*=0,383; *N*=188
	Health Index	**≥3 items:** 51 (53,2%)	**≥3 items:** 54 (58,7%)	χ^2 =2,287; *p*=0,896; *N*=188
		Student's t-test		
		A	*B*	
		Mean	*Mean*	*Sig.*
Health Index		2,66	2,90	0,384

A: liking; choices / B: choices; liking

Table 2. *Food liking per group condition in children with 7 years or older.*

		Student's t-tests			**Chi-squared tests**
		Control group	**Experimental group**		**Food liking per group condition**
		Mean	*Mean*	*Sig.*	
Food liking	Mean of food together	3,26	3,17	0,376	-
	Egg	3,41	3,63	**0,091**	χ^2 =3,170; *p*=0,416
	Fish	3,15	3,12	0,856	$\chi 2$=4,940; *p*=0,174
	Milk	3,74	3,63	0,290	χ^2 =1,501; *p*=0,803
	Water	3,93	3,88	0,412	χ^2=0,686; *p*=0,531
	Tomato	2,73	2,94	0,358	χ^2=2,603; *p*=0,482
	Cabbage	2,94	2,86	0,683	χ^2=1,349; *p*=0,729
	Pumpkin	2,53	2,12	0,100	χ^2=6,217; *p*=0,101
	Carrot	3,36	3,16	0,312	χ^2=5,266; *p*=0,154

Table 3. *Food choices per group condition (frequency and % of choice for each food) for children with normal BMI or underweight.*

		Group condition		
		Control	*Experimental*	***Chi-squared tests***
Food choices - YES	Hamburger -lunch	23 (51,1%)	27 (57,4%)	χ^2 =0,372; *p*=0,676; *N*=92
	Boiled potato - lunch	20 (44,4%)	17 (36,2%)	χ^2 =0,655; *p*=0,524; *N*=92
	Soda - lunch	16 (35,6%)	24 (51,1%)	χ^2 =2,250; *p*=0,147; *N*=92
	Water - lunch	28 (62,2%)	23 (48,9%)	χ^2 =1,643; *p*=0,216; *N*=92
	Fries - lunch	27 (60,0%)	29 (61,7%)	χ^2 =0,280; *p*=1,000; *N*=92
	Fish - lunch	21 (46,7%)	21 (44,7%)	χ^2 =0,037; *p*=1,000; *N*=92
	Soda - dinner	17 (37,8%)	24 (51,1%)	χ^2 =1,643; *p*=0,216; *N*=92
	Tomato - dinner	14 (31,1%)	19 (40,4%)	χ^2 =0,867; *p*=0,390; *N*=92
	Pizza - dinner	29 (64,4%)	25 (53,2%)	χ^2 =1,201; *p*=0,297; *N*=92
	Fries - dinner	29 (64,4%)	23 (48,9%)	χ^2 =2,250; *p*=0,147; *N*=92
	Egg - dinner	19 (42,2%)	26 (55,3%)	χ^2 =1,578; *p*=0,220; *N*=92
	Water - dinner	27 (60,0%)	24 (51,1%)	χ^2 =0,743; *p*=0,410; *N*=92

Table 4. *Food choices per group condition (frequency and % of choice for each food) for boys.*

		Group condition		
		Control	*Experimental*	***Chi-squared tests***
Food choices - YES	Hamburger -lunch	23 (62,2%)	36 (61,0%)	χ^2 =0,013; *p*=1,000; *N*=96
	Boiled potato - lunch	13 (35,1%)	20 (33,9%)	χ^2 =0,015; *p*=1,000; *N*=96
	Soda - lunch	16 (43,2%)	32 (54,2%)	χ^2 =1,099; *p*=0,402; *N*=96
	Water - lunch	20 (54,1%)	29 (49,2%)	χ^2 =0,291; *p*=0,679; *N*=96
	Fries - lunch	24 (64,9%)	36 (61,0%)	χ^2 =0,144; *p*=0,829; *N*=96
	Fish - lunch	15 (40,5%)	24 (40,7%)	χ^2 =0,000; *p*=1,000; *N*=96
	Soda - dinner	18 (48,6%)	33 (55,9%)	χ^2 =0,484; *p*=0,533; *N*=96
	Tomato - dinner	9 (24,3%)	26 (44,1%)	χ^2 =3,826; ***p*=0,081**; *N*=96
	Pizza - dinner	28 (75,7%)	32 (54,2%)	χ^2 =4,459; ***p*=0,051**; *N*=96
	Fries - dinner	23 (62,2%)	29 (49,2%)	χ^2 =1,550; *p*=0,293; *N*=96
	Egg - dinner	13 (35,1%)	31 (52,5%)	χ^2 =2,775 *p*=0,140; *N*=96
	Water - dinner	20 (54,1%)	26 (44,1%)	χ^2 =0,909; *p*=0,403; *N*=96

Table 5. *Food choices per group condition (frequency and % of choice for each food) for children under 7 years.*

		Group condition		
		Control	*Experimental*	***Chi-squared tests***
Food choices - YES	Hamburger -lunch	21 (63,6%)	22 (59,5%)	χ^2 =0,128; *p*=0,808; *N*=70
	Boiled potato - lunch	6 (18,2%)	12 (32,4%)	χ^2 =1,854; *p*=0,273; *N*=70
	Soda - lunch	9 (27,3%)	17 (45,9%)	χ^2 =2,605; *p*=0,139; *N*=70
	Water - lunch	23 (69,7%)	19 (51,4%)	χ^2 =2,446; *p*=0,146; *N*=70
	Fries - lunch	24 (72,7%)	24 (64,9%)	χ^2 =0,500; *p*=0,608; *N*=70
	Fish - lunch	16 (48,5%)	17 (45,9%)	χ^2 =0,045; *p*=1,000; *N*=70
	Soda - dinner	15 (45,5%)	18 (48,6%)	χ^2 =0,071; *p*=0,815; *N*=70
	Tomato - dinner	11 (33,3%)	15 (40,5%)	χ^2 =0,388; *p*=0,623; *N*=70
	Pizza - dinner	27 (81,8%)	22 (59,5%)	χ^2 =4,152; ***p*=0,066**; *N*=70
	Fries - dinner	20 (60,6%)	22 (59,5%)	χ^2 =0,010; *p*=1,000; *N*=70
	Egg - dinner	12 (36,4%)	15 (40,5%)	χ^2 =0,128 *p*=0,808; *N*=70
	Water - dinner	14 (42,4%)	18 (48,6%)	χ^2 =0,272; *p*=0,638; *N*=70

Table 6. *Food Choice Frequencies per "Self-regulation" groups.*

		Health Index *(sum of healthy selected items)*							
		0	**1**	**2**	**3**	**4**	**5**	**6**	**Total**
Whole sample	**Low SR**	10 (23,8%)	9 (21,4%)	2 (4,8%)	8 (19,0%)	6 (14,3%)	3 (7,1%)	4 (9,5%)	42 (100%)
	High SR	16 (11,9%)	18 (13,4%)	21 (15,7%)	21 (15,7%)	26 (19,4%)	17 (12,7%)	15 (11,2%)	134 (100%)
(χ^2=8,924; p=0,176; N=176)									
Experi-mental	**Low SR**	8 (38,1%)	5 (23,8%)	1 (4,8%)	1 (4,8%)	3 (14,3%)	1 (4,8%)	2 (9,5%)	21 (100%)
	High SR	9 (12,5%)	13 (18,1%)	12 (16,7%)	9 (12,5%)	10 (13,9%)	7 (9,7%)	12 (16,7%)	72 (100%)
(χ^2=9,676; p=0,132; N=93)									
Control	**Low SR**	2 (9,5%)	4 (19,0%)	1 (4,8%)	7 (33,3%)	3 (14,3%)	2 (9,5%)	2 (9,5%)	21 (100%)
	High SR	7 (11,3%)	5 (8,1%)	9 (14,5%)	12 (19,4%)	16 (25,8%)	10 (16,1%)	3 (4,8%)	62 (100%)
(χ^2=6,323; p=0,398; N=83)									

Table 7. *Food Choice Frequencies per "Food as a reward" groups.*

		Health Index *(sum of healthy selected items)*							
		0	**1**	**2**	**3**	**4**	**5**	**6**	**Total**
Whole sample	**Low SR**	16 (16,8%)	13 (13,7%)	14 (14,7%)	16 (16,8%)	19 (20,0%)	9 (9,5%)	8 (8,4%)	95 (100%)
	High SR	14 (15,9%)	16 (18,2%)	9 (10,2%)	13 (14,8%)	13 (14,8%)	12 (13,6%)	11 (12,5%)	88 (100%)
(χ^2=3,606; p=0,737; N=183)									
Experi-mental	**Low SR**	11 (23,4%)	8 (17,0%)	6 (12,8%)	5 (10,6%)	8 (17%)	4 (8,5%)	5 (10,6%)	47 (100%)
	High SR	8 (16,3%)	10 (20,4%)	7 (14,3%)	5 (10,2%)	5 (10,2%)	5 (10,2%)	9 (18,4%)	49 (100%)
(χ^2=2,679; p=0,860; N=96)									
Control	**Low SR**	5 (10,4%)	5 (10,4%)	8 (16,7%)	11 (22,9%)	11 (22,9%)	5 (10,4%)	3 (6,3%)	48 (100%)
	High SR	6 (15,4%)	6 (15,4%)	2 (5,1%)	8 (20,5%)	8 (20,5%)	7 (17,9%)	2 (5,1%)	39 (100%)
(χ^2=4,378; p=0,647; N=87)									

FACULDADE DE **ECONOMIA**