

# Tipping the Balance

## *Use of Advergames to Promote Consumption of Nutritious Foods and Beverages by Low-Income African American Children*

Tiffany A. Pempek, PhD; Sandra L. Calvert, PhD

**Objective:** To examine how advergames, which are online computer games developed to market a product, affect consumption of healthier and less healthy snacks by low-income African American children.

**Design:** Cross-sectional, between-subjects examination of an advergame in which children were rewarded for having their computer character consume healthier or less healthy foods and beverages. Children were randomly assigned to 1 of the following 3 conditions: (1) the healthier advergame condition, (2) the less healthy advergame condition, or (3) the control condition.

**Setting:** Urban public elementary schools.

**Participants:** Thirty low-income, African American children aged 9 to 10 years.

**Main Exposure:** Children in the treatment conditions played a less healthy or a healthier version of an advergame 2 times before choosing and eating a snack and completing the experimental measures. Children in the con-

trol group chose and ate a snack before playing the game and completing the measures.

**Main Outcome Measures:** The number of healthier snack items children selected and ate and how much children liked the game.

**Results:** Children who played the healthier version of the advergame selected and ate significantly more healthy snacks than did those who played the less healthy version. Children reported liking the advergame.

**Conclusions:** Findings suggest that concerns about online advergames that market unhealthy foods are justified. However, advergames may also be used to promote healthier foods and beverages. This kind of social marketing approach could tip the scales toward the selection of higher-quality snacks, thereby helping to curb the obesity epidemic.

*Arch Pediatr Adolesc Med.* 2009;163(7):633-637

**W**ITH OBESITY RATES among US children and youth tripling during the past 40 years,<sup>1</sup> childhood obesity in the United States has reached epidemic proportions. One potential contributor to the rise in obesity is media exposure, primarily because television advertising markets high-calorie foods and beverages that have little nutritional value.<sup>2</sup> We know far less about how newer media influence children's food preferences, but Internet use is a very popular activity among youth aged 8 to 18 years.<sup>3</sup> Marketers have taken notice of this online revenue-generating opportunity in which exposure to products costs less than traditional television advertisements and legal restrictions and regulations are virtually nonexistent.<sup>4</sup>

According to the Kaiser Family Foundation, playing electronic games is a favor-

ite pastime of US youth.<sup>3</sup> Because online games are such a popular activity during the middle years of childhood, marketers often attempt to sell products by using advergames, which are online computer games developed specifically for the purpose of promoting a brand.<sup>4</sup> A content

### *See also page 680*

analysis of a sample of food and beverage Web sites found that advergames were present on all of the sites that had links on their home pages to specific areas designed for children.<sup>5</sup> Similarly, Moore<sup>6</sup> found that 73% of a large sample of food and beverage Web sites contained advergames, most of which contained brand identifiers such as logos and characters. These advergames generally marketed products of low nutritional value,<sup>6</sup> mirroring the poor nutritional quality of products directed at youth in television advertising.<sup>7</sup>

**Author Affiliations:** Children's Digital Media Center, Department of Psychology, Georgetown University, Washington, DC.

At present, little is known about how playing advergames affects children's food and beverage choices and eating patterns. Only 1 empirical study of advergame effects on children's food choices has been reported in the literature.<sup>8</sup> An advergame about Froot Loops breakfast cereal (Kellogg Company, Battle Creek, Michigan) implied that this cereal was a healthy product. Although Australian children aged 5 to 8 years who played the Froot Loops cereal advergame were more likely to report a preference for Froot Loops, they did not believe it to be healthier than real fruit and they were no more likely to plan to request Froot Loops than their peers who did not play the game.<sup>8</sup>

By contrast, the negative effects of television advertisements on children's health are well established. In a comprehensive evaluation of the evidence regarding the impact of food marketing on children and youth, an Institute of Medicine panel concluded that, among children aged 2 to 11 years, television advertising influences food preferences and purchase requests for high-calorie, low-nutrient foods, patterns that are linked to childhood obesity.<sup>2</sup> Online marketing could have a negative effect on food preferences, food selections, and childhood obesity, just as has been found for television advertising. In fact, more than half of children and adolescents aged 8 to 18 years use a computer for recreational purposes on a given day and, on average, spend about 1 hour per day using a computer outside of school, most of which is spent online.<sup>3</sup> Thus, children can easily be exposed to foods that are marketed online.

Although companies typically market products of low nutritional value to children, the same types of techniques used to sell unhealthy products to children could be used to sell them healthier products.<sup>2</sup> The Institute of Medicine report recommended that social marketing campaigns be implemented as 1 lever to combat the obesity epidemic. Social marketing campaigns have been effective at preventing negative behaviors, such as smoking tobacco, and increasing desirable behaviors, such as eating nutritional foods and participating in physical activity.<sup>9</sup> Most of these campaigns use television as the vehicle for conveying the intervention to the target audience. Similarly, the use of advergames as a social marketing approach could potentially tip the scales toward the selection of higher-quality foods and beverages by providing an engaging and effective way to promote healthy behaviors among youth. Because computer game playing is popular with youth,<sup>3</sup> advergames might be a particularly cost-effective way of influencing food selections and eating patterns.

The purpose of this study was 2-fold. First, we asked whether playing an advergame that promoted less healthy foods, such as those typically seen in food advertisements directed at children, could affect children's behavior, as measured by what children selected and ate as a snack. Second, we asked whether playing an advergame could promote healthier food choices and consumption patterns. To test these ideas, children played an advergame in which we manipulated whether points were awarded for eating healthier or less healthy foods and beverages. We predicted that children who were awarded points for "eating" less healthy foods and bev-

erages in the game would be more likely to choose and eat a less healthy snack and that those awarded points for eating healthier foods and beverages in the game would be more likely to choose and eat a healthier snack.

## METHODS

### PARTICIPANTS

Participants included 30 African American third and fourth graders (15 boys and 15 girls; mean [SD] age, 9 years 6 months [11 months]) from 5 metropolitan elementary schools in Washington, DC. Participants were from a predominantly low-income area of the city where 97% of individuals were non-Hispanic black and 37% of children were impoverished in 2000.<sup>10</sup> Washington, DC, has a higher proportion of overweight and obese children than any state in the nation, with 39.5% of children and adolescents aged 10 to 17 years classified as being overweight or obese compared with the national average of 30.6%.<sup>11</sup> Consent forms were sent home with the children for parents to sign. Children returned signed consent forms to classroom teachers. Children also signed a form indicating their assent to participate. This study was reviewed and approved by the Georgetown University institutional review board.

### COMPUTER ADVERGAME

The advergame in this study used the Pac-Man arcade game (Namco, Tokyo, Japan) as a prototype. Pac-Man is a 2-dimensional character, drawn as a circle with a mouth. The mouth opens and closes as he eats objects on the screen while moving through an animated maze. The animated Pac-Man character is seen from a side view and moves through the maze while eating or avoiding certain foods and beverages.

Two versions of the Pac-Man advergame were created. In the healthier food version, the player was awarded 10 points for each nutritious snack eaten by the Pac-Man character, and the player was penalized 10 points for each snack eaten by the Pac-Man character that was less nutritious. In the less healthy food version, the player was awarded 10 points for each snack eaten by the Pac-Man character that was less nutritious, and the player was penalized 10 points for each nutritious snack eaten by the Pac-Man character. The other rules for each version of the game were the same.

The players used the 4 arrow keys on the computer keyboard to move the Pac-Man character around the maze. Once the player obtained 100 points, they moved on to the second level of the game, which was similar, except that the number of snacks appearing in the maze increased and 200 points were required to win. Each child played one version of the advergame twice on a laptop computer (Dell Computers, Round Rock, Texas). In level 1, the healthier snack images were orange juice and bananas. The less healthy snack images were soda and a bag of potato chips. In level 2, 4 additional snack images were added and consisted of an apple and a small bag of baby carrots (healthier snacks) and a chocolate chip cookie and a chocolate candy bar (less healthy snacks). The food and beverage images were photographs of real objects embedded in an animated maze.

### PROCEDURE

Within the sex groups, each child was randomly assigned to 1 of the following 3 conditions: (1) the healthier advergame, (2) the less healthy advergame, or (3) the control group. Participants in the treatment conditions played the advergame before making a snack and beverage selection, whereas partici-

pants in the control group selected a snack and beverage before playing the game.

Participants worked individually with an experimenter. The experimenter explained that the child would play a computer game twice, answer some questions, and select and eat a snack. Each child was also told that, if desired, he or she could quit playing the game at any time. For children in the 2 treatment conditions, the experimenter then explained the rules of the game as the child looked at visual depictions of the food items on the computer screen. The rules explained the number of points awarded or lost for eating and drinking certain snacks as well as how many points were needed to win that level of the game. Next, the child played level 1 of the advergaming, followed by level 2 of the game. The game paused between levels 1 and 2, as the experimenter introduced the child to the next level of the game and explained the rules for that level. After completing both levels of the advergaming, the child played both levels a second time.

The amount of time needed to play the advergaming was recorded by the experimenter. Children were given 5 minutes to complete each level of the game. If they failed to do so, the experimenter stopped that level of the game. When a child reached the time limit, the child would then be moved (depending on when this interruption occurred) to (1) level 2 of the first session, (2) level 1 of the second session, (3) level 2 of the second session, or (4) the next phase of the study.

After finishing the game, children in the treatment conditions answered a brief survey consisting of 3 questions about the advergaming and 4 questions about their use of computers. The experimenter read each question aloud, the child answered that question, and the experimenter recorded that response on an answer sheet. An example of an advergaming question was "Did you think the game was: (1) easy, (2) hard, or (3) just right?" An example of a computer use question is "How often do you use the Internet?" with the choices (1) "just about every day," (2) "a few times a week," (3) "about once a week," and (4) "I don't use the Internet." Another computer question read, "If you use the Internet, what things do you use it for (you can pick more than 1)?" with the choices (1) "to send instant messages," (2) "for school work," (3) "to play games," (4) "to send e-mails," (5) "to visit a Web site of a TV show I watch," and (6) "to visit a Web site of foods I like."

Next, the child selected a food and a beverage choice. The order of presentation for the foods and beverages was counterbalanced, and the child selected 1 food and 1 beverage. The snack choices were the same foods and beverages that were in the first level of the advergaming. In other words, the food option was a small banana or a small bag of chips, and the drink option was a small bottle of soda or a small container of orange juice.

In the control condition, children selected and ate a food and beverage snack before playing the healthier version of the advergaming. Then they answered the questions about their computer use patterns. After completing the treatment, we explained the purpose of the study to all children and thanked them for participating. They then returned to their classroom.

## RESULTS

### TREATMENT EFFECTS

To test for an effect of playing advergaming on children's food and beverage selection and consumption, we computed a 3 × 2 (condition × sex) between-subjects analysis of variance with a summary score of the healthier food and beverage as the dependent measure. The summary

**Table 1. Frequency of Children Who Chose Healthier Snack Options as a Function of Condition**

	Healthier Snacks Chosen, Summary Score			Total
	0	1	2	
Condition, No. of children				
Healthier game	1	4	5	10
Less healthy game	9	0	1	10
Control group	4	3	3	10
<b>Total</b>	<b>14</b>	<b>7</b>	<b>9</b>	<b>30</b>

scores ranged from 0 to 2 and are reported as mean (SD). The 2-factor analysis of variance computed on snack selections yielded only a main effect of condition ( $F_{2,24}=6.23$ ;  $P=.007$ ), which had an observed power of 0.85. Bonferroni post-hoc tests indicated that children in the healthier game condition selected and ate a greater number of healthier snacks (mean, 1.40 [0.24]) than did those in the less healthy game condition (mean, 0.20 [0.24]). The mean score of the control condition 0.90 (0.24) fell between the 2 experimental conditions and did not differ significantly from either one.

The same pattern was found when comparing the number of healthier snacks chosen by condition in a  $\chi^2$  analysis ( $\chi^2_2=13.38$ ;  $P=.01$ ). Nine participants (90%) in the healthier game condition chose at least 1 healthier snack, whereas 6 children in the control group (60%) and 1 child in the less healthy game condition (10%) did so. As seen in **Table 1**, the healthier and less healthy conditions significantly differed from one another ( $\chi^2_2=13.07$ ;  $P=.001$ ).

After playing the game, children in all conditions were asked one question about what Pac-Man wanted them to eat and another question about what Pac-Man wanted them to drink. Twenty-five of 28 children answered correctly (based on their condition) when asked what Pac-Man wanted them to eat, and 27 of 28 answered correctly when asked what Pac-Man wanted them to drink. Two additional children did not answer these questions. Thus, children understood the intent of the treatment and did not differ by condition as to whether these questions were answered correctly ( $\chi^2_2=2.95$ ;  $P=.57$ ). The 2-factor analysis of variance computed on food and beverage choices remained significant when the 3 children who provided incorrect responses were excluded from the analysis.

### DESCRIPTIVE DATA

On average, children played the advergaming for 9 minutes 32 seconds (SD, 2 minutes 22 seconds). The  $\chi^2$  analyses indicated that children in each of the 3 conditions did not differ significantly in how much they enjoyed playing the game or in how challenging they thought the game was. Most children liked the game and most found it to be the right level of challenge. When asked how much they liked the game, for example, 27 children said that they "really liked it," 2 "liked it," and no child reported that he or she "didn't like it." One child did not answer this question. Nineteen children reported that the game

**Table 2. Frequency of Children Who Use the Internet to Visit Food Web Sites as a Function of Sex<sup>a</sup>**

	Sex, No. of Children		Total
	Boys	Girls	
No food Web site visits	14	9	23
Food Web site visits	0	5	5
<b>Total</b>	<b>14</b>	<b>14</b>	<b>28</b>

<sup>a</sup>Girls were more likely to visit food Web sites than were boys ( $\chi^2 = 6.09$ ;  $P = .01$ ).

was “just right” in terms of the level of difficulty, 5 said that it was “easy,” and 5 said that it was “hard.” One child did not answer this question.

Only 4 children were unable to complete the first level of the advergame in 5 minutes during the first exposure. Two of those same children were unable to complete level 1 in 5 minutes during the second exposure to the advergame as well. Only 3 children were unable to complete the second (more difficult) level in the 5-minute time frame during the first exposure. One of these children was also unable to complete level 2 in 5 minutes during the second exposure. These children typically had problems using the arrow key to move the Pac-Man character through the maze.

Children reported that they enjoyed playing other online games as well as the Pac-Man advergame from our study. When asked which of 6 activities they typically do while online (where they were allowed to select all that applied), 26 children reported that they used the Internet to play games, 11 children used the Internet for schoolwork or to visit the Web site of a television show that they watch, and 5 children used the Internet for each of the following functions: to send instant messages, to send e-mail, or to visit the Web site of a food they like. Given our interest in food marketing, we conducted a  $\chi^2$  analysis on boys' and girls' use of food Web sites. As seen in **Table 2**, girls were more likely than boys to visit food Web sites ( $\chi^2 = 6.09$ ;  $P = .01$ ) (36% of girls vs 0% of boys). Data from 2 children were missing.

Twenty-seven children reported using the Internet on a weekly basis; 10 children used the Internet “just about every day,” 11 used it “a few times a week,” and 6 used it “about once a week.” Only 2 of our low-income sample said that they did not use the Internet. One student did not answer this question. Thus, there was ample use of the Internet, and online games were the most popular activity.

## COMMENT

The purpose of this study was to examine how advergames affect the food and beverage choices and eating patterns of low-income African American children aged 9 to 10 years. With only 10 minutes of exposure, our results revealed that children selected and ate whatever snacks were being marketed by the advergame, healthy or not. In other words, if the game promoted less healthy foods and beverages, snacks of poor nutritional quality

were chosen and eaten. By contrast, if the game promoted healthier foods and beverages, snacks of better nutritional quality were chosen and eaten. Our findings advance the current knowledge base about advergames by expanding the literature from a preference for a product marketed by an advergame<sup>8</sup> to actual selections and consumption of foods and beverages marketed in the advergame.

Our findings also suggest that public concerns about online advergames that market less healthy foods and beverages to children are justified. Children selected and ate snacks that were of poor nutritional quality after exposure to the advergame that promoted less healthy foods and beverages. However, as demonstrated by this study, advergames may be used just as easily to promote healthier snacks, an approach recommended by the Institute of Medicine report as a way to help curb the obesity epidemic in the United States.<sup>2</sup> In particular, because so many children play online games, health-promoting advergames can be part of a cost-effective social marketing campaign. Indeed, the children in this study reported liking our advergame. Our advergame had only 2 levels and lacked the “bells and whistles” of most commercial video games, indicating that even simple games can be effective in bringing about behavioral change. More sophisticated games with even more levels of challenge that are played over an extended time may yield even stronger effects.

Concerns have been raised that low-income children have less access to computer technologies<sup>12</sup> and that, hence, an online intervention might not reach this group. That was not the case in our study. Our low-income African American sample of third- and fourth-grade children was often online daily or at least several times a week. Only 2 (7%) of them were not online on a weekly basis. Consistent with previous research,<sup>3</sup> the most popular activity was gaming. An alarming 36% of the girls visited food Web sites, but none of the boys did so. Because food Web sites typically promote products that are high in calories and low in nutritional value,<sup>5,6</sup> girls may well be more at risk for exposure to marketing practices that promote foods that can lead to obesity and poor health.

There are several limitations to the present study. First, although an effect was found for the snacks that children selected and ate, long-term effects of advergames on food and beverage choices were not assessed herein. Future studies should examine the benefit of playing health-promoting advergames for a longer period using a longitudinal design. Effects of such game play may be short-lived, but repeated exposure could also enhance the effects. Health professionals and policy makers would benefit from knowing the answer to this question. Second, the treatment conditions statistically differed from each other but not from the control group, which fell in the middle of the treatment group means. However, both versions of the advergame worked as predicted. Finally, the beneficial findings of healthier food and beverage choices should be replicated in children of varying ethnicities and age groups. Although lower-income children may have a higher risk of obesity than higher-income groups, this health epidemic affects all ethnic, income, and age groups in the United States.<sup>2</sup>

## CONCLUSIONS

Children in the United States are experiencing an obesity crisis, an epidemic that casts a long shadow on their future health and well-being. Eating patterns established during childhood affect health throughout the life span.<sup>2</sup> Thus, it is important that we find ways to promote a healthy lifestyle for our children from an early age, particularly those who come from low-income neighborhoods where the risk of obesity is greatest. Overall, our results indicate that reaching low-income African American children via the Internet is feasible and that the use of advergames is a potential way to alter their eating habits in favor of more nutritious foods. By focusing on activities that children enjoy, such as playing online advergames, online social marketing approaches can become a cost-effective method to help address the obesity crisis. Our results suggest that not only is there a market for healthier foods and beverages, but advergames can be used to promote healthier choices and eating patterns, thereby tipping the balance toward a healthier society.

**Accepted for Publication:** November 25, 2008.

**Correspondence:** Sandra L. Calvert, PhD, Children's Digital Media Center, Department of Psychology, Georgetown University, 309 White Gravenor Hall, 37th & O streets NW, Washington, DC 20057 (calverts@georgetown.edu).

**Author Contributions:** *Study concept and design:* Calvert. *Acquisition of data:* Pempek and Calvert. *Analysis and interpretation of data:* Pempek and Calvert. *Drafting of the manuscript:* Pempek and Calvert. *Statistical analysis:* Pempek and Calvert. *Obtained funding:* Calvert. *Administrative, technical, and material support:* Calvert. *Study supervision:* Pempek and Calvert.

**Financial Disclosure:** None reported.

**Funding/Support:** This study was supported by a Reflective Engagement in the Public Interest grant from Georgetown University.

**Additional Contributions:** We thank the children who participated in this study. We also thank the members of the Children's Digital Media Center team for their assistance with this project, particularly Robert Ellis, MA, who designed our advergame; Lisa Alvy, BA, who helped in designing survey materials, recruiting participants, and collecting data; Alexis Lauricella, MA, and Katrina Pariera, BA, who helped collect data; and Yevdokiya Yermolayeva, BA, who helped to enter and manage data.

## REFERENCES

1. National Center for Health Statistics, Centers for Disease Control and Prevention. Prevalence of overweight among children and adolescents: United States, 1999-2002. <http://www.cdc.gov/nchs/products/pubs/pubd/hestats/over99fig1.htm>. Accessed July 14, 2008.
2. McGinnis JM, Gootman JA, Kraak VI, eds. *Committee on Food Marketing and the Diets of Children and Youth, Food and Nutrition Board, Board on Children, Youth, and Families. Food Marketing to Children and Youth: Threat or Opportunity?* Washington, DC: National Academies Press; 2006.
3. Roberts DF, Foehr UG, Rideout V. *Generation M: Media in the Lives of 8-18 Year-olds*. Menlo Park, CA: Kaiser Family Foundation; 2005.
4. Calvert SL. Children as consumers: advertising and marketing. *Future Child*. 2008; 18(1):205-234.
5. Weber K, Story M, Harnack L. Internet food marketing strategies aimed at children and adolescents: a content analysis of food and beverage brand Web sites. *J Am Diet Assoc*. 2006;106(9):1463-1466.
6. Moore ES. *It's Child's Play: Advergaming and the Online Marketing of Food to Children*. Menlo Park, CA: Kaiser Family Foundation; 2006.
7. Kunkel D. Children and television advertising. In: Singer DG, Singer JL, eds. *Handbook of Children and the Media*. Thousand Oaks, CA: Sage Publications; 2001: 375-394.
8. Mallinckrodt V, Mizerski D. The effects of playing an advergame on young children's perceptions, preferences, and requests. *J Advert*. 2007;36(2):87-100.
9. Evans WD. Social marketing campaigns and children's media use. *Future Child*. 2008;18(1):181-204.
10. DC ward profile: Ward 7. Neighborhoodinfo DC Web site. [http://www.neighborhoodinfodc.org/wards/nbr\\_prof\\_wrd7.html](http://www.neighborhoodinfodc.org/wards/nbr_prof_wrd7.html). Accessed June 5, 2008.
11. Childhood Obesity Action Network. State obesity profiles: National Initiative for Children's Healthcare Quality, Child Policy Research Center, and Child and Adolescent Health Measurement Initiative. <http://nschdata.org/Viewdocument.aspx?item=207>. Accessed July 7, 2008.
12. Compaine BM. *The Digital Divide: Facing a Crisis or Creating a Myth?* Cambridge, MA: MIT Press; 2001.

## Call for Papers

*Archives of Pediatrics and Adolescent Medicine* will devote their May 2010 issue to papers on the effects of life experiences occurring during the critical window of birth to age 5 years on the emotional and psychological health and development—or ill health—of children both during that age and at later ages during childhood and adolescence. Papers submitted by September 30, 2009, have the best chance of acceptance.