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Interactive Games to Promote Behavior Change in Prevention and Treatment

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ANYONE WHO HAS OBSERVED SOMEONE DEEPLY ABsorbed in a video game can appreciate that use of these games is a uniquely powerful interaction. For the player, time stands still and self-consciousness disappears. Csikszentmihalyi described this state as “flow.”¹ His concept was exemplified by mountain climbers living in the moment of ascent or surgeons lost in a delicate and demanding task. He could just as well have been describing what happens when individuals engage with some of today’s interactive games.

Games are now a dominant form of media, even larger than the motion picture industry, and are enjoyed across gender, age, and cultural boundaries. Zynga Inc, a Facebook game developer, claims 215 million players worldwide among that social Web site’s half-billion users.² Games targeting healthy behaviors are also proliferating. For example, Web-based games offered by Humana, the large insurance company, are based on conventional objectives for diet and exercise. Other games are appearing on consoles, mobile phones, and less traditional platforms including toys, robots, and medical devices.

Such games deserve serious attention, because clinicians and policy makers will be confronted with decisions regarding their use. There is great promise in channeling these hours of engagement to address some of the most difficult and persistent challenges involving diet, exercise, and adherence to therapy. Sufficiently engaging games might enhance the effectiveness of health messaging, allowing individuals to practice useful thought patterns and behaviors and encouraging them to explore and learn from failure in safe virtual environments.

The efficacy and mechanism of action of games targeting health outcomes are not well defined. Time spent playing entertainment games can enhance psychomotor skills, judgment, and high-level social skills such as leadership and collaboration.³ However, evidence also exists for the negative influence such media exposure can have on the health of children, particularly those exposed to themes of violence and aggression.⁴

Successful entertainment game designs draw on a well-understood set of features, such as a narrative setting that motivates goals, systems of feedback, points, levels, competition, teamwork, trading, and often, self-representation using an avatar.³ The extent to which a game is engaging (and useful for health objectives) depends on the skill with which these are implemented as a package for a particular audience.

To date, the evidence base of studies evaluating games is limited, and only a few health games have been subject to rigorous evaluation. One study evaluated *Packy & Marlon*, a Nintendo console game published in 1994 that allowed children and adolescents to play the role of a character with type 1 diabetes, monitoring glucose levels, using insulin, and selecting foods. In a 6-month, placebo-controlled study, study participants who played the game had a 77% reduction in diabetes-related emergency department visits and urgent care visits.⁵ A school-based computer game for fourth-graders improved daily fruit and vegetable intake.⁶ More recently, *Re-Mission*, a game for adolescent and young adult patients with cancer, has been shown in a randomized trial to improve adherence to chemotherapy and treatment plans.⁷ Some “exergames,” including those on the Wii Fit and DDR dance-pad platforms, have been shown to increase physical activity and may have benefits for treating obesity.⁸

Interactive games are rapidly exploiting new technology. Global Positioning System (GPS) technology in new smartphones is spawning a host of location-based games as well as physical activity-tracking applications that record distance hiked, run, or skied. Accelerometers that turn cell phones into sophisticated pedometers are just beginning to be incorporated into games to promote healthy behavior. Some investigators are evaluating efficacy of games that use dedicated sensors measuring heart rate or expiratory volume that can upload data to the Web via wireless hotspots, cell phones, or personal computers. For example, *Zamzee* is an online rewards system for 11- to 14-year-olds based on physical activity using a pocket monitor. At Cornell University, adolescents playing the *Mindless Eating Challenge*

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receive peer support by sharing cell phone photographs of portion size and ingredients. Investigators at Columbia University are testing *Lit to Quit*, an ingenious game in which smokers trying to quit can puff into an iPhone microphone instead of a cigarette and in 2 game versions use a “rush” or a “relax” form of breathing that helps reduce cravings. In “alternative reality” games, experience comes from the Web and from e-mails and telephone calls from the game and, increasingly, action is connected to the physical world via sensors. For example, at Indiana University, students are participating via these media in an investigational interactive mystery game that promotes healthy eating and exercise.

The Robert Wood Johnson Foundation is encouraging a rigorous evaluation of applications such as these via its program on Health Games Research, including an emphasis on understanding how various game design elements contribute to efficacy in individuals with different demographic and socioeconomic backgrounds.⁹

In addition, there are new resources for quality improvement based on behavior change. The recently passed Affordable Care Act includes \$10 billion for disease prevention and health promotion over the next 5 years. Health games represent an emerging tool that must be considered by community health centers, accountable care organizations, and patient-centered medical homes. The act also requires insurance issuers to spend a minimum percentage of premiums on clinical services or on activities that improve health care quality. Under these “medical loss ratio” rules, health games could qualify as health promotion programs, because Web-based interactions are specifically included in the definitions.¹⁰

In summary, the substantial growth of new interactive game technologies and genres raises new concerns and opportunities. The size and level of engagement of the audience means that health games can affect a wide range of individuals, including those who are difficult to reach with traditional messaging. Powerful technology can also have unintended consequences. Exercise games could work too well and lead to cardiovascular or joint complications. Failure of motivational games could lead to disillusionment and disengagement.

This is just the early stage of knowing how to create and deploy applications that actually deliver health benefits. Additional investigation is necessary to determine whether

and how to integrate effective interactive games into clinical care settings and community programs without disrupting trusted relationships with clinicians. To create the foundation for evidence-based design, use, and refinement of these promising technologies, further studies will need to address questions about mechanism of action, efficacy, and safety across the range of uses and participant demographics. In the meantime, those offering health games should at least make the key design principles and objectives available to health professionals to enable a common-sense evaluation of suitability.

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