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**Can gendered advergames make children develop favorable
attitudes and behaviors towards healthy food?**

Inês Filipa Xavier Frescata de Carvalho, 2043

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Professor Luísa Agante

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Abstract

This paper aims to analyze the possibility of having an impact of gender segmentation in food advergames on children's attitudes and behaviors towards healthy food. A specific healthy advergame with three versions – two segmented by gender and one neutral gendered – was developed for the study. A total of 286 Portuguese children from 7 to 9 years old participated in the study and were randomly assigned to either the experimental or the control groups. After playing the advergame, children answered a structured questionnaire to evaluate liking and purchase intention of healthy food, as well as, perceived fun and perceived healthiness. The results suggested that advergames segmented by gender did not influence children's liking, purchase intention and perceived fun of healthy food, since children already had positive eating behaviors. Moreover, we confirmed that children presented a high perceived healthiness.

Key words: children, healthy food, advergames, gender

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Introduction

Childhood obesity represents one of the most serious risks to health. Globally, in 2013, 42 million preschool children were overweight, presenting high chances to develop diabetes and cardiovascular diseases and to be obese adults in the future (WHO, 2014). In Portugal, one in each three children with 2-12 years old is overweight (APCOI, 2014).

As children mature their cognitive and social skills, they gain an ability to justify their purchase preferences, directly influencing family buying decisions (Thomson et al., 2007), including food choices (Nørgaard et al., 2007). Children's eating choices are affected by exposure to food advertising, which is commonly focused on unhealthy products, high in sugar and fat (Lee et al., 2009; Cairns et al., 2009). Since children enjoy playing online games (Livingstone et al., 2011), brands are adopting more interactive advertising formats to target children, including advergames, which are frequently used by the food industry (Weber et al., 2006).

During childhood, individuals also develop their preferences according to their gender (Acuff and Reither, 1997). The use of gender segmentation in food marketing is mostly used for non-healthy food, but a research about cereals packaging showed that it could shift children's choice towards healthy food products (Montellano and Agante, 2015). However, there is no previous research that explored the topic of gendered segmentation in the context of advergames and its effects in terms of changing the preferences for a variety of healthy food products instead of a single product.

The purpose of this study is to explore the influence of segmenting food advergames by gender on children's attitudes and behaviors towards healthy food, specifically on liking, purchase intention, perceived fun and perceived healthiness.

Literature Review

Children's Role as Consumers

During childhood, individuals experience several transformations in terms of cognitive and social development and they start to prepare themselves to adopt the role of consumers (John, 1999). At about 7-8 years old, in the concrete operational stage of Piaget's Theory of Cognitive Development (Piaget and Inhelder, 1972), some of the most relevant changes in consumer socialization occur. Children face improvements in terms of information processing (Roedder, 1981) and start to consider another person's perspectives (Selman, 1980), being able to perceive advertising by the advertiser's point of view. They develop their persuasion knowledge in order to cope with the persuasion attempts by marketers (Friestad and Wright, 1994). However, although children tend to recognize the persuasive intent of traditional advertising formats (Robertson and Rossiter, 1974), in the case of interactive techniques (e.g. advergames) they have more difficulty (An and Stern, 2011). Due to the immersive environment of advergames, children are extremely involved in the game, becoming less aware of its commercial nature (Waiguny et al., 2014), despite being influenced by the advertising content. Advergames associate products with positive stimuli, persuading children implicitly – leading them to choose a product by “non-conscious, non-rational means, and may even undermine consciously held attitudes.” (Nairn and Fine, 2008: 458). Children are not able to resist implicit persuasion (Nairn and Fine, 2008), thus the marketing messages directed to children through this media should only emphasize positive attitudes and lifestyles, or they may be considered unethical due to the absence of persuasion knowledge by the children.

Digital Generation

Over the past years, with the proliferation of new digital technologies, children are increasingly spending their time on the Internet, for entertainment purposes. A study conducted by Livingstone et al. (2011) reflects that, in Europe, 93% of children with 9 to 16 years old go

online at least once a week and 60% every day or almost every day. Playing games is one of their most preferred online activities. In Portugal, the majority of youth aged 9-16 go online every day or almost every day (Livingstone et al., 2011).

In this context, in order to attract this digital generation, the advertising formats have evolved over time from traditional techniques to new interactive methods, more engaging and fun. The majority of food brands that promote their products on television also place advertising on websites (Moore and Rideout, 2007). Moreover, the entertainment content has been increasingly used as a form of advertising – “advertainment” – through online channels (Kretchmer, 2004). Advergames are a form of branded entertainment (Wise et al., 2008), consisting in online games used to advertise a brand or product. According to Youn and Lee (2005: 322), “Advergames in commercial Web sites are advertisements disguised as games, thus blurring the line between commercial persuasion and entertainment”.

Healthy and Unhealthy Food

Although the concept of healthy eating includes several interpretations and depends on age, gender and physical activity, it is generally associated with high quantity and variety of fruit and vegetables, nutrient-dense, low free sugar and low in fat food (Dietary Guidelines for Americans, 2010; WHO, 2015). Children identify physical and psychological benefits of a healthful diet (O’Dea, 2003), however they associate “kids’ food” with junk, fun, high-sugar and low-nutrient categories of foods while they mention “adult food” as being healthy, including fruits, vegetables and meat (Elliott, 2011). These misconceptions may be driven from advertising targeting young consumers, such as TV and also advergames. Research shows that children’s food preferences and purchase-related attitudes are influenced by food promotions (Cairns et al., 2009). Moreover, when playing a food advergame, children are more prone to choose the food categories advertised in the game, as well as, they tend to prefer non-healthy food (such as chips, hamburger and pizza) if the game emphasizes this type of products (Dias

and Agante, 2011). Furthermore, gender plays an important role in determining children's food preferences. Girls tend to prefer healthy over unhealthy foods, while boys favor the opposite (Levin and Levin, 2010).

An unhealthy diet contributes to childhood overweight and obesity, which represents a risk to health. In 2013, 42 million children under 5 years old were overweight or obese and it is expected that in 2025 this number will reach 70 million, if the current tendency remains the same (WHO, 2014).

Since children are highly exposed to food advergaming, and these games are usually focused on product categories with excessive sugar or fat, including candy, gum, cereals, soft drinks and salty snacks that do not promote healthy lifestyle messages (Lee et al., 2009), it is crucial to take steps to improve advertising content – “Messages that encourage unhealthy dietary practices or physical inactivity should be discouraged, and positive, healthy messages encouraged.” (WHO, 2004: 7).

Advergaming and Children

Advergaming targeting children are a promotion strategy commonly adopted by brands (Culp et al., 2010) and heavily used by the food industry (Lee and Youn, 2008). Moore (2006) developed a content analysis of the main websites that advertise food and target children and found that 73% of those sites had at least one game with food brands. On average, each website included 7 food advergaming. They are easy to play, provide a fun environment and quick rewards (Terlutter and Capella, 2013) while comprising a virtual interaction with a brand or product (Arnold, 2004). Furthermore, advergaming have a high level of involvement and attract children's attention during more time than traditional advertising formats (Moore and Rideout, 2007), thus children's game exposure is higher in interactive techniques.

Advergaming created by for-profit organizations (with the intent to sell products) are usually action or role-playing games that include character representations and punishments when

children do not meet the goals, reflecting sometimes the importance of using the product advertised in the game to win (Cicchirillo and Lin, 2011).

Regarding what motivates children to play advergames, the most common reasons include fun, entertainment and pleasure of playing games (Youn and Lee, 2005). Entertainment has a significant positive impact on children's predisposition towards advergames (Hernandez, 2008). Additionally, when children feel they are challenged by the game – “in the flow” – they present better attitudes concerning the brand advertised (Waiguny et al., 2012). The change in brand attitude associated with game enjoyment is more evident for product-relevant advergames (e.g. food-themed advergames for food companies) (Wise et al., 2008).

Research has increasingly considered the content of advergames (Lee and Youn, 2008, Lee et al., 2009), their impact on children's food choices (Dias and Agante, 2011) and brand attitudes (Waiguny et al., 2012) and whether children understand their persuasive intent (An and Stern, 2011; Nairn and Hang, 2012; Waiguny et al., 2014).

Gender Differences and Gender Stereotypes

A child understands that he (she) is a boy (girl) at about three years old (Acuff and Reither, 1997) and identification based on gender becomes extremely important when children are figuring out who they are (Carey and Samson, 2004). Brannon (1996) considered about 1000 references and identified two different points of view on gender – gender differences are a question of nature, are inherent (maximalist view) or they are a matter of nurture, are learned (minimalist view). The author adopted the latter view.

During preschool years and until they reach 8 years old, children look for products that reinforce their gender role (Carey and Samson, 2004) – they prefer gender-typed toys, that are associated with or labeled as for their gender (Weisgrama et al., 2014). Regarding electronic games, “there is a definite gender split in the kinds of games that appeal to boys and girls” (Acuff and Reither, 1997: 153). Boys prefer fantasy/violence, sports and action adventure computer games and girls

prefer educational, action adventure and entertainment games (Cherney and London, 2006). Moreover, boys tend to play computer games more frequently than girls, in part because girls do not consider the existing games appealing – most of the games have a male-biased appeal, in terms of theme and content (Acuff and Reither, 1997). Cheema (2015) developed a study about gender distinctions in computer use for entertainment and found that “the frequency of boys’ computer use at home [for single player and collaborative games] exceeded that of girls in all 43 economies included in our sample [including Portugal]” (Cheema, 2015: 7).

Children’s attitudes about ads and brands are influenced by gender-content in advertising, thus considering executional gender elements (e.g. colors, language, character portrayals) when designing advertisements is important to promote positive attitudes on young consumers. Incongruence between gender elements may have a negative impact on attitudes (Bakir and Palan, 2010). Regarding color associations, boys and girls have different views. A higher percentage of girls than boys associate happiness and honesty with pink, while the opposite occurs for blue (Byrnes, 1983). The use of feminine colors in toys increases girls’ “sense of belonging” (Weisgrama et al., 2014). Furthermore, boys and girls have different motivations and aspirations. Regarding body image ideals, boys and girls are concerned about different attributes. Girls usually want to be beautiful and thin, while boys want to be athletic (Dittmar et al., 2000).

Gender differences in food preferences are also evident. In elementary school years, girls have a greater preference for vegetables and fruits than boys, who prefer “fast and familiar” foods characterized by having excessive fat (Caine-Bish and Scheule, 2009).

Regarding gender stereotypes, when children reach four years old, they consistently stereotype beliefs, and girls (boys) stereotype females (males) more than males (females) (Gelman et al., 2004). Gender stereotypes are assumptions about “traits commonly identified as descriptive of women and men” (Paludi, 2007: 207) and their acquisition by children is determined and

influenced by family, schools, peer groups and media (Paludi, 2007). Gender stereotypes are frequent in TV advertising, with boys appearing more commonly, being more active and aggressive and adopting more dominant attitudes than girls (Browne, 1998). Women are considered more emotional and gentle and men are considered more active and competitive (Paludi, 2007).

Hypotheses

Children's Food Liking and Purchase Intention

Although genetic predispositions to prefer sweet and salty foods exist, food preferences are learned, thus can be changed with the help of nutritional education (Birch, 1999). There is a link between exposure to food marketing and/or food promotion channels, and food liking and purchase intention of the advertised products (Cairns et al., 2009).

Food advergames play an important role in influencing children's food preferences (Dias and Agante, 2011) and it is expected that they can function as a tool to promote healthier eating habits when emphasizing positive messages. Moreover, during childhood, boys and girls develop different preferences in terms of playing activities, characters and contexts (Acuff and Reither, 1997). Children prefer spending their time doing activities that fit their gender. There are also gender differences in terms of preferred colors – girls prefer red, purple and pink/boys prefer blue (Cohen, 2013) – and games' design (Cherney and London, 2006).

According to this, we expect that an advergame that is created taking into consideration gender differences in preferences will be more appealing and engaging for children and will increase identification with the game, having a greater impact on their food liking and purchase intention after playing the game.

H1: Playing an advergame with healthy food content segmented by gender results in higher children's liking of healthy food than playing a neutral gendered advergame.

H2: Playing an advergame with healthy food content segmented by gender results in higher purchase intention of healthy food than playing a neutral gendered advergame.

Perceived Fun

Segmented advergames by gender will be more appealing, thus children will tend to be more involved in the game. Game involvement has a positive influence on children's affective responses – brand attitude and game attitude (Van Reijmersdal et al., 2012). Thus, children will associate the game with a high level of fun and entertainment, which may translate into children considering healthy food as being more fun.

H3: Playing an advergame with healthy food content segmented by gender results in a better attitude towards healthy food than playing a neutral gendered advergame, in terms of perceived fun.

Perceived Healthiness

Children from 7 to 9 years old already have structured nutritional knowledge, being able to easily distinguish healthy from unhealthy food (Dias and Agante, 2011). Moreover, they associate healthy food to what they should eat (Edwards and Hartwell, 2002). Thus, it is expected that they will have the same perception of food healthiness, regardless of playing the gendered or the neutral advergame.

H4: Playing an advergame with healthy food content segmented by gender results in the same attitude towards healthy food than playing a neutral gendered advergame, in terms of perceived healthiness.

Methodology

Legal and Ethical Issues

A research with children involves several ethical issues that must be carefully taken into account to protect children's interests and rights, as stated by UNICEF. According to this, we informed

the schools, parents and children about the whole experimental process and we granted data confidentiality and anonymity. Informed consent forms were signed by the schools in which the research took place (**Appendix 1**), as well as, by children's parents (**Appendix 2**). Moreover, we explained to children their role in the process and that they were free to decide whether they wanted to participate in the experiment or not. Children's views and feeling were always respected and considered (UNICEF, 2002).

Sample

The final sample consisted of 286 Portuguese children aged 7 to 9 from two private schools located in the urban area of Lisbon. From the 388 consent forms sent to children's parents, 286 were signed and returned, meaning a 74% response rate. This sample is considered representative since it includes more than 100 participants (Diamantopoulos and Schlegelmich, 1997). The experiment was conducted with a group of children with the same cognitive and social abilities that belongs to the concrete operational stage of the Piaget's Theory of Cognitive Development (Piaget and Inhelder, 1972). Children from 2nd to 4th grades are able to use a computer to play games and they can understand and answer simple questionnaires (Greig et al., 2007). Moreover, the sample was composed by approximately the same number of children from each gender (49% of girls and 51% of boys) that were randomly assigned to the experimental group or to the control group.

Assessment Method

The assessment method used for testing our hypotheses consisted in structured questionnaires with pictures of healthy food (the same included in the game). Pictorial cues are appealing to children and allow them to easily understand the questions, thus are an appropriate way to evaluate children's preferences (Dias and Agante, 2011).

We decided to use questionnaires instead of interviews because children tend to provide more socially desirable answers during interviews, specifically in terms of sensitive topics such as

eating behaviors (Miller et al., 2015). Children are more prone to give their honest opinions regarding food choices in a questionnaire they fill out by themselves. To reduce social desirability bias, we ensured data anonymity and informed children that there were no right or wrong answers (Podsakoff et al., 2003).

The questionnaire was composed by 3 questions requiring information for sample characterization (gender, age, and grade) and 28 multiple-choice questions. A pre-test was done with 5 children within the considered age range to guarantee that children understood the questions and to analyze the time they took to fill it out. Minor adjustments were made based on the pre-test results.

Game Design

In order to analyze the influence of an advergame segmented by gender on children's attitudes and behaviors towards healthy food, three versions of a specific advergame were developed – one for girls, one for boys and one neutral. Although boys and girls have different preferences regarding games' design, we decided to use the same type of game in all versions to avoid distinct degrees of challenge and involvement between genders. Since advergames should only emphasize positive messages or they may be seen as unethical for children, the game consisted in collecting only healthy food products. To ensure that the game was challenging, children had to overcome obstacles that appeared (run away from enemies and jump over the peaks). They earned one point each time they grabbed a snack and they passed to the next level when they grabbed all the existing snacks. Children won the game when they passed the two existing levels. The selection of the types of healthy food to include in the game (**Appendix 3**) – jelly, cheese sandwich with lettuce and tomato, banana, orange juice, yogurt, fruit salad, strawberries and whole cereals with milk – was discussed with a nutritionist to take into consideration their nutritional characteristics and, at the same time ensure that the selected healthy snacks were

appealing for children. No brand names appeared in the game since brand-familiarity is not a variable in our research.

The difference between the versions was in terms of colors. We used an unknown character since we did not want to evaluate whether children knew/were familiar with the character. Moreover, the character was the same in all versions with just some adjustments in terms of hair color and color of clothing. To identify the features that are better associated with each gender preferences, we started by talking with a psychologist and a primary-school teacher. After considering their insights, we designed a pre-test with 5 children from 7 to 9 years old to understand how they imagine a perfect online game, asking them to choose their preferred color from the existing options (**Appendix 4**). According to this, the three versions of the game were created – for girls (pink), boys (blue) and neutral (gray) (**Appendix 5**). We chose gray because it represents one of the neutral colors (Chapman, 2014). In fact, “colors like (...) grays blend with all colors and don’t presume to have any particular personality. They are totally neutral in their approach to any other color” (Berman, 2010:150). We did not choose white because it might be seen as “no color” nor black since children might associate it with negative feelings, thus biasing our research.

After having the game created, another pre-test was done to evaluate whether children were able to play the game.

Procedure

After having the consent from schools, we sent an authorization form and a questionnaire to parents (**Appendix 6**), with the purpose of understanding children’s use of Internet for playing games, children’s eating preferences and information on the child’s height and weight since some studies indicate that behavior change is dependent on the child’s Body Mass Index (Guinn et al., 2013; Mitchell et al., 2013). At the same time, we contacted specialists to ensure that the questionnaire given to children and the game were properly developed. The next step consisted

in going to schools and performing the experiment to children that had the consent from their parents. The experiment was done in the schools' computers, with 5 to 15 children playing at a time. Each child was randomly assigned to either the experimental group (advergame version segmented by gender) or to the control group (neutral gendered advergame) and they played for 5 minutes – time considered appropriate by previous research (Acar, 2007; Mallinckrodt and Mizerski, 2007; Wise et al., 2008). According to this, both groups were exposed to the stimuli (the advergame), which we manipulated in terms of being a gendered game vs. non-gendered game, and thus our independent variable is the type of advergame (gendered/non-gendered). Finally, after being exposed to the stimuli, children answered a questionnaire (**Appendix 7**) about their food preferences, purchase intention and attitude towards healthy food in terms of perceived fun and perceived healthiness (dependent variables). All the instructions and guidelines about the process were carefully explained by the researchers. The procedure timeline is presented in **Appendix 8**.

Measures

To evaluate **food preference**, we used a scale that was adopted in some studies involving young children (Edwards and Hartwell, 2002; Wardle et al., 2003) and we asked a type of question that was already considered in a previous research with advergames about promotion of children's healthy eating habits (Dias and Agante, 2011). This single item scale used smiling and sad faces and asked children how much they liked each food (healthy snacks present in the game), using a 5-point smiley likert scale: 1) I hate it; 2) I do not like it; 3) I do not know if I like it or not; 4) I like it; 5) I love it.

To analyze children's **purchase intention** of healthy food, two questions were considered. We asked children whether they would like to buy or would ask their parents to buy the presented healthy snacks and whether they would like to consume those foods (Phelps and Hoy, 1996). We adapted the 5-point semantic differential scale (Greig et al., 2007) from "I would dislike it

at all” to “I would like it at all” – replacing the numbers by smileys to simplify children’s understanding.

To evaluate children’s attitudes towards healthy food in terms of **perceived fun**, we asked children “What do you think about these foods?” and they had to answer using a 5-point semantic scale from “boring” to “very funny” (Dixon et al., 2007), also with smileys.

To study children’s attitudes towards healthy food in terms of **perceived healthiness**, we defined one question – “How healthy do you consider these products?” – and used a 5-point semantic scale from “very unhealthy” to “very healthy” (Dixon et al., 2007), with smileys instead of numbers for the reason explained above.

The data was analyzed through the IBM SPSS Statistics software (version 23) and SmartPLS (version 3.2.3) (Ringle et al., 2015).

Results

Sample Characterization

The research was conducted with 286 children from 7 to 9 years old, equally distributed by gender, grade and group (**Table 1**).

Table 1 – Sample distribution

		Grade			Group		Total		
		2th	3rd	4th	Experimental	Control			
Gender	Male	44	51	51	75	71	146	51%	286 (100%)
	Female	42	44	54	73	67	140	49%	
Total		86	95	105	148	138			
		30,1%	33,2%	36,7%	51,7%	48,3%			
286 (100%)					286 (100%)				

To evaluate children’s attitude towards the Internet, three variables were considered: Internet usage, Internet usage for playing games, and Internet access at home.

Regarding Internet usage, 44,1% of the children in the sample reported that they use it sometimes (**Appendix 9**), however statistically significant differences were found in terms of age ($p=0,001$) (**Appendix 9a**) with older children tending to use the Internet more frequently

(Figure 1). There was no association between Internet usage and gender ($p=0,503$) (Appendix 9b). More than half of the children (59,8%) said that they play online games at least once a week (Appendix 10), with boys

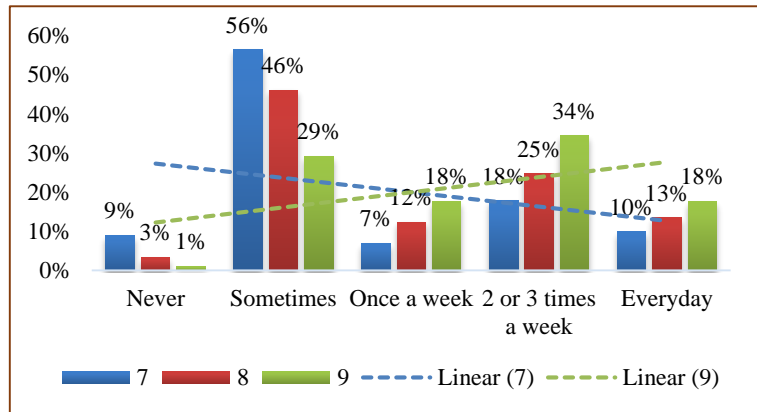


Figure 1 – Internet Usage Rate per Age

playing more often than girls ($p=0,011$ – Figure 2 and Appendix 10a). No association was found in terms of age ($p=0,450$)

(Appendix 10b). Additionally, 98,3% of the children have Internet access at home (Appendix 11). Concerning children’s attitude towards the game they played, the great

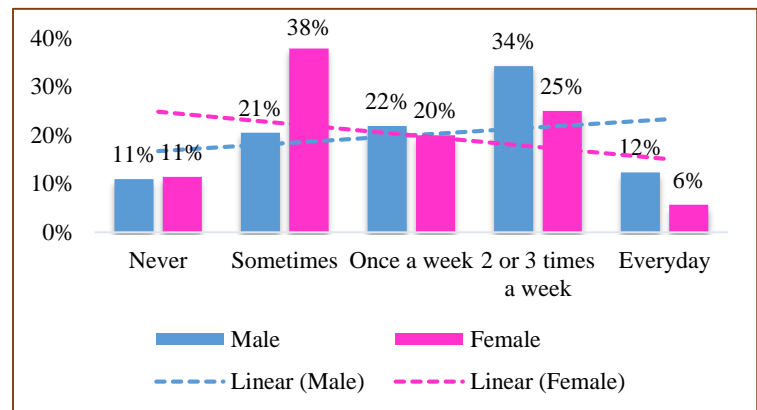


Figure 2 – Internet Usage for Playing Games by Gender

majority of the sample (83,2%) “liked a lot” and only 0,3% “did not like” (Appendix 12a). Similarly, 78% of the children considered the game really fun and only 0,7% said it was boring (Appendix 12b). A medium positive correlation was found between game perceived fun and game liking ($R^2 = 0,440$; $p=0,000$), meaning that the funnier the game was, the more children liked it, and vice-versa. Regarding the game difficulty level, 53,1% of the sample reported that the game was “just right” (Appendix 13).

In terms of eating habits, we observed that more than half of children consumed fruit and vegetables “twice a day” and only consumed *fast food* “sometimes” or “once or twice a month” (Appendix 14).

Hypotheses Testing

Children were required to provide their opinion regarding the considered variables for 6 healthy snacks and composite measures for the variables were created (e.g. Healthy Food Liking = (Sum of the 6 healthy snacks liking)/6). Since all the hypotheses were evaluated by using 5-point smiley likert scales (interval scales), the tests conducted were parametric (independent t-tests), considering a statistical significance of 0,05.

In order to study the influence of a gendered advergaming on children's healthy food liking (**H1**), purchase intention (**H2**) and perceived fun (**H3**), we considered descriptive statistics and independent t-tests for equality of means (for the composite measures and for each single healthy snack) by group (experimental vs. control). Although the means for the variables healthy food liking and healthy food purchase intention in the experimental group were slightly higher than those in the control group (4,252 vs. 4,197 and 4,092 vs. 4,062 respectively), no significant differences were found. The tests revealed equality of means for both groups, leading us to **reject H1, H2 and H3 (Appendix 15)**. This may result from the fact that advergaming engages children in an interactive environment in which they are entertained and have to actively participate in the game. When children like the game (as happened in our research), they are so involved and focused on attaining their objectives that the colors become almost irrelevant for them.

Concerning children's attitude towards healthy food in terms of perceived healthiness (**H4**), the means were similar in both the experimental and the control groups and an independent t-test for equality of means of this variable by group revealed no significant differences ($p=0,313$). Similarly, independent t-tests were also conducted for each healthy snack perceived healthiness by group and the null hypothesis of equal means was not rejected in any case. As a result, we **did not reject H4 (Appendix 16)** meaning that, regardless of playing a segmented or a neutral

gendered advergaming, children from 7 to 9 years old presented a similar and well developed perceived healthiness (mean of 4,39 in a scale from 1 to 5).

Table 2 summarizes the results obtained from hypotheses testing:

Table 2 – Hypotheses testing

	Means		t-tests	Reject Ho?	Decision
	μ_{Neutral}	$\mu_{\text{Segmented}}$	p-value (2-sided)	($H_0: \mu_{\text{Neutral}} = \mu_{\text{Segmented}}$)	Reject H1, H2, H3 and H4?
H1: Liking	4,197	4,252	,466	No	Reject H1
H2: Purchase Int.	4,062	4,092	,694	No	Reject H2
H3: Fun	4,062	4,054	,927	No	Reject H3
H4: Healthiness	4,421	4,364	,313	No	Do not reject H4

Other Results

Positive and significant correlations existed between all the dependent variables, reflecting that they influenced each other. The strongest correlations were between liking and purchase intention ($R^2=0,738$; $p=0,000$), perceived fun and purchase intention ($R^2=0,603$; $p=0,000$) and liking and perceived fun ($R^2=0,531$; $p=0,000$) (**Appendix 17**). When analyzing the same correlations within each gender, we observed that perceived healthiness and liking (and perceived healthiness and purchase intention) presented a higher correlation within girls than boys (although weak in both cases) (**Appendix 17a**). This may be explained by the fact that girls tend to prefer more healthy food than boys (Levin and Levin, 2010), thus the correlation effect (the more they perceived that one snack is healthy, the more they liked and wanted to purchase and vice versa) is more enhanced within girls.

We also performed linear regressions to evaluate whether the dependent variables of our research were explained by gender and age. Only healthy food liking was explained by age ($p=0,024$), however the R^2 was very low (0,018).

SmartPLS Model

The objective of this study was to evaluate children's attitudes towards healthy food after playing an advergaming (gendered or non-gendered), specifically in terms of liking, perceived

fun, and perceived healthiness and whether at the end they would want to buy healthy snacks. According to this, we considered relevant to develop a model to evaluate which variables explained purchase intention of healthy food. Structural Equation Modeling path analysis was performed in SmartPLS. We started by including the respective indicators (composite measures created for hypotheses testing) in each variable. Then, for the reliability analysis, we observed (1) Cronbach Alpha coefficients that should be above 0,7 to guarantee the internal consistency of the results; (2) Average Variance Extracted, which should fall above 0,5; and (3) Composite Reliability, acceptable for values above 0,6 (Diamantopoulos and Sigauw, 2000). The final reliability analysis showed that all values satisfy the criteria (**Appendix 18**). To analyze whether the parameters were significant, we obtained the t-values ($t > 1,96$ are significant at 0,05 statistical significance). The model (**Figure 3**) showed that liking, perceived fun and perceived healthiness had a positive direct influence on purchase intention, with liking presenting the most significant impact on purchase intention. Perceived fun had also a positive indirect impact through liking and perceived healthiness. Consistent with our previous results, the type of game played (variable group) did not have an impact on any variable from the model.

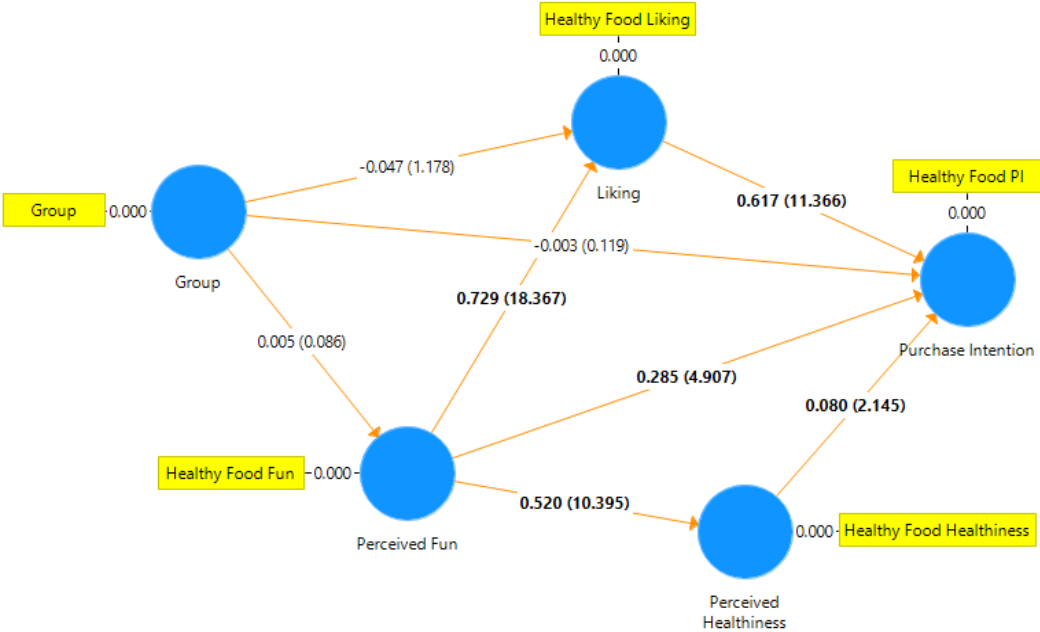


Figure 3 – SmartPLS Model

Complementary Analysis

Our main study suggested that, after playing an advergame with healthy food content (regardless of being neutral-gendered or segmented), children presented positive attitudes towards healthy food, in terms of liking, purchase intention, perceived fun and perceived healthiness (the means for all variables are above 4)

(**Table 3**). Moreover, children enjoyed playing the game (the majority said they liked a lot) and positive (although weak) correlations were found between the

Table 3 – Means for all dependent variables

Variables	Means
Liking	4,226
Purchase Intention	4,078
Perceived Fun	4,058
Perceived Healthiness	4,392

dependent variables and attitude towards the game (**Appendix 19**), meaning that the more children enjoyed the game, the more they liked the healthy snacks that appeared in the game, and vice versa. According to this, we considered relevant to analyze whether children's positive eating behaviors resulted from playing the advergame with healthy food content disregarding of the type of advergame they played. To do so, we applied a questionnaire with the same questions about the 6 healthy snacks showed in the main study to 12 children within the same age range (7 to 9 years old) and from a similar background as for the children in the main study. These children were not exposed to any stimuli before answering the questionnaire (they did not play the game, thus were not immersed in its interactive environment). As a result, we expected that this group of children would reveal less positive attitudes towards healthy food. However, the means for this new control group and the groups that played the game were similar in all dependent variables. To guarantee the equality of means, t-tests were performed and the results showed that, in fact, both children who played the game and children who did not play the game presented similar and good attitudes regarding healthy food (**Appendix 20**).

Discussion and Conclusions

Our research intended to analyze whether an advergame segmented by gender positively affected children's attitudes and behaviors towards healthy food, particularly regarding healthy food liking, purchase intention, perceived fun and perceived healthiness.

The results revealed that segmentation by gender on advergames does not influence children's healthy food liking, purchase intention and perceived fun. On average, children presented positive attitudes concerning healthy food, independently of playing the segmented or the neutral-gendered advergame, or even not playing any advergame and only answering the questionnaire. This may be driven by the fact that the majority of children in the sample consumed fruit and vegetables every day and they were aware of the benefits associated with a healthful diet. Family and school teach children the importance of eating healthily, thus they already liked healthy food, wanted to buy it and even considered it fun.

Interestingly, the impact of gender segmentation varies from static marketing tools to interactive techniques, and this research represents a contribution to the existing literature in terms of defining the limits of an interactive marketing instrument. Despite the positive influence of a segmented packaging on children's choice of healthier breakfast cereals (Montellano and Agante, 2015), the same effect is not verified in advergames. Moreover, past research on the influence of advergames' content on children's eating habits concluded that advergames are an efficient tool to promote healthier choices (Dias and Agante, 2011). However in our research, playing the game was not relevant in changing children's attitudes and behaviors, since all children presented high attitudes towards healthy food. Thus, no significant differences were found between food liking, purchase intention and perceived fun among groups. Therefore we wonder if the effect of these techniques is dependent on the initial level that children have regarding attitudes towards healthy food, a variable that has not been considered in the literature.

We saw that children enjoyed playing an advergame with healthy food content and that they wanted to play again. According to this, we believe that the replacement of advergames with unhealthy messages by advergames encouraging positive behaviors (that children like and play several times) may contribute to improving eating habits for children that are not inclined towards healthy food, since it allows children to become more familiar with healthy food and food familiarity influences food choices (Contento, 2008).

Finally, regarding children's perceived healthiness, we confirmed that all children from 7 to 9 years old are able to distinguish healthy from unhealthy food no matter the circumstances they are face with since there were no differences between children who played the neutral version and those who played the segmented version.

Limitations and Insights for Further Research

This research presented some limitations. Firstly, children only played one time, thus our conclusions were driven from just a single contact with the advergame. Future research may investigate the influence of a continuous exposure to the stimuli on children's food choices. Secondly, we only observed the results post-treatment (children answered a questionnaire after playing the game), so it may be worthwhile to analyze the impact of a segmented advergame when asking children to answer the questions immediately before and immediately after playing the game (instead of having a neutral advergame).

Thirdly, we included unknown non-gendered characters in the advergame and this can be considered a limitation of our study. Future research may evaluate the impact of introducing known gendered characters on the segmented versions of the advergame and study how familiarity with the character contributes to the effectiveness of gender segmentation in advergames. We wanted that the changes in the stimuli were only related to gender and not to the character, but maybe the differences were so subtle that they were not noticed by the children, and thus the results.

Fourthly, as explained in the section above, the attitudes of children towards healthy food were very high even for children who did not play the game. Future research should consider the initial levels of liking and purchase intention of healthy food, to see if lower levels could be influenced by the advergaming.

Finally, our research was conducted with children from 7 to 9 years old, belonging to the same cognitive and social stage of development and could be interesting to perform this experiment with children from different age groups and even compare the results among them.

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