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Influence of Product Placement in Children’s Movies on Children’s Snack Choices

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Abstract

Background—Media exposure affects health, including obesity risk. Children’s movies often contain food placements—frequently unhealthy foods. However, it is not known if these cues influence children’s food choices or consumption after viewing. We explored whether children’s snack choices or consumption differs based on: 1) recent exposure to movies with high versus low product placement of unhealthy foods; and 2) children’s weight status.

Methods—Children ages 9–11 were assigned to watch a high (“Alvin and the Chipmunks,” n=54) or low (“Stuart Little,” n=60) product-placement movie. After viewing, participants selected

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a snack choice from each of five categories, several of which were specifically featured in “Alvin.” Uneaten snacks from each participant were weighed upon completion. Snack choice and amount consumed by movie were compared by t-tests, and differences in snack choices by movie were tested with logistic regression.

Results—Participants consumed an average of 800.8 kcal; mean kcal eaten did not vary by movie watched. Participants who watched the high product-placement movie had 3.1 times the odds (95% CI 1.3–7.2) of choosing cheese balls (most featured snack) compared to participants who watched the low product-placement movie. Children who were overweight or obese consumed a mean of 857 kcal (95% CI: 789–925) compared to 783 kcal (95% CI: 742–823, $p=0.09$) for children who were underweight or healthy weight. Children’s weight status did not significantly affect their choice of snack.

Conclusions—Branding and obesogenic messaging in children’s movies influenced some choices that children made about snack foods immediately following viewing, especially food with greatest exposure time in the film, but did not affect total calories consumed. Future studies should examine how the accumulation of these messages affects children’s long-term food choices.

Keywords

obesity; media; pediatrics; nutrition

INTRODUCTION

Children’s health beliefs and behaviors are associated with their media exposure, and this has been empirically demonstrated for alcohol use,^{1–4} smoking,^{5,6} and violence.^{7,8} Although the sedentary nature of media consumption is likely one reason for the relationship between media and obesity, another possible mechanism is media-based exposure to food and beverage content that promotes high-calorie, low-nutrient foods and beverages.^{9,10} The past several decades have witnessed an increase in such messages specifically targeting children and adolescents,¹¹ with studies showing a direct correlation between the frequency of food-based television advertisements within a given culture and the prevalence of pediatric overweight.^{12,13} Television advertisements are associated with increased preference for^{14,15} and consumption of^{16,17} high-calorie, low-nutrient foods and beverages.

Product placement, an indirect form of advertising that involves the placement of or reference to a branded product, is common in media directed at children.¹⁸ Although the impact of within-program food exposure and branding on children’s food preferences and eating behaviors remains relatively understudied, research to date suggests that beverage brand placement affects later beverage choice.¹⁹ Similarly, online games advertising energy-dense snacks promote consumption of these types of foods,^{20–22} indicating that the effects of food placement on children’s intake may be consistent across media domains.

Although food advertisements and product placement affect all children, data suggest that these relationships may be most pronounced among overweight youth. In a sample of 5th graders, an association between TV fast food advertisement exposure and body weight was evident among children who were overweight and obese, but not among children at healthy

weight.²³ Youth who are overweight or obese consume significantly greater quantities of food following food-based advertising compared with those at healthy weight, particularly of snack and dessert-type foods.²⁴ In a separate study, youth who were overweight consumed more calories when presented with branded versus non-branded foods at a meal. However, this relationship was not evident among non-overweight youth.²⁵ Altogether, these data suggest that youth at the highest end of the weight spectrum may be most affected by food-related advertisements.²³

Today's youth are exposed to more entertainment media than ever before;²⁶ however, few studies have investigated the extent to which media content influences children's food preferences. Therefore, the goals of this study were to: 1) examine children's snack choices and overall food consumption following exposure to a movie with either a high or low amount of unhealthy food placement and visible food brand placement; and 2) evaluate whether children's snack choices and overall caloric consumption after viewing varies with the child's weight status. We hypothesized that children who viewed a movie with more food messaging would more often choose and consume snacks that were featured in the movie than children who viewed a movie with less such messaging and without the featured snacks. We also hypothesized that of all the children who watched a movie and ate snacks immediately following, children who were overweight or obese would consume more calories than those who were not overweight.

METHODS

Study Overview

The Movies and Health Culture study team is a transdisciplinary team of experts in pediatrics, sociology, psychiatry, clinical psychology, quantitative psychology, contemporary art history, public health, and media and mass communication studying children's reception of health- and stigma-related messages in children's movies. Children were recruited from the local North Carolina (United States of America) school district parent e-mail listserv, the university employee listserv, and the university-affiliated children's primary care clinic. Participating children were 9, 10, or 11 years old at the time of recruitment, were able to watch and discuss a movie in English, and did not have food allergies or feeding problems. This age group was chosen as they were old enough to participate in a discussion about movies and capable of sitting still through a movie, survey, and focus group, and also because they were felt to be still young enough to enjoy watching a PG-rated (Parental Guidance Suggested) movie. Children were assigned to view a specific film based on their availability and convenience, but were not aware of the films they would be watching and what would be shown on which day. After providing online consent and assent, each parent and child independently completed an online questionnaire at home. The at-home online questionnaire completed by all children included age, race, and self-reported height and weight. The at-home online questionnaire completed by parents assessed average household income and the child's age, race/ethnicity, and parent-reported height and weight.

Children first completed a brief questionnaire via tablet at the time of arrival for the in-person session. This questionnaire asked children when they last ate, and children reported their current hunger level on a 1 to 10 scale (1 not hungry at all; 10 as hungry as I've ever

felt). They then viewed either “Alvin and the Chipmunks” [“ACM”] (n=54) or “Stuart Little” [“SL”] (n=60). These movies were selected for the following reasons: 1) both were live-action/computer-animated films, 2) both had rodent(s) as the core character, 3) both included a plotline and “end message” centered on the importance of family (neither storyline centered on food or health), 4) both were similar in length (92 min (“ACM”) vs 84 min (“SL”), 5) both had scenes referring to food or depicting food, but in different quantities/qualities.

Movies were categorized a priori as “high dose” (“ACM”) or “low dose” (“SL”) by the study team due to the frequency of unhealthy and branded food messages found in the movie.²⁷ “ACM” included 36 distinct types of packaged and non-packaged food items, 34 of which were for humans; acorns (depicted as being collected for eating purposes) and pet food were the two non-human foods shown. The majority of human foods that appeared on-screen were calorie-dense and low in nutrients. Examples of non-packaged items shown include carrots, cakes, and waffles with whipped cream, and loose potato chips. Of the 34 items for humans, 17 were packaged and branded items that exist on the market for purchase in “real life”, such as Chex™ Mix, Blue Diamond® nuts, Van’s® gourmet waffles, packaged Utz® potato chips, and Lucky Charms™ Cereal. The design of these items’ packaging mimicked the packaging and branding of their purchasable counterparts. One additional item was packaged and branded, but does not exist for purchase; Good-able energy bars were imagined for the movie. “SL” included 14 distinct types of packaged and non-packaged food and beverage items, 13 of which were for humans; cat food was the only non-human item shown. Of the 13 items for humans, only two were in identifiable packaging: Kix™ cereal and Fancy Fish. Fancy Fish does not exist on the market for purchase, though the food product looks exactly like Pepperidge Farm® goldfish crackers, and their box is labeled with “Saltridge Farms Select.” The 11 food items that were unpackaged included the following: meatloaf, vegetables (some sort of greens, unidentifiable to observers), mashed potatoes, bread (dinner roll), cake, hotdogs, cotton candy, peanuts, and pastries. Overall, “ACM” shows human food on-screen for approximately 8 minutes and 58 seconds in total, while “SL” shows human food on-screen for approximately 3 minutes and 20 seconds total.

There are also significant differences between movies in regards to health messages. The mouse in “Stuart”, for example, is served small, mouse-appropriate portions of food and milk for dinner, while his (human) brother is served what would be considered a typical portion for a child. The characters also eat their meal as a family at a table. In “Alvin”, however, the chipmunks are frequently seen eating oversized portions, often eating in front of the television and not during mealtime. In one scene, a chipmunk is standing in front of four toaster waffles topped with a mountain of whipped cream, which reaches above his head. The two movies also differ in the frequency of weight-based teasing. “Stuart” has very few instances in which a character is made fun of for their weight. “Alvin”, however, has many scenes in which characters make weight-based comments that are stigmatizing in nature, or make jokes referring to body habitus. For example, they draw a graphical depiction of how “the size of Theodore’s butt” has grown over time, and the overweight chipmunk is shown struggling to run, blaming it on still having his “baby fat.”

Session groups included between 7 and 12 children who watched one of the two movies in its entirety. After completing a post-movie questionnaire, children were led through a cafeteria-style line and asked to select one of two similar options for each of five different types of snacks to eat during a facilitator-led focus group discussion. Facilitators followed a standardized guide that included questions prompting conversation about the characters in the movie, the characters' behaviors, and the children's perceptions of these behaviors (including healthy eating and exercise), and obesity stigma. Questions about healthy eating behaviors, exercise, food, and obesity stigma occurred at the end of the focus group discussion to minimize their effect on what foods the child was concurrently eating (children universally ate their snacks as soon as they sat down at the beginning of the focus group). The questions only varied between movie conditions when querying children about specific characters or scenes; questions mirrored those of the other movies, but with the appropriate character/scene. Focus groups lasted approximately 60 minutes for all groups. Children were privately and individually asked at the conclusion of the focus group what they thought the purpose of the study was—universally, children reported thinking the study was about how children view movies, and no one reported believing that this study was investigating obesity, health, or food choices. The study was approved by the Institutional Review Board at the University of the University of North Carolina at Chapel Hill (study 15–1354).

Snack Choices

Five categories of snacks with two similar options for each category were chosen by the study team based on the snacks' presence in the high dose movie (Table 1). "ACM" features Utz® Cheese Balls, bananas, Snyder's® Pretzel Rods, and unbranded chocolate truffles; the length of time that each snack was featured in the movie is listed in Table 1. "SL" does not feature any of the snack options presented to children. The alternative non-featured snack options (Cheetos® Cheese Puffs, oranges, Rold Gold® Pretzel Twists, and Hershey's® chocolate bar) were chosen due to their similarity in taste and caloric content to the featured snack. Of note, Cheetos® Cheese Puffs are distinct from traditional Cheetos® in that they are wider, puffier and have a similar texture to Cheese Balls. One of the options—snack cakes (Little Debbie® Swiss Roll or Little Debbie® Oatmeal Creme Pie)—was chosen as a "control" snack since neither option was featured in either movie.

Methodology of snack presentation and delivery

Prior to each session, all snack options were pre-weighed, placed into a transparent, individual snack bag, and labeled with the corresponding study ID number of the participants scheduled to attend the session. Each bag was measured using a food scale, and the exact "pre-weight" was recorded. Children were given a cafeteria-style tray and scripted instructions by a researcher to choose one of the two snack options, and were advised that although they must *choose* one of each of the snack choices, they did not have to *eat* the foods and could eat as much or as little as they wanted. As the children proceeded through the cafeteria-style line, they were asked, using the entire brand name of the snack, which one of two pre-measured snack options from each of the five categories they preferred. While reviewers were not blinded to the movie condition, a strict script was used to minimize verbal cues influencing children's snack choice. To reduce any influence of the snack's appearance in individual packaging on the children's choices, individual snack bags were

placed in a box and obscured from view. Researchers gestured toward the snack option's branded package, placed in the children's view directly in front of the box, when asking for their choice. The display packages were unopened and were purchased from a grocery store to reduce any influence of packaging appearance and size. During the snack selection process, a member of the study team discretely recorded each child's snack choices to ensure accurate tracking.

Children were then directed to the focus group room where each child received a bottle of water and a napkin. Children were then free to eat as desired through the focus group discussion and were reminded that they could eat as much, or as little, of their selected snacks as they would like, but could not receive "extras" and could not trade or share with other children. When the focus group discussion ended, children were instructed to leave all leftovers and garbage on their trays and were told at this time (if asked) that they were not permitted to take home any leftover snacks. After children completed participation and were no longer in the room, researchers weighed each remaining snack item of every study participant and recorded the "post-weight" for each snack. This post-weight was then subtracted from the corresponding pre-weight of each snack in order to calculate the total amount of food eaten (in grams).

Statistical Analysis

The child's report of height and weight were used in these analyses, as parents are known to poorly report height and weight for school-age children, and there is evidence children provide equivalent or better reporting.²⁸ Child BMI was calculated and child BMI z-score derived using United States Centers for Disease Control reference growth curves for age and sex.²⁹ Child obesity was defined as BMI \geq 95th percentile for age and sex, and child overweight as BMI \geq 85th percentile.

Bivariate comparisons, including snack choice and kcal of food eaten by movie, were compared with Pearson's chi-square and t-tests, respectively. Differences in snack choices by movie were tested with logistic regression, adjusting for age, race, income, body mass index z-score (BMIz), and baseline hunger. We used multiple linear regression to predict the mean amount of snacks consumed, adjusting for age, race, income, BMIz, and baseline hunger. Significance was assessed using a two-tailed test at $\alpha = 0.05$. All statistical analyses were performed using Stata version 13.1.

RESULTS

Child and Family Characteristics

Children (N=114) were 9–11 years old, 69% white (5% black, 10% Hispanic, 16% other with a broad range of household family incomes but with more than half over \$100,000. Seventy-one percent of children were healthy weight, 12% were overweight, and 8% were obese. Children's mean baseline hunger was 3.6 on a scale of 1–10 (1 not hungry at all; 10 as hungry as I've ever felt). Detailed characteristics of the study sample are shown in Table 2. Characteristics did not significantly differ between children who saw "ACM" vs. "SL" except that more children had seen "ACM" prior to the study than "SL" (Table 2).

Snack Choice

Participants who watched “ACM” were significantly more likely than those who watched “SL” to choose the snack featured most prominently in that movie (Utz® Cheese Balls) instead of cheese puffs (48% vs. 28%, $p=0.03$). The second most prominent snack, truffles, was also chosen more by participants who watched “ACM” (37% vs 23%), although this difference was not statistically significant ($p=0.10$). Of the less prominently featured snacks, participants who watched “ACM” chose two items featured in the movie, the banana (48% vs. 50%, $p=0.8$) and the pretzel rods (51% vs. 60%, $p=0.4$), less commonly than the children who watched “SL,” although these differences were not statistically significant. For the non-featured snack, participants who watched “ACM” more commonly chose Oatmeal Creme Pies (rather than Swiss Rolls) than participants who watched “SL” (39% vs 23%, $p=0.07$) (Figure 1). The number of times children had seen the movie prior to the study did not affect children’s snack choice (data not shown).

In the multivariate logistic regression model, adjusting for age, race, income, BMIz, and baseline hunger, children who watched “ACM” had 3.1 times the odds of choosing cheese balls (95% CI 1.31–7.18) and 2.7 times the odds of choosing an Oatmeal Creme Pie compared to children who watched “SL” (95% CI 1.01–5.56) (Table 3).

Snack Consumption

The average number of kcal consumed was high (mean \pm SD, 800.8 ± 178.0 kcal) during the study (range 341.4–1103.3). The mean kcal eaten by snack (Figure 2) and by movie watched (796.9 ± 23.7 kcal for “ACM” and 804.2 ± 23.8 kcal for “SL”, $p=0.8$) did not vary. In unadjusted bivariate analyses, children who were overweight or obese consumed a mean of 857 kcal (95% CI: 789–925) and children who were underweight or healthy weight consumed a mean of 783 (95% CI: 742–823), and this difference was not statistically significant ($p=0.09$). In unadjusted bivariate analysis, children who were overweight or obese ate significantly more cheese snacks (Cheese Balls and Cheese Puffs; 43.3g [38.4, 48.3] vs. 36.3g [32.9, 39.7], $p=0.04$) and more Little Debbie® (Oatmeal Creme Pie and Swiss Roll) snacks (50.1g [43, 57.3] vs. 40.2g [35.6, 44.8], $p=0.04$) than children who were underweight/healthy weight. The number of times children had seen the movie prior to the study did not affect the amount of snack that children consumed (data not shown).

After adjusting for age, race, income, movie watched, and baseline hunger, children who were overweight or obese ate significantly more Little Debbie® snacks (51.3g [42.4, 60.1] vs. 39.1g [34.6, 43.6], $p=0.02$) and drank more water (456 g [400, 512] vs. 387 g [358, 415], $p=0.04$) than underweight/healthy weight children. Children’s weight status did not significantly affect their choice of snack (e.g. Cheese Puffs vs Cheese Balls or Oatmeal Creme Pie vs Swiss Roll [data not shown]).

DISCUSSION

Children who watched a movie with more food product placement and branding were more likely to choose the snack most highly featured in that movie than children who watched a movie without significant unhealthy or branded food placement. Participants who watched

“ACM” had three times the odds of choosing the frequently featured cheese balls as opposed to the not-featured cheese puffs. Surprisingly, weight status was not associated with whether children chose the most frequently featured snacks. Despite reporting that they were not particularly hungry and being told they did not need to eat at all or finish foods, participants ate an average of 800 kcal, about half of the daily recommended caloric intake of 1600–1800 calories per day for 9–11 year old children.³⁰ We did not find any differences in amount of snack consumed for any of the snack categories.

It is important to note that the snack (cheese balls) that was on the screen about one minute—almost twice the amount of screen time of any other food item—was the snack most consistently chosen. Less clear is the reason for the difference in the non-featured snack options between movie groups, with children watching “ACM” being more likely to choose Oatmeal Creme Pies. This difference may be a statistical artifact, or the inherent differences between a Swiss Roll and Oatmeal Creme Pie may be associated with some other, unmeasured movie characteristic. There were no differences in snack choice for any of the other snack categories.

Limitations

Limitations must be considered when interpreting our results. Children were assigned to groups based on convenience (mostly by child availability) and were not randomized. Although there is no reason to think that the two groups were inherently different in any way as demographics were similar, this remains a possibility. Height and weight were self-reported, which may have led to an under-reporting of both measures;³¹ however, we used child’s own report which has been shown to be more accurate than parental report.²⁸ While our study population does reflect a range of race/ethnic diversity and socioeconomic status, it is primarily white and - higher income, so results may not be generalizable to all populations. Our small sample size and slightly healthier weight than the national average sample may have limited our ability to detect differences in snack choice and consumption by weight status. And, despite offering numerous snacks in the hopes that we would see variation, children ate an unexpectedly large quantity of the provided snacks, often eating all they were provided. While this is an interesting and sobering finding in and of itself, this lack of variation makes it difficult to detect differences in quantity of snacks eaten between children viewing different movies. While other study designs, such as a buffet with unlimited amounts of food, were considered, we felt that for this study our desire for individual level data and the potential difficulties associated with food measurement during the focus group made this design the best option for this study. Additionally, it is possible that snack preferences between groups were different, which would lead to an inherent group bias.

We acknowledge that children’s movies such as the ones we selected contain an abundance of complex cultural messages, conveyed via a diversity of overt and covert representational modes and in the context of a vast media diet. Children’s movies have become increasingly sophisticated and dense with multifaceted (and often contradictory) meanings, and their reception is impacted by an ever more advanced and pervasive media-messaging system. As with any cultural artifact, the analysis of these movies and the responses generated by them

requires a layered approach, including but not limited to the methods exemplified here. However, this study is strengthened by its transdisciplinary approach and unique methodology of directly observing children's snack choices while they were masked to intent and not simply asking hypothetical questions about food choices or providing snacks without child input or selection.

Applications

Movies geared towards children often contain obesogenic messages.²⁷ In addition to targeted advertisements, exposure to food-related cues within child-directed media may promote unhealthy eating behaviors. Studies investigating television programs indicate that unhealthy foods and beverages, such as cookies, candies, and sugar-sweetened beverages, are more frequently exhibited in programs aimed at child and adolescent audiences than are traditionally healthy foods such as vegetables. Further, consumption of unhealthy foods is most commonly paired with a positive outcome or emotion.^{32–36} Additional studies have demonstrated that targeted advertising of healthy foods can increase their consumption.³⁶ Producers of children's media should consider increasing the visibility of healthy foods and minimizing product placement of unhealthy foods.

In one study, children exposed to a movie with specific soft drink placement were more likely to consume that soft drink after viewing, but only for the children who had seen the movie before.¹⁹ These authors posited that product placement effectiveness was related to exposure; however, our study did not replicate these results. A subsequent study found that children's exposure to high-frequency product placements was significantly associated with snack consumption but not brand or product attitudes.³⁷ Therefore, these authors posited that an implicit-persuasion model explained their findings, in which implicit attitudes affect a child's spontaneous choice but not choices in which children think extensively about their favorite brands or products. Therefore, a child who sees a character consuming a product in a movie at high frequency may be more likely to have future automatic reactions that make them more likely to choose this featured product. This model is supported by our data, although future work should specifically compare brand or product attitudes with implicit attitudes.

In laboratory studies, children consume more snack-type foods after exposure to an overweight cartoon character³⁸ and are more likely to choose and report liking a food, especially sugary and snack-type foods, when they are associated with a popular brand or cartoon character.^{10,23,39–41} These data support the idea that media content itself, particularly when a familiar and liked character is involved, may also promote the consumption of high-fat, high-sugar foods in children. Physicians should counsel parents to discourage media use that has greater exposure to unhealthy foods and beverages and obesogenic messages and to watch films with children to counter negative messaging. Our results should encourage a consumer advocacy role for physicians, parents, and nutrition organizations to be advocates for including nutrition-related content (including unhealthy food prevalence) in content ratings for movies. Future research should examine how the accumulation of these messages affect children's long-term food choices, whether media literacy can help "immunize" children against these messages, and whether decreasing

obesogenic content in children's media decreases children's consumption of unhealthy food choices and decreases obesity.

Conclusions

Obesogenic messages and food product placement in children's movies affect some choices that children make about snack foods immediately following viewing, especially for the food with greatest exposure time in the film.

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Abbreviations

SL	Stuart Little
ACM	Alvin and the Chipmunks
BMI	body mass index
BMIz	body mass index z-score

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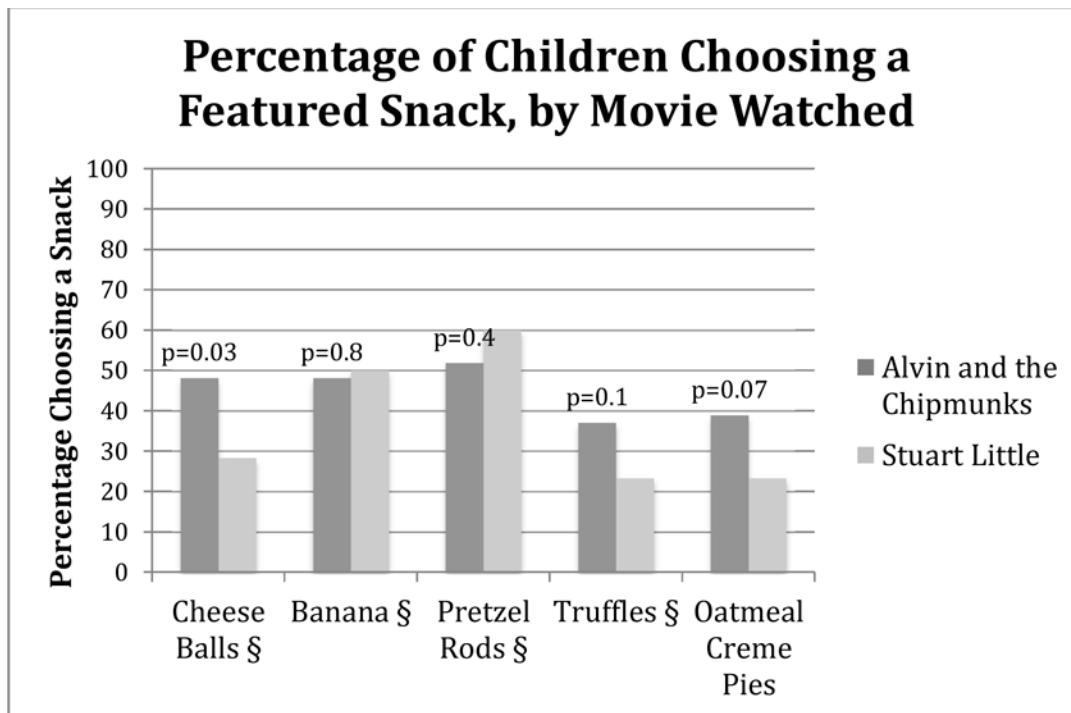


Figure 1. Snack Choice by Movie Watched

§ denotes that the snack was featured in “Alvin and the Chipmunks”

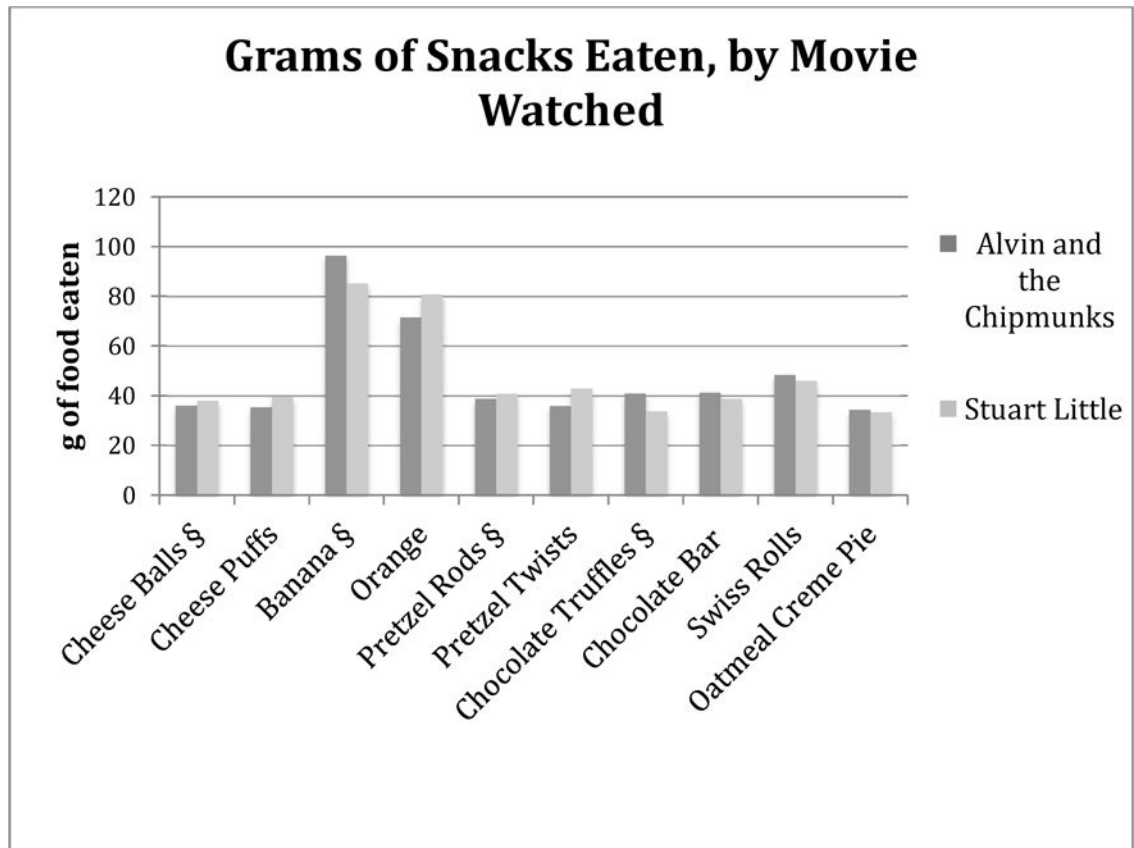


Figure 2. Snack Consumption by Movie Watched
 § denotes that the snack was featured in “Alvin and the Chipmunks”

Table 1

Snack Options

Snack Choice 1	Snack Choice 2	Time snack featured (in seconds)
Utz® Cheese Balls [§]	Cheetos® Cheese Puffs	57
Lindor Chocolate Truffles [§]	Hershey's® Chocolate Bar	33
Banana [§]	Orange	22
Snyder's® Pretzel Rods [§]	Rold Gold® Pretzel Twists	8
Little Debbie® Swiss Roll	Little Debbie® Oatmeal Creme Pie	Neither snack featured

[§]Denotes that the snack was featured in "Alvin and the Chipmunks"

Table 2

Child characteristics

Characteristic	Total % or Mean (SD) N=114	Alvin and the Chipmunks % or Mean (SD) N=54*	Stuart Little % or Mean (SD) N=60*	p
Age				0.5
9	40.4	46.3	35.0	
10	37.7	33.3	41.7	
11	21.9	20.4	23.3	
Race/Ethnicity				0.7
White	69.3	70.37	68.33	
Black	5.3	7.41	3.33	
Hispanic	9.6	7.41	11.67	
Other	15.8	14.81	16.67	
Household Income				0.7
<\$25,000	2.7	1.9	3.4	
\$25–\$49,999	10.7	7.5	13.5	
\$50–74,999	8.0	7.5	8.5	
\$75–99,999	17.0	20.8	13.6	
\$100,000+	61.6	62.3	61.0	
Weight Status*				0.4
Underweight	8.5	10.0	7.1	
Healthy Weight	70.8	76.0	66.1	
Overweight	12.3	10.0	14.3	
Obese	8.5	4.0	12.5	
BMI z-score	0.01 (1.33)	−0.01 (1.29)	0.02 (1.37)	0.9
Baseline Hunger (0–10 scale)	3.6 (2.1)	3.6 (2.1)	3.7 (2.1)	0.9
Seen movie prior to study	50	62.96	38.33	0.01
If seen movie prior, mean number of times	2.51 (2.18)	2.62 (2.54)	2.35 (1.58)	0.48

* For weight status, Alvin N=50 and Stuart N=56 due to some missing height values

Table 3

Odds of choosing a snack if watched “Alvin” (compared to “Stuart Little”)

Snack	Movie OR	95% CI	p
Cheese Balls [§]	3.07	1.31–7.18	0.01
Chocolate Truffles [§]	1.08	0.49–2.40	0.8
Banana [§]	0.78	0.35–1.75	0.6
Pretzel Rods [§]	2.06	0.82–5.21	0.1
Oatmeal Creme Pie	2.67	1.11–6.42	0.03

[§]Denotes that the snack was featured in “Alvin and the Chipmunks”

Adjusted for age, race, income, BMIz, and baseline hunger