

Feelings reported by adolescents after food ingestion: a comparative study

Naíza Carvalho Rodrigues¹, Marize Melo dos Santos¹, Suzana Maria Rebêlo Sampaio da Paz¹, Adriana de Azevedo Paiva¹, Thaís Rodrigues Nogueira¹, Betânia de Jesus e Silva de Almendra Freitas¹, Cecília Maria Resende Gonçalves de Carvalho¹

¹Graduate Program in Food and Nutrition, Universidade Federal do Piauí (UFPI) – Teresina (PI), Brazil

ABSTRACT

Introduction: Food is closely linked with emotions in a complex relationship. The imaginary and symbolic meaning attributed to food has been little studied and the act of eating needs to be better understood. **Objective:** To analyze the association of adolescents' feelings to selected foods. **Methods:** Cross-sectional study with 995 adolescents from public and private schools in Teresina, PI, Brazil. It was a Supplementary Project to the Brazilian national survey ERICA (Estudo de Riscos Cardiovasculares em Adolescentes). Adolescents had to choose one of the following feelings to selected food: well-being/satisfaction, malaise, no feeling, aversion. For the option aversion, the participant had to indicate if it was related to smell, color, appearance, or taste. Adolescents' feelings to foods were analyzed by type of school, sex, and age range, using Pearson's chi-square (χ^2) or Fisher's exact tests. **Results:** There was significant differences regarding the type of school for the feeling to chocolate ($p=0.015$); vegetables ($p=0.003$); leafy greens ($p=0.005$); healthy sandwich/natural fruit juice ($p\leq 0.001$); high fat red meat ($p=0.046$); fruit/natural fruit juice ($p\leq 0.001$). For sex, there was significant differences for healthy sandwich/natural fruit juice ($p=0.001$); beans and rice ($p=0.021$) and high fat red meat ($p=0.005$). There was significant differences between age groups for sandwich, chips, soda and ice cream ($p=0.018$); pasta ($p=0.047$) and high fat red meat ($p=0.021$). Well-being predominated in almost all foods and aversion was poorly reported. **Conclusion:** The results suggest that adolescents' feelings are not directed to specific foods.

Keywords: adolescent; fast foods; patient preference; disgust; emotions.

INTRODUCTION

There is evidence that the valuation of certain preferences or aversion for food may compromise the adolescent's nutritional status and lead to exposure of risk situations and negative health outcomes, such as obesity, anxiety, depression and unspecified feelings^{1,2}. In Brazil, data from ERICA - Estudo de Riscos Cardiovasculares em Adolescentes point to a prevalence of overweight and obesity of 25.5% in 73,399 adolescents³, demonstrating a worrying increase in risk of developing chronic conditions, such as diabetes and cardiovascular diseases at this age⁴.

The expressive growth in the prevalence of overweight and obesity among children and adolescents in the last three decades, between 1980 and 2013, highlights childhood

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Corresponding Author: Cecília Maria Resende Gonçalves de Carvalho - Nutrition Department - Campus Universitário Ministro Petrônio Portella, s/n, Ininga – CEP 64049-550 – Teresina (PI), Brazil - Email: ceciliamaria.pop@hotmail.com cecilia.ufpi@hotmail.com

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obesity as an endemic global public health problem^{5,6}. Several factors, especially eating behavior, can be decisive for the creation of the obesogenic environment. Therefore, nutritional studies should be aimed at understanding what happens at the emotional level in the act of eating, with regard to the sensations coming from the most diverse foods, and/or the experience lived in each specific and individual behavior⁷.

In this sense, food is strongly connected with emotions, which is proved by the simple fact that imagining a favorite food or of important significance evokes associations that combine images, emotions, senses and memory, in a mixture in which it is almost impossible to separate the different components. It is worth mentioning that the relationship “emotion and eating behavior”, in addition to being diversified, is complex, since there is a particularity with regard to the effect of emotion on eating behavior, as well as other particularities, on the effect of the consumed food on the emotional state⁸.

Thus, considering the imaginary and symbolic meaning attributed to food, the objective of this study was to assess the association between adolescents’ feelings related to selected foods.

METHODS

This is a cross-sectional study that used data from a supplementary project to ERICA - Estudos de Riscos Cardiovasculares em Adolescentes, a nationwide survey in Brazil, carried out in the period 2013-2014.

The Supplementary Project of ERICA was a survey conducted only in Teresina, Piauí, coordinated and developed at the Department of Nutrition, in the Universidade Federal do Piauí (DN/UFPI), whose objective was to learn about the behavior, attitudes and feelings of adolescent students about their eating habits. The sampling plan was the same defined by ERICA, which collected data from 33 schools, resulting in 1,507 teenagers, in the city of Teresina, Piauí, Brazil.

For this study, 30 schools were included, since for institutional reasons, three of them did not participate. Thus, the final sample of the study consisted of 995 adolescents, between 12 and 17 years old, enrolled in the 7th, 8th and 9th grade of elementary school and 1st, 2nd and 3rd year of high school, male and female, who effectively answered the specific questions of this study. Data were collected between one and two weeks after completion of ERICA in each school.

ERICA was approved by the Ethics Committee of the Universidade Federal do Rio de Janeiro, and by the Ethics and Research Committee of the Universidade Federal do Piauí, under number 406.353. Each adolescent and guardian signed the informed consent, in which the objectives of the study and all the information about the research were explained.

For the collection of data related to the adolescents’ feelings about their food, a specific illustrated booklet with four blocks of questions previously tested, was used. The information was collected after the training of the interviewers. The foods included in the booklet were the most cited by students in a survey carried out in Teresina between 2011 and 2012⁹.

For this study, only one block (block I) of the booklet was chosen, with the following question: “what do you feel when you eat ...” chocolate, vegetables, leafy greens, sandwich, french fries, soda and ice cream, healthy sandwich and natural fruit juice, beans and rice, pasta, fish, chicken, high fat red meat, fruit or natural fruit juice, artificial juice, soda and ice cream. The response options were no feeling, well-being/satisfaction, malaise, and aversion. For those adolescents who responded that they had an aversion to any of the foods, they had to complement the information by designating which attributes characterized the aversion. These were presented in four response options: color, smell, appearance and taste.

The association between the type of school (public, private), sex and age group (12 to 14; 15 to 17 years) in relation to feelings (well-being, malaise, aversion, or no feeling) was evaluated. For this, the software Stata 14.0 was used. The variables were presented using descriptive statistics: proportions, means and confidence intervals (95% CI), considering the sample weight and the complexity of the sample design when calculating the proportions. Pearson’s chi-square (χ^2) or Fisher’s exact tests were used when appropriate, with $p \leq 0.05$ being significant.

RESULTS

The average age of the adolescents was 14.6 years (95% CI: 14.5-14.7 years), minimum age of 12 and maximum of 17 years, with 499 (50.2%) being female and 496 (49.8%) being male. The distribution of students was mostly from public school (72.6%), with only 27.4% from private schools. Differences were observed between the proportions of the students’ genders, according to the school system ($p=0.05$), with a predominance of women in public schools (53%) and men in private schools (57.2%).

The study revealed a significant association for the feeling of well-being, reported by adolescents from a private school and the consumption of foods: chocolate; vegetables or greens; leafy greens; sandwich with chips, soda and ice cream, beans and rice, high fat red meat, fruit or natural fruit juice, healthy sandwich and natural fruit juice (Table 1), highlighting the high frequency of feeling of well-being associated with the consumption of fruit or natural fruit juice (91.5%).

The absence of feeling prevailed among students in public schools, with an emphasis on the consumption of chocolate (51.3%), and food aversion was more referred to vegetables, leafy greens and fish (Table 1).

Table 1: Feelings reported by adolescents in the act of eating by type of school. Teresina, Piauí, Brazil, 2017.

Foods	Feelings	Public (n=732)	Private (n=263)	p
Chocolate	No feeling	51.3	36.1	0.015
	Well-being	39.8	54.2	
	Malaise	5.1	6.9	
	Aversion	3.8	2.8	
Vegetables	No feeling	27.2	18.8	0.003
	Well-being	49.5	58.5	
	Malaise	3.4	1.8	
	Aversion	19.9	20.9	
Leafy greens	No feeling	30.7	20.5	0.005
	Well-being	45.4	58.2	
	Malaise	3.1	2.3	
	Aversion	20.8	19.0	
Sandwich, french fries, soda and ice cream	No feeling	36.1	23.5	0.091
	Well-being	50.5	58.4	
	Malaise	10.4	14.3	
	Aversion	3.0	3.8	
Healthy sandwich and fresh fruit juice	No feeling	30.6	21.5	<0.001
	Well-being	52.9	65.6	
	Malaise	3.9	1.0	
	Aversion	12.6	11.9	
Beans and rice	No feeling	23.1	19.3	0.320
	Well-being	71.3	77.1	
	Malaise	2.8	-	
	Aversion	2.8	3.6	
Pasta	No feeling	39.3	24.1	0.053
	Well-being	51.7	67.4	
	Malaise	4.2	4.5	
	Aversion	4.8	4.0	
Fish	No feeling	28.3	20.5	0.198
	Well-being	49.6	58.8	
	Malaise	3.5	2.7	
	Aversion	18.6	18.0	
Chicken	No feeling	32.7	22.8	0.117
	Well-being	60.1	72.5	
	Malaise	1.3	0.9	
	Aversion	5.9	3.9	
High fat red meat	No feeling	38.1	24.6	0.046
	Well-being	37.9	49.8	
	Malaise	15.3	15.5	
	Aversion	8.7	10.1	
Fruit or natural fruit juice	No feeling	20.9	6.5	<0.001
	Well-being	75.0	91.5	
	Malaise	0.9	0.5	
	Aversion	3.2	1.5	
Artificial juice	No feeling	45.8	42.1	0.548
	Well-being	28.6	33.2	
	Malaise	9.2	7.4	
	Aversion	16.4	17.3	
Soda	No feeling	41.3	33.0	0.114
	Well-being	43.0	42.4	
	Malaise	11.8	17.2	
	Aversion	3.9	7.4	
Ice cream	No feeling	38.4	28.4	0.063
	Well-being	56.5	64.4	
	Malaise	3.0	5.6	
	Aversion	2.1	1.5	

The feeling of malaise was more frequent among public school students for food: vegetables, leafy greens, healthy sandwich and natural fruit juice, beans and rice, fish, chicken, fruit or natural fruit juice and artificial juice. For private school students in relation to this feeling, the highlights were: chocolate (6.9%); sandwich accompanied by french fries, soda and ice cream (14.3%); soda (17.2%) and ice cream (5.6%).

For high fat red meat the feeling was similar for students from both types of school.

The absence of feeling had a greater proportion for students of public schools, especially chocolate (51.3%). Analyzing the students' feelings about food aversion, it was noticed that the highest proportion was for vegetables; leafy greens and fish (Table 1).

Table 2 describes the feelings expressed by adolescents regarding the consumption of food in relation to sex. It was evident that the different types of feelings experienced by the adolescents were significant for eating healthy sandwiches and natural fruit juice; beans and rice and high fat red meat ($p < 0.05$). For the foods mentioned, well-being was the feeling most reported by male adolescents. On the other hand, the feeling of malaise was little mentioned, however, sandwich in addition to chips, soda and ice cream; red meat; artificial juice and soda were the foods that presented the highest proportion in relation to this feeling for girls.

The results showed a significant association between different types of feelings reported by the adolescents, and the intake of healthy sandwich and natural fruit juice; beans and rice and high fat red meat ($p < 0.05$). The feeling of well-being predominated in the male gender and that of malaise was little mentioned by the adolescents. However, the consumption of sandwiches in addition to chips, soda and ice cream; high fat red meat; artificial juice and soda were the foods that girls reported most malaise.

A higher proportion of feelings of malaise was observed for high fat red meat, with emphasis on females (17.8%). Regarding aversion, fish was the type of meat that had the highest proportion for boys and girls, with girls reporting a higher proportion of this feeling for red meat (12.8%), chicken (5.6%) and fish (20.6%).

The feeling of malaise associated with the consumption of high fat red meat stood out among women (17.8%), and the aversion related to fish consumption prevailed for boys and girls (Table 2).

Analyzing the age group (Table 3), the results showed statistically different feelings for food consumption: sandwich, french fries, soft drinks and ice cream ($p = 0.018$); pasta ($p = 0.047$) and high fat red meat ($p = 0.021$), with emphasis on the feeling of well-being. The feeling of aversion was most mentioned for the youngest, aged between 12 to 14 years old compared to adolescents aged 15 to 17 years old.

Thus, it was also found that the feelings of aversion were quite expressive for vegetables (21.9% vs 18.5%); leafy greens (22% vs 18.4%); and fish (20.2% vs 16.5%) in the age group of younger participants compared to older adolescents, respectively.

DISCUSSION

The results of this investigation bring important contributions to the evolution of knowledge about the feelings related to the act of eating, given the insufficient approach of this theme in the scientific literature, and the use of a representative sample of the target population (teenagers) in this study.

The study showed a wide variety of feelings and sensations associated with different foods, extracting from this the complexity of the subject¹⁰. Probably, the set of beliefs and food values influences the daily emotional experience for each individual differently and can provide feelings varying in intensity and duration, according to the emotional state and mood at the time of the question. This understanding is in concordance with Almeida et al.¹¹, which considers the system of values and beliefs as an inducer for better acceptance or food rejection in each situation, taking into account the individuality of the human being.

Starting from the premise that feelings are complex phenomena that present characteristics that lead to a variety of emotions, it can be said that they feature a system of various emotional dispositions, with different connotative tendencies connected to a common object and subordinated to a common purpose¹². This reasoning possibly justifies the varied responses observed, when analyzing a specific variable, from the same individual.

The most mentioned feeling by teenagers in both schools was the well-being, since the act of eating, by itself, evokes the satisfaction of a basic need; moreover, the better acceptance of juice or natural fruit foods, beans and rice and chicken may reflect values and beliefs regarding the food of this group, the easier access and cost of food, and the selection of "healthy foods" which can be perceived as vital for a healthy diet, as is the case of beans, which is a scorer of healthy eating, according to the national health survey of students PenSE (Pesquisa Nacional de Saúde do Escolar)¹³.

The mixture of beans and rice, for example, mentioned in the Brazilian's Population Food Guide, appears in almost all lunches in various age groups, in the five regions of the country (rural and urban) and in all income classes, translating the food reality of most Brazilians, who should value and privilege fresh or minimally processed food¹⁴. It is recognized that some nutrients contained in food stimulate the release of neurotransmitters responsible for feelings of well-being and pleasure, and legumes have the property of contributing to these experiences and provoking feelings of comfort and improving the mood^{15,16}.

The feeling of malaise, in this case, associated with the consumption of sandwiches with fries, soda and ice cream, high fat red meat and soda, may reflect a better understanding of healthy eating, as a direct and inverse predictor of the intake of unhealthy snacks¹, teenagers's awareness of the need to adopt good and healthy eating habits, able to protect them from illness and being overweight. On the other hand, healthy foods like vegetables; leafy greens; fruit or natural fruit juice also aroused

Table 2: Feelings reported by adolescents in the act of eating by sex. Teresina, Piauí, Brazil, 2017.

Food	Feelings	Female (n=499)	Male (n=496)	p
Chocolate	No feeling	44.8	49.6	0.599
	Well-being	44.9	42.5	
	Malaise	6.4	4.8	
	Aversion	3.9	3.1	
Vegetables	No feeling	24.9	24.8	0.465
	Well-being	49.6	54.5	
	Malaise	3.5	2.4	
	Aversion	22.0	18.3	
Leafy greens	No feeling	26.7	29.2	0.724
	Well-being	49.3	48.5	
	Malaise	2.4	3.3	
	Aversion	21.6	19.0	
Sandwich, french fries, soda and ice cream	No feeling	31.0	34.3	0.136
	Well-being	50.9	54.4	
	Malaise	14.2	8.7	
	Aversion	3.9	2.5	
Healthy sandwich and fresh fruit juice	No feeling	29.9	26.2	0.001
	Well-being	51.2	61.7	
	Malaise	1.8	4.5	
	Aversion	17.1	7.6	
Beans and rice	No feeling	21.9	22.2	0.021
	Well-being	72.6	73.2	
	Malaise	1.1	3.0	
	Aversion	4.4	1.6	
Pasta	No feeling	35.3	35.0	0.472
	Well-being	54.5	57.6	
	Malaise	4.5	3.9	
	Aversion	5.7	3.5	
Fish	No feeling	26.8	25.4	0.455
	Well-being	49.4	54.9	
	Malaise	3.2	3.4	
	Aversion	20.6	16.3	
Chicken	No feeling	31.3	28.7	0.801
	Well-being	62.0	65.0	
	Malaise	1.0	1.3	
	Aversion	5.7	5.0	
High fat red meat	No feeling	34.1	34.7	0.005
	Well-being	35.3	47.0	
	Malaise	17.8	12.9	
	Aversion	12.8	5.4	
Fruit or natural fruit juice	No feeling	17.2	16.7	0.482
	Well-being	78.4	80.8	
	Malaise	0.8	0.8	
	Aversion	3.6	1.7	
Artificial juice	No feeling	46.2	43.4	0.742
	Well-being	28.2	31.6	
	Malaise	9.1	8.3	
	Aversion	16.5	16.8	
Soda	No feeling	38.4	36.7	0.434
	Well-being	41.2	44.5	
	Malaise	14.7	11.9	
	Aversion	5.7	3.9	
Ice cream	No feeling	35.9	35.4	0.787
	Well-being	57.9	59.4	
	Malaise	3.7	3.8	
	Aversion	2.5	1.4	

malaise, attributed to low palatability and the presence of gastrointestinal symptoms linked to their consumption, since they are known to be flatulent and fermentable.

Food aversion was also rarely mentioned by students; and leafy greens, healthy sandwiches, high fat red meat, fish and artificial juice were the most mentioned. For several researchers, the relationship between food intake and the feeling of aversion can be seen in the different tastes for food. Although it is recognized that there is an innate predisposition to certain flavors, it is possible to perceive that learning and repeated actions are important determinants in the experiences^{17,18}. This observation is in agreement with the results of the study by Dunker and Philippi¹⁹, on food aversions, where the taste of food was the main element pointed out. However, the authors warned that the practice of food restriction in adolescence, in part, results from a poor acceptance of body changes, especially from concern about weight, associated with individual, family psychological factors and social appeal that enhances the ideal of thinness.

Food aversions result, therefore, from the interaction of several factors, including individual preferences, socioeconomic conditions, cultural, moral, social or health issues²⁰. Certainly, eating habits are not determined only by biological need, it also appears in a complex symbolic system that involves reality in its various meanings - social, historical, sexual, economic, religious and aesthetic - linked to culture and power²¹.

Research of an additional project to ERICA, carried out by Santos *et al.*²² observed that the proportion of teenagers who reported aversion to fast food was lower than those who declared aversion to fruits or juices and that the number of teenagers with aversion to vegetables was high.

Analyzing the feelings regarding the gender of the teenagers, it was observed a statistically significant association only for the healthy sandwich and natural fruit juice; beans and rice and high fat red meat (Table 2). However, the proportions expressed by teenagers with regard to the feeling of well-being were higher in males, especially for high fat red meat and healthy sandwiches. While for feelings of malaise, the girls pointed out only greasy red meat in a greater proportion. It is emphasized that several factors can be associated with the feeling of malaise, socio-cultural norms, economic status, eating

habits, lifestyle and the influence of the media can lead to negative feelings in the recognition of the consumption of unhealthy foods^{23,24}.

Still regarding the girls' feelings, there was a greater proportion of aversion to high fat red meat, healthy sandwiches and beans and rice, with statistically significant differences. It is known that food preferences develop from genetically determined predispositions, which are later modified by experience²³.

Indeed, social influence is greater than physiological factors such as hunger and satiety and may even affect food consumption individually. These practices play an important role in determining a range of eating experiences, including feelings and associated food intake, which can influence both the physical aspect and mental health²⁵.

For Ogden²⁶, eating habits are more focused on the eating pleasure than on the nutritional value of the food, that is, people eat for pleasure and not for what the food represents in its nutritional and functional aspects, valuing more sensorial aspects and gastronomic pleasures. In addition, it is essential to evaluate eating behavior according to the socio-cultural context, that is, the rules that guide social, family and personal life, as the act of eating can be characterized as "the product of the interface between the individual and his social world, which manifests itself through the themes of communication, conflict and control"²⁶.

In the present study, it was observed that students had a high proportion of well-being for ice cream, with emphasis on students from the private school. This relationship seems to be linked to the fact that adolescents prefer not to struggle to eat, so they look for ready-made or frozen foods, which, in their majority, have high levels of fat, salt and sugar^{27,28}.

Another important aspect to be considered refers to the desire for certain specific foods, which can be a way to improve the emotional state, providing the sensation of pleasure and indefinable well-being. The fact is that teenagers prefer food that is nutritionally unbalanced, densely caloric, rich in saturated fat, cholesterol, sugars, and sodium, which has a negative impact on health²⁹. Cultural and environmental factors, like the food choices of family and friends, in addition to where these foods are consumed (home, school, work) are some reasons that explain this preference¹⁷.

Table 3: Feelings reported by adolescents in the act of eating by age range. Teresina, Piauí, Brazil, 2017.

Foods	Feelings	12-14 years (n=519)	15-17 years (n=476)	p
Sandwich, french fries, soda and ice cream	No feeling	38.2	26.6	0.018
	Well-being	50.4	55.0	
	Malaise	7.7	15.6	
	Aversion	3.6	2.8	
Pasta	No feeling	39.8	30.1	0.047
	Well-being	52.2	60.2	
	Malaise	2.5	6.2	
	Aversion	5.5	3.5	
High fat red meat	No feeling	40.0	28.2	0.021
	Well-being	38.0	44.5	
	Malaise	12.0	19.1	
	Aversion	10.0	8.1	

It is recommended, therefore, that adolescents should adopt a varied diet, including all food groups, as recommended by the Brazilian's Population Food Guide for the prioritizing the consumption of cereals, legumes, fruits, vegetables, legumes, milk and dairy products. In addition, the document also reinforces that a healthy diet is one that feeds the body, mind and spirit, going far beyond simply sustaining life¹⁴.

Despite the recommendations of the Food Guide, the study by Leme *et al.*³⁰ demonstrated that adolescents prefer industrialized and easily accessible foods, therefore, it should be encouraged to conduct research with students on the acceptance and preferences of foods in the sense to value healthy eating at school. Simply improving accessibility to healthy foods may be insufficient to improve eating behavior; therefore, complementary strategies to address individual and socio-environmental influences may also be necessary²³.

It is known that assessing people's feelings about food consumption is a challenge given the complexity of factors that interfere in this relationship. The option for the development of this research in the school environment is to believe that the feelings involved in food intake are potentialities that allow a deeper understanding of eating habits and behaviors. Thus, the present investigation can bring contributions that promote positive impacts on the health and quality of school meals.

Despite the limitations, the present study presented a considerable sample size and a randomized selection process of participants, featuring a representative sample of students aged 12 to 17 years in Teresina, in addition to trained interviewers, which minimized the effects of possible methodological biases.

Among the limitations, some deserve to be considered. The fact that the questionnaire contained only objective questions did not allow for more precise answers about the different feelings after food intake, considering the subjectivity of the theme. In addition, the sociodemographic differences between public (municipal and state) and private schools may have influenced the understanding of the question "What do you feel when you eat ...", regarding the level of understanding, ability and motivation to answer.

Another point that deserves to be highlighted arises from the fact that the study is descriptive and in the evaluation of the results, only measures of relative and absolute frequencies were used, not allowing for more in-depth interpretations on the theme. Other aspects of adolescents' food intake may be important in

evaluating future studies to better understand feelings. In this logic, the experiences related to human nutrition show that the act of eating has a complex relationship with the social, cultural, socio-environmental, personal and behavioral aspects, in addition to the interactions between them in the world. Therefore, it is necessary to transcend the biological, limited and reductionist approach focused only on objective aspects and which does not incorporate subjectivities in the links mediated by food^{31,32}.

Thus, in the view of all the issues raised, the results of the present study should be interpreted with caution, as the act of eating is complex, involves factors of a physiological, psychological, cultural and social nature, and has an expressive symbolic value for the acceptance or rejection of the food. Most adolescents expressed the feeling of well-being associated with the consumption of certain foods, however, vegetables, leafy greens, fish and artificial juice were the most related to food aversion.

There was a significant association between adolescents from public and private schools with the different types of feelings related to chocolate; vegetables or greens; leafy greens; healthy sandwich and natural fruit juice; high fat red meat; fruit or natural fruit juice.

The data related to the results of this study brought important information about the theme that can help to better understand the relationship between feelings and the act of consuming food, however, a specific context was analyzed about the feelings expressed by adolescents induced by different foods. Thus, the results presented indicate future trends or directions that should appear in other research in the area in order to deepen and better understand the emotional behavior related to the different contextual factors in which the food is consumed. In addition, the aversion to healthy foods should be a concern of public policies, which should be looked at more carefully when it comes to the (re)definition of strategies and actions for the adolescents' diet.

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