

A Work Project, presented as part of the requirements for the Award of a **Masters Degree in Management** from Faculdade de Economia da Universidade Nova de Lisboa.

**Can Advergames Boost Children's Healthier Eating Habits?  
A comparison between healthy and non-healthy food.**

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# Can Advergaming Boost Children's Healthier Eating Habits?

## A comparison between healthy and non-healthy food.

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### Abstract

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This research aims to investigate the effects of food *advergaming* on children's eating habits. A total of 231 elementary school-age children were randomly assigned to one of the following two conditions: (i) play the *healthy advergence*; (ii) play the *less healthy advergence*. A post-treatment pictured questionnaire was used to assess their behavior in terms of immediate food choice, food liking, and nutritional knowledge. Results showed that children tend to choose a snack accordingly to what was being advertised in the game. In terms of food liking, children who played the less healthy version of the game reported a higher preference for some of the less healthy options. Regarding nutritional knowledge no differences were registered which leads us to conclude that they already have a solid understanding of what are "good" and "bad" foods for their health. These findings have important legal, educational, management and social marketing contributions.

**Key Words** Advergaming; children; eating behaviors; nutritional knowledge.

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### Introduction

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*"Childhood obesity is one of the most serious public health challenges of the 21st century"*  
World Health Organization<sup>1</sup>

Obesity is now considered the fifth leading global risk for mortality and has reached an epidemic status. 43 million children under five years-old are considered overweight (WHO, 2010). In Europe, Lobstein et al. (2004) showed that there is a higher prevalence for overweight children in Southern Europe, especially in Mediterranean region (Exhibit B1). This is of great concern to all of us, especially to food industry which has largely contributed to this issue due to energy-dense food availability and strong communication campaigns directed to children (Hastings et al., 2006). During the 11<sup>th</sup> International Congress on Obesity<sup>2</sup> (2010), Dr Tim Lobstein (Exhibit A1) adverted:

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<sup>1</sup> <http://www.who.int/dietphysicalactivity/childhood/en/>

<sup>2</sup> International Congress on Obesity official Web Site: <http://www.ico2010.org>

“ (...)heavy marketing of energy dense foods and the promotion of fast food outlets is a likely risk factor for obesity and children are a prime target. We need to take this issue seriously.”<sup>3</sup>

Authors have proven that food marketed to children is predominantly high-sugared and fat-based, inconsistent with dietary recommendations (Story and French, 2004). The same trend characterizes the content of food marketing on popular children websites, where the most marketed food products are candy, cereal, quick serve restaurant meals and snacks (Alvy and Calvert, 2008). Food industry keeps spending millions on less healthy food products advertisement (Exhibit B2). As a result, children’s food decisions are often made in high-calorie or nutrient-poor environments.

These health-related behaviors, largely shaped by media, are developed during early childhood, influencing children’s quality of life (Williams et al., 2005) and are likely to persist in adulthood (McGinnis et al., 2006).

The purpose of this paper is to analyze how *advergames*, interactive product-themed digital games, influence their eating behavior.

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## Literature Review

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### The Web and the Kids

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*Generation Z “the digital natives, the dot com kids”*  
generationz.com.au

The most recent generation in the world, today’s kids, is characterized as the socially empowered generation ever. They are technologically literate and have been shaped to multi-task. Today’s boys and girls were born with Wi-Fi, MySpace and YouTube. They have only known this user-generated world, where knowledge and entertainment are only a few clicks away of them.<sup>4</sup>

In such technological environment is essential to understand how media interacts with young people’s lives in order to develop efficient communication programs.

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<sup>3</sup> *News Release*: [www.polmarkproject.net/documents/IASOPolmarkPressRelease.pdf](http://www.polmarkproject.net/documents/IASOPolmarkPressRelease.pdf)

<sup>4</sup> <http://www.generationz.com.au/index.html>

*Safer Internet* studies (Livingstone and Haddon, 2009) reveal that 75% of European children between 6 and 17 years old use Internet for various purposes and the number is rising every year. To know more about “The web and the Kids” see Exhibit B3.

## **Digital Media**

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*“Consumers are no longer passive media spectators, but interact with media in co-producing settings”*  
Bardhi et al., 2010

The emergence and dynamics of new types of promotions, especially on the web, are changing the way companies communicate to children. It is estimated that 98% of web sites designed for children permit advertising, and more than two thirds rely on advertising as their primary revenue stream (Neuborne, 2001). Moreover, Internet is now able to capture children’s attention for several minutes rather than few 30 seconds TV commercials (Lee et al., 2009; Moore, 2006), contributing to an increase of the product or brand exposure. Moreover, Mark McCrindle (2006) argued that to a multi-media literate generation as today’s, experimental, interactive and visual communication is a more attractive and efficient approach. Internet easily combines all these features. Therefore, it became very attractive for companies and has been increasing over the last few years, especially Internet marketing techniques targeted to children and adolescents (Webber et al., 2006). Moreover, Internet is also considered an appropriate method to create awareness and persuade individuals to adopt health-promoting behaviors (Cassell et al., 1998).

### ***Advergame***

This new form of advertising, where the brand entertains its audience, consists of playing “online games designed for the specific purpose of marketing a single brand or product” (Winkler and Buckner, 2006: 24). The product and the brand are generally the central feature of the game engaging the player in a fun and playful environment.

Empirical evidence shows that Food is among the top three industries using *advergames* into their promotional strategy (Lee and Youn, 2008). Moore (2006) has found that 73% of the major food advertisers' website included *advergames*. Consequently, several questions arise: Are children easily manipulated by the nature of food *advergames*? To what extent would food *advergame* influence their eating behavior?

Similar to advertising, *advergames* may also perform other functions such as entertain or educate (Lee and Youn, 2008). Despite its educational benefits, very few *advergames* were found to educate children regarding eating and dietary behaviors. Only 2,7% of food *advergames* educate children about nutritional and health issues (Lee et al., 2009). Likewise TV food advertisement, *advergames*' food content is predominantly high-sugared and fat-based and authors classified 84% as being "low-nutrient".

## Targeting Children

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*"As for teaching children concepts that they have not already acquired in their spontaneous development, it is completely useless"*

Jean Piaget, 1970

For marketers, children have long been recognized by its market potential. Not only do they represent a current market (because they are able to spend some money) but also other two: influence market and future market (McNeal, 1998).

To choose the most appropriate target for this research I have considered the *Theory of Cognitive Development* of Jean Piaget, who described how the mind processes information based on four different stages of intellectual development<sup>5</sup>. The population in study is composed by elementary school-age children in the concrete operational stage (7/8 years-old). In this stage children are able to think at a more logical level and they develop the ability to make rational judgments (Piaget, 1972). Moreover, they look for more challenging, stimulating and interactive activities (Acuff and Reiher, 1997). Electronic games can supply different levels of challenge and, at the same time, provide

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<sup>5</sup> Sensory-motor (0-2), Preoperational (2-7), Concrete operational (7-11) and Formal operational (11 – adulthood).

a “great deal of visual and auditory stimulation” (Acuff and Reiher, 1997: 88), motivating and engaging children in the activity.

At this cognitive stage they also develop their “moral sense” perceiving things as right or wrong, good or bad (Acuff and Reiher, 1997), which is essential for this study since it is also intended to understand their perception of “good” and “bad” food for health.

### **Food Choice and Food Liking**

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Eating habits are complex and depend on several variables some of which defined genetically even before we were born (Contento, 2008; Duffy and Bartoshuk, 2000; Skinner et al., 2002). According to Contento (2008), people’s food choice and related behaviors depend on the interaction of (Exhibit B4):

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1. *Biological factors*, such as taste or a higher predisposition for sweeter foods;
  2. *Experience with food*, which concerns familiarity levels with each food;
  3. *Personal*, related with one’s beliefs and attitudes or social networks;
  4. *Environmental* such as food availability, advertising or cultural practices.
- 

According to this model, repeated exposure to marketing campaigns has an impact in children’s food choice and preferences, since it builds awareness, reinforces food familiarity, reduces *neophobia* (fear of trying new foods) and influences consumption (Contento, 2008; Sullivan and Birch, 1994).

In spite of *advergaming* increasing popularity, little has been investigated about the effects of food *advergaming* on children’s eating behavior and spontaneous food choices after playing it. The majority of the literature addresses the impact of TV messages advertising food and beverages (McGinnis et al., 2006), suggesting that children’s food choices and preferences reflect their TV exposure experience (Coon et al., 2001; Galst, 1980; Goldberg et al., 1978; Gorn and Goldberg, 1982).

Regarding *advergaming*, only three studies mentioned some eating behaviors. Mallinckrodt and Mizerski (2007) studied the effects of *advergaming* on young

consumers' brand perceptions, preferences and requests of a branded cereal breakfast. They were able to show that although they perceived fresh fruit as being healthier than the cereal advertised (*Froot Loops*), they still plan to request it after playing the *advergame*. Another study (Pempek and Calvert, 2009) used *advergames* to compare the consumption of healthy and less healthy snacks by low-income African American children, concluding they choose to eat what they saw advertised. Finally, Hernandez and Chapa (2010) found that children choose significantly more snacks that were being advertised on *advergames* compared to others not advertised.

The fun and entertainment environment of the *advergame* also plays an important role regarding food familiarity and product liking, since a child is attracted by the fun dimension of a product (Mathiot, 2010). Furthermore, Thomson (2010) came to the conclusion that children are disciplined by brands through its online playing marketing campaigns (referring to some popular breakfast cereal web sites).

There is also empirical evidence on how promotion and availability of healthy food influences children's preferences and purchase behavior of this category, decreasing the consumption of less healthy available items (Rexha et al., 2010).

Wise et al. (2008) found that *advergames* are more effective when its contents are associated with the brand or product being advertised, engaging players in activities related to a behavior they would perform when using the product. This enhances associations between game content and behaviors.

Therefore, it is expected that children's spontaneous snack selection and food liking reflect the food content present in the *advergame* they have played.

*H<sub>1</sub>: Children's spontaneous snack selection will reflect the food content of the advergame they played.*

*H<sub>2</sub>: Children's food liking will reflect the food content of the advergame they played.*

- a) The group who played the healthy version will like healthy food more than the other group.*
- b) The group who played the less healthy version will like less healthy food more than the other group.*



## Nutritional Knowledge

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This research also intends to understand the influence of *advergames* as a possible nutrition educator or distorter, depending on the type of food being advertised.

Children's nutritional knowledge depends not only on their cognitive development stage (Hart, 2002; Lytle et al., 1997) but also on environmental factors (Contento, 2008). Although parents and schools educate young consumers on their eating habits, advertisement mechanisms contribute largely to their nutritional beliefs (Contento, 2008; Hastings et al., 2006; Singleton and Rhoads, 1984).

Edwards and Hartwell (2002: 373) concluded that 8-11 year-old children have "an appreciation of the term *healthy eating* and could relate this to what they should be consuming". Dietary awareness of children is considered to be good since they seem to have a clear idea distinguishing healthy ("good") and non-healthy ("bad") food (Lytle et al., 1997; Noble et al., 2000; Wellman and Johnson, 1982).

Despite their knowledge, they are easily influenced or manipulated by what they see or experience. Noble et al. (2000) noted that because children are receiving different messages about nutrition, their understanding is fragmented and does not help in their food selection, which is aligned with Lytle et al. (1997) conclusions: understanding nutritional messages has not been translated in children's eating habits. Signorielli and Staples (1997: 297) concluded that "there is a positive relation between watching more television and saying that the unhealthy food choice is more healthy". In fact, "the more television they watch, the more likely they are to have incorrect conception of which foods are healthy and unhealthy" (Signorielli and Staples, 1997: 298). Therefore, it is expected that their exposure to *advergames* will influence their nutritional conceptions.

*H<sub>3</sub>: Children's nutritional knowledge will reflect the food content of the advergame they played. This means that children who have played the healthy version of the advergame will register higher nutritional scores compared to those who played the less healthy version of the game.*

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## **Methodology**

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### **Sample Demographics**

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School-age children are the target of this study. Due to their vulnerability we, as researchers, take higher responsibility in protecting their rights. Therefore, all the steps of an ethical research with children (UNICEF, 2002; Greig et al., 2007) were followed.

The required authorization forms were collected from:

- (i) the Portuguese Education Ministry approving the study in schools (Exhibit C1);
- (ii) each individual school and (Exhibit C2)
- (iii) parents authorizing their child to participate (Exhibit C3)

Moreover, children were carefully informed about the activity dynamics, their role and their freedom to express whatever they think or feel during the experiment process. Their willingness (whether they wanted or not to participate even if their parents have consented) was always taken into consideration as well as their personal views.

Out of 10 formal requests, 7 elementary public schools in Oeiras accepted to be involved in the study. However, because of a surprisingly high response rate from parents in the first schools, only 5 schools were able to participate in this research due to the lack of time and available resources.

Participants included 2<sup>nd</sup> and 3<sup>rd</sup> grade children (with 7 and 8 years old). According to the psychologist (see next chapter: Experiment Design), children in this age group are able to work with computers, read, interpret and fill out simple questionnaires.

A total of 234 children returned the signed authorization forms from their parents to classroom teachers (283 forms sent; response rate = 84%). However, on the day of the experiment, 3 children were absent and could not participate. In the end, the sample totaled 231 young students (Exhibit C4).

According to Diamantopoulos and Schlegelmilch (1997), 100 observations are required to ensure the representativeness of a population, which means the current sample is

representative. Moreover, the group in study is considered to be homogeneous since children share similar cognitive (7/8 years old) and social development (all from Portuguese public schools) levels and there are approximately the same number of girls (49,4%) and boys (50,6%). Finally, the sample was randomly distributed between both treatment conditions (see Table 1).

**Table 1** | *Sample constitution per age and group condition*

<i>Gender</i>	<i>Age</i>		<i>Food Type</i>		<i>Total</i>
	<i>7</i>	<i>8</i>	<i>Healthy</i>	<i>Less Healthy</i>	
Boy	62	55	56	61	117 (50,6%)
Girl	60	54	59	55	114 (49,4%)
	122 (52,8%)	109 (47,2%)	115 (49,8%)	116 (50,2%)	213 (100%)

## Experiment Design

Initial qualitative research involved informal discussions with specialized professionals, psychologists and nutritionists, in order to develop the most appropriate method. The conclusions drawn from these interviews were very helpful in designing the experiment, the treatment and the questionnaire (see methodology timeline in Exhibit C5).

**Questionnaires** The specialist in psychology, Professor Luísa Barros (Exhibit A2), suggested that, according to children’s range of cognitive, language and social development, pictorial cues should be employed since it represents an efficient tool to assess their preferences. According to her, cards are easy for children to understand, organize, and communicate their choices in a way that is enjoyable and playful. This technique, also used in previous researches (Birch, 1980; Domel et al., 1993; Sullivan and Birch, 1990), involves nonverbal measures, which minimizes a child’s dependence on the spoken language in understanding the researcher’s questions and in providing his or her own answers (Donohue et al., 1980; Macklin, 1985).

During the meetings with these specialists, it was discussed whether to use a semi-structured interview or a simple questionnaire that children could fill out by themselves.

According to their opinions, which analyzed both options, it was concluded that questionnaires were a more efficient way to reduce social desirability effect. In fact, the nutrition specialist, Rui Lima (Exhibit A4), mentioned that eating habits could be a sensible topic to discuss with children since they have a general good knowledge of what is healthy eating and what they should eat. Moreover, for children the researcher is an adult similar to a teacher, which might lead them to answer the desired and correct regarding their “supposed” eating behaviors. In fact, to reduce the probability of this social desirability response biases, literature has suggested that, not only the researcher should guarantee the anonymity of the responses, but also ensure that there are no right or wrong answers so they can be as honest as possible (Podsakoff et al., 2003).

The questionnaire consisted of 8 structured questions (multiple-choice and multichotomous). The majority uses pictorial cues and, to answer each question, children had to select the picture that best reflects their situations (Exhibit C6).

**Treatment** The present study aims to evaluate possible effects on children’s eating habits originated by the food content present in a computer game. So, in order to make reliable comparisons and exclude other factors (such as different levels of challenge and entertainment) two versions of the same *advergame* were designed and created by the researcher<sup>6</sup>. The only difference relied on the type of food provided (healthy food in the healthy version and less healthy food in the other version), which yields the player with five points every time it grabs one snack. Some snacks were selected from past literature (Cooke and Wardle, 2005; Wardle, 2001) and discussed with the nutritionist.

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<sup>6</sup> As indicated previously, food marketing expenditures is mostly focused on unhealthy and nutrient poor products. Consequently, there are almost no online *advergames* with healthy contents and, those which provide children with some health insights lack interactivity, challenge and enthusiasm.

The game was developed using *Game Maker 8.0 Lite* software, downloaded from yoyogames.com on October 2<sup>nd</sup>, 2010.

The criteria used to select the snacks for the game were based on Portuguese culture and eating habits, food nutritional value and children's access to each product (Exhibit C7).

The character of the game, *Super Mario*, was selected according to a pre-test with 11 children in the same age group of the research population (Exhibit C8). This pre-test was suggested by the psychologist Sílvia Coutinho (Exhibit A3) and included other popular characters such as *Ben10*, *Hello Kitty*, *Super Mario* and *Shrek*. Children were asked to select two characters they would like to see in a digital game.

To make the game challenging enough for this age group there are enemies that penalize the player with 10% of its health if he or she accidentally grabs it, and two different levels (Exhibit C9). Sílvia Coutinho and Rui Lima agreed that real food images should appear in the game, so that the association with the reality would be higher.

Again, pre-tests to evaluate the suitability and general understanding of both the game and the questionnaire were conducted with five children. According to it, adjustments were made in the game (comprising initial rules clarification with images of the food and enemies so they could pay more attention to it before the game started) and in the questionnaire (some food pictures were improved or even changed since children faced some troubles understanding at first, namely the case of the yogurt and potato chips).

**Procedure** The entire experiment took place in the schools' computer labs or in classrooms with groups from one to four children at a time, depending on the number of available computers and it was conducted with the professor or other school professional's supervision. Participants were randomly assigned to one of the game versions, and played for about 5 minutes, which is considered to be enough to engage the child's best attention (Acar, 2007; Mallinckrodt and Mizerski, 2007; Wise, 2008). Afterwards, they fill the questionnaire, which took children an average of 5 – 7 minutes.

Every step of the process was properly explained by the researcher out loud. The researcher also proceeded through the survey, reading the questions and answers so that no doubt arose. Nevertheless, children were allowed to make questions at any time.

## **Measures**

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### ***Snack Selection***

After the game exposure, children were requested to choose between several alternate food types, following the procedure used by Goldberg et al. (1978), Hernandez and Chapa (2010), Mallinckrodt and Mizerski (2007), Pempek and Calvert (2009).

Twelve snacks were selected with the nutritionist and according to what was being advertised in the game. Moreover, this question did not mention any brand in order not to bias children's answers on previous brand associations.

Pictures of the selected snacks were divided into two different 3 x 2 cards (Goldberg et al., 1978) (see Exhibit C6 – question 5). Each card included three healthy snacks, more wholesome generally higher in nutrient value and three less wholesome snacks, considered to be non healthy, especially if eaten in excess. From these, only two foods were not advertised on the game (pudding and yogurt).

Following the procedure used by Goldberg et al. (1978), the researcher asked children to pretend a hypothesized situation as mentioned bellow:

*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. So, suppose I said "here are six snacks, you can choose three to eat". You can tell me which three would you want to eat now by putting a big X on your page.*

After the first set of choices was made in *Card 1*, children made a second set of choices within the available snacks in *Card 2*, considering this was the second day the researcher was babysitting them.

Answers were statistically treated in a binary code using 0 if the snack was not selected and 1 when it was selected. A new variable was then created corresponding to an additive index, “*Health Index*”, that corresponds to the sum of all selected healthy snacks in both cards. Hence, children were able to select up to six healthy choices.

### ***Food Liking***

To evaluate food liking levels, children were asked to indicate how much they liked each food<sup>7</sup> (see Exhibit C6 – question 6). The same question has already been used, in particular for surveying young children (Cooke and Wardle, 2005; Edwards and Hartwell, 2002; Nicklaus et al., 2005; Wardle et al., 2003) and can therefore be considered reliable. Some of these studies used a 5-point smiley likert scale to measure children’s food preferences (Cooke and Wardle, 2005; Edwards and Hartwell, 2002; Wardle et al., 2003). However, in the nutritionist’s perspective, a 4-point likert scale (instead of 5) was more precise to evaluate children’s food likes/dislikes. In his words “adults may consider the neutral point as, for instance, *‘I neither like nor dislike it, but I eat it because I know it is good for my health’*. But when comes to children they don’t care about healthiness.” He also added that by their own will, children will only choose those foods they appreciate more. As a consequence, the neutral point was not considered. The scale comprises five alternative responses from 0 to 4: “never tried it”, “I hate it”, “I don’t like it”, “I like it” and “I love it”. Moreover, to facilitate their understanding and motivation, smiley faces illustrate each option (except “never tried it”). Regarding the smiles, Dr. Rui Lima suggested the use of a “sick smile” for “I hate it” instead of the one previously considered by the researcher (“sad smile”) to be more consistent with the topic analyzed – food dislike (Figure 1).

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<sup>7</sup> All the foods were advertised in the respective game (Exhibit C7), but in order to make the question not too extensive, four were left out (two healthy: milk, fruit salad and other two less healthy: ice cream and soda).



**Figure 1** | Smiley Likert Scale

### ***Nutritional Knowledge***

To understand their conceptions of nutrition and healthy food two different questions were asked. The first (Exhibit C6 – question 7) provided five different pairs of food. In each pair children had to choose which one they thought was healthier, following the procedure used by Signorielli and Staples (1997) and Harrison (2005). The pairs, presented in pictures, were the following (the bold highlights the healthier product):

1. **Yogurt** and ice-cream;
2. Big Mac and **grilled chicken sandwich**;
3. Coca cola and **natural orange juice**;
4. **Popcorns** and chocolate bar;
5. **Fresh fruit** and fruit cereal bar.<sup>8</sup>

Statistically it was treated with a binary code: 0 represents the less healthy food and 1 the healthier option. The answers to this question were combined into an additive index identified as “*Knowledge Index*” which is simply the sum of each respondent’s answers. The maximum value possible is five, if a child chooses all the healthier food items.

The last question (Exhibit C6 – question 8) asked them to make a balanced meal out of 16 foods<sup>9</sup>, regardless of their preferences. This question was adapted from *apetece-me.pt* activities directed to children in this age range and were developed by nutrition specialists under a program created by Nestlé. To analyze their choices two variables were created based on the number of selected food products: “*#Health*” and “*#Less Health*”.

<sup>8</sup> Some changes from the original measure of Signorielli and Staples (1997) were carried out: (i) the pair *frosted flakes and corn flakes* was removed because children in the pre-test seemed not to understand the difference between both and (ii) *fruit roll-up* in the original question was replaced by fruit cereal bar, since the first is an American brand which is not present in Portugal.

<sup>9</sup> Strawberries, Fish, Carrot, Potatoes, Fried Potatoes, Cheese, Big Mac, Chocolate Mousse, Fried Egg, Ketchup, Salt, Coke, Water, Tomato, Lettuce, Soup (Exhibit C10)



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## Results

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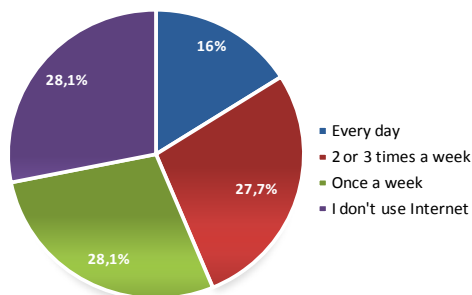
### Sample Characterization

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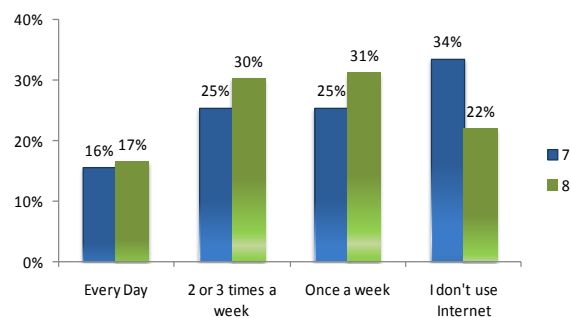
According to children’s self report of **internet usage rate** (Exhibit C6 – question 1), the sample was distributed as illustrates Figure 2 and, in more detail, Exhibit D1 – Table 1.

Younger children in the sample (7 years old) use less frequently the Internet when compared to 8 year-old children (Figure 3) but no statistically significant differences were found regarding age ( $Chi^2 = 3,955$ ;  $p < 0,266$ ) nor gender ( $Chi^2 = 1,813$ ;  $p < 0,612$ ) (Exhibit D1 – Table 2 and 3).

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**Figure 2** | Internet Usage Rate.



**Figure 3** | Internet Usage Rate per age.

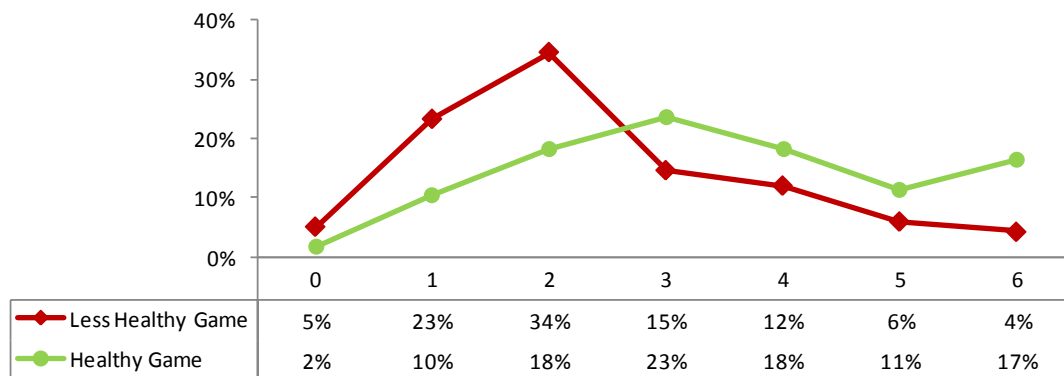
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Regarding online top activities (Exhibit C6 – question 2), 97% of children using the Internet said they use it to *play games* and 28,9% for *school work*. This was a multiple choice question with five possible answers (Exhibit D1 – Table 4).

Children enjoyed playing the game as can be seen by the high registered levels on the **attitude towards the game** (Exhibit C6 – question 3): 98,3% of the children “liked a lot” and the remaining 1,7% said they have “like it more or less”. No one chose the option “I did not like it” (Exhibit D2 – Table 5). Additionally, when asked if they thought the game was easy, hard or just right (Exhibit C6 – question 4) a great part (44,2%) found the difficulty of the game “just right” for them (Exhibit D2 – Table 6).

**H<sub>1</sub>: Children’s Snack Selection** (Exhibit C6 – Question 5)

As mentioned previously, children had to select six snacks after playing the *advergame*. It was hypothesized that those who played the healthy version of the game would tend to select more healthy snacks. Indeed, children exposed to the less healthy version have selected more frequently nutrient poor snacks (63% chose three or more of less healthy food or, in other words, only up to two healthy snacks) while those who played the healthy version have selected more frequently healthier options (70% selected three or more nutritious snacks) as illustrated in Figure 4. A more complete descriptive analysis of the distributions is described in Exhibit D3.



**Figure 4** | Snack Selection – Health Index (sum of healthy selected items).

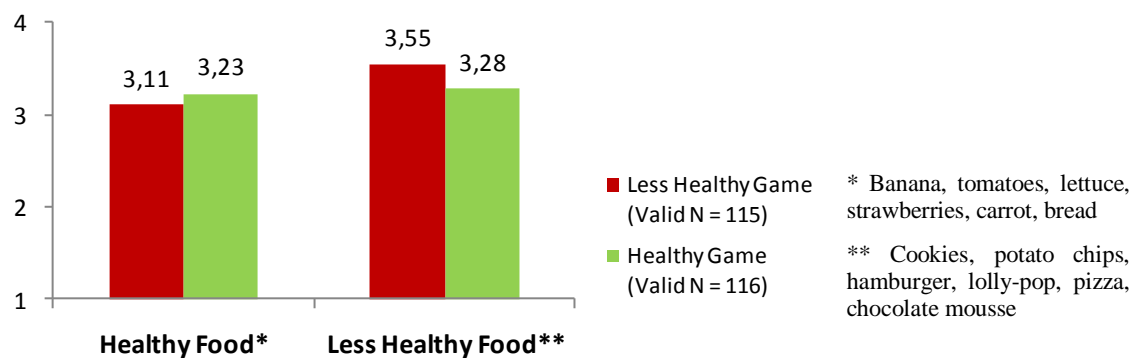
To test if there was any association between these two categorical variables (game type and snack selection) a  $Chi^2$  test of association was used. Results show that these variables are associated ( $Chi^2 = 27,323$ ;  $p < 0,000$ ) and the strength of this association is moderate ( $V = 0,344$ ). (Exhibit D3 – Table 8). As a consequence, there is sufficient evidence not to reject the first hypothesis of this study, which concerns the effect of the food game content on children’s spontaneous snack selection.

*H<sub>1</sub>: Children’s spontaneous snack selection will reflect the food content of the advergame played by them.*      ✓ **Hypothesis Not Rejected**

## H<sub>2</sub>: Children's Food Liking (Exhibit C6 – Question 6)

Due to the metric nature of this measure independent t-tests were used to establish if any significant difference existed between game groups with a statistical significance of 0,05 for all tests.

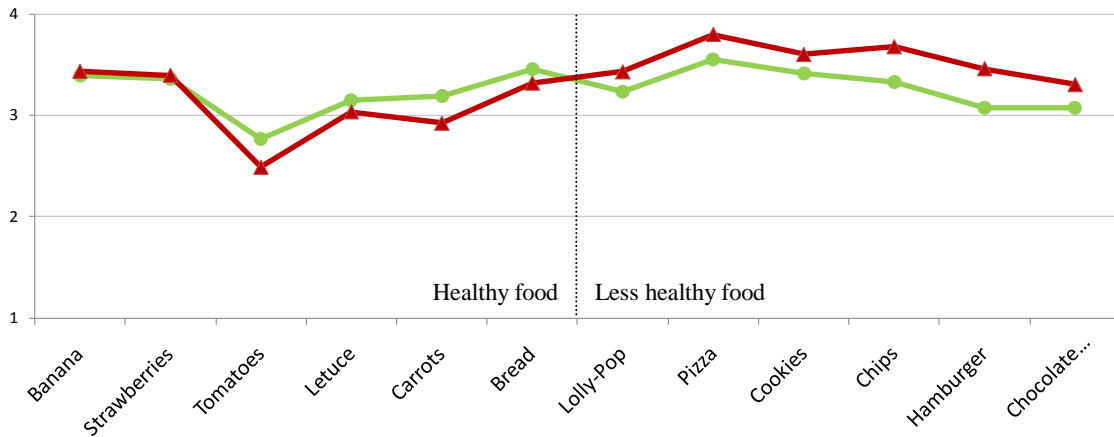
As a first analysis, food products were grouped together according to their nutritional value (healthy vs. less healthy). Through its descriptive statistics, we can see that (i) the mean preference for healthy products is higher for those who played the healthy version (3,23) and (ii) the mean preference for less healthy products is higher for those who played the less healthy version (3,55) (see Figure 5).



**Figure 5** | Food Liking averages by group: healthy food vs. less healthy food

Although the mean differences between groups are small, probably due to the small range in the scale (1 to 4), independent t-tests were computed. These tests suggest no differences regarding healthy food products ( $t = 1,643$ ;  $p < 0,102$ ). However, differences regarding preferences for less healthy products appear to be statistically significant ( $t = - 3,718$ ;  $p < 0,000$ ) (Exhibit D4 – Table 9).

In order to understand which foods were significantly different, mean preferences for each food product were analyzed and the sample distribution by game version is illustrated in the figure 6 (the distribution is described in more detail in Exhibit D4 – Table 10):



**Figure 6** | Food Liking averages by product.

We can identify a pattern regarding less healthy food: children who played the less healthy game version tend to report a higher preference in all less healthy products.

T-tests were performed to every single food product and the results confirmed that no differences regarding healthy food products are significant. The only statistically significant differences were found in some of the less healthy products (Exhibit D4 – Table 11): **potato chips** ( $t = 3,658$ ;  $p < 0,000$ ), **hamburger** ( $t = 3,122$ ;  $p < 0,002$ ) and **pizza** ( $t = 3,063$ ;  $p < 0,003$ ). These three products registered a higher mean preference in the group of children who have played the less healthy version of the game.

*H<sub>2</sub>: Children's food liking will reflect the food content of the advergame they played.*

*a) The group who played the healthy version will like healthy food more than the other group.*

**✗ Hypothesis Rejected**

*b) The group who played the less healthy version will like less healthy food more than the other group.*

**✗ Hypothesis Rejected for all except:**

**✓ Pizza ✓ Chips ✓ Hamburger**

### H<sub>3</sub>: Children’s Nutritional Knowledge

It was previously hypothesized that the nature of food to which children have been exposed in the advergaming would influence their nutritional knowledge. In question number seven, children were asked to choose the healthier option in each pair. The great majority (71%) answered correctly to all five pairs (Figure 7). When data is analyzed according to the game played we observe that differences are marginal (Figure 8).

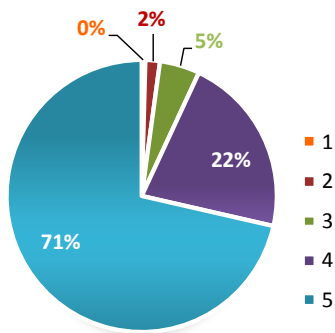


Figure 7 | Knowledge Index sample frequencies.

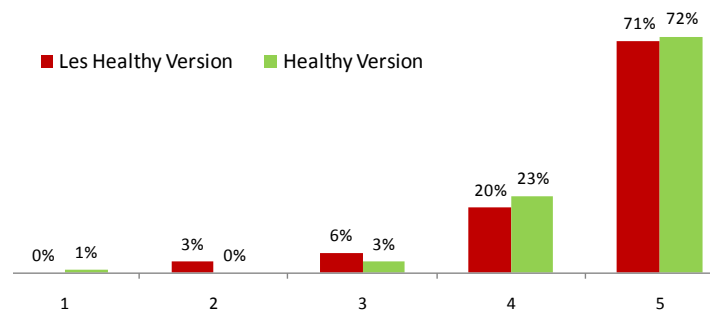


Figure 8 | Knowledge Index frequencies per game version.

A t-test ( $t = -0,905$ ;  $p < 0,367$ ) showed that no significant differences regarding nutritional knowledge averages exist between game groups (Exhibit D5 – Table 12). Afterwards, to verify any possible association between these variables (game version and nutritional knowledge) a  $\chi^2$  was conducted (Exhibit D5 – Table 13). Because 40% of the cells have expected count less than 5 we examine the *Likelihood Ratio* (the *Pearson  $\chi^2$*  should not be analyzed when more than 20% of cells have expected count less than 5). According to the *Likelihood Ratio* we conclude there is no significant association between both variables ( $G = 8,082$ ;  $p < 0,089$ ).

To exclude this issue of few observations in more than 20% of the cells, the values within this variable were re-coded into medium/low and high nutritional knowledge. Likewise, a  $\chi^2$  test was computed and the outcome was the same: no significant association between both variables (Exhibit D5 – Table 14).

Regarding question eight, where children were asked to prepare a balanced lunch choosing from a set of 16 foods, the frequencies distribution of the number of healthy (*#Healthy*) and the number of less healthy food (*#Less Healthy*) chosen is illustrated below (Figure 9 and 10).

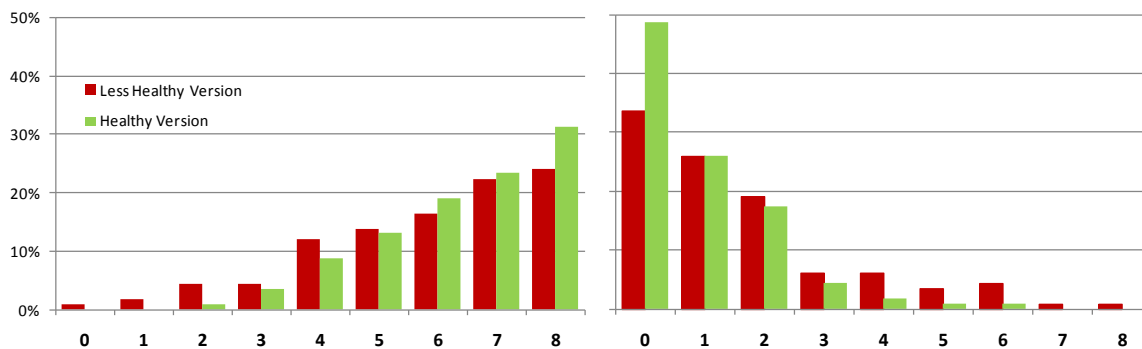


Figure 9 | #Healthy food items selected.

Figure 10 | #Less Healthy food items selected.

We can identify some interesting outputs:

- more children who played the healthy version were able to select more healthy food items for their balanced lunch;
- more children who played the healthy version (49%) have selected zero “less healthy” items (*#Less Healthy*) for their balanced plate when compared to children exposed to the less healthy version of the game (34%).
- Overall, *#Healthy* is left-skewed which means more children selected more healthy food items. Likewise, *#Less Healthy* is right-skewed indicating that the majority of the children have selected few less healthy food items.

Tests of association show that there is no association between nutritional knowledge of a balanced meal and food exposure in the game (Exhibit D5 – Table 15 and 16).

*H<sub>3</sub>: Children’s nutritional knowledge will reflect the food content of the advergaming they played. This means that children who have played the healthy version of the advergaming will register higher nutritional scores compared to those who played the less healthy version of the game.*

**✘ Hypothesis Rejected**

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## Discussion

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Internet is spread everywhere at anytime and its use among children is increasing very fast, especially in younger segments (Livingstone and Haddon, 2009). As a medium with multiple functions, Internet easily attracts children due to their entertainment benefits. Consistent with previous research, the most popular activity on this sample was online gaming. Knowing that, companies have been taking advantage of this market trend to target children and persuade them to buy branded products. Through *advergaming* companies have found a “brand communicator” that is able to retain player’s attention for several minutes and even repeatedly, something television was not able to deliver. Due to its potential, research on the field has been focusing on its efficacy in delivering a promotional message, building brand equity or formulating attitudes toward brands or toward the game itself (Hernandez et al., 2010; Mallinckrodt and Mizerski, 2007; Weber et al., 2006; Winkler and Buckner, 2006).

However, little has been investigated to protect young consumers, particularly concerning their health and eating habits. Food is the most common category targeted to children through *advergaming* and usually promotes energy-dense and nutrient-poor snacks (Alvy, 2008; Hastings et al., 2006; Story and French, 2004). As food marketing is considered one strong ally of childhood obesity (Hastings et al., 2006), concerns about this new promotion tool and its impact on children’s health has stimulated the interest for this project. This paper provides a critical view on this issue and suggests how children’s eating behavior can be manipulated through fun and entertainment.

### Snack Selection

Findings reveal that concerns about *advergaming* marketing unhealthy food are justified. Fortunately, the same principle applies to healthy food. *Advergaming* might also be used

to instigate healthier eating habits.

Empirical evidence drawn from this investigation shows that, when selecting a snack, children tend to choose accordingly to what was being advertised in the game they have just played. Participants were significantly more likely to choose from those foods they have played with in one of the *advergame*'s version. This is consistent with previous studies regarding TV commercials (Galst, 1980; Goldberg et al., 1978) and other regarding *advergames* (Hernandez and Chapa; 2010; Mallinckrodt and Mizerski, 2007; Pempek and Calvert, 2009). Results could be explained through the **active engagement** provided by the interactive, fun and entertainment environment of the game (Mathiot, 2010), **memory** (Hernandez, 2010) and increasing **food familiarity** (Contento, 2008; Sullivan and Birch, 1994). Additionally, we may say, as did Deborah Thomson (2010: 14), that players are “disciplined (through play)” into a specific behavior which will depend on the food nature present in the *advergame*.

As a consequence, “fun food” through *advergaming* can be considered an opportunity instead of a threat. Companies may find in healthier products a new profitable market, as long as they can reach young consumers attention and interest and, at the same time, enhance their CSR.

On a social field, these results build evidence to support social marketing campaigns to fight childhood obesity through health-promoting *advergames* and it also highlights its educational benefits in schools, since playing was able to educate children (Lee and Youn, 2008). The great majority of children reported liking the *advergame* in study, which has only two levels and lack the interactivity of branded games designed by experts. This may indicate that more sophisticated digital games would work much better in shaping children's eating behavior.



Finally, this study also intends to provide additional insights to marketing legislators. As young children are affected by the food content present in the *advergame*, legislation should act accordingly and limit promotion of less healthy food through this channel.

### **Food Liking**

Children's food liking also seemed to be affected by the content of the game. The difference is statistically significant for a specific food type: less healthy food items (particularly potato chips, hamburger similar to a *Big Mac* and pizza) were more preferred by those children who played the less healthy version of the game. As long as children's preference for healthy food does not statistically differ between groups, their preferences for unhealthy food were aggravated after playing the unhealthy game, which means they tend to like it more. This measure, not as much spontaneous as the previous one, reveals that when children are allowed to take a moment to think how much they like each food, they seem to be negatively influenced, particularly in some of the less healthy foods.

The fact that there are no significant differences regarding preferences of most foods can be explained by some intrinsic factors that are harder to change or influence in a one shot interaction. For instance, **biological predispositions** to a specific food or taste (children's higher tolerance to sweet rather than to bitter) and **experience with food** which consists of physiological learning arising from previous food exposure (Contento, 2008). According to Contento (2008) these are the factors that mostly affect preferences and food dislikes.

These results provide evidence to support other studies and, again, legislators. Even though food exposure in *advergames* it does not enhance preferences for healthy products, it may boost less healthy products liking.

## **Nutritional Knowledge**

No significant differences among gaming groups were found in what concerns children's nutritional knowledge. It was proven that children's in this age group have a very good understanding of what is healthy and unhealthy food. Indeed, these findings are aligned with the nutritionist's expectations because such concepts and other nutritional contents are introduced early in elementary Portuguese school.

Moreover, their good knowledge in terms of choosing the healthier food can also be explained by the World Food Day's celebrations every October 16<sup>th</sup>. On this day, schools pay tribute to healthy food and children are involved in handmade projects about what they have learned. In fact, during the experiment period it was clear the presence of these celebrations all over the school walls, which has occurred only a couple of weeks before.

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## **Limitations and Insights for Further Research**

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One limitation of this study was the short-term evaluation. Even though an effect was found for children's snack selection, this was driven by one time playing interaction with the game. Long-term effects of *advergaming* on food choices were not addressed herein and could constitute an insight for future research perhaps using a longitudinal design to evaluate repeated exposure effects. Health, educational and policy professionals would benefit from these answers as well.

Regarding children's nutritional knowledge, question number eight (used to evaluate their nutritional understanding when preparing a meal) should be improved in further research. The fact that no limit in the number of selected food items was imposed lead to a harder interpretation of the results. Moreover, the present study did not mention any

changes pre and post- treatment. Instead, it only made inferences about possible differences caused by exposure to different visual stimuli (food type). Therefore, it could be interesting to address this nutritional assessment comparison before and after the game exposure to better evaluate positive or negative changes. . The fact that the World Food Day was very close to the experiment can be considered a limitation since true values behind the nutritional assessment might have been different before this day celebrations’.

Future research could also hypothesize differences in age groups especially regarding their food choice and preference. The focus here was in elementary school age children with 7 and 8 years old. However, interesting conclusions may arise from children in different cognitive development stages. Branded food could also be analyzed in order to better understand the role brands play in a food environment content.

To conclude, there is still plenty to investigate regarding digital and interactive advertising effects in children eating behavior. The ability of brands to interact with its customers is very powerful and could be channeled to positive and better eating habits. Designing efficient and socially responsible marketing campaigns targeting children is possible and companies just have to be creative.

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# Exhibit A

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## Specialists Brief Biography

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### ***A1. Tim Lobstein***

Dr Tim Lobstein is a member of the non-profit organization *The Food Commission*. He is the Director of Policy and Programs of the International Association for the Study of Obesity (IASO). Dr Lobstein is author of several books including *Children's Food: The Good, The Bad and the Useless*, and *The Nursery Food Book: Guidelines for Under Fives Care Staff*. He is an occasional consultant for the WHO Regional Office for Europe (Food and Nutrition Security Program). One of his current concerns includes the rising incidence of nutrition-related diseases in children.

### ***A2. Luísa Barros***

Luísa Barros, PhD in Psychology, is specialized in Psychotherapy (1992) and Counseling and Aggregation in Health Psychology (2005). She is Full Professor and current Dean of the Faculty of Psychology and Sciences of Education, University of Lisbon, where she coordinates the Sub-department of Health and Illness Psychology Currently head of the Scientific Committee. Ms. Barros is author of several books including *Perturbações de Eliminação na Infância e Adolescência*, and *Psicologia Pediátrica – Perspectiva Desenvolvimentista*. Her main investigation fields are health psychology, pediatric psychology, counselling, parental psychopathology, child and adolescent development.

### ***A3. Sílvia Coutinho***

Sílvia Coutinho is a Psychologist specialized in psychological support, psychotherapy (SAPP – *Serviço de Apoio Psicológico e Psicoterapia*), and family therapy (SPTF – *Sociedade Portuguesa de Terapia da Família*). She works directly with children, adolescents and adults in her office in Lisbon and in several educational institutions. Ms. Coutinho is also specialized in Ludotherapy, which is a technique that creates a playful environment to ease the children's process of expression and stimulate and organize their mental schemes.

### ***A4. Rui Lima***

Dr Rui Lima, nutritionist, is a member of the educational department for health and social services of the Portuguese Ministry of Education (NESASE – *Núcleo de Educação para a Saúde e Acção Social Escolar – Educação Alimentar*, DGIDC – *Direcção Geral de Inovação e Desenvolvimento Curricular*).



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## Exhibit B

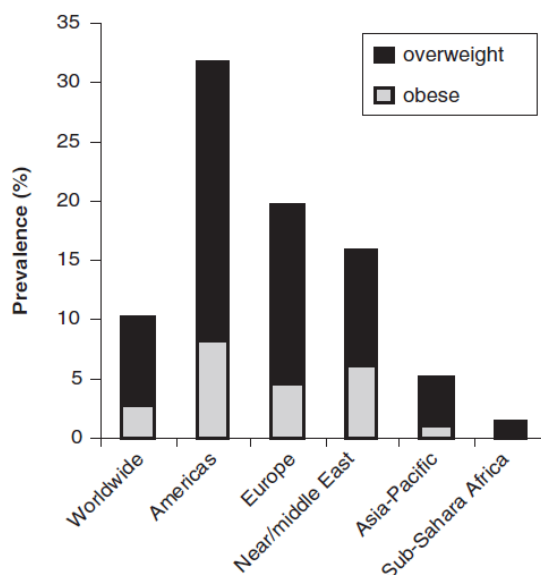
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### B1. Child Obesity – A worldwide problem

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Children obesity rates are growing very fast over the last decade, especially in developed countries. “Current estimates suggest that the rate of obesity in developed countries is double that in developing countries” (WHO, 2010: 8).

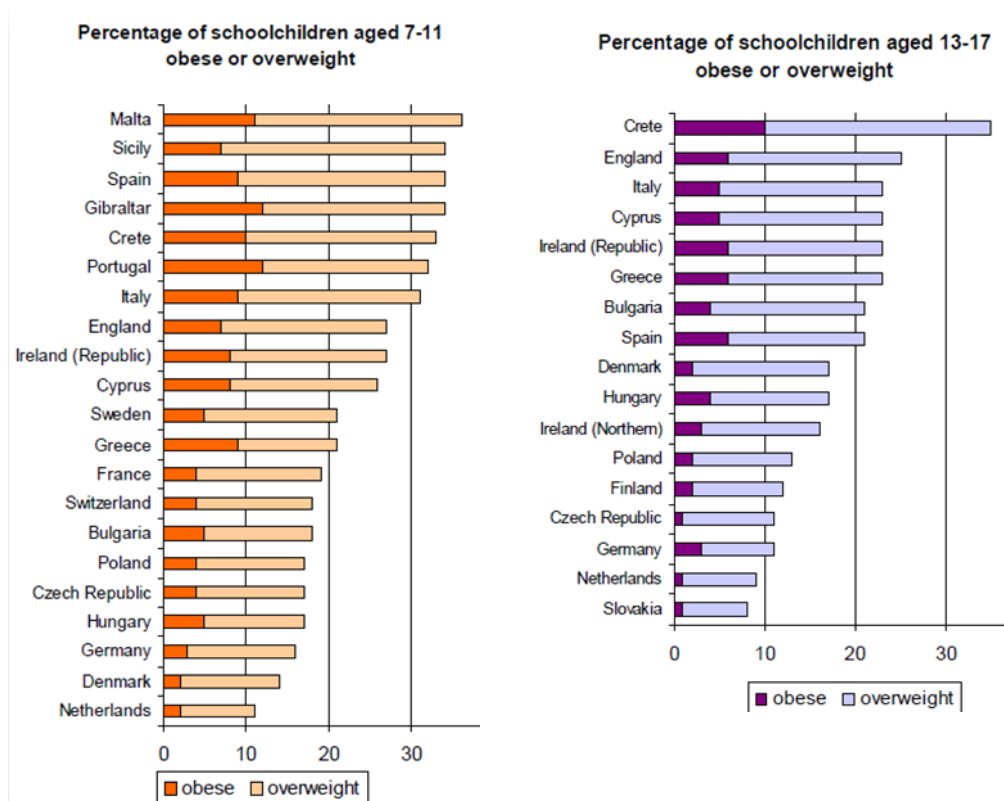
Lobstein (2004) found that 10% of the world’s school-aged children are considered overweight (Figure 1).



**Figure 1** | Prevalence of overweight and obesity among school-age children in global regions. Children aged 5-17 years. Based on surveys in different years after 1990. Source: Lobstein, 2004: 4.

The prevalence of overweight children is increasing in both developed and developing countries, but at a very different speeds and patterns. North America and some European countries have registered the highest prevalence levels (Lobstein, 2004).

In Europe, the problem is recognized as the “Mediterranean Problem” of childhood obesity (Lobstein, 2005) because countries such as Malta, Spain, Portugal and Italy lead the rank of overweight and obesity children aged 7-11, which exceeds 30% of children in this age group. This issue is even worse in this younger segment (7-11) when compared to 13–17 year-old children (Figure 2).



**Figure 2** | Overweight and obesity in children. Source: Lobstein, 2004: 4.

Note: The authors advert that in both figure 1 and 2 data are from available surveys. Comparisons require caution as the year of survey may differ.

Regarding Portugal, Padez et al.<sup>10</sup> found that, in a sample with 4511 children aged between 7 and 9, 20,3% were overweight and 11,3% obese, comprising a total prevalence of 31,5%, which, compared to other European countries is very high. They also found that girls present, on average, higher percentages of overweight and obesity levels than boys. More recent studies (under the European Childhood Obesity Surveillance Initiative – COSI Portugal) confirm that 32% of Portuguese children in elementary school (6-10 years old) are overweight (including 14% considered obese) (Rito and Breda, 2009).

Children are not only getting overweight but they are developing “old age diseases” such as type 2 diabetes and heart dysfunctions (Lobstein, 2005). Consequently, prevention strategies are needed and crucial to reverse this trend.

<sup>10</sup> Padez C, Fernandes I, Mourão I, Moreira P and Rosado V. 2004. Prevalence of Overweigh and Obesity in 7-9-Year-Old Portuguese Children: Trends in Body Mass Index From 1970-2002. *American Journal of Human Biology*. 16: 670 – 678.

## B2. Food marketing directed to children

The PolMark Project<sup>11</sup> (2010) revealed that an impressive majority, 92%, of leading representatives in the food industry, advertising agencies, government and public health bodies, believed there was a link between advertising and child obesity (42% agreed the link was strong). Although the problem awareness is huge, there is still no consensus regarding how this link works and how it should be controlled. Therefore, the industry keeps spending millions promoting food, usually low in nutrient value.

Regarding marketing expenditures, 17% of the total 2006 marketing budget was directed to children between 2 and 17 years old (FTC, 2008). *Fruits and Vegetables* is the food category spending less with marketing addressed to children while *Carbonated Beverages* appear on the top (Figure 3).

Food Category	Marketing That Meets Youth Criteria (\$1000)	Total Marketing (\$1000)	Percent of Total Marketing Meeting Youth 2-17 Criteria
Carbonated Beverages	492,495	3,186,588	15.5
Restaurant Foods	293,645	2,177,306	13.5
Breakfast Cereal	236,553	792,042	29.9
Juice & Non-carbonated Bevs.	146,731	1,252,022	11.7
Snack Foods	138,713	852,342	16.3
Candy/Froz. Desserts	117,694	456,677	25.8
Prepared Foods & Meals	64,283	434,978	14.8
Baked Goods	62,549	153,393	40.8
Dairy Products	54,475	255,697	21.3
Fruits & Vegetables	11,463	46,769	24.5
<b>TOTAL</b>	<b>1,618,600</b>	<b>9,607,815</b>	<b>16.8</b>

Note: Youth 2-17 marketing includes all marketing that meets either the Child 2-11 criteria or the Teen 12-17 criteria, without duplication.

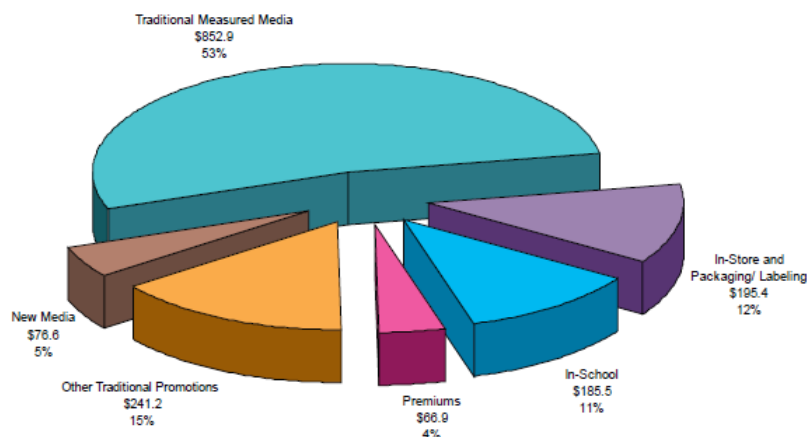
**Figure 3** | Total youth segment marketing spending and percentage of the total marketing by food category.

Source: FTC, 2008: 9.

Other studies, reviewed by Hastings et al. (2006), identified the “Big Four” food items where the industry spends more money promoting: breakfast cereals, confectionary, savory snacks and soft-drinks. In Portugal, 26% of children’s adverts were for breads and sugared cereals, 35% for sweets (chocolates and cookies) and 12% for soft drinks.

Companies use a variety of marketing strategies towards children but traditional media (comprising television, radio and print advertising) is still the most preferred by marketers to target this segment (Figure 4).

<sup>11</sup> Lobstein T (project coordinated by). 2009. Marketing Food and Beverages to Children. Stakeholder views on Policy Options in the UK – Findings from the PolmMark Project (POLicy options for MARKeting Food and Beverages to children). *IASO – International Association for the Study of Obesity*.



**Figure 4** | Reported Total Youth Marketing Expenditures by Promotional Activity Group (in millions of Dollars).

- 1) Traditional Measured Media, consisting of television, radio, and print advertising;
- 2) New Media, consisting of company-sponsored websites, Internet, digital, word-of-mouth, and viral marketing;
- 3) Packaging and In-Store Marketing;
- 4) Premiums;
- 5) Other Traditional Promotions, consisting of product placements, movie theatre, video, and video game advertising, character or cross-promotion license fees, athletic sponsorships, celebrity endorsement fees, events, philanthropic activities tied to branding opportunities, and other miscellaneous marketing expenditures;
- 6) In-School Marketing

Source: FTC, 2008: 12.

However, there is some evidence that this dominance of the television and traditional media has recently begun to wane. “The importance of strong, global branding reinforces a need for multifaceted communications combining television with merchandising, ‘tie-ins’ and point-of-sale activity.” (Hastings et al., 2006: 19).

Regarding New Media, of the \$77 million spent, \$32 million was for company-sponsored websites; \$39 million for advertising on third-party Internet sites; and \$1 million was for other digital marketing, such as mobile marketing (FTC, 2008).

Interactive marketing, such as *advergaming*, is still in its developmental stage. Nevertheless, Webber et al. (2006) found *advergames* in 63% of food web sites analysed. Other marketing techniques found in food web sites were cartoon characters (50%) or spokes characters (55%), or had a specially designated children’s area (58%).

Regarding companies claims of advertised foods, Moore (2006) concluded that 80% of food web-site claims were brand benefit (such as taste, texture, appearance, convenience, variety) and nutrition claims represent only 20% of the total. Although product’s amount of fat has been communicated by food marketers there is evidence that companies do not keep its promises on acting on children’s health behalf (Lewin et al., 2006)<sup>12</sup>.

<sup>12</sup> Lewin A, Lindstrom L, Nestle M. 2006. Food Industry Promises to Address Childhood Obesity: Preliminary Evaluation. *Journal of Public Health Policy*. 24 (4): 327 - 348

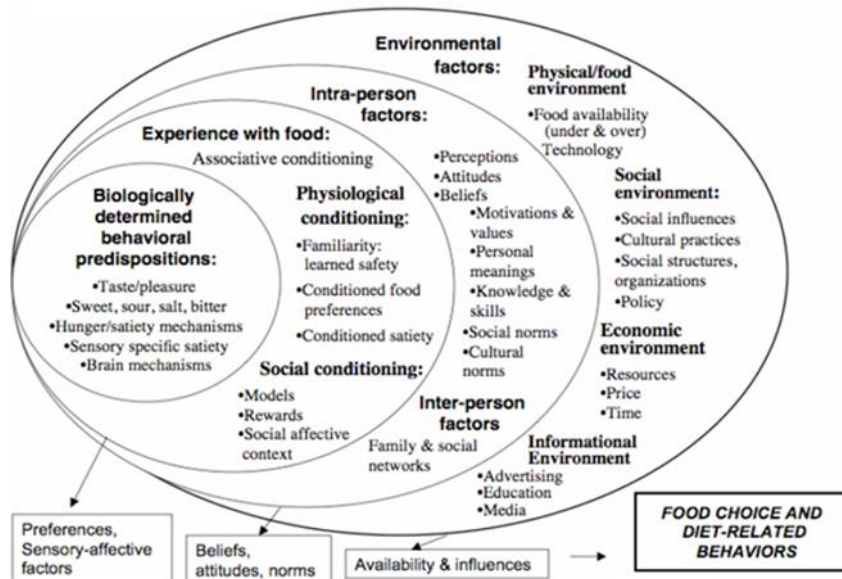
### B3. The Web and the Kids

Children's use of internet continues to grow especially in younger segments. A recent study showed that in 2005, 70% of 6-17 year old children in the EU-25 were online. By 2008, this number increased to 75% on average, though there was a lower increase in use among teenagers. The biggest increase has been registered among younger children. By 2008, 60% of 6-10 year-old children used the internet for several activities. Playing is on the top 5 of the most preferred activities online (Marketest<sup>13</sup>).

Country	Population <sup>2</sup> (est. millions)	Internet (Broadband <sup>4</sup> ) Penetration (%)	Child Internet Use, by Age <sup>3</sup> 2008 (2005) <sup>6</sup> (%)				Parents' Internet Use, 2008 <sup>7</sup> (2005) (%)
			All	6-10	11-14	15-17	
EU 27	489.1	60.7 (31.6)	75 (70)	60	84	86	84 (66)
Portugal (PT)	10.7	39.8 (23.8)	68 (54)	54	81	75	65 (37)

**Figure 5** | Percentage of online children in Europe and Portugal. Source: Livingstone S and Haddon L. 2009: 5.

### B4. Food choice and diet-related behaviors



**Figure 6** | Food Choice and diet-related behaviors. Source: Contento, 2008: 177.

<sup>13</sup> <http://www.marktest.com/wap/a/n/id~14ea.aspx>, February 2010

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# Exhibit C

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## Methodology

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### *CI. Authorization from the Portuguese Ministry of Education*



Mónica Dias <monica.srdias@gmail.com>

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## Monotorização de Inquéritos em Meio Escolar: Inquérito nº 0150700001

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mime-noreply@gepe.min-edu.pt <mime-noreply@gepe.min-edu.pt>

8 November 2010 16:52

To: monica.srdias@gmail.com

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

O pedido de autorização do inquérito n.º 0150700001, com a designação *Can Advergames Boost Children's Healthier Eating Habits*, registado em 25-10-2010, foi aprovado.

Avaliação do inquérito:

Exmo(a). Senhor(a) Dr(a) Mónica Dias

Venho por este meio informar que o pedido de realização de questionário em meio escolar é autorizado uma vez que, submetido a análise, cumpre os requisitos de qualidade técnica e metodológica para tal.

Com os melhores cumprimentos

Isabel Oliveira

Directora de Serviços de Inovação Educativa

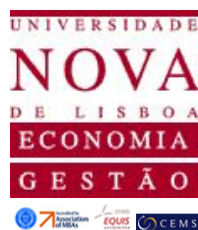
DGIDC

Observações:

Sem observações

Pode consultar na Internet toda a informação referente a este pedido no endereço <http://mime.gepe.min-edu.pt>. Para tal terá de se autenticar fornecendo os dados de acesso da entidade.

## C2. Authorization forms – Schools



Mónica Sofia Rodrigues Dias

[monica.srdias@gmail.com](mailto:monica.srdias@gmail.com)

[mst15000493@fe.unl.pt](mailto:mst15000493@fe.unl.pt)

Faculdade de Economia  
Universidade Nova de Lisboa

Campos de Campolide  
1099-032 LISBOA

### Assunto **Pedido de autorização para participação em estudo sobre formas divertidas para educar e incentivar hábitos de consumo mais saudáveis.**

Exmo. Sr(a). Director(a) / Coordenador(a),

O meu nome é Mónica Dias, sou aluna de Mestrado em Gestão da Universidade Nova de Lisboa. Neste momento estou a desenvolver a minha tese no âmbito do *Comportamento do Consumidor Infantil*. Mais concretamente estudo formas alternativas (e ao mesmo tempo divertidas) de educar e incentivar crianças de 7/8 anos a adoptar escolhas alimentares mais saudáveis. Por outro lado este projecto visa também contribuir para a familiarização destes alimentos no dia-a-dia das crianças.

**A experiência** (que tentei manter o mais breve possível para não interferir com o normal funcionamento das aulas) consiste em duas fases:

1. Entrega, aos alunos, do pedido de autorização ao Encarregado de Educação
2. (após a recepção da autorização assinada) Avaliação dos efeitos de um jogo digital.

As crianças jogam, durante cerca de 5 minutos, um jogo de computador, propositadamente desenvolvido para o presente estudo. Depois do jogo, cada um responderá a um breve questionário que pretende avaliar os efeitos dos conteúdos alimentares presentes no jogo nas **escolhas imediatas**, nas suas **preferências alimentares** e, finalmente, nos seus **conhecimentos nutricionais**. Toda a experiência decorrerá num máximo de 30 minutos, respeitando sempre a política da escola. As cópias e exemplares estão a meu cargo de forma a que a escola não tem qualquer tipo de encargo financeiro.

Devo ainda acrescentar, que tanto o jogo como o questionário foram desenvolvidos com a colaboração da Psicóloga Dra. Sílvia Coutinho experiente em Ludoterapia e do Nutricionista Dr. Rui Lima, Técnico do Núcleo de Educação para a Saúde e Acção Social Escolar - Educação Alimentar.

Os dados recolhidos serão analisados por mim e a sua confidencialidade é total, sendo apenas publicados na tese os resultados do estudo sem referência aos dados dos alunos, e sem a identificação das escolas onde o estudo foi realizado (apenas se mencionará o concelho e o tipo de escola pública ou privada). 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.

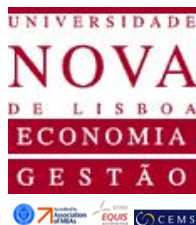
Caso seja necessário qualquer esclarecimento adicional relativamente ao estudo pode contactar-me pelo telemóvel **91 6744460** ou através do email [monica.srdias@gmail.com](mailto:monica.srdias@gmail.com). Estarei disponível para uma reunião onde posso explicar detalhadamente o estudo e o processo experimental se assim o desejar.

Finalmente, peço que considere o meu pedido e aguardo breve resposta devido aos prazos relativamente curtos impostos pela faculdade.

Agradeço a compreensão e toda a disponibilidade.  
Com os meus melhores cumprimentos,

Mónica Dias

### C3. Authorization forms – Parents



**Mónica Sofia Rodrigues Dias**

[monica.srdias@gmail.com](mailto:monica.srdias@gmail.com)

[mst15000493@fe.unl.pt](mailto:mst15000493@fe.unl.pt)

Faculdade de Economia  
Universidade Nova de Lisboa

Campos de Campolide  
1099-032 LISBOA

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**Assunto Pedido de autorização para participação em estudo sobre formas divertidas para educar e incentivar hábitos de consumo mais saudáveis.**

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Exmo.(a) Sr.(a) Encarregado(a) de Educação,

Sou aluna de Mestrado em Gestão, na Faculdade de Economia, da Universidade Nova de Lisboa. Para concluir o Mestrado, estou a desenvolver uma tese sobre formas alternativas (e ao mesmo tempo divertidas) de educar e incentivar as crianças a adoptar escolhas alimentares mais saudáveis.

Para esse efeito, necessitava que o(a) seu(sua) educando(a) participasse neste estudo que consiste num pequeno questionário para avaliar os seus conhecimentos nutricionais e as suas escolhas alimentares após jogar 5 minutos de um jogo de computador relacionado com o tema. A experiência decorrerá na presença do professor e coordenado com a aula.

Peço-lhe assim que autorize a sua participação, assinando em baixo, e que a entregue ao professor.

Os dados recolhidos serão analisados por mim e a sua confidencialidade é total, sendo apenas publicados na tese os resultados do estudo sem referência aos dados dos alunos, e sem a identificação das escolas onde o estudo foi realizado (apenas se mencionará a localidade e o tipo de escola pública ou privada). 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.

Sinta-se à vontade para me contactar se assim o desejar.

Agradeço desde já a sua colaboração.

Com os meus melhores cumprimentos,

**Autorizo** o(a) aluno(a) \_\_\_\_\_ do \_\_\_\_\_  
°ano, turma \_\_\_\_\_ a participar neste estudo.

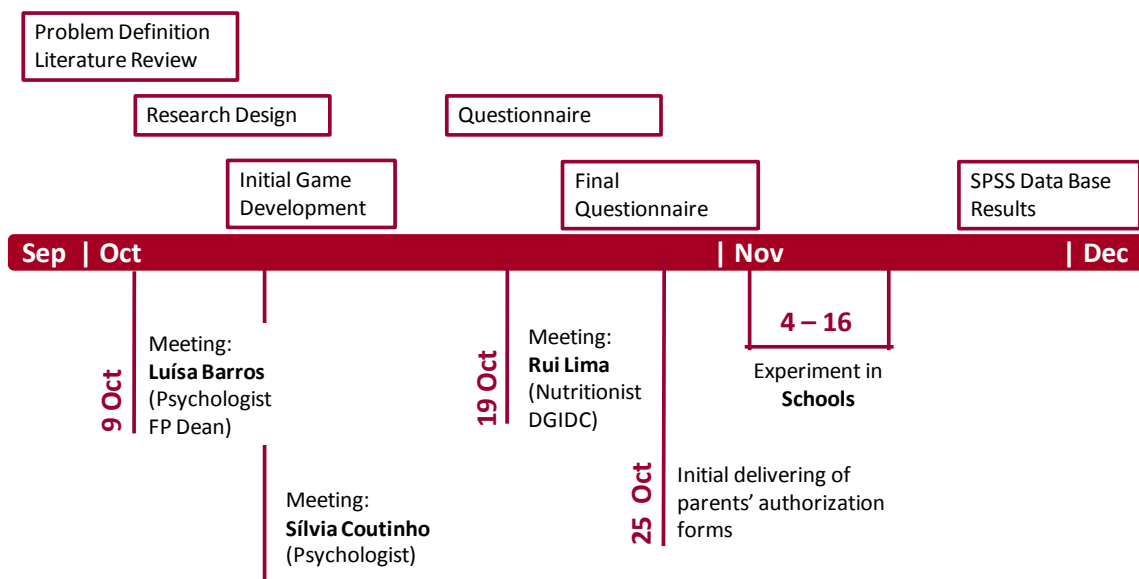
\_\_\_\_\_ (local) , \_\_\_\_\_ (dia) de Outubro de 2010



#### C4. Fieldwork plan

School	Grade	# Sent Autoriz.	Valid Autoriz.	# Students	#Absences	Resp. Rate	Date	
A	2 <sup>nd</sup>	26	26	25	1	1,00	04-Nov	13h00
	3 <sup>rd</sup>	21	21	21	0	1,00	04-Nov	09h00
B	2 <sup>nd</sup>	26	25	24	1	0,96	05-Nov	11h30
	3 <sup>rd</sup>	21	19	18	1	0,90	05-Nov	16h30
C	2 <sup>nd</sup>	26	23	23	0	0,88	11-Nov	09h00
	2 <sup>nd</sup>	26	23	23	0	0,88	09-Nov	13h00
	3 <sup>rd</sup>	24	21	21	0	0,88	10-Nov	09h00
D	3 <sup>rd</sup>	24	18	18	0	0,75	10-Nov	13h00
	2 <sup>nd</sup>	18	14	14	0	0,78	15-Nov	9h00
	3 <sup>rd</sup>	26	25	25	0	0,96	15-Nov	13h00
E	2 <sup>nd</sup>	20	15	15	0	0,75	16-Nov	9h00
	3 <sup>rd</sup>	25	7	7	0	0,28	16-Nov	13h00
Total		<b>283</b>	<b>237</b>	<b>234</b>	<b>3</b>	<b>0,84</b>		
<b>Total Sample = 234 - 3 = 231</b>								

#### C5. Methodology Timeline



## C6. Questionnaire



# Questionário - Parte I

**Olá!**

Em baixo estão algumas perguntas para tu responderes.

Idade \_\_\_\_

Ano \_\_\_\_

És...

Menino  <sup>(1)</sup>

Menina  <sup>(2)</sup>



### 1. Com que frequência usas a Internet?

- a) Todos os dias  <sup>(1)</sup>
- b) 2 ou 3 vezes por semana  <sup>(2)</sup>
- c) 1 vez por semana  <sup>(3)</sup>
- d) Não uso Internet  <sup>(4)</sup>

### 2. Costumas usar a Internet para...

(podes escolher mais do que uma opção)

- a) Enviar mensagens (sms)  <sup>(1)</sup>
- b) Fazer trabalhos para a escola  <sup>(2)</sup>
- c) Jogar jogos  <sup>(3)</sup>
- d) Enviar e-mails  <sup>(4)</sup>
- e) Visitar um site de comidas que gosto  <sup>(5)</sup>

### 3. Gostaste do jogo?

- a) Gostei Muito  <sup>(1)</sup>
- b) Gostei mais ou menos  <sup>(2)</sup>
- c) Não Gostei  <sup>(3)</sup>

### 4. Achas que o jogo foi...

- a) Fácil  <sup>(1)</sup>
- b) Díficil  <sup>(2)</sup>
- c) Normal  <sup>(3)</sup>

## Questionário - Parte 2

5. Vamos fazer de conta que os teus pais foram trabalhar e pediram para eu tomar conta de ti. Mas eu não sei as comidas que tu podes querer comer. Então imagina que eu digo que destes 6 alimentos tu podes escolher 3 para comer.

Marca uma **X** aquele que mais te apetecia comer.

### Bartaz 1



# Bartak 2



**6. Gostas destes alimentos?**

Responde fazendo um círculo à volta do número que corresponde à tua resposta

= 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



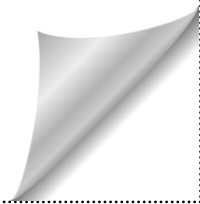
2



3



4





Nunca  
Provei



1



2



3



4



Nunca  
Provei



1



2



3



4



Nunca  
Provei



1



2



3



4



Nunca  
Provei



1



2



3



4



Nunca  
Provei



1



2



3



4



Nunca  
Provei



1



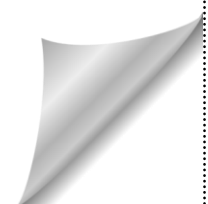
2



3



4



## Questionário - Parte 2

7. Onde está o alimento mais saudável em cada um dos pares?

Marca uma **X** nas tuas escolhas.



Gelado



Iogurte



Sandes de Frango Grelhado



Big Mac



Sumo de Laranja Natural



Coca Cola



Barra de Chocolate



Pipocas



Barra de Chocolate

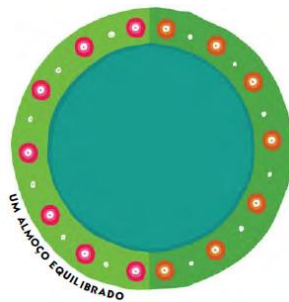


Pipocas



**8. Agora vamos fazer um jogo com cartões.**  
**Faz duas refeições colocando os alimentos nos pratos:**

**“um almoço equilibrado”**



**ObriGAda Por pArticipAres!**



**C7. Food content by game version (images from the game)**

**Healthy Version**



**Less Healthy Version**



**C8. Game characters Pre-test**

Qual destas personagens gostavas de ver num jogo de computador?  
Escolhe duas opções marcando com uma X.



### C9. Game Levels

The game begins asking children if they want to play (1). Then, rules explaining how to play and what food to collect (2a – healthy version, 2b – less healthy version and 3) appear in the screen. After the child is prepared to begin, they move on to the first level by pressing “enter” (4). In the first one (5), *Super Mario* walks to the right and left to collect the food and run of from enemies. 200 points are needed to move on to the second level (6), which is faster and harder. This time, *Super Mario* is able to fly, using every direction (right, left, up and down) (7). The game ends when the child gets another 200 points in this level (8).

(1)



(2a)



(2b)



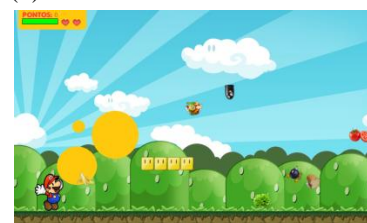
(3)



(4)



(5)



(6)



(7)






(8)



C10. Pictures used in question 8



 <p><b>MORANGOS</b></p>	 <p><b>Peixe</b></p>	 <p><b>CENOURA</b></p>	 <p><b>BATATAS COZIDAS</b></p>
 <p><b>BATATAS FRITAS</b></p>	 <p><b>QUEIJO</b></p>	 <p><b>BIG MAC</b></p>	 <p><b>MOUSSE DE CHOCOLATE</b></p>



 <p><b>OVO ESTRELADO</b></p>	 <p><b>KETCHUP</b></p>	 <p><b>Sal</b></p>	 <p><b>COCA COLA</b></p>
 <p><b>ÁGUA</b></p>	 <p><b>TOMATE</b></p>	 <p><b>ALFACE</b></p>	 <p><b>SOPA</b></p>

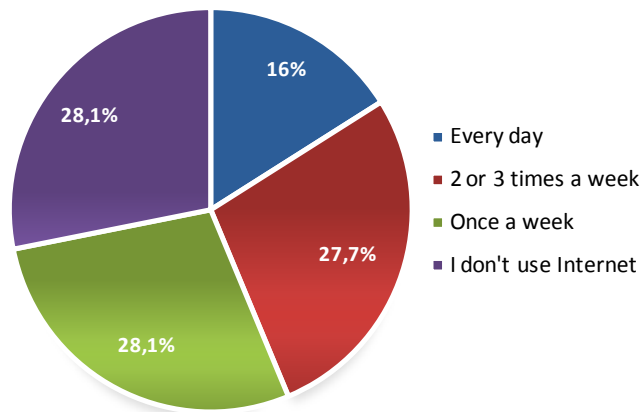
# Exhibit D

## Results

### D1. Internet usage rate

**Table 1 | Frequencies – How often do you use the Internet?**

Valid N = 231	Frequency	Percent	Valid Percent
Every day	37	16,0	16,0
2 or 3 times a week	64	27,7	27,7
Once a week	65	28,1	28,1
I don't use Internet	65	28,1	28,1
Total	231	100,0	100,0



**Table 2 | CrossTab – How often do you use the Internet? x Child Gender**

Valid N = 231	Boy		Girl		Total	
Every day	22	19%	15	13%	37	16%
2 or 3 times a week	30	26%	34	30%	64	28%
Once a week	34	29%	31	27%	65	28%
I don't use Internet	31	26%	34	30%	65	28%
Total	117	100%	114	100%	231	100%
<b>Chi-Square Test of Association</b>	$\chi^2$	d. freedom	p-value (2-sided)	Reject H <sub>0</sub> ?		
H <sub>0</sub> : There is no association between <b>internet usage rate</b> and <b>child gender</b>	1,813 <sup>a</sup>	3	<b>0,612</b>	Do not reject the H <sub>0</sub> . There is no association		
<sup>a</sup> . 0 cells (.0%) have expected count less than 5.						

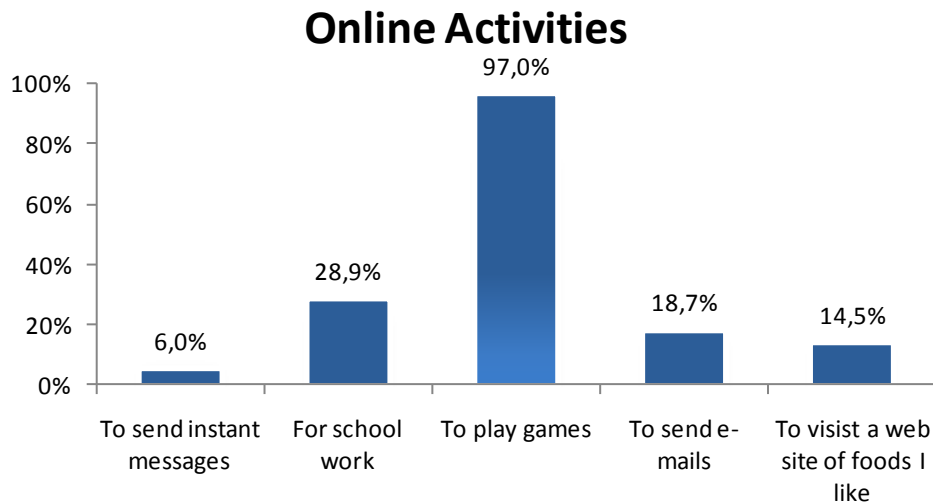
**Table 3 | CrossTab – How often do you use the Internet? x Child Age**

Valid N = 231	7		8		Total	
Every day	19	16%	18	17%	37	16,0%
2 or 3 times a week	31	25%	33	30%	64	28%
Once a week	31	25%	34	31%	65	28%
I don't use Internet	41	34%	24	22%	65	28%
Total	122	100%	109	100%	231	100%
<b>Chi-Square Test of Association</b>						
	$\chi^2$	d. freedom	p-value (2-sided)	Reject H <sub>0</sub> ?		
H <sub>0</sub> : There is no association between internet usage rate and child age	3,955 <sup>a</sup>	3	<b>0,266</b>	Do not reject the H <sub>0</sub> . There is no association		
<sup>a</sup> . 0 cells (,0%) have expected count less than 5.						

**Table 4 | Frequencies – Do you use the Internet...**

Valid N = 166*	Frequency	Percent	Valid Percent
To send instant messages.	10	4,3	6,0
For school work.	48	20,8	28,9
To play games.	161	69,7	97,0
To send e-mails.	31	13,4	18,7
To visist a web site of foods I like	24	10,4	14,5

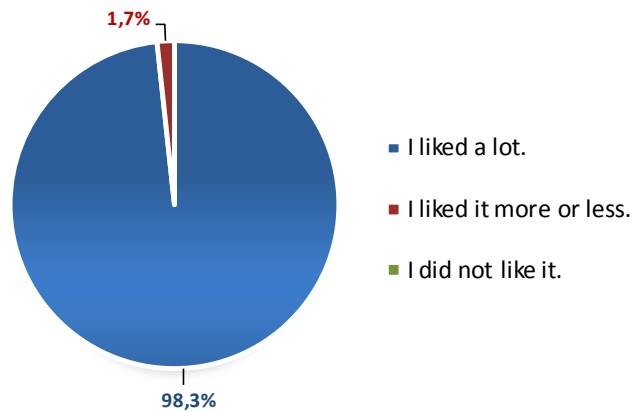
\* 65 children did not use the Internet



## D2. Attitude towards the game

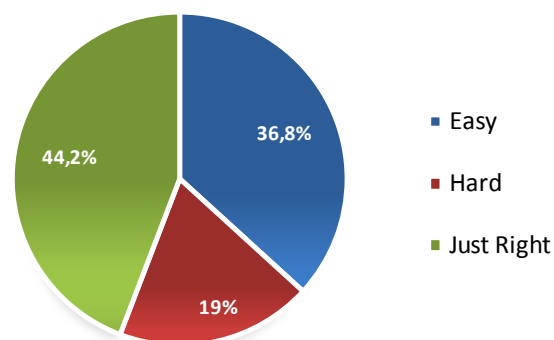
**Table 5 | Frequencies – Did you like this game?**

Valid N = 231	Frequency	Percent	Valid Percent
I liked a lot.	227	98,3	98,3
I liked it more or less.	4	1,7	1,7
I did not like it.	0	0	0
Total	231	100,0	100,0



**Table 6 | Frequencies – Do you think this game was:**

Valid N = 231	Frequency	Percent	Valid Percent
Easy	85	36,8	36,8
Hard	44	19,0	19,0
Just Right	102	44,2	44,2
Total	231	100,0	100,0

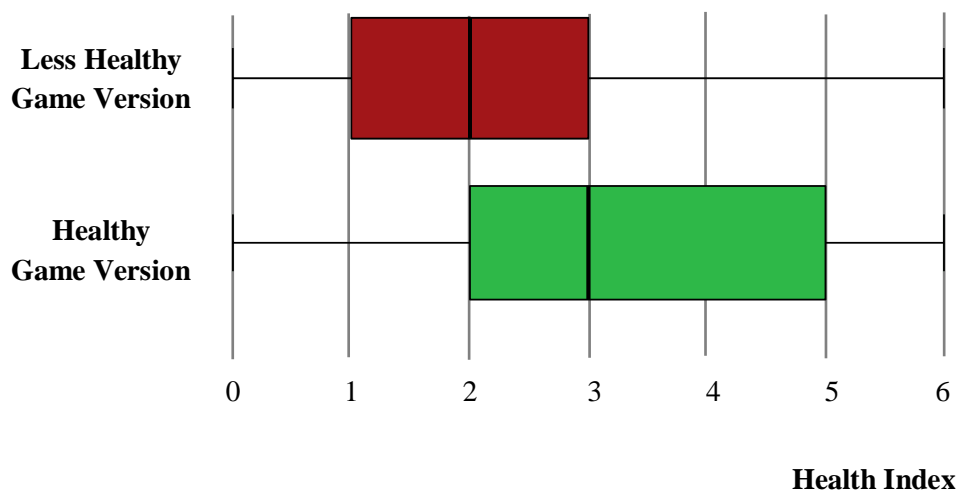
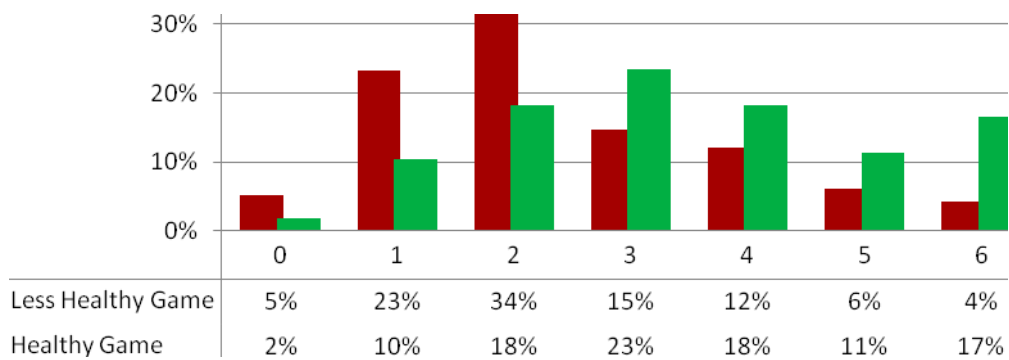


### D3. Children's snack selection

$H_1$ : Children's spontaneous snack selection will reflect the food content of the advergaming played by them.

**Table 7 | CrossTab – Health Index (sum of healthy selected items) x Game Version**

Valid N = 231	0	1	2	3	4	5	6
Less Healthy Game	6   5,2%	27   23,3%	40   34,5%	17   14,7%	14   12,1%	7   6,0%	5   4,3%
Healthy Game	2   1,7%	12   10,4%	21   18,3%	27   23,5%	21   18,3%	13   11,3%	19   15,5%
Total	8   3,5%	39   16,9%	61   26,4%	44   19,0%	35   15,2%	20   8,7%	24   10,4%



This box plot provides a very good visual summary of many important aspects of the sample distribution, facilitating its interpretation.

- **Distributions' dispersion:**

As we can see, the less healthy distribution has a lower variation (2,16) than the healthy game sample (2,69). Moreover, 50% of less healthy game distribution is concentrated between 1 and 3 healthy snacks with 75% selecting up to 3 healthy food items, while 50% of the healthier distribution is located between 2 and 5 healthy snacks with 75% of the sample choosing until 5 healthy food items to eat.

- **Distributions' central location:**

The less healthy version registered a median of 2 and a mean of 2,41.

The healthy version distribution registered a median of 3 and a mean of 3,46.

**Conclusion:**

Children who played the less healthy version of the game tended to select fewer healthy snacks when compared to the group exposed to the healthy version of the game.

**Table 8 | Chi Square – Health Index (sum of healthy selected items) x Game Version**

Chi-Square Test of Association	$\chi^2$	d. freedom	p-value (2-sided)	Reject H <sub>0</sub> ?
H <sub>0</sub> : There is no association between <b>Health Index</b> and <b>game version</b>	27,323 <sup>a</sup>	6	<b>0,000</b>	Reject the H <sub>0</sub> . There is association
<sup>a</sup> . 2 cells (14,3%) have expected count less than 5.				
<b>Cramer's V</b>	<b>0,344</b> – Moderate Association between variables (p-value = 0,000)			



#### D4. Food Liking

H<sub>2</sub>: Children's food liking will reflect the food content of the advergame played by them.

**Table 9 | Independent t-tests – of food type by game version**

	Healthy Food *			Less Healthy Food **		
H <sub>0</sub> : $\mu_{\text{Less healthy game}} = \mu_{\text{healthy game}}$	t	d. freedom	p-value (2-sided)	t	d. freedom	p-value (2-sided)
The food liking mean in the <b>less healthy game</b> is equal to the <b>healthy game</b> group	1,643 <sup>a</sup>	229	0,102	-3,718 <sup>b</sup>	195,711	0,000
<b>Decision</b>	Do not Reject H <sub>0</sub> of equal means			Reject H <sub>0</sub> of equal means		
<sup>a</sup> . Equal variances assumed (F = 1,449 and Sig. = 0,230). <sup>b</sup> . Equal variances not assumed (F = 18,472 and Sig. = 0,000).						

\* Banana, tomatoes, lettuce, strawberries, carrot, bread

\*\* Cookies, potato chips, hamburger, lolly-pop, pizza, chocolate mousse

**Table 10 | Statistics – How much do you like each of the following foods?**

	Less Healthy Game			Healthy Game			Mean Difference
	Valid N	Mean	St. dev	Valid N	Mean	St. dev	
Banana	115	3,43	0,762	115	3,39	0,746	0,04
Strawberries	111	3,40	0,937	112	3,36	0,948	0,04
Tomatoes	111	2,49	1,242	109	2,77	1,191	-0,28
Lettuce	116	3,03	1,071	114	3,15	1,107	-0,12
Carrots	116	2,92	1,136	112	3,19	1,027	-0,27
Bread	116	3,32	0,787	115	3,46	0,704	-0,14
Lolly-Pop	114	3,43	0,841	115	3,23	0,976	0,20
Pizza	115	3,80	0,463	115	3,55	0,752	<b>0,25</b>
Cookies	113	3,60	0,662	115	3,42	0,805	0,18
Potato Chips	115	3,68	0,539	115	3,33	0,866	<b>0,35</b>
Hamburger	115	3,46	0,798	115	3,08	1,044	<b>0,38</b>
Chocolate Mousse	112	3,30	1,003	114	3,07	1,095	0,23

**Table 11 | Independent t-tests – of each single food item by game version**

H <sub>0</sub> : $\mu_{\text{Less healthy game}} = \mu_{\text{healthy game}}$	Equal variances assumed?	t	d. freedom	p-value (2-sided)
Banana	Yes	,437	228	,662
Strawberries	Yes	,311	221	,756
Tomatoes	Yes	-1,731	218	,085
Lettuce	Yes	-,798	228	,426
Carrots	Yes	-1,847	226	,066
Bread	Yes	-1,444	229	,150
Lolly-Pop	Yes	1,619	227	,107
<b>Pizza</b>	<b>No</b>	<b>3,063</b>	<b>189,465</b>	<b>,003</b>
Cookies	No	1,890	219,176	,060
<b>Potato Chips</b>	<b>No</b>	<b>3,658</b>	<b>190,792</b>	<b>,000</b>
<b>Hamburger</b>	<b>No</b>	<b>3,122</b>	<b>213,279</b>	<b>,002</b>
Chocolate Mousse	Yes	1,670	224	,096

### D5. Nutritional Knowledge

The mean of corrected answers is similar between groups: children who played the less healthy game registered, on average, 4,48 correct answers compared to 4,66 correct answers in the healthy game group. A t statistic was used to test equality of means between game versions.

**Table 12| Independent t-test** – of nutritional knowledge by game version

H <sub>0</sub> : $\mu_{\text{Less healthy game}} = \mu_{\text{healthy game}}$	Equal variances assumed?	t	d. freedom	p-value (2-sided)
Knowledge Index	Yes <sup>a</sup> .	-0,905	229	0,367
<sup>a</sup> . Equal variances assumed (F = 3,554 and Sig. = 0,061).				

**Table 13| Chi Square** – Knowledge Index (sum of correct answers) x Game Version

Valid N = 231	0	1	2	3	4	5
Less Healthy Game Version	0	0	4	7	23	82
Healthy Game Version	0	1	0	4	27	83
Total	0	1	4	11	50	165
<b>Chi-Square Test of Association</b>						
	$\chi^2$	d. freedom	p-value (2-sided)	Reject H <sub>0</sub> ?		
H <sub>0</sub> : There is no association between <b>Knowledge Index and Game version</b>	6,140 <sup>a</sup>	4	0,189	x		
<sup>a</sup> . 4 cells (40%) have expected count less than 5 – fail condition required for a valid Chi <sup>2</sup> test.						
<b>Likelihood Ratio Test</b>						
	G	d. freedom	p-value (2-sided)	Reject H <sub>0</sub> ?		
H <sub>0</sub> : There is no association between <b>Knowledge Index and Game version</b>	8,082	4	<b>0,089</b>	Do not reject the H <sub>0</sub> .		

**Table 14| Knowledge Index** – Recoded

Valid N = 231	Low / Medium Knowledge *	High Knowledge *		
Less Healthy Game Version	11	105		
Healthy Game Version	5	110		
Total	16	215		
* Up to three correct answers (0, 1, 2 or 3 correct)				
** Four or more correct answers (4 or 5 correct)				
<b>Chi-Square Test of Association</b>				
	$\chi^2$	d. freedom	p-value (2-sided)	Reject H <sub>0</sub> ?
H <sub>0</sub> : There is no association between <b>Knowledge Index and Game version</b>	2,362 <sup>a</sup>	1	<b>0,124</b>	Do not reject the H <sub>0</sub> .
<sup>a</sup> . 0 cells (,0%) have expected count less than 5.				

**Table 15| CrossTab – #Healthy food items x Game Version**

Valid N = 231	0	1	2	3	4	5	6	7	8
Less Healthy Game	1 0,9%	2 1,7%	5 4,3%	5 4,3%	14 12,1%	16 13,8%	19 16,4%	26 22,4%	28 24,1%
Healthy Game	0 0%	0 0%	1 1%	4 3%	10 9%	15 13%	22 19%	27 23%	36 31%
Total	1	2	6	9	24	31	41	53	64
<b>Chi-Square Test of Association</b>									
		$\chi^2$	d. freedom	p-value (2-sided)	Reject H <sub>0</sub> ?				
H <sub>0</sub> : There is no association between #Healthy and Game version		7,711 <sup>a</sup>	8	<b>0,462</b>	Do not reject the H <sub>0</sub> .				
<sup>a</sup> . 8 cells (44,4%) have expected count less than 5.									
<b>Likelihood Ratio Test</b>									
		LR	d. freedom	p-value (2-sided)	Reject H <sub>0</sub> ?				
H <sub>0</sub> : There is no association between #Healthy and Game version		9,120	8	<b>0,332</b>	Do not reject the H <sub>0</sub> .				

**Table 16| CrossTab –#Less Healthy food items x Game Version**

Valid N = 231	0	1	2	3	4	5	6	7	8
Less Healthy Game	39 34%	30 26%	22 19%	7 6%	7 6%	4 3%	5 4%	1 1%	1 1%
Healthy Game	56 49%	30 26%	20 17%	5 4%	2 2%	1 1%	1 1%	0 0%	0 0%
Total	95	60	42	12	9	5	6	1	1
<b>Chi-Square Test of Association</b>									
		$\chi^2$	d. freedom	p-value (2-sided)	Reject H <sub>0</sub> ?				
H <sub>0</sub> : There is no association between #Healthy and Game version		12,,711 <sup>a</sup>	8	<b>0,122</b>	Do not reject the H <sub>0</sub> .				
<sup>a</sup> . 10 cells (55,6%) have expected count less than 5.									
<b>Likelihood Ratio Test</b>									
		LR	d. freedom	p-value (2-sided)	Reject H <sub>0</sub> ?				
H <sub>0</sub> : There is no association between #Less Healthy and Game version		14,037	8	<b>0,081</b>	Do not reject the H <sub>0</sub> .				

Because more than 20% of the cells in previous analysis have expected count less than 5, it is more appropriate to interpret the Likelihood Ratio Test. Both tests reveal that for higher values of the Likelihood Ratio statistic the observed result was more likely to occur under the null hypothesis of no association when compared to the alternate, and therefore, the null hypothesis cannot be rejected.