ORIGINAL RESEARCH

Sugary, fatty, and prominent: food and beverage appearances in children's movies from 1991 to 2015

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Summary

Background: Media presentations of unhealthy food are considered a contributor to childhood obesity.

Objective: This study describes food and beverage presentations in a longitudinal sample of children's movies.

Methods: We conducted a content analysis of the 250 most successful children's movies from 1991 to 2015. We identified and coded food and beverage appearances and differentiated between healthy, mixed, and unhealthy products. We also coded integration characteristics and movie characteristics.

Results: A total of 6414 references occurred. Out of these, 41.4% presented clearly unhealthy products. Furthermore, unhealthy products 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. Year and country of production as well as age rating did not have any effects on the appearance and integration of unhealthy products.

Conclusions: The predominance of unhealthy foods and beverages in children's movies is a global and stable phenomenon that concerns children of all ages. Given the ways with which unhealthy foods and beverages are integrated into children's movies, their persuasive potential is much higher compared with healthy and mixed foods and beverages, thus potentially promoting factors that increase childhood obesity.

KEYWORDS

children, content analysis, food placements, longitudinal analysis

1 | INTRODUCTION

In the popular movie "The SpongeBob Movie. Sponge Out of Water," a whole plot is created around the love of the Thalassians' for the "Krusty Burger." Likewise, in "Over the Hedge," the squirrel Hammy is thrown into overdrive by consuming an energy drink, providing him with super speed. And in "Inside Out," pizza is frequently pre-sented as the favourite food of the young lead character Riley, whereas broccoli regularly arouses explicit disgust. As these examples demonstrate, unhealthy foods are frequently given prominent and positive roles in popular movies specifically targeted at children.

Such frequent and positive depiction of unhealthy foods and bever-ages may have significant consequences for the children watching those movies.[1-4] In fact, we know from extant research that the amount of

children's media consumption is positively correlated with childhood obesity and their inclination to prefer unhealthy products.[5] On the one hand, media consumption replaces other (active) leisure activities, and thus, leads to a decrease in physical activity over the course of a day. On the other hand, media content presents and promotes high numbers of unhealthy food and beverage products in both commercial and editorial content.[6] Such promotion can, as many studies have demonstrated, significantly shape the eating habits of children.[1,2,7-9] It is, therefore, of great importance to understand the ways in which foods and beverages are presented in media targeted at children. Previous research has shown, for instance, that TV commercials for children are very likely to depict foods high in salt, fat, and sugar.[10,11] Other research has focused on foods embedded in editorial content such as television programming.[12,13] These studies clearly suggest that the foods presented in television content targeted at children dominantly depict unhealthy products.[14,15] Despite these research efforts, we lack studies systematically analysing children's movies. Watching movies still holds a considerable amount in children's spare time activities.[16] Furthermore, children like to watch their favourite movies in a continuous loop, and they often do so unsupervised by parents.[17] More importantly, movies usually target global audiences and are produced by global companies.[18] In one pioneering study, Sutherland, MacKenzie, Purvis, and Dalton[19] have provided a comprehensive analysis of food and beverage brand placements in 200 popular movies. A high portion of those movies were targeted at children and featured nutrition poor foods and beverages. However, despite this seminal research effort, a number of important questions remain unanswered. First, while pioneering in many aspects, Sutherland et al did not examine integration characteristics, that is, food placement prominence, evaluation, food character interaction as well as depicted food and beverage consumption.[19] However, these integration characteristics are important factors determining the impact on children's food preferences shaped by media content.[1,8,9] Second, Sutherland et al sampled the top 20 US box office movies from 1996 to 2005.[19] The 10-year time span is valuable but unable to reveal larger trends over time. Third, the study sampled only movies from the United States, and thus, no conclusions can be drawn for other parts of the world. Finally, the study did not use movie characteristics to predict the appearances of healthy and unhealthy foods.

To fill these research gaps, we conducted a content analysis of the most successful children movies for each year over the past 25 years. Moreover, we sampled movies from the United States and Europe as we analysed movies published in Germany. In Germany, movies from the United States and movies from around Europe are released,[20] allowing, for the first time, a comparison between the United States and Europe. Also, we not only examined the mere appearance of unhealthy and healthy foods and beverages but also explained their depiction by integration characteristics and movie characteristics in a multilevel model.

2 | METHOD

2.1 | Sample

We coded 250 children's movies, composed of the 10 most successful children's movies of each year between 1991 and 2015. As the largest

study to date, a total of 402 hours of material was coded. The study was part of a bigger data set examining also brands placed in children's movies.[12] We defined children's movies according to three characteristics: (1) age rating,[19] (2) presented content,[21] and (3) the main characters depicted.[21] For age rating, we considered the German Freiwillige Selbstkontrolle der Filmwirtschaft (FSK) system (all age groups = FSK0, children from the age of 6 = FSK6, children from the age of 12 = FSK12, adolescents from the age of 16 = FSK16, and movies for adults from the age of 18 = FSK18).[22] Therefore, to depict the target group of all children up to the age of 12,[23] we classified movies as FSK0, FSK6, or FSK12 (equivalent of the US G-rated, PG-rated, and PG13-rated movies). For the remaining movies, we watched the trailer to assess whether they fulfilled our defined criteria of content and characters appropriate for children's movies. As children relate strongly to characters of their own age[23] as well as animated characters,[21] we sampled movies depicting children or adolescents (eg, "Harry Potter" or "Home Alone") and animated movies. Movies associated with the teen-movie genre (eg, "American Pie") were not considered due to inappropriate content (ie, drinking, explicit sexual behaviour, and inappropriate language). However, so-called family movies[17] in which the plot is based on a story involving whole families such as "Mrs Doubtfire" or "Family Beethoven" were also incorporated because children were provided with at least one lead character they could relate to.[23] Movie sampling was reliable (Krippendorff's Alpha = .81).

2.2 | Coding procedures

In line with previous content analyses,[14,18,24,25] we measured food appearances as verbal mentioning and/or visual depictions of food (including beverages). Only clearly recognizable depictions of food (longer than 1 sec) were coded. It was of importance that the food was humanly consumable in its presented form (eg, raw meat as consumed by the hyenas in "The Lion King" would not constitute as humanly consumable) and that the food presentations were related to potential consumption (eg, nicknames like "Honey" were excluded).[14]

Our coding scheme was based on predefined movie chapters of the DVDs. Hence, all food indications of one type of food within a chapter were considered as a single depiction of a food, similar to the scene-coding scheme applied in previous content analyses.[24] This is a technical presetting provided on a DVD, which summarizes coherent storylines of the movie. Four coders coded all the material. As the initial coding procedure started out with three coders, and a fourth coder was included later on, we report Krippendorf's alpha as a range from the two separate coding rounds.

2.3 | Measures

2.3.1 | Embedded food placements

On the basis of the previous studies,[18,25] we differentiated several food and beverage categories (α = .84-.97). In an open category, we assessed the name of the product and subsequently differentiated between 12 food and beverages categories. In total, 6414 food references (4354 food

and 2060 beverage placements) were coded. Of the coded food placements, the most reoccurring food category were menus (33.7%, n = 1467), followed by sweets (26.6%, n = 1159), and fruit and vegetable depictions (25.5%, n = 1109). Fast food was shown in 5.1% (n = 220), salty snacks like chips in 4.2% (n = 184), dairy goods in 2.9% (n = 127), and seeds, nuts or grains in 2.0% (n = 88) of all food depictions. Of the coded beverage placements, the most reoccurring drink type was alcohol (28.9%, n = 595). In total, 73.6% of all analysed children's movies contained some kind of reference to alcohol. At the same time, only 14.3% of all beverage placements showed water (n = 295), 24.3% (n = 500) showed soft drinks or energy drinks, and the same amount (24.3%, n = 501) of hot beverages were shown. Milk was shown 169 (8.2%) times.

We, then, assigned the food and beverage categories to three different food types according to level of unhealthiness:[14,26] Healthiness of food was based on the nutritional value, level of processing, and its calories. High calorie, highly processed products that include high amounts of sugar, fat, and salt but are low in nutritional value, (ie, hardly contain minerals or vitamins) were defined as unhealthy.[14,18] High calorie, processed products that contribute to energy intake and which are high in nutritional value (ie, contain vitamins, minerals, and dietary fibres) and low in sugar were conceptualized as mixed. [14] Low calorie, unprocessed or only slightly processed products, which are high in nutritional value were coded as clearly healthy.[18] Thus, we differentiated clearly healthy products (=1; ie, water; milk; seeds, nuts, and grains; and fruit and vegetables; 25.9%, n = 1661), mixed products, which included healthy and unhealthy components (=2 ie, hot beverages such as coffee, tea, or hot chocolate; dairy products; and menus such as pasta, sandwiches, meat and garnish, or casseroles; 32.7%, n = 2095), and clearly unhealthy products (=3; ie, soft drinks and energy drinks; alcohol; fast food; sweets; and salty snacks; 41.4%, n = 2658). Descriptive results are shown in Table 1.

2.3.2 | Integration characteristics

We measured integration by assessing centrality, evaluation, interaction, and consumption. Centrality distinguished background placements (ie, presented on the second image plane), central placements (shown on the first image plane), and close-ups (ie, depicted the brand on the first image plane on more than 50% of the screen; α= .71-.79).[24]

Furthermore, verbal indications were classified as central (α = .79-.90).[24] We created a dummy variable assessing whether the product was placed centrally or close up (=1) or in the background (=0). The vast majority of food placements were integrated centrally (91.6%, n = 5875).

Moreover, we coded whether the characters evaluated the food or beverage.[14] Evaluation of the product assessed whether the product was not evaluated at all, evaluated solely negatively, solely positively, or in a mixed way (α= .83-1.00). Evaluations had to be explicit (eg, "delicious" or "Yuk!"). We created a dummy variable (1 = positive evaluation; 0 = negative, mixed, or no evaluation). Positive evaluations rarely occurred (11.0%, n = 705).

Interaction was assessed by verbal interaction and physical interaction. Verbal interaction was only coded if the modality was verbal or audiovisual. We differentiated between verbal interaction with the main character, with a secondary character, and with more than one character within a movie chapter (α = .77-.81).[27] Physical interaction occurred if a character was shown carrying food in a shopping situation, serving food, or preparing a meal.[18] Again, we differentiated between no interaction, interaction with the main character, interaction with a secondary character, and interaction with more than one character (α = .77-.82). We dummy-coded both interaction categories and summarized them to create a measure of interaction (1 = verbal or physical interaction; 0 = no verbal or physical interaction; 40.7% verbal of physical interaction, n = 2611).

We coded consumption only when food was not just handled but actually consumed by the character.[14,24] Again, we differentiated which character (main character, secondary character, or more than one character) was shown eating or drinking a food placement (α = .78-.84). We once more created a dummy variable to summarize whether the food was consumed (=1) or not (=0). Food was consumed in 1616 cases (25.2%).

2.3.3 | Movie characteristics

Movie characteristics comprise formal codes such as year of publication, country of production, and age rating as well as production information such as type of production, the depicted main characters, and the scenery of the movie. Year of publication, country of production,

TABLE 1 Frequencies of food and beverage category occurrences

Category		Number	Percent	Embedded food placement type
Food placements	Fruit and vegetables	1109	25.5	Clearly healthy
	Seeds, nuts, grains	88	2.0	Clearly healthy
	Dairy goods (butter, cheese, cream)	127	2.9	Mixed
	Menu (pasta, sandwiches, soups, casseroles, meat, and garnish)	1467	33.7	Mixed
	Fast food (pizza, burger, french fries)	220	5.1	Clearly unhealthy
	Sweets (candy, desserts, etc)	1159	26.6	Clearly unhealthy
	Salty snacks (chips, salted nuts, etc)	184	4.2	Clearly unhealthy
	Total food placements	4354	100	
Beverage placements	Water	295	14.3	Clearly healthy
	Milk	169	8.2	Clearly healthy
	Hot beverages	501	24.3	Mixed
	Alcohol	595	28.9	Clearly unhealthy
	Soft drinks, energy drinks	500	24.3	Clearly unhealthy
	Total beverage placements	2060	100	

and age rating were coded based on the labelling provided on the DVD cover, Insidekino.de, or the international movie database imdb.com (α = 1.00).[26-28] As for age rating, the majority was classified as FSK0 (57.2%, n = 143), followed by FSK6 (34.4%, n = 86), and FSK12-rated movies. Regarding country, most of the movies were produced or co-produced in the United States (60.0%, n = 150). The rest were produced in a European country (39.6%, n = 99), and only one movie was a sole production of Australia. We retrieved information about type of production (animated or nonanimated) based on the international movie database imdb.com (α = 1.00).[28] We found that about half of the analysed movies were animated (53.2%, n = 133).

Children's movies often are fanciful and depict worlds and characters that have only a marginal relationship to our real world.[21] What kind of food is shown and how this food is depicted can therefore highly depend on the main characters depicted and the sceneries of the movie (eg, movies with only animals as main characters such as "The Lion King" might not show any food, which is consumable for humans). Thus, we assessed whether most characters were humans, animals, or fantasy figures such as monsters (α = .93). Furthermore, we looked at whether the movie depicted a world similar to human environment, a scenery largely showing nature, or a fantasy world (α = .70). The analysed movies most frequently depicted a world mirroring our own (64.4%, n = 161), followed by movies set in a pure nature scenery (18%, n = 45), and fantasy worlds (17.6%, n = 44). The main characters were mostly humans (64.8%, n = 162), 22% (n = 55) were animals, and 13.2% (n = 33) fantasy figures.

2.4 | Data analysis

After a descriptive analysis, we analysed the effects of movie characteristics and the ways of food integration on the unhealthiness of the embedded food with an ordinal hierarchical linear model (ie, multilevel analysis). We inserted the level of food unhealthiness as the dependent variable (1 = clearly healthy; 2 = mixed; and 3 = clearly unhealthy). Level 1 variables included variables regarding the ways of food integration. Level 2 variables included movie characteristics. Furthermore, we assessed multilevel interactions regarding the year of publication and the level of food integration.

3 | RESULTS

Out of the children's movies analysed (N = 250), all but two (n = 248) contained some kind of humanly consumable food or beverage placement. As described above, a total of 6414 food and beverage references occurred in the analysed movies. We coded 25.9% (n = 1661) clearly healthy, 32.7% (n = 2095) mixed, and 41.4% (n = 2658) clearly unhealthy food and beverage products. Thus, similar to existing studies,[14] clearly unhealthy products were shown twice as much as clearly healthy products. A chi-square goodness-of-fit test indicated a significant difference between the coded categories (χ^2 = 233.76, df = 2, P < 0.001).

We, then, conducted a multilevel analysis (see Table 2). Regarding the integration characteristics, all inserted variables were significant predictors for level of unhealthiness. When a product was depicted in the centre or as a close-up, it was significantly more likely unhealthy than healthy or mixed (b = .50, z value = 5.46, P < 0.001). If a depicted food and beverage was interacted with (b = .26, z value = 5.22, P < 0.001), or was consumed (b = .52, z value = 9.09, P < 0.001), it was more likely unhealthy than mixed or healthy. Furthermore, if a food or beverage was evaluated positively (b = .43, z value = 5.28, P < 0.001), it was more likely unhealthy than mixed or healthy. These results are also evident in the descriptive distributions. For details on the share of each placement category (ie, placement centrality; placement interaction; placement consumption; and positive evaluation) stratified by clearly healthy, mixed, and clearly unhealthy food or beverages, see Table 3.

Yet, we found no interaction effects regarding year of production and integration characteristics. This suggests that the ways of unhealthy food integration have not changed over the past 25 years.

TABLE 2 Multilevel model as an ordinal regression for level of food placement unhealthiness stratified per movie

		b	SE b	Z value	LLCI	ULCI
	Healthy to mixed	−.60	0.19	−3.09	−0.98	−0.22
	Mixed to unhealthy	.92	0.19	4.71	0.53	1.30
Level 1 variables	Placement centrality	.50	0.09	5.46	0.32	0.68
	Placement interaction	.26	0.05	5.22	0.16	0.36
	Placement consumption	.52	0.06	9.09	0.41	0.63
	Positive evaluation	.43	0.08	5.28	0.27	0.58
Level 2 variables	Year of publication	−.00	0.01	−0.09	−0.01	0.01
	US production vs Europe	−.04	0.11	−0.33	−0.25	0.18
	Ag rating FSK0 vs FSK12	−.16	0.18	−0.92	−0.50	0.18
	Age rating FSK6 vs FSK 2	−.09	0.17	−0.54	−0.42	0.24
	Type of production animated movie	−.27	0.12	−2.28	−0.50	−0.04
	Main characters animals vs humans	.14	0.13	1.05	−0.12	0.40
	Main characters fantasy figures vs humans	.29	0.16	1.83	−0.02	0.60
	Scenery nature vs real world	−.60	0.13	−4.49	−0.86	−0.34
	Scenery fantasy vs real world	.06	0.14	0.46	−0.20	0.33
Multilevel interactions	Placement centrality year of publication	−.00	0.01	−0.36	−0.03	0.02
	Placement interaction year of publication	.00	0.01	0.13	−0.01	0.01
	Placement consumption year of publication	−.01	0.01	−1.59	−0.03	0.00
	Positive evaluation year of publication	.02	0.01	1.77	−0.00	0.04

Level of food healthiness 1 = clearly healthy, 2 = mixed, 3 = clearly unhealthy
CI 95%, bootstrap sample = 10 000, R^2 = .24;

TABLE 3 Share of placement characteristics stratified by clearly healthy, mixed, and clearly unhealthy food or beverage

		Clearly healthy	Mixed	Clearly unhealthy
Cases in total *n*		1661	2095	2658
Share of placement centrality	n	1429	1975	2471
	%	86.0	94.3	93.0
Share of placement interaction	n	562	885	1164
	%	33.8	42.2	43.8
Share of placement consumption	n	265	530	821
	%	16.0	25.3	30.9
Share of positive evaluation	n	109	241	355
	%	6.6	11.5	13.4

Regarding the impact of movie characteristics, we only found significant effects of production type and the depicted main characters on the level of unhealthiness of the depicted food. The number of unhealthy products was decreased in animated compared with nonanimated movies ($b = -.27$, z value $= -2.28$, $P = 0.023$). Also, movies that were set in a nature scene ($b = -.60$, z value $= -4.49$, $P < 0.001$) contained less unhealthy products compared with movies set in a real-world environment. Yet, whether the movie was produced in Europe or the United States did not impact the level of unhealthiness of the inserted products. Also, the year of publication and age rating had no impact.

4 | DISCUSSION

In the largest study to date, we analysed 250 children's movies to explain the depiction of healthy, unhealthy, and mixed beverages and foods over the past 25 years. We confirm findings from previous research that media content targeted at children is dominated by energy-dense and nutrient-poor foods.[11,14,15,19,25] Even more importantly, our study is the first to demonstrate that unhealthy foods and beverages are more likely to be presented centrally, to be evaluated positively, to be interacted with, and to be consumed in children's movies. These integration characteristics are all key drivers for the effectiveness of the depicted products.

This suggests that children's movies are not only dominated by unhealthy food and beverages but also that this food type is depicted in ways that are especially impactful when it comes to the effects on children. Combined with research on placement effectiveness, these findings are alarming. There is clear evidence that food placements impact children's food preferences[1-4,8,12] and that media characters have the potential to shape children's behaviours and preferences.[29] Thus, the high number of clearly unhealthy prominent and positively evaluated food placements has to be critically considered by educators and producers.[30] As media content can serve as a role model for eating behaviour,[31] healthy products should be inserted more often and more prominently in the future to allow a positive role-modelling influence of media content.

We also found that the integration of unhealthy compared with healthy or mixed foods and beverages did not vary over time. In other words, the difference in integration characteristics between healthy and unhealthy products was as present in the early 90s, as

it is today. In line with this, we did not observe an effect of year of production on the depiction of unhealthy versus healthy foods. Rephrased, older movies did include as many unhealthy compared with healthy food placements as is the case with more recent movies. This suggests that the depiction of unhealthy foods and beverages has already received a ceiling effect. On the basis of these findings, we do not expect a further rise in the depiction of unhealthy products in the next decade.

As another key finding, productions from the United States were as likely to contain unhealthy placements as compared with productions from Europe. This is somewhat surprising given the fact that European audiences are generally more critical about placing products in movies compared with the Americans.[32] What is more, the predominance of unhealthy over healthy foods and beverages does not depend on the age rating of the movies. We believe this is an alarming finding because it suggests that even younger children—those with the least resources to critically reflect about the presented content—are as likely to be confronted to unhealthy foods and beverages as are older children. Also, the type of the main character did not explain the unhealthiness of depicted products. Only two movie characteristics exerted significant effects: first, if a movie was set in a nature scenery, there were significantly more healthy products than unhealthy ones compared with movies set in a world mirroring our own. This is based on the fact that unhealthy products are usually processed to a high degree, making them an unlikely product to consume in movies such as "The Lion King" or "Finding Nemo." Second, animated movies contained less unhealthy products compared with nonanimated ones because unhealthy products may have a poor fit in the context of animated movies.

4.1 | Limitations and future research

As a primary limitation, we grouped the food categories for the content analysis following existing guidelines.[18] Yet, of course, nutritional guidelines are far more complex, and the foods we categorized as clearly healthy may not automatically describe a healthy, wholesome nutrition. However, our categorized healthy products (ie, water; milk; seeds, nuts, and grains; and fruit, and vegetables) are arguably the basis (and should make up a considerable part) of a healthy nutrition. As an additional limitation of our food categories, we did not consider the type of preparation and the specific ingredients of processed food. That is, in content analysis, we are unable to determine how a food was prepared and what kind of ingredients have been used for the depicted foods. We, thus, need to rely on general, albeit not fully precise categorizations of healthy and unhealthy foods. A more fine-grained coding of ingredients is beyond the scope of a content analysis, and we, therefore, had to follow the established guidelines of categorizing certain products (such as fast food) as unhealthy foods.[18] For instance, we had to code a burger as "unhealthy," because of the typical ingredients of a burger (ie, those available at fast food restaurants). However, when a burger was depicted with a side salad or a side of vegetables as part of a menu, we coded "mixed" because healthy and unhealthy foods were both present.

As with all content analyses, we can only derive assumptions about potential effects. Yet, we believe that content analytical findings are an important base for all effects studies. Content analyses inform us about prevailing techniques, and thus, help to interpret the scope and relevance of effect studies analysing those techniques. Future research should expand our analysis to other regions such as South America, Africa, or Asia to get a more comprehensive overview of how unhealthy foods are placed in children's movies around the world. Also, while most research has focused on advertising and television programming targeted at children, we still lack insights about online and interactive media environments.[33]

5 | CONCLUSION

Our conclusions are twofold. First, it is safe to say that the persuasive power of unhealthy foods and beverages in children's movies is significantly higher compared with healthy or mixed products. The reason is that unhealthy foods and beverages are depicted more prominently; they are evaluated more positively, they are shown more often in interaction with a character, and they are consumed more frequently by a character compared with healthy or mixed ones. Second, on the basis of the finding that there were no effects of the year and the country of production as well as the movie age rating, we conclude that the predominance of unhealthy foods in children's movies is a global and stable phenomenon that concerns children of all ages. We believe these findings are a cause for concern, and they clearly demonstrate the need to change the ways in which children are confronted with foods and beverages in entertainment media.[34]

CONFLICTS OF INTEREST

The authors have no conflicts of interest relevant to this article to disclose.

AUTHOR CONTRIBUTIONS

Jörg Matthes conceptualized the study, supervised data collection instruments, data collection, and drafted the initial manuscript. Brigitte Naderer designed the data collection instruments, collected data, carried out the initial analysis, and reviewed and revised the manuscript. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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