

Effects of Fast Food Branding on Young Children's Taste Preferences

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Objective: To examine the effects of cumulative, real-world marketing and brand exposures on young children by testing the influence of branding from a heavily marketed source on taste preferences.

Design: Experimental study. Children tasted 5 pairs of identical foods and beverages in packaging from McDonald's and matched but unbranded packaging and were asked to indicate if they tasted the same or if one tasted better.

Setting: Preschools for low-income children.

Participants: Sixty-three children (mean \pm SD age, 4.6 \pm 0.5 years; range, 3.5-5.4 years).

Main Exposure: Branding of fast foods.

Outcome Measures: A summary total taste preference score (ranging from -1 for the unbranded samples to 0 for no preference and +1 for McDonald's branded samples) was used to test the null hypothesis that children would express no preference.

Results: The mean \pm SD total taste preference score across all food comparisons was 0.37 \pm 0.45 (median, 0.20; interquartile range, 0.00-0.80) and significantly greater than zero ($P < .001$), indicating that children preferred the tastes of foods and drinks if they thought they were from McDonald's. Moderator analysis found significantly greater effects of branding among children with more television sets in their homes and children who ate food from McDonald's more often.

Conclusion: Branding of foods and beverages influences young children's taste perceptions. The findings are consistent with recommendations to regulate marketing to young children and also suggest that branding may be a useful strategy for improving young children's eating behaviors.

Trial Registration: clinicaltrials.gov Identifier: NCT00185536.

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THE GLOBAL CHILDHOOD obesity epidemic is focusing attention on the effects of food and beverage marketing.^{1,2} A recent report published by the World Health Organization and the Food and Agriculture Organization of the United Nations concluded that marketing of energy-dense foods and fast food outlets is a "probable" cause of increasing overweight and obesity among the world's children.³

Food marketing to children is widespread. The food and beverage industries spend more than \$10 billion per year to market to children in the United States.¹ One of the goals of marketing is branding to encourage children to recognize and differentiate particular products and logos. By 2 years of age, children may have be-

liefs about specific brands,⁴ and 2- to 6-year-olds can recognize familiar brand names, packaging, logos, and characters and associate them with products,⁵⁻⁸ especially if the brands use salient features such as bright colors, pictures, and cartoon characters.⁸ By middle childhood, most children can name multiple brands of child-oriented products.⁷ Even among very young children, awareness and recognition translate into product requests, begging and nagging for specific product names and brands.^{7,9}

In a prior experiment, we demonstrated that even a single exposure to a television advertisement affected preschool children's brand preferences.¹⁰ To follow that experiment and extend the existing research,¹ it is desirable to examine the effects of the broader, cumulative, real-

world marketing and brand exposures that young children experience but that we are unable to measure directly. In the current experiment, therefore, we investigated whether preschool children's taste preferences were influenced by branding from a heavily marketed source. To do so, we asked preschool children to taste identical foods in packaging from McDonald's and in matched but unbranded packaging and to indicate if they tasted the same or if one tasted better. We chose McDonald's because it is the largest fast food advertiser in the United States,¹¹ and we expected most, if not all, preschool children to be familiar with the McDonald's brand because of extensive marketing.¹² We hypothesized that 3- to 5-year-olds would prefer the taste of foods they perceived to be from McDonald's compared with the same foods without McDonald's branding.

METHODS

Participants were 3- to 5-year-old children and their parents recruited from 6 centers in San Mateo County, California, for Head Start, a federally sponsored preschool program for low-income families. The study was introduced at parent meetings, and informed consent and a 2-page parent questionnaire in English and Spanish were sent home to parents. Parents noted if their child should not be allowed to eat each food and drink to be tested. The study was approved by the Stanford University Panel on Human Subjects in Medical Research.

Trained research assistants asked participating children if they wanted to play a food tasting game. Children were told they did not have to play if they did not want to, and they could stop at any time. Communication was in English and/or Spanish as appropriate. Children sat at a table with a tray in front of an opaque screen. One research assistant (RA1) sat behind the screen and could not see the child or the tray, but her arms could reach around the screen. She said, "When I sit here, you won't be able to see me, but we can still talk to each other." She then said, "[name of RA2] is going to bring you 2 foods to taste." Research assistant No. 2 placed 2 samples of each of 5 foods in front of the child, 1 at a time, on the left and right sides of the tray. The foods were (1) one-quarter of a McDonald's hamburger, one partially wrapped in a white McDonald's wrapper showing the McDonald's logos and the word *Hamburger* in brown and the other wrapped identically in a matched plain white wrapper of the same size and material; (2) a Chicken McNugget in a white McDonald's bag with a red arches logo and the phrase *Chicken McNuggets* in blue and the other in a matched plain white bag; (3) 3 McDonald's french fries in a white bag with a McDonald's yellow arches and smile logo on a red background and the words "We love to see you smile" in blue on yellow along the edge and 3 fries in a matched plain white bag; (4) about 3 ounces of 1% fat milk (or apple juice for 1 child who was not allowed to drink milk) in a white McDonald's cup with lid and straw and in a matched plain white cup with lid and straw; and (5) 2 "baby" carrots placed on top of a McDonald's french fries bag and on top of a matched plain white bag. Hamburgers, chicken nuggets, and french fries were all purchased from a local McDonald's. Carrots were not available or marketed by McDonald's at the time of the study. Only unused (not previously in contact with food) McDonald's and plain wrappings, bags, and cups were used so there would be no residual smell or taste. Only the most basic available McDonald's packaging was used, without any additional promotional markings (eg, additional graphics, Ronald McDonald image, or images of movie characters). Each food in the

McDonald's packaging was taken out of a McDonald's brown paper bag with a yellow, blue, and red arches logo, and each food in plain packaging was taken out of a matched plain brown paper bag. The order of foods presented and placement of the McDonald's wrapped food on the left or right followed a predetermined random order for each child and each food.

After placing the 2 food samples on the tray, RA2 asked, "Can you tell me which of these foods [drinks] is from McDonald's?" to ensure that the experimental manipulation was apparent to the child. The RA did not say anything more if the child correctly identified the food or drink in the McDonald's wrapping. If the child did not answer or answered incorrectly, RA2 pointed to the McDonald's branded food or drink and said in a neutral voice, "This food [drink] is from McDonald's." Research assistant No. 2 stood behind and out of eye contact with the child to prevent any unintentional expressions of approval or disapproval and did not repeat instructions or assist the child during the task.

The blinded RA1 then said, "Now, take 1 bite [sip] of this food [drink]," pointing her finger around 1 side of the screen following a predetermined random order. She next pointed around the other side of the screen and said, "Now, take 1 bite [sip] of this food [drink]." She then said, "Tell me if they taste the same, or point to the food [drink] that tastes the *best* to you." It was an important design feature to offer the option that the 2 food samples tasted the same, the "correct" answer, to be able to falsify our hypothesis. Research assistant No. 2 recorded the child's responses, and the procedure was repeated for each food or drink.

Parents completed a self-administered questionnaire in English or Spanish, including their child's birth date; their child's race/ethnicity; the number of television sets in their home; whether there was a television in their child's bedroom; the number of hours of TV their child watched in a typical week; the frequency with which the TV was on at their house for most of the morning, in the afternoon, during dinner, and in the evening¹³; if in the past week their child had asked them for any foods or drinks that he/she saw on television¹⁴; how often their child ate food from McDonald's and other fast food restaurants; and whether there were any toys from McDonald's in their home.

The null hypothesis was that children would express no preference between the 2 samples of each food or drink (the correct answer). To favor the null hypothesis, children were considered to have no preference when they (1) responded that the 2 samples tasted the same, (2) did not respond at all, or (3) did not know. Preference for the food identified as McDonald's was coded +1, preference for the unbranded food was coded -1, and no preference was coded 0. For the primary analysis, testing preferences across all foods combined, we averaged a participant's answers to create a total preference score between -1 and +1 for each participant. To test the null hypothesis, we used a nonparametric Wilcoxon signed rank test. In secondary analysis, we also tested the null hypothesis for each food or drink separately using a nonparametric McNemar test. We then explored whether measured pre-existing factors moderated¹⁵⁻¹⁷ children's total preferences scores using the nonparametric Spearman rank correlation for scaled variables, the nonparametric Wilcoxon Mann-Whitney U test for dichotomous variables, and the nonparametric Kruskal-Wallis test for categorical variables. Statistical significance was set at a 2-tailed $\alpha < .05$.

RESULTS

Parents of 95 children correctly completed and returned consent forms and questionnaires of which 63 children (66%) completed the food tasting experiment and

Table 1. Sample Characteristics

Characteristic	Value
Age, mean \pm SD, y (range)	4.6 \pm 0.5 (3.5-5.4)
Female, %	52.4
Race/ethnicity, %	
Latino/Hispanic	55.6
African American/black	1.6
Asian/Pacific Islander	6.3
Native American/Alaska native	1.6
White	12.7
Multiethnic or other	22.2
Spanish-language parent survey was used, %	47.6
Experiment with child was conducted in Spanish or mixed English and Spanish, %	38.1
How often child ate food from McDonald's, %	
Never	3.2
<1 Time per month	25.4
1-3 Times per month	39.7
1 Time per week	19.1
2-3 Times per week	12.7
4-7 Times per week	0.0
How often child ate food from other fast food restaurants, %	
Never	6.4
<1 Time per month	23.8
1-3 Times per month	42.9
1 Time per week	17.5
2-3 Times per week	7.9
4-7 Times per week	1.6
Any toys from McDonald's were in the house, %	76.2
TVs in the home, mean \pm SD, No.	2.4 \pm 1.2
Child's bedroom had a TV, %	57.1
TV watching by child per week, mean \pm SD, h	7.4 \pm 6.9
Household TV use, mean \pm SD (scale score range, 0-16)	7.3 \pm 3.8
Child requests for foods or drinks seen on TV during the past week, mean \pm SD, No.	1.0 \pm 1.5

Abbreviation: TV, television.

comprised the analysis sample; 7 declined to participate when asked; 8 were absent, had moved, or were not available during the days and/or times of the experiment; and 17 were unable to understand or refused to complete the protocol. **Table 1** lists characteristics of the analysis sample. Participating and nonparticipating children did not significantly differ on any of these measures.

The 63 children performed a total of 304 individual tasting comparisons. Three, 2, 3, 1, and 1 child were not allowed to eat hamburger, chicken nuggets, french fries, milk, and carrots, respectively, and 1 child was unable to bite the carrots. The McDonald's branded food was positioned on the left side for 48.6% of comparisons. Children needed to be told which food was from McDonald's for 20.6%, 30.2%, 22.2%, 33.3%, and 27.0% of the hamburger, chicken nuggets, french fries, milk/apple juice, and carrot comparisons, respectively (not statistically significant across foods). Sixty-two percent, 17%, 8%, 5%, 2%, and 6% of children needed to be told which food was from McDonald's for 0, 1, 2, 3, 4, and all 5 comparisons, respectively. There were no statistically significant differences between these groups of children for their total preference scores or any of the

measures listed in Table 1 except parent survey and child experiment language. Children who needed to be told were significantly more likely to have a parent who completed a Spanish language survey or completed the experiment in Spanish or mixed English and Spanish.

The mean \pm SD total preference score was 0.37 \pm 0.45 (median, 0.20; interquartile range, 0.00-0.80) and significantly greater than zero ($P < .001$), rejecting the null hypothesis and demonstrating that children preferred the tastes of foods and drinks if they thought they were from McDonald's. Results for each food and drink are listed in **Table 2**. Secondary analysis found that children were significantly more likely to prefer the taste of a food or drink if they thought it was from McDonald's for 4 of 5 comparisons. The findings were similar when excluding those comparisons where children were told which food was from McDonald's (mean \pm SD total preference score, 0.35 \pm 0.46; median, 0.33; interquartile range, 0.00-0.73; $P < .001$).

Moderator analysis found that children with more television sets in their homes ($r = 0.27$, $P < .04$) and children who ate food from McDonald's more often ($r = 0.30$, $P < .02$) were more likely to prefer the taste of foods/drinks if they thought they were from McDonald's (**Figure 1** and **Figure 2**). Other baseline measures listed in Table 1 were not statistically significant moderators.

COMMENT

By the early age of 3 to 5 years, low-income preschool children preferred the tastes of foods and drinks if they thought they were from McDonald's, demonstrating that brand identity can influence young children's taste perceptions. This was true even for carrots, a food that was not marketed by or available from McDonald's. These taste preferences emerged despite the fact that 3 of the foods were from McDonald's and only the branding was changed, indicating that the effects were not due to familiarity with the taste or smell of McDonald's food. Even the children with the lowest frequency of eating food from McDonald's had average positive total preference scores, indicating they preferred more of the branded foods (Figure 2).

We used McDonald's branding in this experiment because of its leadership position in fast food advertising and marketing.^{11,12} Although the participating children ranged in age from only 3 through 5 years, about a third of the parents reported their children were eating food from McDonald's weekly or more, and just 2 of 63 reported never eating food from McDonald's. McDonald's food was eaten more frequently than food from all other fast food restaurants combined, and about three-quarters of parents reported that they had a toy from McDonald's in their homes. Although it was not possible to objectively measure total past exposure to McDonald's marketing, these reports indicate the children were receiving substantial exposure to the McDonald's brand.

Exploratory moderator analysis was performed to identify characteristics that define potentially more or less susceptible groups of participants and to help inform fu-

Table 2. Children's Taste Preferences

Food or Drink Item	No. (%)			P Value ^a
	Plain	Taste the Same or No Answer	McDonald's	
Hamburger	22 (36.7)	9 (15.0)	29 (48.3)	.33
Chicken nuggets	11 (18.0)	14 (23.0)	36 (59.0)	<.001
French fries	8 (13.3)	6 (10.0)	46 (76.7)	<.001
Milk or apple juice	13 (21.0)	11 (17.7)	38 (61.3)	<.001
Carrots	14 (23.0)	14 (23.0)	33 (54.1)	.006

^aNonparametric McNemar test.

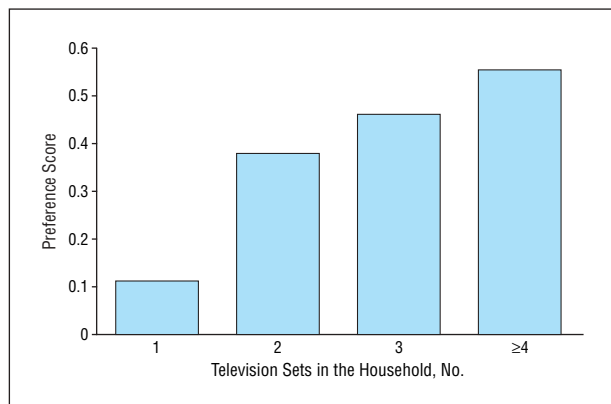


Figure 1. Number of television sets in the household as a moderator of taste preferences. Total preference scores may range from -1 (preferred the unbranded food in all comparisons) to +1 (preferred the McDonald's branded food in all comparisons).

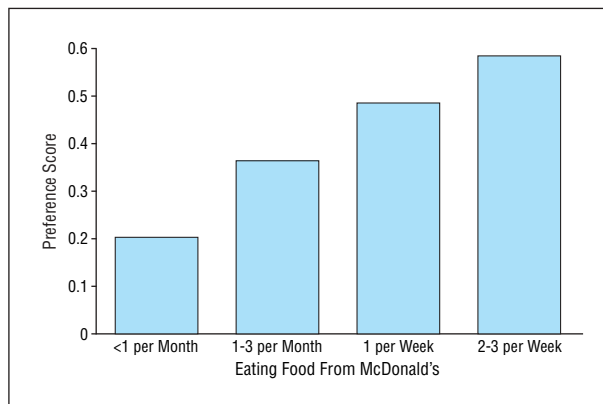


Figure 2. Frequency of eating at McDonald's as a moderator of taste preferences. Total preference scores may range from -1 (preferred the unbranded food in all comparisons) to +1 (preferred the McDonald's branded food in all comparisons).

ture research.¹⁵⁻¹⁷ These are relatively low-powered hypothesis-generating analyses. Only the number of television sets at home and frequency of eating food from McDonald's were found to be statistically significant moderators of the branding effect (Figure 1 and Figure 2). Frequency of eating McDonald's food indicates greater opportunities for brand exposure and prior taste experiences and potentially represents familiarity, trust of the source, safe provenance, and implicit approval by parents. Number of televisions in the home might indicate greater exposure to McDonald's advertising or be associated with other mechanisms leading to greater responsiveness to branding. Other measures related to television exposure were not statistically significant moderators, although number of televisions may be more reliably and validly measured than estimates of viewing time,¹⁸ providing more power for the analysis. Another possible marker of marketing exposure is having toys from McDonald's in the home. Lack of a significant moderator effect of this variable might reflect its very high prevalence in the sample, reducing power. Finding that frequency of eating McDonald's food was a statistically significant moderator but frequency of eating food from other fast food restaurants was not may suggest some specificity of the branding effect on taste preferences.

This was a real-world study addressing a straightforward, real-world question: do children prefer the taste of food and drinks if they think they are from McDonald's?

Instead of testing the effects of only advertising, as in past research, this study was designed to try to capture the influences of the entirety of McDonald's brand exposure, including direct and indirect marketing, that young children had already experienced by 3 to 5 years of age. This study included a number of design features to enhance the ability to draw causal inferences. It was a true experiment in which only the branding was manipulated. Pairs of food and beverage samples were taken from the same original servings and packaging was matched in color, material, shape, and design. Only basic McDonald's packaging was used with no images of Ronald McDonald or other markings that could potentially influence the children's preferences, and only previously unused packaging was used to avoid residual smells or tastes. We ensured the success of the manipulation by making sure children were aware of the branding difference for each food or drink pair. Although it is impossible to totally rule out the possibility of demand effects, we took many steps to prevent unintentional bias. For example, the RA giving instructions was not able to see the food or the child; food and drink samples were randomly ordered and positioned, also preventing order effects; and children were not given feedback about their selections. Children were given the option of saying the samples tasted the same, allowing falsification of our hypothesis. We also coded choices conservatively to favor the null hypothesis; children who did not, could

not, or would not respond were included with “taste the same” answers for analysis. We tested the null hypothesis with a single omnibus test for statistical significance to reduce the risk of type I error and checked this result excluding those children who needed to be told which sample was from McDonald’s, finding similar results. A secondary analysis for each individual food or drink found statistically significant effects in 4 of 5 comparisons, all with a majority favoring the McDonald’s branded sample (about 54%-77%) over the other 2 possible responses. Of course, a nonsignificant test result does not indicate no effect. For the fifth comparison, about 48% preferred the McDonald’s branded hamburger compared with 37% who preferred the unbranded hamburger and 15% who thought they tasted the same or were unable to answer. Together, these results demonstrate substantial homogeneity across different foods and drink. We also used nonparametric statistics for hypothesis testing, making no assumptions about the distributions of our measures.

Our findings add to past research by demonstrating that specific branding can alter young children’s taste preferences. We are unable to directly measure or manipulate total marketing (direct to the child and indirect via family, peers, and others) and/or product exposure for the entire first 3 to 5 years of life, and multiple exposures to the brand cannot be disentangled. We did not, and cannot, anticipate or test how each individual direct and indirect exposure to McDonald’s marketing, food, packaging, etc, influences a child’s perceptions but accepted these as a complex whole of both independent and interacting influences on emotions and perceptions about the brand. Children’s responses to the McDonald’s branding in the experiment, therefore, may reflect past direct and/or indirect marketing exposure as well as past experience with McDonald’s products or packaging. Notably, these branding effects were evident in our low-income, ethnically and culturally diverse, 87% nonwhite, and 38% Spanish-speaking or bilingual English-Spanish-speaking sample of 3- to 5-year-olds.

These results add evidence to support recommendations to regulate or ban advertising or marketing of high-calorie, low-nutrient foods and beverages, or all marketing, that is directed to young children. This approach has been advocated based on evidence that advertising to young children is inherently unfair because most children younger than 7 to 8 years are unable to understand the persuasive intent of advertising.¹⁹⁻²¹

Our findings also suggest a need for research on marketing in general, and branding in particular, as strategies to promote more healthful taste preferences and food and beverage choices in young children. In this experiment, children preferred the taste of carrots and milk if they thought they were from McDonald’s. This is an opportunity for heavily marketed brands to respond to rising rates of childhood obesity by changing their product offerings. However, although McDonald’s was an appropriate brand to use in this experiment, the results may not generalize to less recognizable brands or public health campaigns if they are not marketed as extensively and comprehensively.

Future research might examine the effects of less recognizable brands or contrast different brands and packaging with variable levels of recognition and natural exposure.

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Author Contributions: Dr Robinson was principal investigator of the study and had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. *Study concept and design:* Robinson, Borzekowski, Matheson, and Kraemer. *Acquisition of data:* Matheson. *Analysis and interpretation of data:* Robinson and Kraemer. *Drafting of the manuscript:* Robinson, Borzekowski, Matheson, and Kraemer. *Critical revision of the manuscript for important intellectual content:* Robinson, Borzekowski, Matheson, and Kraemer. *Statistical analysis:* Kraemer. *Obtained funding:* Robinson. *Study supervision:* Matheson.

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