

# Does Children's Screen Time Predict Requests for Advertised Products?

## Cross-sectional and Prospective Analyses

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**Objective:** To examine children's screen media exposure and requests for advertised toys and food/drinks.

**Design:** Prospective cohort study.

**Setting:** Twelve elementary schools in northern California.

**Participants:** Eight hundred twenty-seven third grade children participated at baseline; 386 students in 6 schools were followed up for 20 months.

**Intervention:** None.

**Main Outcome Measures:** Child self-reported requests for advertised toys and foods/drinks.

**Results:** At baseline, children's screen media time was significantly associated with concurrent requests for advertised toys (Spearman  $r=0.15$  [TV viewing] and  $r=0.20$  [total screen time]; both  $P<.001$ ) and foods/drinks (Spear-

man  $r=0.16$  [TV viewing] and  $r=0.18$  [total screen time]; both  $P<.001$ ). In prospective analysis, children's screen media time at baseline was significantly associated with their mean number of toy requests 7 to 20 months later (Spearman  $r=0.21$  [TV viewing] and  $r=0.24$  [total screen time]; both  $P<.001$ ) and foods/drinks requests (Spearman  $r=0.14$  [TV viewing] and  $r=0.16$  [total screen time]; both  $P<.01$ ). After adjusting for baseline requests and sociodemographic variables, the relationship between screen media exposure and future requests for advertised foods/drinks remained significant for total TV viewing and total screen media exposure. The relationship with future requests for toys remained significant for total screen media exposure.

**Conclusions:** Screen media exposure is a prospective risk factor for children's requests for advertised products. Future experimental studies on children's health- and consumer-related outcomes are warranted.

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**C**HILDREN ARE IMMERSSED IN advertising in media. A recent national survey found that the average child in the United States spends 6 and a half hours a day using media, more than any other waking-time activity, and the majority of media time is spent watching television.<sup>1</sup> In the new era of expanded media channel options, niche programming and advertising have singled out children as a targeted audience.<sup>2</sup> The average US child will see more than 40 000 television commercials a year<sup>3</sup> in addition to frequent product placements in television programs and movies.

Advertising to children is used to change their preferences for advertised products and to change their requests to parents for such items. Consistently, studies have shown that advertising influences children's preferences, choices, and requests for

advertised products.<sup>2,4-15</sup> These influences start very young. In 1 experimental trial, preschool children demonstrated preferences for foods seen in ads only briefly.<sup>12</sup> In another study, 63% of Latino preschoolers had asked for a toy seen on TV in the previous 2 weeks and 55% had made a request for advertised food or drinks.<sup>4</sup> Since parents control family budgets, child requests are important forces for family spending and may negatively impact interactions between parents and children.<sup>2,4,10</sup> In addition, in a small-scale randomized controlled trial, a screen media reduction curriculum for third and fourth graders resulted in children making fewer toy purchase requests compared with controls.<sup>16</sup>

Much of the past research exploring the effects of television advertising on children was conducted in the 1970s. Recently, this area of research has become more relevant to children's health, with evi-

dence that food advertising is playing a role in the childhood obesity epidemic.<sup>14,17</sup> As the home screen media environment, children's media use, and advertising have changed, new data are needed to explore the role of advertising in today's children's health and behaviors. Prospective studies are also needed to examine the temporal relationships between screen media exposure and potential outcomes to establish media as a risk factor for purchase requests. Therefore, in a large, ethnically and socioeconomically diverse sample, we conducted a prospective study of preadolescents' screen media exposures and their concurrent and future requests for advertised toys and foods/drinks. We hypothesized that children who reported more screen media exposure at the beginning of third grade would report more requests for advertised toys and food and drinks, both then and during the subsequent 20 months. Establishing screen media exposure as a risk factor for purchase requests would provide stronger support for further efforts to reduce screen time and/or advertising exposure as potential clinical and public health intervention strategies.

## METHODS

All third grade students from 12 public elementary schools in northern California and their parents were eligible to participate in a randomized controlled trial of obesity prevention (6 schools) and smoking prevention (6 schools). Assessments were performed by trained research staff at baseline (September-October 1999), in the spring of third grade (April-May 2000), in the fall of fourth grade (September-October, 2000), and in the spring of fourth grade, approximately 20 months after baseline (April-May 2001). At each point, children completed self-report questionnaires on 2 non-Monday weekdays. A research staff member read each question out loud. Classroom teachers did not participate in the assessments. Parents were interviewed by telephone at baseline by trained interviewers following a standardized protocol.

Tracking and confidentiality were maintained by using unique identification numbers. Parents or guardians provided passive informed consent for their children to participate in each assessment. During classroom assessments, research assistants acquired verbal assent for participation from each child. Children who declined to participate did another nonpunitive activity with their classroom teacher. Parents gave active verbal consent for their own participation in telephone interviews. The study was approved by the participating school districts and the Stanford University Panel for the Protection of Human Subjects in Medical Research (Stanford, Calif).

## MEASURES

### Demographics

Children reported their date of birth and sex. Ethnicity was obtained from school district records. Parents reported the main language spoken at home, their marital status, and the highest level of education completed by parents or guardians.

### Media Use and Home Media Environment

Children reported the time they spent "watching television," "watching movies or videos on a VCR," and "playing video games" separately for before school and after school "yester-

day" and "last Saturday" on the first assessment day and "yesterday" on the second assessment day. Prior to reading these items, the research staff led children through several participatory time-estimating exercises.<sup>18</sup> This instrument was adapted from a similar instrument previously used in young adolescents with high test-retest reliability ( $r=0.94$ ).<sup>19</sup> For purposes of this analysis, children's screen media use reports derived 4 variables: average weekday television viewing; average Saturday television viewing; total weekly TV viewing (the sum of  $5 \times$  the average weekday viewing and  $2 \times$  Saturday viewing); and weekly total screen time (the sum of  $5 \times$  average weekday TV, movies or videos, and video games use and  $2 \times$  Saturday TV, movies or videos, and video games use). Children also reported if there was a TV set in the room where they regularly slept.

### Purchase Requests

Children were asked, "In the past week, have you asked someone to buy you any foods or drinks that you have seen on TV?" and "In the past week, have you asked someone to buy you any toys that you have seen on TV?" For each question, those who responded yes were asked to write the names of up to 4 specific items they had requested and the responses were scored from 0 to 4 for analysis.

## STATISTICAL ANALYSIS

The baseline sample for cross-sectional analysis included children from all 12 schools. Because the obesity-prevention intervention included screen time reduction, only participants from the 6 schools randomly assigned to smoking prevention were included in the prospective analysis sample.

To test our hypothesis, we used nonparametric Spearman rank correlations. First, we examined baseline (fall, third grade) screen exposure variables and baseline requests first for toys and then baseline requests for foods/drinks. Then we examined the prospective sample for correlations between baseline screen exposure and the mean number of requests for toys and foods/drinks over the subsequent assessments (mean of spring third grade, fall fourth grade, and spring of fourth grade).

We performed multivariate linear regression to further examine these relationships, adjusting for covariates. First, all variables were centered<sup>20</sup> (for example, boys were coded  $+0.5$  and girls were coded  $-0.5$ ). In model 1, we regressed follow-up requests on screen media exposure, baseline requests, and their interaction. In model 2, we additionally adjusted for sex and ethnicity and all first-order, 2-way interactions. In model 3, using the subset of participants with parent interviews, we further adjusted for parent education, marital status, and language spoken at home and all first-order, 2-way interactions. Statistical significance was defined at a 2-tailed  $\alpha=0.05$ . Analysis was performed with SAS for Windows, version 9.1 (SAS Institute Inc, Cary, NC).

## RESULTS

Of 860 children enrolled in the 12 elementary schools at baseline, 836 (97%) completed surveys. Nonparticipants included 22 parent refusals, 1 child unable to participate owing to cognitive difficulties, and 1 child who was absent on all assessment days. We randomly chose 1 child for analysis from each of 9 sibling sets to avoid violating the assumption of independence, leaving a final baseline analysis sample of 827 children. Of the 827 students, 410 were enrolled in 1 of the 6 smoking-

**Table 1. Participant Characteristics at Baseline**

	Baseline Sample (12 Schools)	Prospective Sample (6 Schools)
Sample size	827	392
Boys, %	48	47
Age, y, mean (SD)	8.45 (0.38)	8.45 (0.39)
Race/ethnicity, %		
Hispanic/Latino	35	39
Filipino	27	25
White	17	15
Asian/Pacific Islander	15	13
African American	4	4
Other	2	4
Primary language spoken at home, %*		
English	72	66
Spanish	20	25
Other	8	9
Marital status, %*		
Married	74	71
Separated/divorced	17	20
Single, never married	8	9
Widowed	<1	<1
Maximum parent education level, %*		
<High school	8	10
High school graduate or GED	23	23
Some college/technical school	33	31
4-year college graduate	28	29
Some/graduate degree	8	7
Screen media use, h, mean (SD)		
Weekly TV exposure	10.8 (10.8)	11.3 (11.2)
Average weekday TV exposure	1.6 (1.7)	1.7 (1.8)
Saturday TV exposure	1.4 (1.8)	1.4 (1.8)
Weekly total screen time	22.8 (24.7)	24 (26)
TV in child's bedroom, %	70	70
Children's purchase requests, mean (SD)		
No. of toy requests per week	0.95 (1.29)	1.15 (1.41)
No. of food requests per week	0.61 (1.14)	0.77 (1.29)

Abbreviation: GED, general equivalency diploma; TV, television.

\*From parent survey data, N = 684 to 691 (baseline sample), N = 315 to 320 owing to missing data.

prevention schools. Of the 410 students, there were 14 parent refusals, 2 child refusals, 2 children were unable to complete the surveys, 1 child was absent, and 5 children from sibling sets were removed, which resulted in a potential prospective sample of 386 students. There were an additional 39 children with no follow-up data: 22 children had moved and 17 parents refused participation, leaving 347. Overall, 347 (85%) of 410 students in the 6 smoking-prevention schools participated in at least 1 follow-up assessment and were included in the final prospective analysis sample. Two hundred ninety (84%) of these children also had complete parent interview data for parent education, marital status, and the language spoken at home and were included in the model 3 analysis sample.

Characteristics of the baseline and prospective analysis samples are presented in **Table 1**. The sample was ethnically and sociodemographically diverse. Children reported watching more than 10 hours of TV and more than 22 hours of total screen time per week. Children reported making nearly 1 request per week for toys and more than 1 request every 2 weeks for food/drinks. The

**Table 2. Cross-sectional Association Between Screen Media Exposure and Requests for Toys and Food/Drinks\***

	Toy Requests	Food/Drink Requests
Weekly TV exposure	0.15†	0.16†
Weekday TV exposure	0.16†	0.17†
Saturday TV exposure	0.10‡	0.09§
Weekly total screen time	0.20†	0.18†

\*Values are expressed as nonparametric Spearman rank correlation coefficients.

† $P < .001$ .

‡ $P < .01$ .

§ $P < .05$ .

**Table 3. Prospective Association Between Baseline Screen Media Exposure and Subsequent Requests for Toys and Foods/Drinks\***

	Toy Requests	Food/Drink Requests
Weekly TV exposure	0.21†	0.13‡
Weekday TV exposure	0.19†	0.15§
Saturday TV exposure	0.19†	0.06
Weekly total screen time	0.22†	0.16§

\*Values are expressed as nonparametric Spearman rank correlation coefficients.

† $P < .001$ .

‡ $P < .05$ .

§ $P < .01$ .

smaller prospective sample with complete parent data for model 3 was nearly identical to the full prospective sample for all variables.

Spearman rank correlation coefficients between baseline screen exposure variables and baseline requests for toys and food/drinks are reported in **Table 2**. All correlations were statistically significant (range, 0.09-0.20), confirming the hypothesis that screen exposure is cross-sectionally related to children's requests for advertised products.

To test whether the amount of screen media exposure is a prospective risk factor for future requests for toys or food/drinks, we examined Spearman correlations between baseline screen media exposure and the average toy and food/drink requests at 7, 12, and 20 months (**Table 3**). All screen media exposure variables were significantly associated with the mean of future requests for toys ( $r = 0.19$ - $0.24$ ) and weekly TV viewing; weekday TV viewing and weekly total screen viewing time were significantly associated with the frequency of future requests for food/drinks ( $r = 0.14$ - $0.16$ ), confirming the hypothesis that screen exposure is related to subsequent requests for advertised products. Having a TV in the bedroom was not significantly correlated with requests for advertised products cross-sectionally at baseline or prospectively ( $r = 0.5$ - $0.6$ ).

As a secondary analysis, we further examined these prospective relationships, adjusting for demographic factors using multivariate linear regression (**Table 4**). After adjusting for baseline requests for toys (model 1),

**Table 4. Relationships of Baseline Media Exposure and Future Requests for Advertised Toys and Foods and Drinks Adjusting for Demographic Variables\***

	No. of Toy Requests		No. of Food/Drink Requests	
	Parameter (SE)	P Value	Parameter (SE)	P Value
<b>Model 1</b>				
Weekly TV exposure	0.005 (0.031)	.88	0.011 (0.004)	.005
Weekday TV exposure	0.048 (0.031)	.12	0.066 (0.024)	.006
Saturday TV exposure	0.006 (0.005)	.20	0.044 (0.023)	.053
Weekly total screen time	0.008 (0.002)	.001	0.006 (0.002)	<.001
<b>Model 2</b>				
Weekly TV exposure	0.009 (0.036)	.80	0.019 (0.005)	<.001
Weekday TV exposure	0.074 (0.047)	.06	0.103 (0.030)	<.001
Saturday TV exposure	0.010 (0.006)	.11	0.079 (0.026)	.002
Weekly total screen time	0.010 (0.003)	.002	0.011 (0.002)	<.001
<b>Model 3</b>				
Weekly TV exposure	0.008 (0.063)	.90	0.022 (0.007)	.001
Weekday TV exposure	0.068 (0.056)	.22	0.134 (0.042)	.002
Saturday TV exposure	0.008 (0.009)	.40	0.100 (0.046)	.03
Weekly total screen time	0.012 (0.004)	.004	0.010 (0.003)	.003

\*Model 1 adjusts for baseline level of requests made for toys and foods/drinks and their interaction with media exposure. Model 2 adjusts for baseline level of requests made for toys and foods/drinks, sex, ethnicity, and all first-order, 2-way interactions between variables. Model 3 adjusts for baseline level of requests made for toys and foods/drinks, parental education (ordinal), marital status (married/not married), language spoken in the home (English/other), and all first-order, 2-way interactions between variables.

weekly total screen time was significantly associated with future toy requests. This result was consistent when further adjusting for ethnicity/race and sex (model 2) and parent education, marital status, and language spoken at home (model 3).

Television viewing exposure variables alone were not statistically significantly related to future requests for toys. For food/drink requests, baseline hours of weekly TV viewing, weekday TV viewing, and weekly total screen time remained significantly associated with future food/drink requests after adjusting for baseline food requests (model 1), and all screen time exposure variables were significantly related to future food/drink requests after adjusting for ethnicity/race and sex (model 2) and parent education, marital status, and language spoken at home (model 3). As in the bivariate analyses, a TV in the bedroom was not significantly correlated with requests for advertised products.

#### COMMENT

We hypothesized that in a racially/ethnically and socio-demographically diverse sample of third and fourth grade public school children those who report more screen media exposure at the beginning of third grade would report more requests for advertised toys and food and drinks, both concurrently at baseline and subsequently, through the end of fourth grade. Our findings confirmed our hypothesis. Past research provided evidence that advertising exposure influences children's concurrent or immediate preferences, choices, and requests.<sup>4-9,11-13,15,16,21</sup> Our findings confirm those past findings, using contemporary data from a more diverse sample, and extend them by following up children prospectively. Our prospective findings demonstrate that baseline screen media exposure predicts future requests for advertised toys and

foods/drinks. In this prospective study, the screen media exposure was antecedent to the outcome of requests; therefore, we are able to define media exposure as a true risk factor<sup>22,23</sup> for future requests for toys and food/drinks.

In our sociodemographically diverse sample, we found that third graders reported an average of nearly 11 hours per week of TV watching and nearly 23 hours per week of total screen media use. The media consumption was similar<sup>24</sup> to less<sup>25</sup> than other reports in the literature. They also reported requesting an average of about 1 advertised toy per week and 2 foods or drinks every 3 weeks, which is consistent with the literature.<sup>4</sup> Our primary prospective analysis demonstrated that TV and other screen media exposure are true risk factors for future requests for advertised products. In multivariate analysis, we also explored these relationships adjusted for baseline requests and sociodemographic factors. Only the relationship between the hours of Saturday TV viewing and requests for advertised foods or drinks became nonsignificant in prospective analysis, although the magnitude of the correlation was about the same. The relationships between screen media exposure and future food/drink requests remained statistically significant in the multivariate analysis. These results indicated that, even after adjustment for baseline product requests and demographic variables, an extra 1 hour per day in total weekly TV viewing at baseline was associated with an average extra request for an advertised food/drink about every 6 to 13 weeks (0.08-0.15 requests per week) 7 to 20 weeks later, and an extra 1 hour per day of total screen media exposure was associated with an average extra request for an advertised food/drink about every 13 to 24 weeks (0.08-0.04 requests per week) 7 to 20 months later. Because our media time self-reports are slightly lower than other reported samples, it is possible that these effects

would be even larger if examined in other samples reporting greater exposure, making these results even more compelling.

When adjusting for baseline toy requests and demographic variables, however, only baseline total screen media exposure continued to be statistically significantly related to future toy requests. An extra hour per day of total screen media exposure at baseline was associated with an average extra request for an advertised toy about every 12 to 18 weeks (0.06-0.08 requests per week) 7 to 20 months later.

For both the toy and food/drink multivariate analysis, we did not find any consistent evidence of significant differences by sex, race/ethnicity, parent education, marital status, or language spoken in the home. In addition, we found no evidence for baseline requests or demographic variables as significant moderators of the associations between baseline screen exposure and subsequent requests for toys.

Although both toy and food/drink requests were significantly predicted by TV viewing and total screen media exposure more than 6 months earlier, it is interesting to speculate on potential reasons for the difference between toy and food/drink requests in the multivariate analysis. First, it is possible that excessive power was lost because of the addition of variables that may not have sufficiently added to the fit of the models. Additional power was sacrificed by using a smaller sample in model 3 because it required complete parent survey data. It is also possible that advertising trends and preferences for toys are more transient or seasonal than those for food/drinks. If individual toy popularity and toy advertising change more frequently with time and age, the link between TV exposure at 1 point and requests for toys more than 6 months later may be weaker. The media variable that did remain statistically significant, total screen media exposure, included video game, movie, videotape, and DVD use in addition to TV. More total screen media time might also produce greater overall exposure to marketing for toy products, thus creating a more durable and sustained level of requests. Alternatively, this group of children who use greater amounts of multiple forms of screen media may represent a subset within our population more heavily geared to consumerism and/or whose families are more likely to respond positively to such requests, themselves leading to additional subsequent requests.

It is always possible that the lack of association in toy requests could be influenced by biased sampling, in which there was a differential in sampling between those predisposed to the effects of toy advertising vs food/drink advertising. However, we had data for 85% of the eligible population-based sample and there were no significant differences in age, sex, marital status, language spoken at home, or educational level of parents for those with and without complete data. Therefore, we believe that sample bias is an unlikely explanation.

A limitation of our study is that we assessed screen media exposure as a proxy for advertising exposure and not advertising directly. It would be methodologically difficult to measure actual exposure and attention to advertising in a population-based study. In a study where

consumerism is the outcome of interest, it would be ideal to assess and catalog advertising as direct or product placement on TV, video games, movie, videotape, and DVD in movies. However, from a practical standpoint and in the current policy environment, the easiest way for parents to reduce exposure to screen advertising is to reduce screen time. Therefore, we believe that assessing total screen time was the most reasonable method for drawing relevant practical and policy conclusions. In addition, this study does not take into consideration that new requests may have displaced requests for similar products; however, in analyzing requests over time it is clear that overall requests increased. Despite its limitations, the current study does document that screen media exposure is a true prospective risk factor for subsequent consumeristic behavior, adding to the evidence supporting behavioral and policy interventions to reduce children's exposure to screen media and advertising, whether implemented at the individual family level, institutional level, or the population level through legislation and changes in social norms.

One compelling reason to study the effects of media and advertising on children is to further explore their role in the current obesity epidemic.<sup>14</sup> Advertising and consumerism have been identified as potential targets for both individual and population-based strategies to prevent obesity.<sup>2,26</sup> A causal relationship has been established between children's exposure to food advertisements and food choice<sup>15</sup> and a school-based intervention to reduce screen time resulted in reduced toy requests.<sup>16</sup> Investigators in Australia found that overweight children were more susceptible to food advertising than their lean counterparts.<sup>11</sup> Our study contributes support that reducing children's exposure to screen media may reduce their requests for advertised foods and drinks, which are predominantly high in calories and low in nutritional density.<sup>14</sup>

Potential policy actions should be grounded in empirically derived evidence. Further prospective studies could be designed to further establish advertising directed at children as a risk factor for obesity and consumerism and help identify biological, psychological, and/or social factors that may moderate an individual's susceptibility to advertising and marketing messages and/or mediate their effects on behavioral and physiological outcomes. The finding that screen media exposure is a true risk factor for subsequent requests for advertised products provides rationale for studies examining the effects of individual- and population-level interventions to reduce screen media exposure in general, and advertising in particular, for their impacts on child health.

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“When is the ideal time for us to have another baby?” a mother will ask.

“Ideal for whom?” I generally reply.

“Well, I'd like him to want the baby—and to see it as his.”

This is wishful thinking. No first child ever wants the invasion of a second child. Parents should decide for themselves when they feel they can handle another.

—From *Touchpoints* by T. Berry Brazelton, 2004