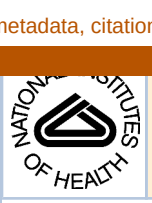

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TV Use and Snacking Behaviors Among Children and Adolescents in China

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Abstract

Purpose—Television (TV) use has been linked with poor eating behaviors and obesity in young people. This study examines the association between TV watching and paying attention to TV commercials with buying and requesting snacks seen on commercials, and eating snacks while watching TV among youth in China.

Methods—Data from 1,552 participants (ages 6–17.99) in the 2004 China Health and Nutrition Survey (CHNS) were analyzed cross-sectionally. The CHNS is conducted in nine Chinese provinces.

Results—Most respondents (92.2%) reported watching TV; on average children (6–11.99 years old) and adolescents (12–17.99 years old) watched 9–10 hours per week. Nearly half (49.7%) of all the respondents said they “sometimes” or “often” paid attention to TV commercials. Respondents who reported paying attention to commercials had higher odds of requesting snacks (OR = 3.42; 95% CI = 2.55–4.60) and buying snacks (OR = 2.73; 95% CI = 2.17–3.43) seen on TV, and eating snacks while watching TV (OR = 1.60; 95% CI = 1.23–2.07) than those who did not pay attention. Frequency of watching TV was not significantly related to snacking, however.

Conclusion—Attention to TV commercials for snack foods may be one of the factors affecting the increase in obesity among children and adolescents in China.

Keywords

China; children; adolescents; television; TV; snacking; nutrition; commercials

Introduction

The World Health Organization [WHO; 1] indicates that high-calorie foods, drinks, and snacks permeate advertising aimed at children worldwide. WHO [1] recommends that such food marketing be reduced to prevent poor nutrition habits and future obesity. Television (TV) in general has also come under more scrutiny as a potential cause of increased obesity in children and adolescents [2]. TV use has been linked to increased consumption of high-calorie snack foods [3] and low physical activity [4] among children in the United States. We aimed to explore whether similar associations between TV use and snacking behaviors exist among children and

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adolescents in China, a country where access to Westernized TV programming and food advertising has been increasing since its reform in 1978, and especially over the last decade [5].

In China, few studies have considered the influence of TV on snacking behaviors. In 1997, according to a survey of nearly 3,875 households in nine urban and rural provinces in China, few had access to modern TV programming [6]. The youth (ages 6–18) surveyed watched less than an hour of TV per day on average, and fewer than 10% watched two or more hours a day [7]. In 1999, however, McNeal and Ji [8] reported that urban Chinese children spent 17.2 hours a week—1.7 hours on weekdays, and more than 8 hours on weekends—watching TV. Although it is possible that the large discrepancy in TV exposure between these studies is in part a reflection of methodological differences—the first study included both urban and rural children from multiple provinces, and the latter included only those from Beijing—the patterns suggest that TV use, especially among urban young people in China, is increasing.

Ji and McNeal [9] compared the content of Chinese and American commercials targeted at children, and found that ads for food products, including soft drinks and salty chips, constitute more than 80% of commercials in China compared to about 30% in the United States. In 2004, food and drink were the most commonly advertised products (to all audiences) in China [10]. According to mothers surveyed in urban areas in China, many children as young as age four have their own spending money, and children often use this money to buy snack food and beverages [11]. Chinese children report using TV as a main source of information about snacks [8], and Chinese parents report that their children influence their purchases, especially of snack foods [11].

Some research suggests that snacking might mediate the relationship between TV use and overweight/obesity [12], and it is possible that this relationship could be one of the precursors to growing obesity rates in China. Snacking has been increasing among people of all ages in China, but children are snacking more than adults [13]. In a study of nearly 1,800 adolescents in Xi'an City, China, 19.9% were overweight or obese, and those who reported drinking soft drinks one to four times per week (n = 934) had increased odds of being overweight or obese [14]. Another study indicated that as of 2004, 11.4% of children ages 10–18 in China were overweight or obese. The rate of child overweight and obesity had more than doubled since 1991, increasing faster than the rate of adult overweight [15].

Several theories help to explain the hypothesized relationship between TV and commercial exposure and snacking. McGuire [16] theorizes that paying attention to messages is most important in persuasion, suggesting that attention to TV ads about snacks, sugar beverages, and other food products would strengthen the persuasive impact of those ads, thereby increasing children's likelihood to want and/or consume those products. TV exposure alone might also play a role in the relationship between TV use and snacking behaviors. Schechter's [17] theory of external eating holds that people who are affected by food cues in the environment will be more likely to eat when exposed to those food cues whether or not they are truly hungry. Food products seen on TV programming and commercials provide comparable food cues to children, and thus, snacking, particularly while watching TV, might increase in response to exposure to these kinds of food cues [3].

Given that TV is expanding rapidly into Chinese households, that TV advertising in China increasingly promotes high-calorie foods, and that Chinese youth exert consumer power, it is important to explore how increased TV viewing is related to nutrition behaviors and health status of children in China. We hypothesized that Chinese children and adolescents who watched more hours of TV and/or who paid attention to TV commercials would be more likely

to request advertised snacks from their parents, buy snacks seen on TV, and eat snacks while watching TV than those who watched less TV or paid less attention to commercials.

Methods

The longitudinal China Health and Nutrition Survey (CHNS) has been conducted since 1989 in nine of the 23 Chinese provinces (Guangxi, Guizhou, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Liaoning, Shandong), which agreed to participate in the study and which vary substantially in geography, economic development, public resources, and health indicators. Data from the 2004 CHNS survey were used to test the hypotheses in this cross-sectional study.

Sample

A multistage, random-cluster process was used to draw the sample surveyed in each of the provinces. Counties in these provinces were initially stratified by income, and a weighted sampling scheme was used to randomly select four counties in each province. In each county, the township capital was selected, and three villages were chosen randomly. Each provincial capital and a lower income city from each province were selected [18]. Twenty (20) households were randomly selected in each community, and every household member was interviewed.

In 2004, 2,324 children under 18 years old in 1,821 households were surveyed using the CHNS Child Questionnaire. Participants outside the age range of 6–17.99 were excluded (n = 596, 26% of the original sample) from the analyses reported here. Cases (n = 176, 10% of the eligible sample) with missing values on the primary variables of interest were also removed from the data set before analysis began. The final sample included 1,552 participants from 1,295 households. Data were collected from participants during face-to-face interviews with trained interviewers. The University of North Carolina Institutional Review Board and the Chinese Centers for Disease Control and Prevention reviewed and approved the procedures used for data collection in the CHNS.

Measures

TV watching—Children reported their average daily hours spent watching TV during the week (Monday–Friday) and on weekends (Saturday–Sunday). These hours were combined to create a continuous measure of total TV hours per week. This measure was also divided into tertiles: low (fewer than six hours), medium (between 6–10.99 hours), and high (11 or more hours per week). Although there is not yet a gold-standard for measuring exposure to media like TV [19], similar methods for obtaining information on TV watching hours among youth, and for creating ordinal measures of exposure have been used in studies in the United States and other countries [e.g., 2,12,20–22].

Attention to TV commercials—Respondents reported the frequency (“never,” “sometimes,” “often”) with which they paid attention to TV commercials. Since few children (4.1%) reported “often” paying attention to commercials, “sometimes” and “often” responses were combined to create a dichotomous measure of paying attention to TV commercials (0 = no, 1 = yes). Slater and Rasinski [23] used a similar measure of attention in a U.S. study of the effects of advertising.

Snacking behaviors—Respondents also reported the frequency (“never,” “sometimes,” “often”) with which they (1) ask their parents to buy food or drinks seen on TV commercials, (2) buy these products for themselves, and (3) eat snacks while watching TV. Others have used similar measures in U.S. studies of media use and advertising with elementary school children, although the wording of the questions and/or response option frequency scales was somewhat different [12,21]. “Sometimes” and “often” were again combined to create a dichotomous

measure (0 = no, 1 = yes) for each of these snacking measures (1.6% reported requesting snacks "often," 1.2% reported buying snacks "often," and 5.9% reported eating snacks "often").

Socio-demographic characteristics—Data on age, income, and gender were collected. Both the Western and Chinese calendars were used when collecting age data, and the traditional Chinese dates were later converted into Western dates. Age was calculated in years to the nearest two decimal points, and child (6–11.99 years) and adolescent (12–17.99 years) age groups were created. These age groups are defined by the Institute of Medicine (IOM), consumer socialization models, and cognitive development theory as potentially different in information processing styles and nutrition behavior [11,24–25]. Participants in both age groups responded to the same survey questions (adults completed different questionnaires).

Household income score was deflated by the consumer price index to Chinese currency (measured in 1988 Yuan), and split into low, medium, and high tertiles. Income was included in this analysis because previous studies in the United States and China have indicated that income is associated with TV viewing among youth [26], TV use during meals [3], and other eating behavior [13].

Data analysis

Linear regression was used to compare mean TV watching hours among different demographic groups. Pearson Chi-square tests were performed to examine the relationships between demographic variables and TV use (tertiles) with snacking behaviors. Finally, to determine if the relationships between TV use and snacking behaviors remained after holding the demographic variables constant, exponentiated effect parameters and 95% confidence intervals (CI) for each outcome variable were calculated using binary logistic regression. Demographic characteristics, TV watching (continuous measure), attention to TV commercials, and significant interactions of TV use and demographic simple main effects were included in the final regression models for each outcome variable. To accommodate the survey design, all statistical tests were conducted using survey commands in STATA/SE 10 (StataCorp LP, College Station, TX). An alpha level of 0.05 was used for all statistical tests.

Results

Descriptive statistics for the demographic variables and TV use are presented in Table 1. Nearly 44% of participants were children, 56% were adolescents; 47% were female, and 40% were low-income. Most respondents (92.2%) reported watching TV. Children on average reported watching more than 10 hours per week (M = 10.29 hrs, SE = 0.39), while adolescents reported watching slightly fewer hours (M = 9.85 hrs, SE = 0.39). Linear regression results showed that this age group difference in TV watching hours was not statistically significant, and neither were gender (male: M = 10.09 hrs, SE = 0.41; female: M = 9.99 hrs, SE = 0.41) or residential (rural: M = 10.26 hrs, SE = 0.41; urban: M = 9.48 hrs, SE = 0.39) differences. However, the average number of hours spent watching TV differed significantly between low-income respondents (M = 10.59 hrs, SE = 0.48) and high-income respondents (M = 8.81 hrs, SE = 0.41), $F(2, 44) = 6.53$, $p < .01$. Nearly half (49.7%) of all the respondents said they "sometimes" or "often" paid attention to TV commercials. More than half (52.4%) of all respondents reported eating snacks while watching TV, while 22.8% said they requested snacks seen on TV commercials from parents, and 36.7% bought such snacks for themselves.

Table 2 shows the relationships between each of the snacking measures and TV use. Bivariate analysis indicated that the frequency of TV watching (ordinal measure) was not significantly related to requesting or buying snacks seen on TV commercials, or eating snacks while watching TV. Paying attention to TV commercials was significantly related to all categories of snacking behaviors, however, indicating that respondents who reported paying attention to

TV commercials tended to request ($\chi^2(1, N = 346) = 98.96$, $p < .001$) and buy (χ^2 $(1, N = 557) = 83.44$, $p < .001$) snacks seen on TV commercials, and eat snacks while watching TV ($\chi^2(1, N = 795) = 22.56$, $p < .001$) more than children who did not pay attention to commercials (35.1% vs. 13.5%, 49.7% vs. 26.9%, and 59.4% vs. 47.1%, respectively).

Demographic factors were related to snacking as well (Table 2). Adolescents reported buying snacks seen on TV commercials more often than children (41.5% vs. 30.5%; $\chi^2(1, N = 558) = 19.38$, $p < .001$), while children requested snacks seen on TV from their parents more than adolescents did (29.6% vs. 17.5%; $\chi^2(1, N = 346) = 31.25$, $p < .001$). Females tended to eat snacks while watching TV more often than males. Lastly, respondents in higher-income households were more likely than those in lower-income households to engage in all three snacking behaviors.

Binomial logistic regression analyses (Table 3) show the relationship between TV use and snacking behaviors while holding other factors constant. Paying attention to TV commercials was related to snacking behaviors after other variables were introduced. The odds of requesting snacks seen on TV were 3.42 (95% CI = 2.55–4.60) times higher among respondents who said they paid attention to TV commercials than those who did not. Respondents who paid attention to TV commercials also had higher odds of buying (OR = 2.73; 95% CI = 2.17–3.43) snacks seen on TV commercials, and eating snacks while watching TV (OR = 1.60; 95% CI = 1.23–2.07). The frequency of TV watching (continuous measure), however, was not significantly related to any of the snacking behaviors after other variables were entered.

Other main effects showed that adolescents had higher odds than younger children of buying snacks seen on TV, and lower odds of requesting snacks from parents or eating snacks while watching TV. Females had higher odds than males of eating snacks while watching TV, and children and adolescents from medium- and high-income households were more likely than those from low-income households to request and buy snacks seen on TV commercials, and to eat snacks while watching TV. Interactions between these demographic factors and TV use (paying attention to TV commercials or TV watching) were not significantly associated with any of the snacking behaviors.

Discussion

Analyses confirmed the hypothesis that Chinese children and adolescents who pay more attention to TV commercials are more likely than those who pay less attention to request, purchase, and consume snacks they see advertised on TV. Counter to the hypothesis, however, sheer amount of time spent watching TV was not related to more snacking, snacking requests, or purchases.

It is surprising that the frequency of watching TV was not significantly associated with any of the snacking behaviors, given that other studies have found such a relationship [e.g., 12,22]. The lack of a significant relationship between snacking and TV watching versus the presence of a significant relationship between snacking and attention to TV commercials may suggest that a measure of attention is a better indicator of exposure to food cues on TV than is the overall amount of time spent with TV. The results related to attention parallel McGuire's persuasion framework [16] because it appears that Chinese viewers who paid attention to TV commercials were more persuaded to engage in the promoted snacking behaviors than those who did not pay attention to TV commercials.

Several interpretations of the associations between demographic factors and snacking behaviors are feasible. Adolescents were more likely than children to report buying snacks seen on TV commercials, but less likely to request snacks. Youth in China also have more individual spending power as they get older, and Chinese adolescents (above age 11) tend to

make more independent purchases than children, so they may not need to make as many requests of their parents [11]. Respondents in low-income households spent significantly more hours watching TV than did high-income respondents, which is similar to patterns found in the United States and Europe [28–9]. However, those with higher incomes tended to request and buy snacks seen on TV more than did those with lower incomes. Using 1991 and 2004 waves of the CHNS data, Wang et al. [13] also found that people in China with higher incomes were more likely to snack than their lower-income counterparts.

One limitation of this study is that the primary measures of TV use and TV-related snacking behaviors are self-reported, and the measures have not yet been tested for test-retest reliability and predictive validity, so the associations reported here should be approached with some caution. Gold-standard methods for measuring media exposure have not been established in the United States or elsewhere [19]. Children's attention to TV commercials has sometimes been measured in experimental studies in which children are purposefully exposed to specific ads [e.g., 30], or investigators directly observe children's TV use and exposure to TV ads [31]. Self-report measures of TV use are typical in surveys assessing TV effects even with children [19]. Still, the youngest children in this sample might not have been able to accurately report their own TV use and snacking habits. Robinson [21], however, reported moderate correlations between parents' reports of their child's media use and the child's self-report, suggesting that children may be able to report their own media use at least as well as parents do. Further development of more precise measures that fit the TV viewing and eating environments in China is warranted.

This study also did not examine the relationship of parent weight and children's snacking behaviors. In a U.S. study, parental weight status moderated the effects of TV viewing and snacking on girls' weight [32]. Eating patterns during meals in front of the TV have also been found in the United States to contribute to increased caloric intake, and consumption of sugar beverages and foods similar to snacks [3,33–34]. These factors warrant further research in Chinese youth populations.

It is important to emphasize that the cross-sectional data analyzed here restricts conclusions about a causal relationship between TV use and snacking behaviors among youth. The associations found here could suggest that attention to food ads leads to increased snacking, but the opposite sequence is plausible as well—increased snacking could result in more attention to the ads that promote the snacks consumed most frequently. Other factors might also contribute to both attention and snacking, such as lack of alternative activities.

Finally, while we hypothesize that obesity is a distal outcome connected to the association between TV use and snacking behaviors among Chinese youth, these initial analyses do not address the extent to which TV-related snacking behaviors result in obesity among child viewers. In 1997, few children in China watched more than one hour of TV per day, and Waller, Du, and Popkin [6] did not find significant differences in TV (and video) use and snacking behaviors among overweight and normal weight Chinese children. Our study shows that by 2004, daily TV watching by youth in China had increased to about 1.4 hours per day, and others have reported even higher estimates [8]. Thus, the influence of TV on overweight/obesity might also be increasing and should be measured over time. We also did not test obesity as a confounder in the regression models because we hypothesize that it is a dependent variable coming after TV use and snacking behaviors, rather than a confounder influencing both TV use and snacking.

This analysis constitutes one of the first large-scale studies of the relationship between TV use and snacking behaviors among children and adolescents in China, and our results indicate that TV use, specifically paying attention to TV commercials, does have a significant association

with buying, requesting, and consuming snacks among Chinese youth. The pathway between TV use and snacking might be one of the catalysts in the already steepening trajectory of obesity in China. Longitudinal studies that are able to track nutrition behaviors, as well as physical activity and obesity trends, alongside the growth of TV use in China are warranted.

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Table 1

Descriptive statistics by age of respondents

	Children[a] (n = 677)		Adolescents[b] (n = 875)	
TV watching				
Yes (n, %)	639	94.4%	792	90.5%
No (n, %)[c]	38	5.6	83	9.5
Weekday hrs (Mean, SE)	6.13	0.29	5.86	0.31
Weekend hrs (Mean, SE)	4.19	0.14	4.10	0.16
Full week hrs (Mean, SE)	10.29	0.39	9.85	0.39
Low (n, %)	158	23.3%	337	38.5%
Medium (n, %)	263	38.8	258	29.5
High (n, %)	256	37.8	280	32.0
Attention to TV commercials[d]				
Yes (n, %)	292	44.2%	360	42.0%
No (n, %)	369	55.8	498	58.0
Age (Mean, SE)	9.15	0.09	14.90	0.06
Gender				
Male (n, %)	361	53.3%	467	53.4%
Female (n, %)	316	46.7	408	46.6
Residence				
Urban (n, %)	172	25.4%	261	29.8%
Rural (n, %)	505	74.6	614	70.2
Income (Mean, SE)	9,181.07	450.59	9,091.33	480.95
Low (n, %)	277	40.9%	335	38.3%
Medium (n, %)	221	32.6	303	34.6
High (n, %)	179	26.4	237	27.1

SE = Standard Error

[a] Children were 6–11.99 years old;

[b] Adolescents were 12–17.99 years old.

[c] Respondents who reported watching no TV were counted as watching zero (0) TV hours in other TV hours calculations.

[d] Some respondents who reported watching no TV did not provide information on their attention to TV commercials (n=33), and thus, were not included in calculations of attention to TV commercials.

Table 2

Snacking behaviors by demographics and TV use

Independent variables		Snacking Behaviors					
		Requests snacks seen on TV commercials		Buys snacks seen on TV commercials		Eats snacks while watching TV	
	N	%	χ^2 (*df*)	%	χ^2 (*df*)	%	χ^2 (*df*)
TV watching							
Low	463	21.4	1.02(2)	38.2	2.56(2)	47.7	5.83(2)
Medium	521	22.6		34.0		53.9	
High	536	24.1		38.1		54.9	
Attention to TV commercials							
No	652	13.5	98.96(1)***	26.9	83.44(1)***	47.1	22.56(1)***
Yes	867	35.1		49.7		59.4	
Age							
Child	662	29.6	31.25(1)***	30.5	19.38(1)**	57.7	13.38(1)**
Adolescent	858	17.5		41.5		48.3	
Gender							
Male	817	22.3	0.24(1)	37.1	0.11 (1)	49.3	6.55(1)**
Female	703	23.3		36.3		55.9	
Income							
Low	585	14.0	44.26(2)***	28.9	28.36(2)***	43.4	37.79(2)***
Medium	520	26.2		39.0		54.0	
High	415	30.8		44.8		62.9	

Percentage shown is within the independent variable.

* $p \leq .05$;

** $p \leq .01$;

*** $p \leq .001$

Table 3

Logistic regression models of snacking behaviors by demographics and TV use (N=1,519)

Independent variables	Requests snacks seen on TV commercials	Buys snacks seen on TV commercials	Eats snacks while watching TV
	Exponentiated effect parameters (95% CI)	Exponentiated effect parameters (95% CI)	Exponentiated effect parameters (95% CI)
TV watching hours	1.00(0.98–1.02)	1.01(0.99–1.02)	1.01(1.00–1.02)
Attention to TV commercials			
No	1.00	1.00	1.00
Yes	3.42 (2.55–4.60)***	2.73 (2.17–3.43)***	1.60 (1.23–2.07)***
Age group			
Children	1.00	1.00	1.00
Adolescents	0.48 (0.34–0.69)***	1.72 (1.30–2.28)***	0.67 (0.51–0.88)**
Gender			
Male	1.00	1.00	1.00
Female	1.14 (0.88–1.47)	0.99 (0.80–1.24)	1.37 (1.10–1.72)**
Income			
Low	1.00	1.00	1.00
Medium	2.26 (1.60–3.19)***	1.57 (1.15–2.14)**	1.60 (1.23–2.08)**
High	2.70 (1.82–3.99)***	1.98 (1.39–2.81)***	2.28 (1.70–3.06)***
Model F ($df1$, $df2$)	18.57 (6, 40)***	23.46 (6, 40)***	8.78 (6, 40)***

† Reference category

†† Odds ratios for interactions are presented in the narrative. NS = Not significant in the full model

* $p \leq .05$;

** $p \leq .01$;

*** $p \leq .001$