Ecological Momentary Assessment of Urban Adolescents' Technology Use and Cravings for Unhealthy Snacks and Drinks: Differences by Ethnicity and Sex

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ABSTRACT

Background Adolescents' technology use is generally associated with food cravings, but it is not clear whether specific types of technology elicit particular types of cravings or whether personal characteristics play a role in these associations.

Objective We examined whether momentary associations between four technology types (ie, television, video games, computer messaging, and phone messaging) and cravings for unhealthy snack foods and sweetened drinks were moderated by youths' sex, ethnicity, body mass index, and age.

Methods Urban adolescents (N=158) aged 14 to 17 years provided momentary information about their technology use and food cravings during the course of 1 week and completed survey reports of their personal characteristics. We used multilevel modeling to determine momentary associations and interactions.

Results Non-Hispanic adolescents showed stronger associations between television exposure and cravings for sweet snacks, salty snacks, and sweetened drinks. Being Hispanic was associated with stronger associations between phone messaging and cravings for sweet snacks, salty snacks, and sweetened drinks. Males showed stronger associations between video game use and salty snack cravings.

Conclusions As the public health field continues to monitor the effects of technology use on adolescents' eating and overall health, it will be important to determine the extent to which these groups are differentially affected by different forms of technology.
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ADOLESCENT OBESITY IS A PUBLIC HEALTH CONCERN of increasingly serious and far-reaching consequences, contributing to a wide range of comorbid disorders[1,2] and early death.[3-7]

The recent surge in adolescent obesity is due, in part, to a substantial increase in sedentary behaviors in the past 20 years, most notably those behaviors involving technology use.[8] Media consumption, in particular, is not only sedentary and may substitute for physical activity, but may also expose teens to cues that promote unhealthy eating. Although television is still a prominent medium for youths' sedentary behaviors, other media, including video games, computers, and handheld devices, have become increasingly popular sources of entertainment. Television viewing, in particular, has been linked to poor eating habits, including unhealthy snack consumption[9]; it is less well understood, however, how other modes of technology may accelerate the pace of unhealthy weight gain.

Earlier work has already established that television viewing can be differentiated from other sedentary behaviors (eg, doing homework) because it involves receiving images, chiefly through advertising, that promote unhealthy food consumption.[9] In response to substantial increases in communication-based technology use among adolescents in recent years, an emerging line of research has begun to examine the extent to which communication-based technology use is a problematic sedentary behavior.[10] Although communication-based technology use appears to be negatively related to physical activity level,[10] little is known about other specific mechanisms by which this sedentary behavior may contribute to eating behavior. To understand these mechanisms and to yield recommendations for prevention programs, it is important to closely examine internal states that may be precursors to unhealthy eating; determine the differential effects of electronic-based and communication-based technology use on these internal states; and identify which personal characteristics may increase or decrease the effects of electronic-based and communication-based technology use on youths' responses. In this study, we examined momentary relations between electronic-based and communication-based technology use and unhealthy food and drink cravings in a sample of urban adolescents. We also estimated the extent to which ethnicity, sex, age, and body mass index (BMI; calculated as kg/m^2) moderated the strength of these momentary associations.

Food cravings are important to study because they increase the likelihood of consuming unhealthy foods,[11] often in larger quantities than intended.[12] The intense desires associated with cravings are challenging to measure with retrospective self-reports because they reflect a desire for a specific food or type of food and are often variable and fleeting. The difficulty of recalling levels of cravings for different types of foods in the presence of environmental stimuli may lead to biased results. To capture the real-time reports of youths' technology use and food cravings, we collected data using Ecological Momentary Assessment (EMA), in which youths were prompted to respond to questions concerning their environments and internal states using a handheld Palm Pilot during the course of 7 days. EMA approaches have produced reliable and valid measures of sedentary and food-related behavior,[13,14] the results of which can provide rich, detailed assessments of many data points.

To examine momentary relations between technology use and cravings, we chose two forms of electronic-based (television and video games) and two forms of communication-based (computer messaging and phone messaging) technologies that are commonly used among adolescents. In addition, we measured the following targets of cravings: salty/fatty snacks; sweet snacks, and sweetened drinks. Electronic-based technology use has been linked to a host of mental and physical health problems,[15-17] including obesity.[18-21] Television can be particularly problematic for youths because it is a major vehicle for transmitting unhealthy snack advertisements, but increasing numbers of embedded snack and drink advertisements in video games[22] highlights the need to examine the role of gaming in food cravings more closely.

Communication-based technology use in general has been implicated in reduced physical activity levels among adolescents, but very little is known about the extent to which it may also promote unhealthy eating behavior. In addition to the content of the messages themselves, peer-to-peer platforms, such as G-chat and Facebook, produce targeted advertisements to youths based on their messaging content and demographics. As a result of the pervasiveness of food advertising in communication platforms, adolescent health researchers have justifiably called for close examination of how communication-based technology use may contribute to poor eating.[23]

In addition to examining the momentary associations among electronic-based and communication-based technology use and cravings, we also sought to determine whether personal characteristics either increased or reduced these momentary relations. Specifically, we tested whether sex, ethnicity, BMI, and age predicted the strength and direction of technology use and cravings. Prior research with adults assessing sex-related qualitative differences in food cravings in response to screen-based stimuli indicated that women showed stronger responses to sweet food cues than men,[24-26] although studies among adolescent populations are sparse. Findings related to ethnic group differences also do not provide enough evidence to draw solid conclusions. Given that Hispanic youths have higher rates of obesity than non-Hispanic youths,[27] and that major food companies incorporate strategies to target Hispanic/Latino consumers, it is important to determine how they might be differentially affected by different forms of technology use. Finally, we included BMI and age as predictors of the momentary relations among technology use and cravings due to past research indicating that adolescents with higher BMIs tend to engage with screen media with more focused attention than youths with normal BMIs,[28] and engagement with cell phones increases significantly from earlier to later high school years.[29]

Summary

In this study, we measured momentary relations among electronic-based and communication-based technology use and cravings for salty foods, sweet foods, and sweetened drinks in a sample of urban adolescents. In addition, we determined whether these relations were different according to youths' sex, ethnicity, BMI, and age.

METHOD

Participants

The data for this study come from a larger research project on adolescent dietary behavior. See Grenard and colleagues[14] for a detailed description of the participants and procedures. Briefly, students were eligible to participate if they were between the ages of 14 and 17 years of age, spoke English, did not have a major illness, were not being treated for obesity, and were attending a high school in which a minimum of 25% of students receive free or reduced school lunch in Los Angeles County. In addition, a parent or guardian must have been willing to come to the initial session with the student. Students were recruited using fliers distributed on school grounds with consent of the school administrators. Eligibility for the study was determined during a telephone interview. A total of 158 participants from 13 schools met the criteria and were recruited into the study. The participants were predominantly female and Hispanic/Latino; remaining groups include non-Hispanic white (5.1%); non-Hispanic African American (4.4%), Asian (2.5%), Native American (2.5%), mixed (15.8%), and other (1.1%). Twenty-five percent of the participants were obese, according to the BMI percentiles calculated per Centers for Disease Control and Prevention guidelines.

Procedures

Each participant came to a university facility with one of their parents or a guardian for assessment and training. See Grenard and colleagues[14] for details of procedures and consent; the research procedures were approved by the Claremont Graduate University Institutional Review Board. Participants completed a series of assessment and training tasks, including measurement of weight and height, interviews about afterschool activities, training on the EMA protocol, and a baseline computer-based questionnaire.

A standardized procedure was used to train participants on how to operate the personal digital assistant (PDA).[14] Palm E2 PCA devices were programmed to project specifications (invivodata, Inc) to display a series of questions about physical location, social environment, activities, mood, cravings, and foods consumed. Participants were instructed to initiate the questions each time they drank or ate something. Prompts (alarms) were randomly issued by the PDA (two times on weekdays after school and four times on weekend days) for the participants to complete the same set of questions, to capture states and settings when the participants were not drinking or eating. Finally, participants responded to a series of questions each evening about things that might