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Nutrition

The Association of Television Viewing With Snacking Behavior and Body Weight of Young Adults

Maria Thomson, MSc; John C. Spence, PhD; Kim Raine, PhD, RD; Lory Laing, PhD

Abstract

Purpose. Investigate whether TV viewing and recognition of snack food advertisements were associated with snack food consumption and the odds of being overweight or obese.

Design. Cross-sectional internet-based survey.

Setting. University of Alberta, Edmonton, Canada.

Subjects. Undergraduate university students aged 18 to 25 years ($N = 613$).

Measures. Self-reported TV viewing, energy-dense snack consumption, snacking while viewing TV, and body weight.

Analysis. Hypothesis testing was completed using multiple analysis of variance, analysis of covariance, and logistic regression.

Results. Students reporting medium or high TV viewership snacked more frequently while watching TV and recognized more advertising than students who were considered low viewers. High viewers also reported more consumption of energy-dense snacks than low viewers. Snacking frequency appeared to be related to TV viewing and place of residence, but the association between snacking frequency and TV viewing was not accounted for by advertising. Conversely, the association between TV viewing and consumption of energy-dense snacks was accounted for by advertising recognition. Finally, male students (odds ratio [OR], 2.78; 99% confidence interval [CI], 1.68–4.59) and medium (OR, 3.11; 99% CI, 1.37–7.08) and high (OR, 5.47; 99% CI, 1.97–15.16) TV viewers had higher odds of being overweight or obese.

Conclusions. Associations were found among TV viewing, energy-dense snack consumption, and snacking behavior, and between TV viewing and body weight status. (*Am J Health Promot* 2008;22[5]:329–335.)

Key Words: Diet, Advertising, Television, Food Habits, Obesity, Prevention Research. Manuscript format: research; Research purpose: modeling/relationship testing; Study design: nonexperimental; Outcome measure: behavioral, biometric; Setting: home, school; Health focus: nutrition; Strategy: skill building/behavior change; Target population: youth, adults; Target population circumstances: education/income level

PURPOSE

The past few decades have witnessed population-level changes in dietary intake trends in North America.¹ People are increasingly eating more food away from home,¹ consuming more soft drinks,^{2,3} and snacking more often.^{4,5} Since 1977, the average number of snacks consumed in the United States has increased significantly by approximately 24% to 32%.⁶ Although the energy density of snacks has remained virtually unchanged, the sheer number of snacks consumed has increased. Snacks currently contribute an estimated 25% of dietary energy and as much as one-fifth of other dietary nutrients.⁶ Although fat intake has decreased for all age groups in the United States, the absolute and relative proportion of fat from snacks has increased throughout the same period.⁶ Thus, for many, snacking is becoming an important dietary component and may be a factor in the increasing prevalence of overweight and obesity among North Americans.^{2,7,8}

Changing population diet trends have been accompanied by changes in food advertising practices. Although there are many media avenues through which food messages are conveyed, TV still receives the most attention and highest advertising budgets from food companies.⁹ Content analyses show that although the average time allotment for TV commercials has not changed, the average commercial length has decreased, in effect doubling the number of product exposures.^{10,11} At the same time, the food marketing industry has increased and

Maria Thomson, MSc, is with the Department of Health Studies and Gerontology, University of Waterloo, Waterloo, Canada. John C. Spence, PhD, is with the Faculty of Physical Education and Recreation; Kim Raine, PhD, RD, is with the Centre for Health Promotion Studies; and Lory Laing, PhD, is with the School of Public Health, University of Alberta, Edmonton, Canada.

Send reprint requests to John C. Spence, PhD, Faculty of Physical Education and Recreation, E-488 Van Vliet, University of Alberta Edmonton, Alberta, T6G 2H9 Canada; jc.spence@ualberta.ca.

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Table 1
Participant Demographics in Comparison With the Distribution for the University Population

Characteristic	Study Sample (N = 613)		University Population (N = 24,442)	
	n	%	n	%
Age, y				
18	75	12%	3135	13%
19	103	17%	3661	15%
20	110	18%	4199	17%
21	106	17%	4408	18%
22	96	16%	3408	14%
23	58	9%	2346	10%
24	38	6%	1777	7%
25	27	5%	1508	6%
Sex				
Male	221	36%	10,534	43%
Female	392	64%	13,908	57%

intensified its targeting of youth populations in an attempt to influence current and future consumer behaviors.¹² Thus, poor population dietary habits may in part be related to TV exposure of children,¹³ adolescents,¹⁴ and young adults.¹⁵

The transition from adolescence to adulthood has been shown to be a period of adoption for many negative health behaviors including increases in smoking and alcohol use and decreases in physical activity and fruit and vegetable consumption.¹⁶⁻¹⁹ However, limited information is available on the possible associations between food advertising exposure and snacking behaviors among young adults.

Cultivation analysis is a useful theoretic framework for assessing media effects.²⁰ Originating in studies of TV violence, cultivation analysis posits that heavy TV viewers are more likely to perceive the world in terms of the ideas and values that are consistent with “TV reality” than are light viewers.^{21,22} In contrast, light viewers are less exposed to “TV reality” and are more likely to draw on other sociocultural influences to create their own world views.^{22,23} The present exploratory study conceptualized “TV reality” as depicting a particular TV diet in which no food was considered a “bad food.” It was hypothesized that heavy TV viewing would be associated with higher levels of energy-dense (ED) snack consumption, greater recognition of TV adver-

tising, increased likelihood of snacking while viewing TV, and higher levels of body weight.

METHODS

Design

To facilitate access to a large sample of young adults, an e-mail recruitment protocol and web-based survey were used with students at the University of Alberta in Edmonton, Canada. Following procedures recommended in the literature,^{24,25} participant information was collected through an Internet-based 22-item questionnaire developed from a variety of previously validated survey instruments.²⁶⁻²⁹ With the approval of the University of Alberta Health Research Ethics Board, we obtained a random list of 5000 student e-mail addresses from the University of Alberta Computing and Networking Services office. Solicitation e-mails, containing a link to the web-based survey, were sent out twice to the students over a 2-week period in March 2005. Upon clicking the link provided, students were automatically redirected to the survey, and informed consent was requested. All surveys were completed and collected anonymously. The services of Academic Technologies for Learning, a university-based service, were contracted for assistance with web site creation, maintenance, and data collection.

A key feature of the web-based survey was the fact that participants could not return to previously completed sec-

tions. Because it was thought that participants may have been inclined to answer the snack food consumption section differently in light of the TV viewing and advertising sections in the latter part of the survey, each survey component was treated as a separate section requiring the participant to submit completed answers to load the next section.

Sample

The study sample was drawn from the population of students aged 18 to 25 years attending the University of Alberta. In total, 613 students enlisted, resulting in a response rate of 13%; 64% were female, and the mean participant age was 20.8 (SD, 1.9). Comparisons of sex and age distributions suggest that the sample demographics are representative of the total population of university students (Table 1).

Measures

Television Viewing. Television viewing was assessed by asking participants to estimate the total number of hours viewed on 1 average weekday and 1 average weekend day. These answers were then summed to yield a weekly total. In accordance with the American Academy of Pediatrics³⁰ TV viewing classification system, participants were categorized as high viewers if they watched ≥ 4 hours of TV per day and as low viewers if they watched < 1 hour of TV per day.

Snack Food. A modified version of a food frequency questionnaire created by Block et al.²⁶ was used to quantify the amount of snack food participants consumed in a typical week. Snacking was defined as the consumption of any food item that is not a meal. In total, 12 snack categories were created. Seven were considered ED snack choices (e.g., salty snacks, soft/fruit drinks, candy, baked goods and ice cream/frozen yogurt, salted meats, and snack bars), and 5 were considered healthy snack choices (e.g., fruit, dairy, vegetables, nuts, and breads/rolls/biscuits). The scores for each snack category ranged from 0 (never ate the snack) to 4 (consumption exceeded five times in 1 week). The categories were summed to create two separate

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scores: healthy snacks and ED snacks. The highest scores possible for the healthy and ED snacks were 20 and 28, respectively.

Advertising Recall. Advertising recall was measured by 10 fill in the blank questions that required the participant to either finish the advertising slogan or name the product for various televised ED snack food items. The products and their associated slogans were chosen from recent television programming to ensure their currency. To do this, an abbreviated content analysis of Canadian television programming was performed. Ten hours of television programming were examined for a period of 1 week during January 11 to January 17, 2005. Based upon the 2004 *TV Times* Reader's Choice Awards,³¹ the top-rated programs from 10 program categories were recorded for 1 hour each. Program categories included situation comedy, daily talk show, drama, sports, news, late-night talk show, animated series, daytime soap opera, reality series, TV movie, and game show. If the program was only 30 minutes, it was recorded twice in the same week. All jingle and product tag lines used in the survey were derived from this analysis. The same snack classification used in the food frequency questionnaire was used to identify ED snack advertisements. Fast food advertisements were included in the ED snack food count because it is possible that these foods are consumed both in replacement of and in addition to meals.

Snacking Frequency. Snacking frequency was assessed by one question: "How often do you snack while watching television?" Responses were measured using a five-point Likert scale ranging from "never" to "everyday."

Body Weight Status. Based on self-reported height and weight, the body mass index (BMI) of each participant was calculated.³² These measures were reported using either the International System of Units (kg/m) or the US/Imperial scale (pounds/inches).

Demographics. Participants were asked to report their age, sex, and place of residence. Residence was measured by

asking participants to indicate whether they currently resided in on- or off-campus housing. Research has shown that socioeconomic status (SES) is an influential factor in population food consumption patterns and bodyweight status.³³⁻³⁵ Because our sample consisted of young adults attending university, we assumed that SES would not vary greatly within the sample, and thus it was not measured or analyzed.

Analysis

All analyses were conducted with the SPSS 13.0 statistical computing software (SPSS Inc, Chicago, Ill). Descriptive statistics, including Pearson correlations, were calculated for all variables. Hypothesis testing was completed using multiple analysis of variance (MANOVA), analysis of covariance (ANCOVA), and logistic regression. Significant interactions were followed up with analyses of simple effects and *post hoc* contrasts. Due to extreme nonnormality and skewness in the data, a square-root transformation was performed on the TV viewing variable so that it could be treated as a continuous variable in the correlation analysis. Because of the numerous statistical tests conducted, an α of .01 was adopted for all analyses.

RESULTS

It was expected that approximately 28% of participants would be high TV viewers and 15% would be low TV viewers.^{36,37} Distributions in the current sample approached expected distributions with 18% and 20% of participants reported as high and low viewers, respectively. Approximately 30% of participants reported consuming soda and snack bars more than once per week. Twenty-five percent reported a similar intake of salty snacks and baked goods, and 18% consumed as much candy. Less than 6% of participants reported consuming salted meats or ice cream and frozen yogurt more than once per week. In terms of BMI, 28% of respondents were overweight (21%) or obese (7%), 66% were normal weight, and 6% were underweight.

Television Viewing and Snacking Behavior

According to the correlation matrix in Table 2, TV viewing (square-root transformed) was related to snacking frequency ($r = .56$), slogan recognition ($r = .24$), and ED snack consumption ($r = .20$). A two (male or female) by three (high, medium, or low TV viewing) factorial MANOVA was conducted with snacking frequency, slogan recognition, ED snack consumption, and healthy snack consumption as dependent variables. Based upon Pillai's criterion, the combined dependent variables were significantly related to TV viewing ($F[8, 1208] = 25.36, p < .0005, \eta^2 = .14$) but not to sex ($F[4, 603] = 1.88, p = .11, \eta^2 = .01$) or their interaction ($F[8, 1208] = 0.90, p = .52, \eta^2 = .01$). When the results for the dependent variables were considered separately, significant differences were observed for snacking frequency ($F[2, 1210] = 114.48, p < .0005, \eta^2 = .27$), slogan recognition ($F[2, 1210] = 11.94, p < .0005, \eta^2 = .04$), and ED snack consumption ($F[2, 1210] = 7.92, p < .0005, \eta^2 = .03$). Follow-up simple contrasts revealed that medium TV viewers recognized more slogans (mean, 9.60; SD, 3.26) and snacked more often while watching TV (mean, 2.97; SD, 0.99) than low TV viewers (mean, 8.68; SD, 3.15 and mean, 1.81; SD, 0.87, respectively). High TV viewers recognized more slogans (mean, 10.79; SD, 3.38), snacked more often while watching TV (mean, 3.77; SD, 0.99), and consumed more ED snacks (mean, 11.16; SD, 3.97) than low TV viewers (mean, 8.68; SD, 3.15; mean, 1.81; SD, 0.87; M, 9.29; SD, 3.42, respectively).

Slogan Recognition and Snacking Behavior

Two 2×2 between-group ANCOVAs were conducted to assess whether slogan recognition accounted for the relationship between TV viewing and snacking frequency or TV viewing and ED snack consumption. The independent variables were TV viewing (low, medium, and high) and residence (on campus and off campus). Sex was not included as an independent variable because it was not related to either snacking behavior in the previous set of

Table 2
Intercorrelations for Snacking Behavior, TV Viewing, Slogan Recognition, and BMI

	ED Snacks	Healthy Snacks	Snacking Frequency	TV Viewing	BMI	Slogan Recognition
ED snacks	1.00	0.11*	0.27*	0.20*	0.04	0.13*
Healthy snacks	—	1.00	0.06	−0.02	0.02	0.00
Snacking frequency	—	—	1.00	0.56*	0.06	0.21*
TV viewing	—	—	—	1.00	0.18*	0.24*
BMI	—	—	—	—	1.00	0.10
Slogan recognition	—	—	—	—	—	1.00

BMI indicates body mass index; and ED, energy dense.

* $p < 0.01$ (two-tailed).

analyses. Preliminary checks were conducted to ensure that no violation of the assumptions of normality, homogeneity of variances, or homogeneity of regression slopes existed. After we adjusted for slogan recognition, significant main effects of TV viewing ($F[2, 605] = 60.29, p < .0005, \eta^2 = .17$) and place of residence ($F[1, 605] = 8.95, p = .003, \eta^2 = .02$) were observed for snacking frequency. Specifically, high TV (mean_{adj}, 3.53) and medium TV (mean_{adj}, 2.84) viewers reported higher snacking frequency than low TV viewers (mean_{adj}, 1.76) and students living off campus (mean_{adj}, 2.91) snacked at a higher rate than those living on campus (mean_{adj}, 2.51). No significant interaction was found for snacking frequency. After we adjusted for slogan recognition ($F[1, 605] = 6.98, p < .008, \eta^2 = .01$), no significant interaction or main effects were observed for ED snack consumption; suggesting that slogan recognition accounted for much of the relationship between TV viewing and ED snack consumption.

Body Weight Status

In a hierarchic logistic regression analysis, body weight status (underweight/normal weight vs. overweight/obese) was regressed on age, sex, residence, TV viewing, snacking frequency, slogan recognition, and ED snack consumption. A test of the full model with all eight predictors (two for TV viewing) against a constant-only model was statistically reliable ($\chi^2 [8, N = 606] = 57.74, p < .0001$). The variance explained in body weight

status, according to Cox and Snell and Nagelkerke R square statistics, was between 9% and 13%, respectively ($-2\log$ likelihood = 661.53). Table 3 shows regression coefficients, Wald statistics, odds ratios (OR), and 99% confidence intervals (CI) for each of the predictors. Sex (OR, 2.78; 99% CI, 1.68–4.59), medium TV viewing (OR, 3.11; 99% CI, 1.37–7.08), and high TV viewing (OR, 5.47; 99% CI, 1.97–15.16) were associated with body weight status, indicating that male students and medium and high TV viewers had higher odds of being overweight or obese than female students or low TV viewers. Considering the small decreases in the Wald statistic for TV viewing from step 2 to step 3 (Table 3) and the fact that none of the snacking variables were significant predictors of body weight status, it appears that snacking behavior may have partially, but not significantly, mediated the association between TV viewing and body weight status.

DISCUSSION

Studies have examined food intake and caloric consumption in relation to TV viewing among adults,¹⁵ but few have considered the role of snacking. The current study specifically examined snacking in relation to TV viewing and body weight status among young adults. We found that university students reporting medium or high TV viewership snacked more frequently while watching TV and recognized more advertising than students who were considered low viewers. High viewers also reported more consump-

tion of ED snacks than low viewers. Snacking frequency appeared to be related to TV viewing and residence, but the association between snacking frequency and TV viewing was due to advertising. However, advertising recognition did account for the association between TV viewing and consumption of ED snacks. In addition, male students and medium and high TV viewers had higher odds of being overweight or obese.

The literature suggests two mechanisms of influence to explain the relationship between TV viewing and snacking and food consumption, that is, (1) exposure to advertising will stimulate a desire to consume a particular product^{38–41} and (2) TV viewing provides an opportunity to snack.^{37,42–46} Results from the current study support claims for both of these potential pathways. Snacking frequency was related to the amount of TV viewed, a relationship that was not explained by advertising recognition. Although high TV viewers reported more ED snack consumption than viewers of low levels of TV, it appears that much of this relationship was accounted for by advertising recognition. Thus, consistent with the tenets of cultivation analysis,²¹ the effect of TV viewing on ED snack consumption may work through the advertising viewed on TV and the extent to which that advertising is recognized and remembered. Further research is needed to expand on these preliminary findings and compare advertising recognition with specific product consumption.

Many studies have investigated the relationship between TV viewing and

**Table 3
Summary of Logistic Regression Analysis Predicting Body Weight Status (N = 606)**

Variable	B	SE	Wald Test	OR	99% CI	
Step 1						
Age	0.06	0.05	1.31	1.06	0.93	1.20
Sex (male)	0.95	0.19	25.96	2.59	1.60	4.19
Place of residence	0.02	0.27	0.00	1.02	0.50	2.06
Step 2						
Age	0.07	0.051	1.86	1.07	0.94	1.22
Sex	1.04	0.193	28.86	2.82	1.71	4.63
Place of residence	-0.26	0.288	0.81	0.77	0.37	1.62
Low TV viewing				1.00		
Medium TV viewing	1.12	0.298	14.05	3.06	1.42	6.60
High TV viewing	1.69	0.345	23.95	5.42	2.23	13.18
Step 3						
Age	0.08	0.05	2.22	1.08	0.95	1.23
Sex	1.02	0.20	27.60	2.78	1.68	4.59
Place of residence	-0.29	0.29	0.95	0.75	0.35	1.60
Low TV viewing				1.00		
Medium TV viewing	1.14	0.32	12.76	3.12	1.37	7.08
High TV viewing	1.70	0.40	18.39	5.47	1.97	15.16
Snacking frequency	-0.05	0.10	0.24	0.95	0.73	1.24
Slogan recognition	0.03	0.03	1.14	1.03	0.96	1.12
ED snacks	0.02	0.03	0.32	1.02	0.95	1.08

CI indicates confidence intervals; ED, energy dense; OR, odds ratio; and SE, standard error.

BMI with equivocal results.⁴⁷⁻⁴⁹ For instance, a recent meta-analysis concluded that only a small relationship exists between TV viewing and BMI among children and youth.⁴⁹ In the current study, medium and high levels of TV viewing were significant predictors of body weight status. The odds of high TV viewers (i.e., ≥ 4 hours per day) being overweight or obese were approximately 5.5 times greater than low TV viewers. Although the variance explained by this model was small, it does not discount the possibility of TV viewing having an effect on population-level BMI ratios. In addition, it is possible that the relationship between TV viewing and body weight is cumulative and does not become large enough to detect until adulthood. The fact that none of the snacking behaviors or slogan recognition predicted body weight status once TV viewing was taken into account suggests that it may be the sedentary behavior that results from TV viewing, as opposed to subsequent snacking, that leads to overweight and obesity.

Previous studies have postulated that place of residence, especially in child

and adolescent populations, may play a role in determining food choice and food consumption patterns.^{33,50,51} In our study, residence was related to snacking consumption with those students living off campus reporting higher levels of snacking than those living on campus. This finding may be indicative of the differential access to snacks in different locations. Although significant, the difference between the groups was not large, probably reflecting the fact that these young adults have increased autonomy and are able to acquire snack foods in whatever type or quantity desired regardless of the residential dietary milieu.

The current study had some limitations that merit discussion. Due to the cross-sectional design adopted, we could only investigate associations or group differences between variables; questions of causality could not be addressed. The use of self-reported measures may have introduced participant recall bias. However, the measures of TV viewing and snack food consumption have been used in prior research with positive results.^{26,27} The inclusion of a university sample may

have presented a bias because of the higher education levels of participants. For instance, the consumption of healthy snacks in this sample was high. This result may be reflective of the higher SES of university students as compared with the general population. Based on Canadian population data,⁵² a negative relationship exists between fruit and vegetable consumption and BMI. The low levels of overweight and obesity found in this sample further suggests that the reported healthy snack consumption may be higher than that of the general population. Higher levels of SES may have attenuated the link between healthy snacks and television viewing because both of these factors have been linked to diet and consumption behaviors.^{50,53} It is not clear the extent to which these results are generalizable to other Canadian populations.

The use of self-reported height and weight for the calculation of BMI is a definite limitation of this study. In comparison with objective measures, people tend to underreport weight and BMI and overreport height.⁵⁴ However, when conducting surveys with large

samples, or over the Internet, it is difficult to avoid the use of self-reported measures of height and weight. Numerous studies of college students have used self-reported height and weight.⁵⁵⁻⁵⁷ In terms of prevalence of overweight and obesity, our findings (28%) are similar to those of Huang et al.,⁵⁵ who found that approximately 26.5% of University of Kansas students were either overweight (21.6%) or obese (4.9%). However, until correction factors are developed to increase the accuracy of self-reports of height and weight, the limitations of this procedure will need to be continually acknowledged.

Because of the relatively large sample size, several of the analyses in our study detected small effects as being statistically significant that would not have been detected with a smaller sample. However, because the direction of the study results were consistent with the proposed hypotheses and are consistent with results from other studies,^{6,13,48,58-60} we do not believe these findings are anomalies or irrelevant. That is, in spite of the limited explanatory power of these models, there does appear to be a positive relationship among TV viewing, advertising, and consumption of ED snacks among Canadian university students.

A final limitation is the low survey response rate of 13%. It is possible that a self-selection bias was present. Perhaps those students who answered the survey were the same individuals who felt most strongly about TV viewing, snacking, or both. This would then maximize the differences observed between the highest and lowest viewers. However, because of the similarity of sex and age distributions between the sample and parent population shown in Table 1; the expected proportions of high, medium, and low TV viewers; and the relatively large sample, we are confident that the responses were representative of the university population. Not surprisingly, low response rates (e.g., 0.24%–10%) have been reported by others using Internet-recruiting strategies.^{24,25,61} Lack of appropriate incentives, timing conflicts, and difficulty differentiating the authenticity and legitimacy of invitation e-mails from spam were suggested

reasons for these low rates of recruitment.^{24,61}

The tenets of cultivation analysis suggest that regular, long-term exposure to TV and advertising will have an effect on heavy viewers.^{21,23} Each of the hypotheses in this study were constructed on the assumption that high TV viewing cultivates a “TV reality” that is associated with distinct differences in consumption and behavioral patterns related to snacking as compared with low viewing. Overall relationships were found among TV viewing, ED snack consumption, and snacking behavior, and between TV viewing and body weight status. Further study is required to understand the motivations for choosing specific snacks in different populations and how these motivations are influenced by advertising.

SO WHAT? Implications for Health Promotion Practitioners and Researchers

Television commercials are a common method of advertising food throughout the industrialized world. Our research shows that university students who watch ≥ 4 hours of TV per day snack more frequently while watching TV, recognize more advertising, and consume more ED snacks than students who view ≤ 1 hour of TV per day. Furthermore, the odds of a university student being overweight or obese increase substantially if he or she views ≥ 4 hours of TV per day, regardless of snacking behavior.

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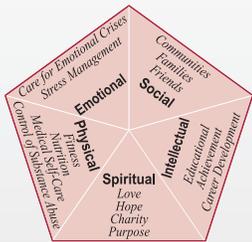
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