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Electronic Gaming and the Obesity Crisis

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Abstract

Children and adolescents in the United States and in many countries are projected to have shorter life spans than their parents, partly because of the obesity crisis engulfing the developed world. Exposure to electronic media is often implicated in this crisis because media use, including electronic game play, may promote sedentary behavior and increase consumption of high-calorie foods and beverages that are low in nutritional value. Electronic games, however, may increase children's physical activity and expose them to healthier foods. We examine the role of electronic games in the pediatric obesity crisis and their contribution to more favorable health outcomes.

In just three short decades, the U.S. pediatric obesity rate has tripled (McGinnis, Gootman, Kraak, & the Committee on Food Marketing and the Diets of Children and Youth, 2006); the percentage of 6- to 11-year-old children who were obese increased from 7% in 1980 to 20% in 2008 (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010). The escalating obesity rates are not likely caused by genetic factors alone in such a short time frame, implicating the environment as a major contributor to this health crisis.

Maintaining the same weight involves energy balance, in which the number of calories consumed is equal to the number of calories expended (Calvert, 2008). Two environmental factors that have been implicated as causing obesity involve the consumption of high-fat, low-nutrient foods and beverages, and the sedentary life style that is now common in our nation from watching so much television or playing sedentary video games (Vandewater & Cummings, 2008). Media exposure, particularly to television advertising, has been linked to childhood food preferences and consumption of high-fat, low-nutrient foods (McGinnis et al., 2006). The link between media exposure and sedentary behavior, however, has been more difficult to demonstrate, particularly since media are increasingly mobile as youth move (e.g., walk and talk) when using them. For example, children can work out while listening to their iPods or move while interacting with exergames, which are video games that require gross motor movement for game play (Staiano & Calvert, 2011a).

Like food and beverage diets, then, media use also involves a diet comprised of activities that can potentially increase or decrease caloric balance. Put another way, the quality of media exposure as well as the quantity of media exposure should be considered given that U.S. 8- to 18-year-olds play electronic games for an average of 90 minutes per day (Rideout, Foehr, & Roberts, 2010). Our goal here is to describe how we can put those 90 minutes to good use so that we can alter the course of the pediatric obesity crisis.

Food and Beverage Marketing to Children

Media provide platforms for marketers of low-nutrient foods to reach children and adolescents, which can increase obesity and other health-related issues such as type II diabetes and cardiovascular disease (Calvert, 2008). After examining the extant literature, a National Academies Committee concluded that there were causal links between food and beverage advertising and children's food preferences, their food choices, and their short-term food consumption, as well as correlational links with adiposity (i.e., body fatness) (McGinnis et al., 2006). At that time, the literature consisted almost entirely of television advertising studies. An emerging, but neglected, area of research involves online marketing.

Subsequent research in the online marketing world revealed that similar kinds of products and techniques were used to market to children in the online and television spheres. For instance, an examination of the top 10 websites visited by 8- to 11-year-old children found that 70% of these sites marketed food to children, primarily candy, cereal, quick-serve restaurants, and snacks, and advergames were used to market products on some of these sites (Alvy & Calvert, 2008). Consistent with these findings, content analyses of food websites found that marketing unhealthy foods was pervasive (Moore, 2006; Weber, Story, & Harnack, 2006), with techniques like advergames being used to engage children in marketed content in game-like contexts (Moore, 2006).

Though far less prevalent, the same techniques used to make interacting with online food sites fun for children can also be used to market healthier foods and beverages. Dole Food Company, Inc., offers one such example. Using one of the Dole advergames as a guide, Pempek and Calvert (2009) created an advergame based on PAC-MAN® that rewarded consumption of healthy products such as orange juice, bananas, apples, and carrots, while punishing the consumption of unhealthy products such as soda, chips, and cookies. In another condition, the reward contingencies were reversed so that children were rewarded for consumption of the unhealthy products and punished for the consumption of the healthy ones. After 3rd- and 4th-grade low-income children played the advergame for 10 minutes, they selected and ate a snack. There was also a control condition where children selected the snack first and then played the advergame. Children who played the healthier version of the advergame selected and consumed more healthy snacks than those in the unhealthy advergame condition, with the control group falling in the middle of these two groups.

In a naturalistic study involving online advergames that promoted healthy or unhealthy foods, Harris, Speers, Schwartz, and Brownell (2012) found that 1.2 million children visited food company websites each month, and they devoted about 1 hour of their time on some of these websites. Children comprised more of the visitors on websites with advergames. These

sites primarily promoted candy, sugared cereals, and fast food that involve heavy concentrations of calories, which, if consumed, would increase the likelihood of weight gain. When 7- to 12-year-old children played advergames that promoted unhealthy foods from these websites, they were more likely to subsequently consume snacks that were poor in nutritional value. Results were stronger for those who had played advergames in the past. By contrast, when they played advergames that promoted healthy foods, children were more likely to consume fruits and vegetables. However, only one website (once again, Dole) promoted healthy foods via advergames (Harris et al., 2012). Taken together, the results suggest that children will eat and consume the kinds of products that are marketed via advergames to them, be they healthy or unhealthy foods. Notably, marketers overwhelmingly promote unhealthy foods.

Food Preferences and Mobile Apps

Another approach to get children to eat healthy is via mobile phone apps. For example, *Time to Eat* is an app in which a virtual pet gives grade school–aged children feedback about their breakfast consumption. Eating breakfast is associated with lower, more healthy weights, whereas children who skip breakfast eat more poorly and have higher, less healthy weights (Sjoberg, Hallberg, Hoglund, & Hulthen, 2003). Byrne and colleagues (2012) provided motivational incentives for children to eat breakfast through virtual pets who provided feedback to children after they sent pictures of their breakfasts to their pets via their mobile phones. Children whose pets looked happy and sad were twice as likely to eat breakfast as those who only got happy feedback from their virtual pets or those who had no virtual pet at all. Those whose pets looked sad as well as happy were also more likely to report feeling attached to their pet than those who only received positive feedback from their pet. The implication of this study is that a combination of positive and negative feedback from virtual pets can motivate children to eat breakfast, thereby getting their day off to a healthy start.

Movement, or the Lack Thereof, and Media Exposure

The sedentary behavior involved in consuming traditional media, including traditional video game play, is known as the displacement effect because media use is thought to displace more active physical experiences (see Vandewater & Cummings, 2008). However, links between television viewing or video game use with children's physical activities yield either small correlations or none whatsoever (Vandewater & Cummings, 2008). Instead, media use like television viewing seems to displace other indoor activities, such as board games, rather than vigorous outdoor activities that yield high levels of energy expenditure (Vandewater, Bickham, & Lee, 2006).

Moreover, not all screen exposure is created equally in terms of physical movement. For instance, sedentary video game play involves more caloric expenditure than television viewing (Wang & Perry, 2006). Even so, the findings are mixed, as 9- to 12-year-old girls who played moderate amounts of video games showed increased weight (Vandewater, Shim, & Caplovitz, 2004).

A recent game changer involves exergames, in which children engage in gross motor activity during game play (Staiano & Calvert, 2011a), an experience that results in caloric

expenditure (Graf, Pratt, Hester, & Short, 2009). Exergame play results in more energy expenditure than sedentary video game play (Graves, Stratton, Ridgers, & Cable, 2007), yielding about as much caloric expenditure as walking at a 3-mile-per-hour pace (Bausch, Beran, Cahanes, & Krug, 2008).

Social variables play an important role when examining the impact of exergame play, particularly during adolescence. For instance, African American adolescents who played Wii tennis in a short-term competitive situation expended more calories than those who played alone (Staiano & Calvert, 2011b). In a follow-up longitudinal study of overweight and obese African American adolescents that lasted 6 months, however, competitive exergame play did not yield weight loss, but cooperative exergame play did (Staiano, Abraham, & Calvert, 2012). More specifically, youth who played Wii Active exergames in rotating teams with the goal of losing the most calories on a weekly basis lost weight when compared to a no-treatment control group as well as to their own baseline scores. By contrast, those who competed as individuals in teams to lose the most weight stayed at about their same baseline weights.

Social influence has also been examined through sensor-based monitoring with systems that involve gaming elements. Examples of these systems include Chick Clique, Fish'n'Steps, and Shakra. Chick Clique and Fish'n'Steps both recorded step count from a pedometer, which was then shared across a social network of other users. Chick Clique automatically transmitted the user's step count to peers who were also playing the game. The competitive nature of the game resulted in an increase in the number of steps taken among high school students, but was unsuccessful in maintaining the interest of younger adolescents (Toscos, Faber, An, & Gandhi, 2006). In Fish'n'Steps, the number of steps taken contributed to visual feedback in the form of a fish that appeared in a fishbowl on a computer screen. Participants' fish were either represented in their own fish bowl (a solitary play condition) or in a communal fish tank with other users' fish (a cooperative yet competitive condition). Users in the cooperative condition reported that their influence on their peers' fish motivated them to keep their step count high during the day which, in turn, kept their fish healthy and happy (Lin, Mamykina, Lindtner, Delajoux, & Strub, 2006).

Mobile phones also play a key role in making sensor-based experiences enjoyable and motivating for the user. Shakra, for example, used mobile phone signals to determine the distance traveled and velocity, enabling differentiation among types of activity, such as running versus walking (Anderson et al., 2007). This kind of information can also be applied to competitive mobile game applications. For example, Fujiki, Kazakos, Puri, Buddharaju, and Pavlidis (2008) developed an innovative sensor-based application that ran in the background of a mobile phone at all times. Every movement counted toward the user's ultimate goal of winning a race against another user. The competitive nature of the race resulted in sustained motivation for the users to continue being physically active.

Taken together, the results from these studies suggest that exergames and mobile games have untapped promise to get youth to exercise and even lose weight. To be effective, social variables must be considered in order to sustain the kinds of activity levels that are necessary for beneficial health outcomes over the long run.

Conclusions

Energy balance, in terms of consuming the right kinds of media to promote healthy eating as well as physical movement, is within our grasp. Youth enjoy playing games, and the knowledge base is emerging to increase energy expenditure during exergames and mobile games as well as guide food consumption patterns via advergames and mobile games. Social variables, including cooperation and, to a certain extent, competition, as well as contingent feedback in terms of reinforcers, are key to effective behavioral changes. The challenge for us is to take the necessary steps as individuals and as a nation to tip the balance toward a healthier food and media environment for our children.

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