



ORIGINAL ARTICLE

Food content on children movies from 2013 to 2018: taking food processing into account[☆]



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Abstract

Objective: Movies and TV programs directed to children contain food information that can potentially negative influence their food consumption. The NOVA classification is a useful system for monitoring food informational environment. Therefore, this study aimed to evaluate food content on children movies using the NOVA classification.

Methods: The 13 top box office children movies released from 2013 to 2018 were evaluated. Each food reference was classified as unprocessed or minimally processed, processed and ultra-processed food (UPF) and as positive, negative, and neutral message transmitted.

Results: One hundred and ninety-eight ($n = 198$) scenes that contained 555 food references were included. The frequency of references to unprocessed and minimally processed foods (60.1%) was similar to references of UPF (59.1%). Fruit/vegetables and sweets represented 37.9% of food appearances each. Scenes containing fruit/vegetables conveyed more negative (62.5%) or neutral messages (49.3%) than positive (26.4%). UPF scenes contained more positive (70.9%) and negative content (75.0%) than neutral (37.3%). Regarding UPF subcategories, sweets scenes were more positive (49.1%) than neutral (22.4%) and fast food meals scenes were more negative (37.5%) than neutral (5.9%).

Conclusions: UPF, unprocessed food, and minimally processed foods have similar frequency in the movies. Except for fast food meals, UPF were commonly more associated with positive situations and unprocessed and minimally processed foods were more commonly associated with negative contexts.

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Introduction

Food environment is defined as the interface that mediates one’s food acquisition and food consumption with the wider food system, and encompasses the dimensions of food availability, accessibility, affordability, desirability, convenience, information, and marketing.^{1–3} Food informational environment is a dimension of the food environment, and includes all the information about nutrition and food presented in different media.²

Movies and TV programs directed to children contain information about food and feeding practices⁴ that can potentially influence their food consumption.^{5,6} The number of times that children are exposed to a food item and the type of message that is disseminated can influence their food acceptance. The promotion of positive experiences with certain types of foods is commonly associated with food predilection. Children’s food habits are also inspired by other individuals, such as friends, parents, teachers, and preferred characters, which are commonly represented in movies and TV programs.^{5,6}

A pioneering study sampled the top box office movies from 1996 to 2005 and found nutrition-poor foods and beverages brand placements and a high portion movie targeting at children.⁷ More recently, other authors conducted a content analysis of the most successful children movies between 1991 and 2015. More than 6000 food references were coded and 41.4% presented clearly unhealthy products.⁸ In these investigations, the healthiness of a food item was based on its nutritional value, level of processing, and calories.^{7,8}

However, food practices now recognized healthiness as more than mere nutrient content, the NOVA classification system was proposed to better classify food, regardless of nutritional value. It is a powerful reference to be adopted in public health-oriented studies, based on the extent and purpose of food industrial processing.^{9–11}

According to the NOVA classification, unprocessed foods are obtained directly from plants or animals, without having undergone any changes or processing, such as fruit, vegetables, and fresh meat. Minimally processed foods are fresh foods that have undergone minimal changes, such as dried, polished, and packaged grains, among others. Processed foods ingredients are products extracted from unprocessed foods that are used during food preparation to enhance flavor, such as oils, fats, sugar, and salt. These include canned vegetables, salted meats, cheeses, breads, and fish preserved in oil; that is, unprocessed or minimally processed foods to which salt, sugar, oil or another processed culinary ingredient was added. Ultra-processed food (UPF), in turn, comprise industrial formulations with five or more ingredients, which include, for example, antioxidants, stabilizers, and preservatives.^{9–11}

Excessive consumption of UPF impacts calorie and critical nutrients intake, such as sodium, saturated fat, and free sugars, and a large body of evidence links UPF consumption with obesity, metabolic syndrome, cancer, and cardiovascular disease.^{12–16} Combined, these diseases represent one of the most important public health problems worldwide, since the prevalence of obesity among children has increased dramatically in the last decades and, consequently, their risk of developing non-communicable diseases later in life.^{17,18}

Table 1 Children movies characterization in accordance to release year, box office and number of food reference scenes, 2013–2018.

Movie	Release year	Box office (US\$)	Food reference scenes (n ^a)
Monsters University	2013	268,492,764	9
Despicable Me 2	2013	368,061,265	24
Frozen	2013	400,738,009	14
Maleficent	2014	241,410,378	3
Inside Out	2015	356,461,711	21
Minions	2015	336,045,770	16
The Secret Life of Pets	2016	368,384,330	18
The Jungle Book	2016	364,001,123	5
Zootopia	2016	341,268,248	26
Finding Dory	2016	486,295,561	3
Despicable Me 3	2017	264,624,300	24
Beauty and the Beast	2017	504,014,165	21
Incredibles 2	2018	608,581,744	14

^a Number of scenes in which at least one type of food was placed.

This study aimed to evaluate food content on children movies released from 2013 to 2018 using the NOVA classification as a reference method for food categorization. The results will contribute to the knowledge of the food informational environment directed to children and can guide possibilities of intervention aiming at the promotion of healthy eating habits in childhood.

Methods

This study identified scenes with food content on the 13 top box office children movies released from 2013 to 2018.

The inclusion criteria for the movies were: having been launched in the selected years; been identified as a children movie, with a PG (parental guidance suggested) or G (general audiences) rating by the Motion Picture Association of America (available on: <https://www.mpa.org/who-we-are>); and having been listed in the 10 top box office movies in their respective release year in accordance with Box Office Mojo (available on: <https://www.boxofficemojo.com/alltime/world/>).

In accordance to these criteria, the selected movies were: *Monsters University* (2013), *Despicable Me 2* (2013), *Frozen* (2013), *Maleficent* (2014), *Inside Out* (2015), *Minions* (2015), *The Secret Life of Pets* (2016), *The Jungle Book* (2016), *Zootopia* (2016), *Finding Dory* (2016), *Despicable Me 3* (2016), *Beauty and the Beast* (2017), and *Incredibles 2* (2018; [Table 1](#)).

All these movies could potentially be accessed by children at cinemas, bought in stores, or watched online through streaming services.

Table 2 Examples of scenes with food reference according to the type of message.

Message	Scene description
Positive	<ul style="list-style-type: none"> • On <i>Zootopia</i>, the police receptionist eats several donuts with satisfaction; • On <i>Incredibles 2</i>, Jack-Jack has a lollipop with satisfaction; • On <i>Despicable Me 3</i>, minions run in the direction of a pizza delivery man because they are hungry and want pizza; • On <i>Inside Out</i>, Riley remembers when she was a child and had a happy moment with her parents having an ice-cream.
Negative	<ul style="list-style-type: none"> • On <i>Inside Out</i>, Riley is having a meal with her parents when broccoli is offered to her. Disgust (a character representing the feeling of disgust) influences Riley to reject broccoli; • On <i>Incredibles 2</i>, Dash does not accept his mother delivery request containing vegetables; • On <i>Despicable Me 3</i>, two characters are eating and one of them sneak out broccoli and leave only spaghetti on the plate; • On <i>Maleficent</i>, the birthday cake made by the fairies for Aurora's birthday does not seem attractive and delicious.
Neutral	<ul style="list-style-type: none"> • On <i>Beauty and the Beast</i>, Beauty offers breakfast to her father and the scene continues without showing any relation between him and the meal; • On <i>Zootopia</i>, Judy's boss prevents Duke from stealing onions; • On <i>The Jungle Book</i>, fruit are eaten by Baloo, the Bear.
Both	<ul style="list-style-type: none"> • On <i>Incredibles 2</i>, when the family is having breakfast, two types of cereals are been offered: a sugary cereal and a whole-grain cereal. Mr. Incredible decides that the best cereal for the family is the whole-grain one and Dash expresses his desire to have the sugary one. • On <i>Incredibles 2</i>, Dash says he does not want to eat vegetables but Mr. Incredible advises that a healthy diet contains vegetables.

Movies were independently watched by two researchers that identified each food reference in the scenes. Only foods that might be associated with people or human-like characters were selected. Furthermore, each food placement was classified in accordance to the type of message transmitted: positive, negative, and neutral. Positive message was defined when the food reference caused a positive reaction (facial and corporal expressions or in the speech) in the character that was evolved in the scene; negative message, when food placement resulted in a dislike impression; and neutral message, when the character was not specific in demonstrating happiness or unhappiness. Some scenes were classified as positive and negative at the same time and were nominated both (Table 2). All divergences between each researcher data collection were discussed until reaching consensus.

Only the type of food in the scenes was considered, not the number. For example, in a scene that presented two types of meat (pork and ground beef), meat was counted only once. In addition, some scenes had more than one food reference. Alcoholic beverages were not considered, as they are not supposed to be consumed by children. All data were registered in a Excel folder containing the following information: movie name, release year, food in the scene, message conveyed, and the exact time as the scene occurred.

Subsequently, foods were classified in unprocessed or minimally processed; processed; and UPF, in accordance with the NOVA classification.⁹⁻¹¹ No processed culinary ingredient was identified in the movies.

The unprocessed and minimally processed foods category was also broken down in fruit/vegetables (including natural juices), meat and eggs, and tea and coffee; the UPF

category was subdivided into sweets (desserts, ice creams), fast food meals (pizza, hamburger, French fries), and beverages (soda, packaged juices). These categories were defined, as they were the most prevalent in the movies. Other unprocessed and minimally processed foods were grouped together (pasta, nuts, and popcorn) due to their low occurrence. Similarly, sugary cereals, cookies, sausages, ham, and salty snacks were grouped in other ultra-processed categories.

Data analysis was conducted by calculating the frequency of food placement in accordance with the NOVA classification and the type of message conveyed. The chi-squared test was applied to compare food placement according to the type of message at 5% significance level (p -value < 0.05). Subsequently, Bonferroni correction test for multiple comparisons was performed, adjusting the level of significance for all possible comparisons. In the present study, the level of significance was adjusted to 1.7% ($p < 0.017$), given the possibility of three comparisons in the tests. Scenes classified as both (*i.e.*, positive and negative at the same time) were excluded from statistical analysis, as they were rare in the movies. Stata (version 12.0) was used for statistical analysis. Regarding the ethical aspects, this study did not involve human subjects or animals.

Results

Total duration of the movies was 1,322 min; 198 scenes that contained 555 food references were registered.

Movies with the highest frequency of food placement scenes were: *Zootopia* ($n=26$), *Despicable Me 2* ($n=24$),

Table 3 Food content in children movies in accordance to NOVA classification and message content, 2013–2018.

Foods	n ^a	Frequency (%)	Message (%)			
			Positive	Negative	Neutral	p-Value
<i>Unprocessed and minimally processed foods</i>	119	60.1	52.7	62.5	70.2	0.070
Fruit/vegetables	75	37.9	26.4 ^B	62.5 ^A	49.3 ^A	0.001
Milk	12	6.1	8.2	0.0	2.9	0.207
Tea and coffee	19	9.6	10.9	0.0	10.5	0.384
Meat and eggs	19	9.6	10.9	12.5	5.9	0.494
Other unprocessed and minimally processed foods	18	9.1	10.0	6.3	8.9	0.883
<i>Processed foods</i>	21	10.6	12.7	6.3	5.9	0.302
<i>Ultra-processed foods</i>	118	59.6	70.9 ^A	75.0 ^A	37.3 ^B	<0.0001
Sweets	75	37.9	49.1 ^A	31.3	22.4 ^B	0.002
Fast food meals	30	15.2	17.3	37.5 ^A	5.9 ^B	0.004
Beverages	27	13.6	15.5	18.8	10.5	0.550
Other UPF	22	11.1	17.3 ^A	0.0	2.9 ^B	0.004

UPF, ultra-processed foods.

^a Number of food references in the scenes. Some scenes contained more than one food reference.

Note: Different letters in the same columns indicate statistically significant differences in the chi-squared test with Bonferroni-corrected alpha level adjustment.

and *Despicable Me 3* (n=24). In contrast, *Finding Dory* and *Maleficent* had three references of foods each (Table 1).

The frequency of unprocessed and minimally processed foods (60.1%) on movies scenes was similar to UPF (59.1%) placement. Fruit/vegetables and sweets represented 37.9% of food appearances each (Table 3).

The messages conveyed by more than half of the scenes (55.6%) were classified as positive; 8.1% were classified as negative, 33.8% as neutral, and 2.5% as both positive and negative (data not shown). Some examples are presented in Table 2.

Scenes containing fruit/vegetables conveyed negative (62.5%) or neutral messages (49.3%) more frequently than positive messages (26.4%; p-value = 0.001). UPF scenes showed more positive (70.9%) and negative messages (75.0%) than neutral (37.3%; p-value = <0.0001). Regarding UPF sub-categories, scenes containing sweets were more positive (49.1%) than neutral (22.4%; p-value = 0.002), while scenes containing fast food meals were more negative (37.5%) than neutral (5.9%; p-value = 0.002; Table 3).

Discussion

In the present study, a high occurrence of food references was observed in children movies, equally represented by unprocessed and minimally processed foods and UPF. Fruit/vegetables and sweets were the main type of foods presented. In addition, there were differences related to the type of message associated with the food reference: fruit/vegetables and fast food meals were more frequently associated with negative or neutral situations. In contrast, sweets were more linked to positive contexts.

Before discussing the study results, it is important to point out some limitations. First, some foods that were considered in the present study as UPF, such as sandwiches and pizza, can be homemade dishes made only with unprocessed

and minimally processed foods. However, the authors opted to classify all these products as UPF since they represent the most common form of consuming these types of food^{9,10} and because it is impossible to distinguish which food placement in the movies represents a homemade product and which represents a product bought in a fast food chain. Moreover, investigating the type of message conveyed is a measure of high subjectivity; in the present study, double data typing was applied in order to attempt to reduce the subjectivity.

Matthes et al.⁸ investigated food content in 250 children movies and observed, similarly to the study, that unhealthy and healthy food participation was quite similar. Other studies also investigated food content in other types of children programs and showed similar findings.^{19,20} One study found 86% of food or beverage appearances in television programs from Iceland, being 26% of high-calorie and low-nutrient foods and 23% of fruit/vegetables.¹⁹ Another study investigated 25 worldwide popular children cartoons and counted 1065 food placements: 45% were from the low recommended consumption categories and 42% were from the highly recommended consumption categories.²⁰

Then, in accordance to the present study and the literature,^{8,19,21} what really differs between food reference inside children programs is the type of message attributed to the scene. In general, positive scenes are more commonly associated with unhealthy foods, whilst negative messages are more commonly associated with healthy foods. An exception was identified in the present study regarding fast food meals and its association to negative contexts. In the sample of movies under study, these foods were commonly associated with scenes of sadness and food compulsion. The high level of subjectivity in this analysis can possibly explain differences among the studies.

In the sample studied by Matthes et al.,⁸ unhealthy foods were more likely to be presented centrally, to be evaluated positively, to be interacted with, and to be consumed

compared with healthy or mixed foods and beverages.⁸ In the Iceland study, high-calorie and low-nutrient foods were also presented as desirable by appearing more frequently with child characters than fruit/vegetables.¹⁹ In addition, in Greece, in 94 episodes of an animated comic series, one or more food cues were recorded; out of the positive cues measured, almost half referred to sweets and snacks.²¹

Some experimental studies have addressed the association between food content exposure and interest on food^{22,23} and food consumption.²⁴ An experimental eye-tracking study indicated food generally aroused more visual attention in children compared to non-edible objects and no difference was observed between healthy and unhealthy food presentations. Nonetheless, compared to healthy products or non-edible objects, unhealthy food presentations do not require the same amount of visual attention in order to be remembered.²² In line with that study, an investigation used eye tracking to determine children's attention to unhealthy and healthy food cues embedded in a narrative cartoon movie. Unhealthy food cues attracted children's visual attention to a larger extent than healthy cues. However, their initial visual interest did not differ between unhealthy and healthy food cues.²³ Finally, a study explored whether children's snack choices or consumption differs based on recent exposure to movies with high *versus* low product placement of unhealthy foods. After watching movies, children aged 9–11 exposed to the high product-placement movie had 3.1 times the odds of choosing the most featured snack in the movie when compared with participants who watched the low product-placement movie.²⁴

Therefore, the present study supports literature regarding the children food informational environment that contains a high reference of food content that stimulate unhealthy eating practices.^{5,7,8,19–21} The innovation of the present study is that it adopted the NOVA classification for the food references identified in a sample of movies with high box office. Thus, the present findings have some public health implications and highlight the importance of reviewing food content in children programs. These programs could focus on creating content that promote healthy eating. A study explored whether a cartoon show with healthy eating messages positively affected 4–8-year-old children's food choices and food preferences. The study showed that children who watched cartoons with healthy eating messages chose significantly more healthy food items in a 10-minute subsequent snack than those in the other group. Although it was an acute exposure evaluation study, it indicates that cartoons can be used to promote healthy food choices.²⁵ In addition, parents should be counseled to discourage media that has greater exposure to unhealthy foods and beverages and to watch movies with their children in order to counter the negative message. Future experimental studies can evaluate the long-term impact of both types of intervention (changing food content on direct to children programs and advising parents for counseling children) on children eating practices.

In sum, the present study demonstrated that the frequency of UPF and unprocessed food and minimally processed foods is similar in movies; however, the type of message associated with food reference differed regarding food processing. Except for fast food meals, UPF were

commonly more associated with positive situations and unprocessed and minimally processed foods were more commonly associated with negative contexts.

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Conflicts of interest

The authors declare no conflicts of interest.

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