

Digital Gaming and Pediatric Obesity: At the Intersection of Science and Social Policy

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Children and adolescents in developed countries are heavily immersed in digital media, creating an inexpensive, far-reaching marketing opportunity for the food industry and the gaming industry. However, exposure to nonnutritious food and beverage advertisements combined with the use of stationary media create a conflict between entertainment and public health. Using the popular digital gaming platforms advergames (online games that market branded products) and exergames (video games that involves gross motor activity for play) as exemplars, the following article provides an analysis of the negative and positive health impacts of digital gaming as they relate specifically to overweight and obesity outcomes for children and adolescents. Theoretical explanations including the food marketing defense model, persuasion knowledge model, and social cognitive theory are used to explain the influence of gaming on young players' health. Throughout the article, we discuss the role of public policy to encourage the development and use of health-promoting digital games as an innovative, effective tool to combat the pediatric obesity crisis.

Policy makers, social scientists, and the public are increasingly concerned by obesity rates, a worldwide epidemic that is rapidly spreading throughout the developed world that casts a long shadow on the future of children and youth. Globally, 43 million overweight children under age 5 now join the 1.5 billion overweight and 500 million obese adults (World Health Organization [WHO], 2011a). Rates of pediatric overweight and obesity exceed 20% in at least 30 countries worldwide, including the United States, Canada, Kuwait, New Zealand,

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and China (IASO, 2011). In the United States alone, one third of all children and adolescents are now overweight or obese (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010). Overweight and obese youth are expected to have shorter life spans than their parents, suffering from major health problems including type 2 diabetes and hypertension (Koplan, Liverman, & Kraak, 2005). Moreover, 80% of overweight adolescents become obese adults (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997), which dramatically increases the risks for lethal chronic diseases, including heart disease, stroke, diabetes, and certain cancers (WHO, 2011a).

Digital media, a major pastime of children and adolescents (Rideout, Foehr, & Roberts, 2010), are implicated in this epidemic in at least two ways. One pathway to obesity involves the marketing of foods and beverages that are high in calories and low in nutritional value (McGinnis, Gootman, & Kraak, 2006). The second pathway involves the sedentary behavior that often accompanies media experiences (Vandewater & Cummings, 2008). Both pathways can lead to an imbalance in energy in which more calories are consumed than expended, thereby resulting in weight gain, which can lead to overweight and obese youth.

Given the pervasiveness of digital media in children's daily lives, with U.S. 8- to 18-year-old youth spending on average 7.5 hours each day using media (Rideout et al., 2010), it is timely for policy makers and social scientists to consider media a primary target in pediatric obesity prevention. The focus thus far has been the role that television viewing, particularly food advertisements, plays in children's food preferences, consumption patterns, and health outcomes (McGinnis et al., 2006). Yet marketers now employ a transmedia marketing strategy through most technologies and their interfaces, including mobile phones, Twitter feeds, and social networking websites (Israelsen-Hartley, 2011).

Electronic games, which occupy much of youths' daily media use (Rideout et al., 2010), create innovative portals, such as advergames, which are online games that market branded products, to expose youth to foods and beverages that are typically high in calories and low in nutritional values (Calvert, 2008; Moore & Rideout, 2007). Videogames also often involve sedentary media experiences that can lead to overweight issues (Vandewater & Cummings, 2008). Both advergames and video games can be risk factors for overweight and obesity issues.

These same kinds of gaming experiences, however, could be modified to market healthier foods and beverages as well as promote healthier active lifestyles. Advergames, for instance, can be adapted to encourage consumption of healthy foods and beverages, which can lead to healthy snack consumption (Pempek & Calvert, 2009). In our article, public policies that protect children and adolescents from unhealthy messages, already seen in the United States and the United Kingdom, are examined in the context of digital gaming experiences.

Exergames, digital video games that involve gross motor activity, can play a role in promoting energy expenditure (Staiano & Calvert, 2011a). Specifically,

exergames can promote caloric expenditure at moderate to vigorous levels of physical activity (Bailey & McInnis, 2011), increase heart rate to levels of cardiovascular fitness (Unnithan, Houser, & Fernhall, 2006), and improve coordination and balance skills that could potentially transfer to other sports and physical activities (Staiano & Calvert, 2011a). Empirical evidence on the impact of exergame play on weight, fitness, and physical activity levels is also explored in this article. These findings are then linked to policy opportunities to promote physical activity in children's daily lives.

Playing Games to Consume Calories: The Case of Advergames

As children spend more time in the digital world, online food advertisements are becoming increasingly sophisticated. Online advertising techniques, such as banner ads at the top of web pages and pop-up ads that appear where the computer cursor is moving, are often ineffective with consumers (Smith, 2007). In contrast, an innovative and popular marketing vehicle for online food advertisements is the advergame, which uses a digital game to promote a specific brand or product (Casey, 2005). Advergames use branded products as a dynamic and interactive part of a game, often integral to the reward or goal of the game (Buijzen, Van Reijmersdal, & Owen, 2010). An example of an advergame is Nabisco's Race for the Stuf, in which the player must race against the clock to collect virtual icons labeled "Twist," "Lick," and "Dunk" and reach the "Double Stuf Oreo Cookie" table to win the game. Virtually acquiring the branded product of Nabisco Double Stuf Oreos is the entire goal of this game.

Policy can play an important role in curtailing the negative effects of advergames on youth. Current governmental and self-regulatory policies could be strengthened with clear definitions and guidelines, specific regulation of advergames and other online marketing techniques, strong sanctions for infractions, a complaints system available to parents and concerned citizens, and legislation. Because advergames are predominantly characterized by foods that are poor in nutritional content (Moore & Rideout, 2007), a key policy goal is to require advergames to contain healthier food choices or health-promoting messages when geared toward children. Data collected via sophisticated marketing techniques could also be regulated to prevent marketers from targeting young consumers based on their individual habits, preferences, and attitudes. Ad breaks and media literacy programs that help youth distinguish an advertisement from entertainment could protect children from the obesity-promoting effects of many advergames. In light of these policy goals, the following section outlines theoretical models and scientific evidence that explains how youth interact with advergames, discusses marketing policies, and recommends policies to regulate advergames.

Theoretical Lenses for Understanding the Effects of Advergaming: Children as Naïve Consumers

Part of the challenge for children's exposure to advergaming is their lack of comprehension of commercial intent, i.e., that an advertiser or marketer is attempting to sell them a product (Calvert, 2008). Advergaming is a form of "masked marketing" (Mizerski, 2009) in which the commercial source, intent, and message are masked as a fun, interactive game. To protect themselves, mature consumers employ a conscious understanding that marketers are attempting to persuade them to buy a product, a realization needed to build resistance against purchasing a marketed product (Raney, Arpan, Pashupati, & Brill, 2003). However, young children are less able to protect themselves from marketing because they cannot separate advertisements from entertainment (Calvert, 2008). Children are also susceptible to marketing disguised as gaming, because classical conditioning occurs as the fun experience of playing the game becomes associated with the marketed product. The following section describes various theoretical models that explain how youth are naïve consumers interacting with advergaming.

Food Marketing Defense Model. Harris and colleagues (2009) developed the food marketing defense model in which the following skills are required to resist food marketing: awareness, which includes attention and comprehension; understanding, which includes understanding both the processes of how advertisements work and how to resist the advertisements; ability, which refers to the cognitive resources needed to resist the marketed message; and motivation, which is the desire to resist the advertised message. Extensive evidence demonstrates that children and even some adolescents lack the pertinent skills to resist many traditional food-marketing strategies (Harris, Brownell, & Bargh, 2009).

Persuasion Knowledge Model. In the persuasion knowledge model (Friestad & Wright, 1994), consumers gradually develop cognitive defenses against advertisements, which are mental "guards" that allow one to recognize the message, source, and intent of persuasive content to cognitively protect themselves against advertisements. Recognizing the intent of marketers allows the consumer to critically analyze, discount, and reject the advertised message (McCarty, 2004). By contrast, the relative ineffectiveness of intrusive advertising, such as banner ads that are displayed across the top of the screen and pop-up ads which appear on screen while the user is trying to do a different activity, occurs because the advertisement is more obvious (Edwards, Li, & Lee, 2002).

However, if a consumer is not consciously aware that the online experience is an advertisement, cognitive defenses are lowered and the message is processed differently (Raney et al., 2003). Put another way, when the entertainment of gaming distracts consumers from the advertisement, they are less likely to recognize the

persuasive intent and to protect themselves against the marketer's message. The stealth marketing techniques used in advergames make consumers more vulnerable to the marketers' message than a more obvious advertisement, such as a television commercial (Calvert, 2008).

Not only may young children lack cognitive defenses against advertising, they may also be unable to identify or even recognize an advertisement (McIlrath, 2006). Without a clear understanding of persuasion and the ability to distinguish commercial versus noncommercial messages, young children cannot adequately analyze, discount, and potentially reject the marketed message (McCarty, 2004).

Processing of Commercialized Media Content (PCMC) Model. Most theories describing children's processing of advertisements are based on data from viewing television commercials. Because the marketing environment is rapidly evolving to include more complex platforms such as advergames, Buijzen and colleagues (2010) developed the comprehensive young people's PCMC model to respond to the changing marketing landscape experienced by youth. Built on theories of consumer, cognitive, social, and personality development, the PCMC model identifies four stages of children's understanding of persuasive intent (Buijzen et al., 2010). When a child is younger than 5 years, advertisements are primarily perceived as entertainment without persuasive intent. Due to limited cognitive ability to process an advertised message, automatic responses to bright colors, lively music, and animated characters can create positive attitudes in a child toward the advertised brand or product. A child in middle childhood at 6–9-years old begins to differentiate entertainment content from advertisements and begins to understand the persuasive intent of an advertised message, though this is still difficult to do during the actual advertisement experience. Simple cues can override children's cognitive defenses at this stage, such as spokescharacters, which are branded animated characters that are used to sell products such as Kellogg's Tony the Tiger who advertises Frosted Flakes cereal (Calvert, 2008), and premium rewards, which are free merchandise that comes with a product such as a toy that accompanies a McDonald's Happy Meal (Calvert, 2008).

During late childhood from ages 10 to 12 years, a child becomes more critical of persuasive messages, yet peer influences and status symbols can still interfere with the child's ability to defend against an advertisement (Buijzen et al., 2010). Often children at this age are beginning to have more disposable income in the form of an allowance, allowing them more autonomy in making purchasing decisions. In the adolescent period of 13–16-years old, children gradually achieve adult levels of processing, including becoming critical of commercial messages. However, peer pressure and identity formation can still distract adolescent consumers, especially toward products related to social status and physical attractiveness. The PCMC model reveals that in every stage of childhood and adolescence, there are significant

pressures on children that weaken their defenses against advertisements, making them naïve consumers.

Information Processing Model. The information processing model can be used as an alternate explanation of how children develop defenses against persuasive messages, yet still focuses on how young consumers are less equipped to process advertisements than adults are. In particular, the child has limited cognitive resources to be deployed, in this instance to win a game and to simultaneously defend against marketing techniques; thus, there are insufficient resources to attend to and process the persuasive intent of the message (Edwards et al., 2002). The child, then, may be so distracted by playing an advergame, learning rules, controlling characters, and creating strategies to win, that they do not recognize the commercial message that is embedded in the game (Grigorovici & Constantin, 2004). This distraction may be compounded by the emotional and entertaining experiences of gameplay, which decreases the child's ability to build a rational defense against the product or brand (Nairn & Dew, 2007).

Classical Conditioning Model. Whereas most models describe explicit and conscious understanding of commercial messages, the classical conditioning model describes the implicit and unconscious association that is developed between a stimulus and a response (Grigorovici & Constantin, 2004). Advergames can create positive, emotional experiences that become associated with an actual product, a branded logo, or a spokescharacter who advertises the product. By creating a positive association between the product or brand and the game rewards, the player may become more likely to purchase the product.

Summary of Theoretical Models. Taken together, the cognitive and behavioral theoretical approaches all reflect a common theme: young children do not understand the persuasive intent of commercial messages. Therefore, young children may be especially vulnerable when exposed to marketed products, which is particularly evident in examining how online marketing masked as digital gaming can promote unhealthy food products that contribute to the pediatric obesity epidemic. We turn next to children's exposure to marketing and to advergame effects.

Exposure to Online Marketing

Each day marketers enjoy an ever-expanding window of time to reach young consumers through the computer screen, as daily online usage by 8- to 18-year-old children increased from 1 hour in 2005 to 1.5 hours in 2010 (Rideout et al., 2010). An estimated 98% of children's websites depend on advertisements and

marketing as a source of revenue, with two thirds using advertisements as their primary revenue source (Neuborne, 2001).

Due to its popularity, low cost, and potential effectiveness, online in-game marketing has been dubbed the most promising strategy (Chang, Yan, Zhang, & Luo, 2010). Unlike banner ads or pop-up ads that occur outside of consumer control, consumers choose to play the game (Deal, 2005). The active participation required for advergaming means that in addition to a fun, emotive experience, the consumer is likely paying more attention to the branded product or logo than is true for a television advertisement (Deal, 2005). Miniclip.com, a popular game development and hosting site, markets its space as a way for companies to attract the attention of millions of users who already play its 35 advergaming titles, including those sponsored by Coca Cola and Starburst (Miniclip, 2011). The millions of advergaming players represent a diverse population, since the global reach of the Internet puts advergaming at the fingertips of diverse ethnic and cultural groups (Hernandez, Chapa, Minor, Maldonado, & Barranzuela, 2004).

Food and beverage advertisements are ubiquitous on children's websites. Responding to a call by the U.S. Institute of Medicine (IOM) to research newer food marketing venues beyond the traditional television screen, Alvy and Calvert (2008) analyzed food advertisements on the 10 most popular websites for children aged 8–11-years old in the United States. Seven of the top ten websites advertised foods that were low in nutritional value and high in calories, such as candy, sugar-coated cereals, quick serve restaurants, and snacks.

Advergaming Target Young Players

In a U.K. content analysis of 290 websites sponsored by Cartoon Network and Nickelodeon, advergaming was ubiquitous (Culp, Bell, & Cassidy, 2010). Advergaming was present on 81% of the websites for a total of 247 unique games, and all games had at least one brand included. An examination of 77 popular food websites, which drew a combined total of 49 million 2- to 11-year-old users each year, found that 73% contained advergaming (Moore & Rideout, 2007). Similarly, 100% of websites sponsored by the 40 most popular children's food and beverage companies used advergaming (Weber, Story, & Harnack, 2006).

Advergaming provides relatively inexpensive marketing vehicles to reach child consumers (Calvert, 2008). For instance, of the \$1.6 billion annually spent in the United States by the food, beverage, and restaurant industries to market to children and adolescents (Lee, Choi, Quilliam, & Cole, 2009), a sizable \$295 million was spent in 2007 to develop advergaming titles that promote specific brands and products online (Verna, 2008). Yet a relatively small investment of \$1,000 per game (Wallace & Robbins, 2006), or an estimated \$2 per 1000 users (Pereira, 2004), produces tremendous payback for businesses. More and more marketing dollars are targeted to young consumers, as children have sizable

discretionary income compounded with pestering power (Calvert, 2008), which is a child's ability to influence the family's buying decisions and eventual purchases through persistent requests. Considering their spending power (Calvert, 2008) and time spent online and preferences for playing electronic games (Rideout et al., 2010), youth seem to be the "perfect" audience for advergames.

Unlike a television commercial that is typically no longer than 30 seconds, the Internet provides unlimited exposure to advertisements (Staiano & Calvert, forthcoming). Marketers realize that gameplay is a popular activity for youth, providing opportunities to build preferences and brand loyalty. For example, within the United States, 8- to 18-year-old boys and girls spend 25 minutes and 8 minutes per day, respectively, playing online games, but girls spend more time on social networking sites (25 minutes daily versus 19 minutes for boys), which also contain a plethora of advergames (Rideout et al., 2010). Girls and boys who are aged 8–18 years average 1 hour 29 minutes each day using the computer outside of school work (Rideout et al., 2010), and 2- to 17-year-old regular gamers spend 6–16 hours per week playing computer games (NPD Group, 2007). Much of the time spent online is unsupervised (Dahl, Eagle, & Báez, 2006), providing marketers with ample opportunity to bypass parents (Lee et al., 2009).

To attract children to the marketers' sites and maintain their attention, advergames employ several marketing techniques, including spokescharacters (Montgomery, 2001), product placement (Mack, 2004), and interaction with branded products (Blades, Oates, Blumberg, & Gunter, forthcoming). These techniques give advergames their "stickiness," i.e., the ability to keep the consumer's attention for long periods of time and to encourage repeated visits. Indeed, it is estimated that children play each advergame on average 100 or more times (Gunn, 2001), and the average amount of time spent on a gaming site for all online visitors is 25 minutes (Bertrim, 2005). Games are also being brought into the physical world through augmented reality, which transports the digital game from the computer screen into the child's physical environment. For instance, Nestle's cereal boxes contain a cutout that can be worn on a child's wrist and then read by a webcam that grants the child access to play an advergame (Orland, 2011). Gameplay, then, provides an opportunity for prolonged and repetitive brand exposure, immersing players in a fun emotive experience that marketers hope will translate to increased product purchases and brand loyalty.

Advergames are extremely appealing to young players. Marketers use an extensive set of advergaming strategies to capture young consumers' attention, including sweepstakes, clubs, newsletters, and in-game rewards involving scores, virtual currency, and peer rankings (Staiano & Calvert, forthcoming). An analysis of advergames on 77 popular food websites that had 49 million visits annually by 2- to 11-year-old children revealed that the games use many engagement tactics including individual scores and ranks (69%), multiple challenge levels within a game (45%), and customizability to personalize a game (39%) (Moore & Rideout,

2007). Customizing an avatar increased the enjoyment and the emotional reaction measured by skin conductance level in thirty 10- to 12-year-old children, more so than when children were given preassigned avatars (Bailey, Wise, & Bolls, 2009). Cartoon characters and spokescharacters are also featured prominently on child-directed advergames (Weber et al., 2006), which may make them particularly appealing to young children. The production features of advergames, such as animation, music, and sound effects (see Calvert, 2008), also appeal to young children. High levels of interactivity and rich media content can also produce heightened affective responses during advergame play (Sukoco & Wu, 2011).

Advergames Affect Memory, Attitudes, and Behaviors

Advergames influence youths' memory for advertised brands (Deal, 2005), their positive attitudes about food (Van Reijmersdal, Jansz, Peters, & Van Noort, 2010), and their consumption patterns (Pempek & Calvert, 2009). A study conducted by Nielsen Games found that players' product recall increased by 44% following advergame play (Brightman, 2008). Similarly, 68% of young adult gamers recalled a brand marketed in an advergame versus only 16% who recalled a brand marketed in an online banner ad (Deal, 2005). Interestingly, adolescent players who reported positive affect toward an advergame and its food product also performed higher on recognizing and recalling the brand (Hernandez & Chapa, 2010).

Advergames positively influence children's opinions and attitudes toward food products, especially when children lack knowledge about persuasive intent (Friestad & Wright, 1994) and food marketing defense mechanisms (Harris et al., 2009) to reject marketed messages. An experiment conducted with 2,453 girls aged 11–17 years found that playing advergames increased positive attitudes toward the brand image, produced more favorable behavioral intentions, and increased brand awareness (Van Reijmersdal et al., 2010). Similarly, 61% of players reported more favorable opinions toward the product after playing an advergame (Brightman, 2008). In fact, 82% reported similar levels of enjoyment for games with marketing compared to those without marketing (Brightman, 2008).

If applying the classical conditioning model to examine advergames, the fun, emotive experience of advergame play builds an association between the stimulus of the branded product and the response of choosing and consuming that product. When 5- to 12-year-old children played an advergame promoting Welch's fruit snacks, the number of children who chose to consume the fruit snacks when also presented with Skittles or raisins increased from 29% at baseline to 50% after gameplay (McIlrath, 2006). Similarly, 5- to 8-year-old children who played a Froot Loops cereal advergame preferred and chose Froot Loops after gameplay more often than a control group did (Mallinckrodt & Mizerski, 2007). Even a mere 10-minute exposure to a Pacman advergame, where the character

was rewarded for consuming either healthy or unhealthy foods, influenced 9- to 10-year-old children's consumption of the marketed foods and beverages (Pempek & Calvert, 2009). In adolescents, 65% of those who played an advergame selected the marketed snack foods, which was significantly higher than for those who did not play the advergame (Hernandez & Chapa, 2010). Perhaps even adolescents do not fully understand that an advergame is a marketing technique. For instance, a study of 5,200 Canadian children and adolescents found that over 3/4 of those who regularly play advergames thought that they were only games (Media Awareness Network, 2005), beliefs that were also found in a U.K. study of 7–15-year olds (Fielder, Gardner, Nairn, & Pitt, 2007).

Concerns about Child-Directed Advergames

Advergames pose a serious health and policy dilemma when they are geared toward children. The “culture of consumption” that surrounds children purportedly produces physical, emotional, and social harm to children (Hill, 2011). This creates what Drumwright and Murphy (2004) dubbed a “moral myopia,” where marketers continue to advertise to young children even though young children cannot make mature consumer decisions. Most relevant to pediatric obesity, a chief concern is that nearly all food advergames market products that are poor in nutritional quality (Moore & Rideout, 2007). Another issue is that advergames rarely clearly identify themselves as advertisements (Dahl et al., 2006). Because young children are not cognitively or developmentally mature enough to understand marketed messages, they are particularly vulnerable to them (Calvert, 2008). An added concern is that advergames are loaded with appealing attributes that make them very attractive to child players. Finally, many advergames collect personal information on players that can then be used to specifically target young consumers, creating privacy concerns (Montgomery, 2007).

The nutritional wasteland. The overwhelming majority of advergames promote foods to children that are low in nutritional value (Moore & Rideout, 2007). According to the WHO (2010), foods should not be advertised to children if high in saturated fats, sugars, and salt. Nevertheless, an analysis of 247 advergames on popular children's websites revealed that the foods marketed almost all contained high levels of sugar (Culp et al., 2010). Candy and gum (28.6%) were the most frequently marketed products, along with cereal (19.5%), carbonated beverages (9.5%), and salty snacks (7.5%) (Lee et al., 2009).

Games sponsored by the food and beverage industry also work to build brand loyalty for eventual food purchases. For instance, McDonald's sponsors McWorld, a website that allows children to play in a virtual world by personalizing avatars and decorating virtual treehouses (Brustein, 2011). Although a child could play McWorld seeing few if any food products, the loading icon is a McDonald's Happy

Meal box with a bright yellow smile and the word “Happiness” flashing below. Such advertising tactics, termed engagement-based marketing (Brustein, 2011), seek to create a positive emotional experience for a player while constantly promoting the brand, thereby building brand loyalty and promoting future purchases through classical conditioning. The McWorld site also promotes current food purchases by requiring codes collected from Happy Meal boxes in order to access special parts of the site.

Advergames collect personal information from players. Advergames can collect extensive personal information on individual child players, including food preferences and brand attitudes (Staiano & Calvert, forthcoming), which provide information for businesses to target specific children with marketing specific to their tastes. For instance, quizzes on food websites are routinely used to match specific products to children’s tastes and demographic characteristics (Federal Trade Commission [FTC], 2008), thereby tailoring marketed messages unbeknownst to the child consumer. In addition to the demographic data of the child, the frequency and duration of visits can also be tracked (Moore, 2006). With the use of data-mining techniques disguised as games, marketers can integrate entertainment content with advertisements (Grimes, 2008).

Five of seven major Australian food companies collect detailed personal information on child- or teen-directed websites (Jones & Reid, 2010). Of the 40 sites most often visited by children in the United Kingdom, 3/4 collected personal information (Fielder et al., 2007). Although 92% of the sites had a clearly labeled privacy policy, 9- to 13-year-old children did not understand most of the policies (Fielder et al., 2007). Marketers also encourage child players to provide their friends’ personal information in return for free offers, thereby building their database of personal information (Fielder et al., 2007). General Internet protection policies, such as the U.S. Children’s Online Privacy Protection Act (COPPA) of 1998, which prevents marketers from collecting personal information from children, are in place to protect children. Yet many of these policies do not mention advergames. More empirical evidence should be collected on what information is routinely recorded by marketers and how businesses use this information to target young consumers (Bray, 2004), especially in promoting unhealthy foods and drinks.

Regulations of Advergames for Young Consumers

Many researchers and policy makers argue that companies have a social responsibility when marketing to children (Stern & An, 2009; Dahl et al., 2006), recognizing that children and adolescents are especially vulnerable to marketing masked as games. Legal efforts to regulate advergames include arguments that the new business practices characterized by stealth marketing techniques fly under

the radar of outdated government regulations, as well as industry's own codes of conduct (Grimes, 2008). Moreover, any nation-specific guidelines can be quickly usurped due to the global nature of the Internet (Dahl et al., 2006). How can one country protect its young citizens from an advergame sponsored by a foreign company?

Nairn and Dew (2007) describe the concern against unfair marketing practices, a reaction from interest groups and parents against the alleged unethical targeting of children through Internet marketing. These concerns led to a series of papers, articles, and news stories about unfair online marketing practices. The authors advised companies, advertisers, and self-regulatory bodies to regulate the content of advergames. Researchers also emphasized the need for company-sponsored websites frequented by young visitors to critically review the appropriateness of their marketing practices, and businesses should reconsider how their advergames and embedded content may be deceptive to children and youth (Nairn, 2008).

Where industry self-regulation falls short, governmental policy seeks to ensure accountability and consequences for infractions. Several governments and cross-national organizations have developed international and national codes for responsible online marketing practices, especially pertaining to children (Nairn & Dew, 2007). For instance, a main focus of the World Health Organization (WHO) report on implementing a global strategy for the prevention and control of noncommunicable diseases was regulating food and beverage marketing to children due to its link to unhealthy diets and obesity (WHO, 2010). This WHO report identifies websites as new marketing communication techniques that promote branding and consumer loyalty.

The WHO recommends that regulatory policies aim to reduce both the exposure (reach, frequency, and impact) and the power (content, design, and execution) of food marketing to children (WHO, 2011b). To do so, governments are asked to establish clear definitions, guidelines, complaint systems, and sanctions for regulating content that is marketed to children, agreeing to cross-border cooperation to prevent unregulated content from reaching children residing in a regulated country (WHO, 2011b). Although online marketing is not directly outlined as a policy guideline, one WHO recommendation specifically states that children's environments should be free from marketing of foods that are low in nutritional value, which could be extended to the online spaces where advergames are played.

The International Code of Advertising Practice developed by the International Chamber of Commerce attempted to regulate online marketing. However, this code has been criticized as being too television-centric, lacking real punitive sanctions, being reactive rather than proactive, and neglecting the issues of controlling advertisements that appear outside of national jurisdiction (Dalmeney, Hanna, & Lobstein, 2003). Yet international codes may reconcile contradictions in country-specific codes, such as varied restrictions on what marketed content is

allowed or different minimum ages for children to play advergames (Dahl et al., 2006), so continued pursuit of international regulations may be worthwhile.

European codes have also been developed to provide international regulation, many in response to the European Charter on Counteracting Obesity and the WHO European Action Plan for Food and Nutrition Policy 2007–2012 (WHO, 2007). This report found that 11 European countries were actively regulating food and beverage marketing to children with a program or policy, with five countries reporting full implementation (Denmark, Ireland, Spain, Sweden, and the United Kingdom). In the United Kingdom, for instance, the British Broadcast Committee of Advertising Practice (CAP, 2010) operates under a mixture of mandatory guidelines and self-regulation. The mandatory code is funded by an industry tax on advertisers and includes supervision of advertisements during pre- and postpublication, as well as monitoring of complaints. There is mention of online advertisements including banner and pop-up ads, but there are no direct guidelines for actual websites or advergames. The code does, however, carry sanctions ranging from warning letters to press releases that condemn the company for the specific infraction, eventually resulting in legal action as a final resort.

In the United States, governmental regulations are chiefly concerned with protecting children from television advertisements (Calvert, 2008). An exception is the COPPA of 1998, enforced by the U.S. Federal Trade Commission (FTC), which specifies policies for collecting information from children under age 13, such as obtaining parental consent and protecting children's privacy and safety (Montgomery, 2001). However, there is no governmental regulation about advergames, leaving marketers free to expose children to advergames repeatedly for long durations of time without clearly identifying these games as commercial content (Moore & Rideout, 2007). One major roadblock to developing U.S. governmental regulations on online marketing is that the Supreme Court routinely privileges free speech to marketers under the First Amendment (Grossman, 2005). Who holds responsibility for deceptive Internet advertising and marketing is a subject of legal debate (Hertz, 2002).

In the United States, self-regulating bodies are preferred to government regulation. For instance, the Children's Advertising Review Unit (CARU) is an organization sponsored by the Council of Better Business Bureaus. Its main guideline related to online marketing to children is that advertisements must be clearly identified (Quilliam, 2009). Although the guideline also states that the advertisement should not mislead children, a footnote is included that clarifies the guideline does not apply to the mere presence of a product or character (Stern & An, 2009), thereby excusing many advergames from the rule. This example of an industry-driven voluntary pledge to restrict marketing may, in fact, have no practical effect on regulating advergames.

The Children's Food and Beverage Advertising Initiative (CFBAI) is another self-regulatory body in the United States, in which food and beverage

manufacturers pledge to use responsible advertising in marketing products to children. Participants pledge that advertised food and beverage products to children aged 12 and under must include a health-promoting message relating to healthy dietary or lifestyle choices (Quilliam, 2009). Twelve companies pledged to market only “better for you” foods to young children, and four companies pledged to stop marketing to children completely (Better Business Bureau, 2011).

Summary of marketing codes. It is useful to find commonalities across national and international codes in order to highlight the various options available to policy makers. Nairn and Dew (2007) collapsed marketing codes into two major areas of regulation: advertising content and advertising labeling. The following regulations are fairly standard across codes for advertising content: do not include hazardous situations that could inflict physical, mental, or moral harm; do not include inappropriate violent or sexual material; do not include products that are illegal for children; do not encourage pester power; do not portray the product as capable of increasing the child’s bravery, loyalty, or superiority for gaining peer acceptance. The following guidelines regulate advertising labeling: advertising should be separate from content; advertising and links to advertisers’ sites should be clearly labeled; advertising should not use labels such as “now” or “only” that convey urgency or artificial shortages; spokescharacters and celebrities should not endorse a product where they are providing the main entertainment, and they should not be used next to advertiser’s links (Nairn & Dew, 2007).

Effectiveness of Regulations

The digital world is incredibly difficult to regulate, as sites cross international boundaries, making regulations seemingly impossible to enforce. Moreover, unlike television commercials or print advertisements, websites and advergames are adapted, updated, and published in real time. Codes for regulating online marketing to children must overcome many obstacles to be effective. As described by Dalmeny et al. (2003), codes are typically focused on television advertisements, ignoring the growing influence of online marketing practices. Moreover, most codes lack clear sanctions or the authority to enforce the sanctions, and often sanctions that do exist are retroactively enforced after the marketed content is published online (Dalmeny et al., 2003).

Even in the United Kingdom where some regulations are governmentally enforced, a study conducted of 50 popular children’s websites found that most websites do not clearly differentiate between the marketed content and the entertainment content (Nairn & Dew, 2007). For instance, 54% of websites did not include a warning when the user was leaving the site to visit a marketer’s website, and 49% of advertisements were not clearly labeled. This finding is particularly applicable for children, since they have a difficult time activating cognitive defense

mechanisms to understand the persuasive intent of marketed messages (Nairn & Dew, 2007). Moreover, 25% of websites included spokescharacters, and 9% of websites used urgent language including “now” or “only,” clear violations of the U.K. code. On a positive note, websites rarely committed certain infractions against international guidelines: implying that the child user will be superior, popular, or brave if he or she buys the product (2%) and encouraging pester power (<1%). In another analysis of the 40 popular websites used by children in the United Kingdom, Fielder and colleagues (2007) provided further evidence of the following infractions: (1) data protection rules and marketing codes were not being followed, (2) masked persuasion was used that may not be recognized by children, (3) free offers unfairly enticed children to play games and visit websites, and (4) age rules that differed by jurisdiction proved confusing to both parents and children.

Where public policy falls short in effectiveness, most countries throughout the world, including the United States, continue to rely on self-regulation by industry rather than governmental regulation. U.S. federal legislation that was proposed in 2011 outlines guidelines for food marketers to follow voluntarily, focusing on advertising foods that contribute to a healthful diet, while limiting the marketing of foods high in saturated fat, trans fat, added sugars, and sodium (FTC, 2011). Critics of self-regulation point to the ineffectiveness of such codes, which lack any real authority to issue sanctions for infractions (International Obesity Task Force, 2008). Moreover, self-regulated online marketing codes appear to be largely ineffective and not implemented (Nairn & Dew, 2007). For instance, the U.S. CARU guideline of including an ad break that separates the commercial from the entertainment content is only followed by 22% of websites hosted by the 40 most popular children’s food and beverage company websites (Weber et al., 2006). In a report on food advertising practices to children, the American Psychological Association recommended that the CARU guidelines be made more readily available to parents so they could detect and report infractions (Wilcox et al., 2004).

A study of CFBAI members found that 83% of food products marketed in advergames were considered unhealthy, only 63% of commercial websites included ad breaks or disclaimers, 37% included healthy lifestyle messaging, and just 30% included “better for you” products (Quilliam, 2009). Similarly, a study of 24 children’s websites whose sponsors are members of CFBAI revealed that a majority used advergames (79%), in addition to branded downloadable content (76%), free website membership (63%), and leader boards (50%) (Brady, Elson, Farrell, & Wong, 2010). Each of these marketing strategies was used to promote branded food and beverage products, revealing that self-enforced regulatory codes were not being followed. Clearly, marketing regulatory policies are needed to control emerging media practices.

Despite evidence that many companies do not follow self-imposed regulations, there are exceptions. Four food companies—Cadbury Adams, Coca-Cola

Company, Hershey Company, and Mars Inc.—who pledged to not market at all to children actually kept their promises in relation to television marketing (Kunkel, McKinley, & Wright, 2009), though online content including advergames has yet to be examined.

Science-Based Options for Regulatory Policies

Recent scientific studies of the effects of advergames on children's preferences, attitudes, and behaviors reveal promising strategies for regulating advergames for children. More evidence is needed about how marketing practices, such as those found in advergames, affect children's attitudes, choices, and behaviors (Wright, Friestad, & Boush, 2005). There also needs to be more evaluation of regulations and interventions to protect children from emerging marketing practices. At the same time, clinicians, policy makers, and public health professionals are investigating emerging marketing practices on newer media platforms and creating strategies about how to use them for health promotion (Freeman & Chapman, 2008).

Change games to promote healthy choices. The promotion of foods and beverages that are of poor nutritional content in children's advergames may be counteracted by social marketing techniques that contain health-promoting messages. However, of 290 websites sponsored by two popular children's networks (Cartoon Network and Nickelodeon), there was only one health-promoting message for every 45 brand exposures (Culp et al., 2010). In another analysis of 251 children's food advergames, just 2.7% included nutritional or health-related information (Lee et al., 2009).

Another strategy to promote healthy eating patterns is to use advergames to market nutritious foods. For instance, Pempek and Calvert (2009) found that 9- to 10-year-old players were more likely to choose and eat healthier snacks after playing a Pac Man game that provided rewards to the character for "consuming" orange juice and bananas than a game version where Pac Man was rewarded for "consuming" chips and sodas. Health-promoting advergames are already available online, though sparse in number. Examples include Dole's games promoting bananas and the MyPyramid Blastoff game sponsored by the U.S. Department of Agriculture.

Policies that encourage advergame developers to promote healthy choices could be shaped from current policies regulating television content. As one example, the U.S. Children's Television Act (CTA) limits commercial content during children's television programs to 10.5 minutes per hour on weekends and 12 minutes per hour on weekdays (FCC, 1996). Television regulations such as the CTA could be adapted to regulate online marketing, such as limiting the amount of children's playtime on each host website.

Require ad breaks. Ad breaks are notifiers that alert the consumer to the fact that the advergaming is an advertisement (Stern & An, 2009). According to the persuasion knowledge model, consumers develop an understanding over their lifetime of how, when, and why marketers attempt to influence their attitudes, beliefs, and subsequently their purchases (Friestad & Wright, 1994). Ad breaks to separate television commercial from noncommercial content have been required by law in the United States since the early 1970s. For young consumers in particular, ad breaks next to or within advergaming may temporarily separate players from the rapidly paced, interactive advergaming experience, and thereby provide them with time to consider the source, intent, and message of the advergaming. A group of 8- to 11-year-old children exhibited decreased memory of, and decreased desire for, a marketed product following an ad break, although the ad break did not help the children determine the commercial intent or source of the advergaming (An & Stern, 2011). Ad breaks may, therefore, be a policy strategy to protect older children from the effects of food marketed within advergaming by making the advergaming products less appealing and less memorable.

Support media literacy programs. Media literacy, and more specifically advertising literacy, seeks to develop children's critical thinking skills to evaluate advertisements and decide whether to accept or reject a persuasive message (An & Stern, 2011). Public campaigns and school-based lessons may help children identify, discount, and reject commercial messages in advergaming. The American Psychological Association advocated this approach for school-aged children to combat potential negative effects of advertising (Wilcox et al., 2004). Requiring advertising literacy as a component of school curricula, or as an objective in school wellness policies, could be a policy direction to ensure that media literacy is taught in schools.

Indeed, advertising literacy interventions increase children's skepticism and awareness of persuasive advertisements (Livingstone & Helsper, 2006). For example, a 10-minute advertising literacy lesson was effective in increasing 138 8- to 11-year-old children's understanding of a commercial sponsor and the persuasive intent of an advergaming (Stern & An, 2009). The teacher-taught lesson focused on the purpose and persuasive techniques of advergaming and discussed ways for children to identify the commercial intent of games. The authors suggest that media literacy provides one effective vehicle for teaching children the purpose and techniques of advergaming. Similarly, a brief media literacy session increased fourth- and fifth-grade children's recognition of embedded advertisements by 33% as well as increased their understanding that the advergaming was a marketing technique rather than entertainment content by 26% (Wollslager, 2009).

Summary

Food marketing is now disguised as fun, interactive digital games that increase memory, positive attitude, desire, and consumption of a branded food product. Theoretical explanations focus on persuasion knowledge, developmental stages of identifying commercial content, limited information processing skills, and classical conditioning to explain how children and adolescents are susceptible to the persuasive power of advergames. The poor nutritional content of the foods in most advergames is of concern, as are privacy issues when food and beverage companies collect personal information from children for targeted marketing campaigns. Although several countries have governmental and voluntary marketing codes, many codes do not yet cover advergaming, and those that do are largely ineffective in changing the online marketing environment. Using advergames to promote healthy food products, creating ad breaks to differentiate commercial from non-commercial content, and educating children to improve advertising literacy may weaken negative influences of advergames on children's food choices, thereby combating pediatric obesity outcomes. Even with such changes advergames remain only part of the solution, as they are a sedentary pastime. We turn next to a discussion of active gaming that can prevent pediatric obesity through increased physical activity.

Playing Games to Burn Calories: The Case of Exergames

Whereas advergames predominantly impact children's caloric intake, exergames influence children's caloric expenditure. Exergames, which can be called active play video games, exertainment, and active games (Lieberman et al., 2011), have become extremely popular. The exergame industry comprised \$6.4 billion of the \$42 billion video game industry (Donner, Goldstein, & Loughran, 2008). In the United States, a national survey of 8–18-year-olds found that youth spend on average 73 minutes each day playing video games, about half of which still occurs on a console hooked up to a television set (Rideout et al., 2010).

A portion of console-based video gaming is shifting from sedentary gaming into exergaming where gross motor physical activity occurs. Of the 87% of adolescents who have a video game console in the home, 36% have a Wii, 36% have an Xbox, and 18% have a Playstation (Rideout et al., 2010), and each console has the capability to operate exergames with the purchase of additional equipment. Wii Play and Wii Sports have been played by an estimated 64% of all U.S. youth (Rideout et al., 2010). Interestingly, exergames appear to attract a wide audience, with 58% of boys and 64% of girls playing exergames, and roughly equal numbers of typical gamers and nongamers playing (Lenhart, 2008).

Theoretical Explanation of Exergame Effects on Health Outcomes

Social cognitive theory, which describes a reciprocal relationship among personal factors, behaviors, and environments, provides a good fit for the multiple individual and environmental factors that come into play during exergaming (Staiano, Abraham, & Calvert, 2011). The social gaming experience during play can presumably increase the youth's intrinsic motivation and self-efficacy, i.e., the belief that one can control the events in one's life (Bandura, 1997). The behavior, in this case the physical action of playing the exergame, is also expected to influence personal variables, including self-efficacy and self-esteem. Moreover, environmental variables such as social interaction and peer support during gameplay can provide further motivation to sustain exergame play, which can produce caloric expenditure and weight loss (Staiano et al., 2011).

Potential Health Benefits of Exergame Play

Exergames could play a key role in the pediatric obesity epidemic. Most traditional video games involve long durations of sedentary behavior, and sedentary behavior has been linked to negative health outcomes including cardiovascular risk factors and the metabolic syndrome (Sisson et al., 2009). In fact, video game play has been linked to childhood obesity for postmenarchal females and children already at risk for obesity (Vandewater & Cummings, 2008).

By contrast, exergames require physical activity that involves caloric expenditure that increases players' heart rates (Graves, Stratton, Ridgers, & Cable, 2007). In a review of exergame studies in children and adolescents, Biddiss and Irwin (2010) found that exergames demand a higher level of energy expenditure than sedentary video games. Specifically, energy expenditure and heart rate during exergame play versus rest were compared. While results were highly variable, energy expenditure and heart rate were on average 222% and 64% higher, respectively, compared to resting. Despite these promising results, the authors urged caution in drawing conclusions from the extant data as the evidence is limited at this point in time and the long-term efficacy of exergames for physical activity or health outcomes is unknown. Nevertheless, this review provides support for encouraging exergame use in place of traditional sedentary video games (Biddiss & Irwin, 2010).

Due to the physical activity involved in exergame play, there is also evidence that children and adolescents can benefit from improved systolic blood pressure and maximal oxygen consumption (Warburton et al., 2007), as well as improved respiratory rate and ventilation (Wang & Perry, 2006). Endothelial function, which is vital to the healthy functioning of the cardiovascular system, is important for decreasing hypertension, cholesterol levels, and obesity, which are all associated with cardiovascular disease and type 2 diabetes mellitus (Murphy, 2007).

A 12-week intervention using the exergame *Dance Dance Revolution* improved endothelial function and aerobic fitness in 35 overweight children who initially had endothelial dysfunction (Murphy, 2007). Studies also demonstrate significant weight loss over a 20-week intervention when youth played an exergame cooperatively when compared to their baseline scores and a control group who followed their typical daily activities (Staiano et al., 2011). Exergames may even promote coordination and balance skills that could potentially transfer to other sports and physical activities (Staiano & Calvert, 2011a).

However, the physical activity and health benefits vary based on the selected exergame and the characteristics of the player. Overall, exergaming does not reach the physical activity levels of actual sports play (Daley, 2009). Many exergaming activities produce only light levels of physical activity, but a few exergames do in fact engage youth in moderate intensity physical activity (Daley, 2009). In fact, one study of 12- to 18-year-old children playing Wii Sports tennis found that those who competed against peers while playing the exergame expended the same amount of calories compared to participating in a beginner's tennis lesson on a tennis court (Staiano & Calvert, 2011b). Importantly, games involving the lower body produced significantly higher energy expenditure than upper body only games (Biddiss & Irwin, 2010). Daley (2009) concluded that there is a need for randomized, high-quality, controlled trials to test the effectiveness of exergaming and potential clinical outcomes to discover what aspects of exergames promote moderate to vigorous intensity exercise. It is also important to specify the motivational factors that sustain player interest over long periods of time.

Evidence is emerging for other benefits of exergame play that accompany the physical health benefits, such as socioemotional benefits that might motivate children to continue playing on a regular basis, particularly for overweight and obese children and adolescents who face social and emotional difficulties. For instance, a 20-week Wii Active intervention for 54 overweight and obese low-income African American adolescents produced higher self-efficacy, a key part of success in Bandura's social cognitive theory, as well as increased peer support (Staiano et al., 2011). The increased self-esteem from socialization experiences during video game play can motivate children to continue playing a game (Suhonen, Väättäjä, Virtanen, & Raisamo, 2008), which would allow them to reap maximal physical health benefits. Additionally, exergame players demonstrate positive attitudes toward physical activity and establish healthier daily activity patterns (Chin A Paw, Jacobs, Vaessen, Titze, & Van Mechelen, 2008; Lin, Mamykina, Lindtner, Delajoux, & Strub, 2006).

Policy Approaches to Exergame Play

Gaming and physical activity are important policy concerns pertaining to pediatric obesity, as video games consume much of youth's attention and time

(Read & Shortell, 2011). Regular physical activity contributes to cardiovascular, musculoskeletal, and neuromuscular growth as well as healthy weight maintenance (WHO, 2011a). The inactive lifestyle of contemporary youth has been addressed by various governmental, nonprofit, health, and education organizations.

Incorporate exergaming into physical activity recommendations. The WHO recommends that children aged 5–17 years participate in at least 60 minutes of daily moderate to vigorous intensity physical activity (WHO, 2011a). This guideline has also been implemented in several countries, including the United States (U.S. DHHS, 2008). However, only 15.3% of U.S. youth exercise 60 minutes a day (Fulton et al., 2011).

Because exergames are already an integral part of many youths' lives (Lenhart, 2008), they may be a viable and sustainable source of regular physical activity. The U.S. President's Council on Fitness, Sports, and Nutrition now includes exergames as a recommended and approved activity for the Presidential Active Lifestyle Award (President's Council, 2011). The Compendium of Physical Activities, widely used as a reference to calculate intensity of various physical activities, added "activity promoting video games" as a conditioning exercise that produces light, moderate, or vigorous levels of intensity depending on effort level (Ainsworth et al., 2011). Norway now recognizes exergaming as an official sport. Exergaming is even being incorporated into school wellness policies and physical education programs, due to its positive effect on physical fitness, motor skills, and exercise motivation (Papastergiou, 2009).

Incorporate exergaming into schools. When children and adolescents play exergames during lunch-time or after-school programs, physical activity increases (Young, Marshak, Freier, & Medina, 2007) and even weight loss occurs (Staiano et al., 2011). Exergames are also being integrated into school curricula. For instance, in a New York public middle school, 4 hours of Nintendo Wii play each week fulfilled gym requirements (Montero & Gonen, 2009). In fact, exergames have now been implemented into physical education classes in at least 35 of the 50 U.S. states (Entertainment Software Association, 2011).

Create funding opportunities for exergaming. Ample opportunity exists for video games to promote desirable health outcomes, including diet, exercise, and therapy adherence, and governmental funding opportunities are emerging. Read and Shortell (2011) outline grants enabled by the U.S. Affordable Care Act, which includes a 5-year \$10 billion source of funds for health promotion and disease prevention, as well as a new stipulation that health promoting video games may be counted toward the minimum percentage of premiums that health insurers must contribute toward improving health care in the United States. TIGA, a game industry consortium based in the United Kingdom, supports various policies geared

toward promoting game development, including tax credits and relief for research and development in the gaming industry, prototype funding, improved linkage between university and business collaboration, and migration and employment policies related to gaming.

Create public-private partnerships to research exergaming. In addition to policy opportunities, possibilities exist for public-private partnerships and diverse, interdisciplinary collaborations in exergaming research. For instance, the American Heart Association (AHA) created an alliance with Nintendo of America in May 2010 to promote exergames as physical activity tools that can build a gateway to other physical activities. The AHA logo is displayed on the Wii Fit Plus and Wii Sports Resort games to market these products as part of a healthy lifestyle. A multidisciplinary summit was held in January 2011 to assemble experts in physical activity and health research, the health care industry, and game development. The summit revealed important areas for future research, focusing on how exergames can promote health and prevent diseases (Lieberman et al., 2011). Research directions included examining exergame effectiveness, how exergaming may increase physical activity and sports participation, how exergames influence self-confidence and self-esteem, and the use of exergames in special and at-risk populations, such as children and adolescents.

The Robert Wood Johnson Foundation also sponsors the Health Games Research program in the United States which funds 19 interdisciplinary research teams to investigate the effectiveness and design of digital gaming for health outcomes. The Serious Games Initiative, at the Woodrow Wilson Center for International Scholars in the United States, seeks to connect the electronic game industry with policy, education, training, and health projects. Humana Games for Health provides a business-gaming collaboration, in which the Humana health care company has partnered with game developers to create new technologies that impact health outcomes.

Summary

Exergaming is a popular activity among youth that promotes positive physiological outcomes including potential weight loss (Staiano et al., 2011). Social cognitive theory and mediators explain how children and adolescents who play exergames increase in self-efficacy, self-esteem, and friendship quality (Staiano & Calvert, 2011a,b), which can promote sustained interest in gameplay. The potential for sustainability of exergaming may help youth meet physical activity recommendations established by governmental and school policies, particularly since many exergames require moderate intensity levels of physical activity. Research on the specific aspects of exergaming that promote maximal physiological benefits is needed to test the effectiveness of exergames for weight loss and healthy

weight maintenance. Public-private partnerships create a window of opportunity to promote pediatric physical activity within a gaming environment.

Conclusion

As pediatric obesity rates continue to rise, so too does digital gaming by youth (Ogden et al., 2010). Despite the high frequency and duration of gameplay by a diverse range of youth, scientific evidence on the effects of digital gaming on children's health and obesity outcomes remains surprisingly sparse. Theoretical explanations for how gaming impacts children's health are examined primarily through the research about traditional television advertisements and sedentary video games, despite the increasing prevalence and use of newer interactive media. Advergaming and exergaming provide two examples of how digital gaming affects pediatric obesity, yet there are many new technologies to investigate, such as virtual reality (Morie & Chance, 2011) and mobile games (Pollak et al., 2010). Policy makers have a challenge to balance the negative effects of gaming, involving the increased caloric intake prompted by most advergaming play and the sedentary activity involved in many traditional video games, with the potentially positive health benefits of activity-promoting exergaming and advergaming that promote healthy food and beverage consumption. The melding of electronic games with the health of children and adolescents is an intersection of science and social policy, gathering social scientists, game developers, and policy makers who can develop innovative, effective games that are engaging and fun to the many digital natives that are in great need of a much healthier lifestyle.

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