

# TECH WATCH

## Games For Health: The Latest Tool In The Medical Care Arsenal

Computer-based simulations and interactive programs are introducing a powerful new force into health care: fun.

by **Carleen Hawn**

**ABSTRACT:** At the heart of any promising plan to transform the health care system lie two priorities: broader access to care for patients, and deeper engagement in health care by patients. Although the problem of expanding access to affordable care remains unresolved, new tools for deepening consumers' engagement in health care are proliferating like viral spores in a virtual pond. Digital games, including virtual realities, computer simulations, and online play, are valuable tools for fostering patient participation in health-related activities. This is why gaming is the latest tool in the arsenal to improve health outcomes: gaming makes health care fun. [Health Aff (Millwood). 2009;28(5):w842-8 (published online 4 August 2009; 10.1377/hlthaff.28.5.w842)]

**J**ANET SHANTA HAS all the enthusiasm of the typical video game enthusiast—and perhaps more. She raves about playing the game Dancetown with her friends. They spend two hours playing it every Monday afternoon in a Henderson, Nevada, community center near Las Vegas. Dancetown entices groups of players to perform dance steps on a digitized footpad, following a set of visual and musical cues from a computer. The enticement works, according to Shanta. “We like music, we like to dance, and this is just fun,” she says.

But please understand, Shanta adds: this is more than mere competition or mind-numbing entertainment. “We get our heart rate up. It’s eye-foot coordination, it’s rhythm, it’s concentration. You have to pay attention to what you’re doing,” Shanta says. And Shanta is no mere game-obsessed teeny-bopper; she’s soon

to be 68 years old, and her favorite dance partner, her husband John, is a youthful 70. The considerable health implications of their activities become clear when you learn the results. In the six months since she has been playing Dancetown, Janet Shanta, who once struggled with high cholesterol, has been able to drop her LDL by fourteen points. “The good cholesterol went up and the bad went down!” she exclaims. Her cholesterol now measures 258/211. Her doctors still want her to get her LDL below 200, she says, “but I don’t want medication. So I’ll do it with an active lifestyle.”

### The Rise Of Exer-Games

Dancetown is just one of many multiplayer video games now being developed specifically to encourage exercise or other healthy behavior, improve coordination, and enhance cognition. It’s modeled on the social game Dance Dance Revolution, popular with teens in

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movie theatres and malls for more than a decade. In winter 2008, Humana, the nation's fourth-largest insurer with approximately twelve million members, hired Cobalt Flux, a gaming company in Salt Lake City, Utah, to develop Dancetown so that it would have a specific look and feel appealing to seniors. Dance Town made its debut in January 2009 and is now deployed in two of Humana's "guidance centers," similar to the one Janet Shanta frequents in Henderson.

It's too early into this pilot program to report clinical outcomes, says Humana's Rhonda Mayland. But anecdotally, she says, many members who regularly play Dancetown at her Las Vegas-area guidance center have lost weight and register fewer complaints over chronic illnesses like arthritis. One member, who has had both hips replaced and has arthritis in other joints, says Dancetown "really helps her to move." And John Shanta—an active man with a bad knee who wears two leg braces when he plays other sports—is now able to play Dancetown without any pain at all.

Humana has now dedicated an entire unit of its innovation department to gaming and plans to roll out Dancetown in many of its other fifteen guidance centers in ten states during 2009. And Humana isn't alone. An estimated \$50 million in venture capital investment has poured into developing health games over the past five years. Major corporations like Johnson and Johnson, Unilever, Kraft, Nike, Apple, Disney, and other technology or consumer-goods companies are also developing or supporting new products related to health gaming. And foundations from the Robert Wood Johnson Foundation (RWJF) to the Kaiser Family Foundation and Aetna Foundation are investing millions of dollars in health game research and development.

As a result, the roster of new health-related games keeps on growing. The National Institutes of Health (NIH) gave \$9 million to the multimedia firm Archimage to develop Escape

from Diab, an interactive game that educates kids with diabetes about healthy eating and exercise. In the game, "an active inner city youth" named DeeJay falls into the warped world Diab, where people eat nothing but junk food. DeeJay must use his knowledge of nutrition and exercise to escape. The Centers for Disease Control and Prevention (CDC) employs a simulation game called WhyFlu to educate kids about flu vaccinations. Kaiser Permanente has won awards for its bilingual

game about nutrition called The Amazing Food Detective. Meanwhile, the insurer CIGNA has partnered with HopeLab, a nonprofit research organization focused on serving youth with chronic illnesses, to distribute a game called Re-Mission. It allows cancer patients to

control a virtual "nanobot" that kills cancer cells and battles treatment side effects.

### Health Effects

Research is beginning to show that the games are far more than just entertainment and truly can lead to healthier behavior and better health. Take the example of Re-Mission. A recent article in the journal *Pediatrics*<sup>1</sup> reported on a randomized clinical trial of the game, involving 375 male and female patients at 34 medical centers in the United States, Australia, and Canada during 2004–2005. The study showed that patients who played the game actually became more engaged in their care and, in effect, turned into better patients. The authors, Pamela M. Kato and colleagues, concluded that patients who played the game "significantly improved treatment adherence and indicators of cancer-related self-efficacy and knowledge," compared to patients who did not play. "The findings support current efforts to develop effective video-game interventions for education and training in health care," the authors wrote.<sup>1</sup>

It's no secret that all types of video games are big business: the worldwide market for game hardware and software generated \$42

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billion in revenues in 2007 and will grow to an estimated \$68 billion by 2012, according to PriceWaterhouseCoopers.<sup>2</sup> Games designed to promote healthy activities, or “health games,” are today a fraction of this market, at an estimated \$6.6 billion in annual sales. But the potential seems immense. A 2008 survey by the Entertainment Software Association shows that nearly 65 percent of U.S. households say that they play games regularly.<sup>3</sup> This could equate to as many as 140 million individual “gamers.”<sup>4</sup> Gaming isn’t only for the young, either. More than one-fifth of those age 50 and older play games, and the number is growing fast.

At the most basic level, health-oriented games like Dancetown can help improve fitness or even contribute to recovery from injury or stroke. “The beauty of a game is that it gives you a goal,” says Debra Lieberman of the Institute for Social, Behavioral, and Economic Research (ISBER) at the University of California, Santa Barbara. Lieberman, who oversees health game research under an RWJF-funded program, adds that “people will work longer and harder if [an activity] is game-based.” That idea appears to be borne out by the huge success of games like Wii Fit Balance Board, one of the popular Wii family of games produced by the Japanese company Nintendo. Released in the United States in 2008, Wii Fit is a so-called exer-game that uses pressure sensors and software to monitor a player’s body mass index (BMI) while he or she engages in such actions as aerobics or yoga. (Players have to enter their height into the Wii Fit software program.) Users say it’s fun and keeps them exercising longer than they might otherwise. Since its release in December 2007, Nintendo has sold more than eighteen million copies of Wii Fit globally, generating more than \$1.5 billion in gross sales.<sup>5</sup>

Another recent entry in the “exer-game” field is Horsepower Challenge, created by Humana and pilot-tested among a group of 100

sixth-graders at five public schools in Louisville, Kentucky, Humana’s home base. The children were given a wireless-enabled pedometer and encouraged to walk. All of their steps were recorded and uploaded to power a networked video game. The more steps they took, the more power they had to play the game. After a four-week trial, Humana reported a 13 percent increase across all five schools in the number of steps the kids were taking.<sup>6</sup> “They were actually organizing them-

selves on recess to increase their step count,” says Greg Matthews, chief of Humana’s Consumer Innovation Group, which includes the new gaming division, HG4H. Even better, says Matthews, at the conclusion of the trial, 53 percent of kids said that they had begun to exercise with their families at home, well after the daily “gaming” had come

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to an end.

Since that pilot-test, Humana has extended its Horsepower Challenge to three schools in England and is now attempting to roll it out to a total of 100 schools in 20 additional U.S. cities. For Humana, gaming represents what Matthews calls the “third wave” of the company’s focus on encouraging behavior change to improve health—and breaking out of the doldrums of the disease management business. “The first wave was, ‘We’ve got to change people’s behavior’ to help them avoid chronic disease,” Matthews says. That failed because people didn’t like being told what to do. “The second wave was, ‘Let’s take healthy behaviors and make them more fun.’ So we added a television to a treadmill to distract you from the fact that it’s painful to run 10 miles.” That only worked if someone already enjoyed running. Now, Matthews says, “We’re thinking about the things people already love to do, and we’re adding health to those things. We’re connecting with their lifestyles, not telling them what to do.”

The concept of adding “health” to games is now moving beyond exercise to focusing on

the goals of health education and promotion—and, for the elderly, even to attaining the goal of enhanced cognition. There are so-called serious games—simulations or narratives that can require long periods of time to play—such as Re-Mission; Escape from Diab; Quest for the Code, which is an asthma education game; and Pulse!!, a simulation game used to train medical students. There are also “casual games,” usually simple word games or puzzles that can be played quickly. A common example is computer-based solitaire. Casual games with suggested health benefits include Nintendo’s Brain Age and Brain Training, both of which use puzzles like sudoku and math problems to “stimulate the brain.”

It might seem self-evident that playing a game about controlling your diabetes would have a bigger effect on children than listening to a lecture from a parent or doctor. But why this might be the case is critical, says Lieberman. In effect, games can be used to “build character,” a psychological term for experiencing consequences. In games, the effects of good or bad behavior, like eating the wrong foods or not killing cancer cells, are actually internalized by a player and are no longer limited to an abstract concept of what happens to “other” people. When people play simulation games, they feel like something happened to them directly—“It’s me, I went through this experience,” she says—even if it was fantasy.

In the broadest sense, the theory behind all of these games is that deeper knowledge of healthy behavior, patient engagement in care, and compliance with clinical protocols will improve health outcomes. Better outcomes, the theory continues, will lower costs for everyone—patients, providers, payers, and the health care system at large. And all of this will start with the premise that unlike much about health care, the games elicit interest and involvement because they are fun. They are “everything inviting, and health care is everything that is NOT inviting,” says health game advo-

cate Ben Sawyer. A health game, he says, “says ‘please have fun, please leave wanting more, please do this with your friends and your family and people you don’t even know.’”

### Funding Developments

Although insurers like Humana have already embraced the hypothesis that games will improve health and lower costs, the broader health care world still needs convincing. So to test these ideas, the RWJF since 2008 has plowed \$8.25 million in grant funding into health-related gaming through its Pioneer portfolio of grants. “Where you find innovation is often at the intersection of two previously unrelated fields,” such as games and health, says Paul Tarini, senior program officer of the foundation’s Pioneer

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portfolio. “[We] saw that when kids played games, they would spend a lot of time with the game, and they were able to retain a lot of information. It seemed to be very ‘sticky.’ So we wondered, how might you use games as...a supportive therapy to facilitate behavior change? There wasn’t a lot of funding being done there. So we started out to see if we could facilitate more of an intersection between these two fields.”

The foundation’s grant funding helped in 2004 to form two new nonprofit entities with complementary goals: Games for Health and Games Health Research. Games for Health’s role is to cultivate the community of health games developers; Games Health Research aims to build a body of data to demonstrate games’ impact on health outcomes. In just five years of existence, the Games for Health community has made good progress. According to Sawyer, Games for Health’s codirector, there are now more than 500 people worldwide either actively developing games or conducting research to further establish the clinical impacts of gaming on health outcomes. Games Health Research awarded the first round of twelve grants in May 2008 to researchers evaluating health games at more than a dozen in-

stitutions, including Cornell University, Indiana University Bloomington, the University of Southern California, and the medical schools at the University of Washington and University of California, San Diego. The second round of grants will be awarded before September 2009.

The Games Health Research program is managed for the RWJF by Debra Lieberman of ISBER. A psychologist and educator by training who earned a doctorate in communication from Stanford University, Lieberman had long conducted research on how people learn through interactive media. Scientists have understood for years that interactive games are “an amazingly powerful tool for education, or attitude and behavior change in players,” she says. That awareness led her to become an early health game developer herself when, in the mid-1990s, she helped produce a game called Packy and Marlon for children with diabetes.

Designed to be played on Nintendo, the game aims to teach kids about controlling their blood glucose levels and becoming more empowered and less socially isolated in the process. For example, when two children play the game together, each must keep track not only of his or her own glucose level but the other player’s as well. Clinical trials of the game have shown that children who play it with their friends are more open to talking about their disease, better able to seek social support for themselves, and more likely to adhere to their glucose control regimens as a result. In a randomized controlled trial conducted by Stanford University Medical Center and Kaiser Permanente, kids who played Packy and Marlon for six months reduced their diabetes-related emergency room visits by 77 percent, from 2.4 to 0.5 visits a year, versus a control group that played a non-health-related video game over the same period.<sup>7-9</sup>

## Extending The Health System

Health game advocates believe that the games can now play a critical role in filling the gaps in inadequate systems of public health or primary care. “You see your doctor for just ten minutes a year if you’re lucky,” Sawyer notes. “We have evidence that if doctors talk to their patients about quitting smoking for several minutes, it can have a very big effect. But in ten minutes, smoking does not come up.” So, Sawyer says, a quit-smoking game might effectively take the place of a lecture from a time-strapped primary care provider.

Similarly, games may translate into an effective new form of telemedicine: a technology that can help extend physicians’ reach, especially the reach of specialties that are in short supply. Christine

Aguilar is a pediatric psychiatrist with Kaiser Permanente who works with young patients suffering from such conditions as cerebral palsy, spina bifida, muscular dystrophy, or spinal cord and head injuries to help them recover the ability to function. There are fewer than 150 psychiatrists focused on children in the country, and Kaiser has only two. Aguilar can’t possibly see all of her patients in person, even though physical therapy is crucial to their treatment. So she recently began experimenting with a combination of Skype, a Web-based video phone service, and the Wii Fit to deliver remote physical therapy sessions to her patients. It’s still in the testing phase, but kids love it, and results have been positive. “Whatever children embrace, whatever adults embrace,” says Aguilar, “medicine has got to say ‘this is important.’”

## Need For Data On Outcomes

For the health care community, the biggest hurdle to embracing health games is that there are not yet large bodies of peer-reviewed data that provide the standard of proof that health games really do work. “People in medicine ask

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us all the time, ‘where is the data?’,” says Lieberman. “We are committed to growing the field academically. We will assemble the research. We will establish evidence of outcomes, we will establish an evidence-based set of principles for best practices in game development.” Plenty of games are neither well conceived nor effective, she admits, and consumers deserve to have the highest standards for games that address their health.

In particular, Lieberman and her colleagues are eager to focus on what features of games produce the greatest “self-efficacy,” or the self-confidence to carry out a specific behavior. “The games let you try things out and practice, and you get feedback on your performance. You can make a mistake and it

is not dangerous,” she notes. This “rehearsal” aspect to games, Lieberman adds, appears to be an important precursor to behavior change, since it creates the sense of confidence that the changes can be carried out.<sup>10</sup> If research can help shed light on which aspects of games produce the greatest self-efficacy, game producers might then be able to create products that are most likely to improve health outcomes.

Of course, any improvements in those outcomes will also need to be measured. Private investors are already betting that they will be—and that when they are, they’ll be positive and will thus help grow the gaming market. One such investor is Andy Donner, of San Francisco-based Physic Ventures, which focuses on consumer health. “Everything happening in [health care reform]—in the Obama administration, at the [CDC], with the payers—is all about health outcomes,” Donner says. Measuring outcomes requires data—“and the fascinating thing about games” is that they produce a lot of it, he adds. In *Dancetown*, the software that powers the game collects data about users’ weight. In *Horsepower Challenge*, the data collected are about distance walked. In *Glucoboy*, a diabetes game in which players must insert a glucose test strip into a console to move on to more advanced levels,

the data collected are about blood sugar.

At the simplest level, Donner says, the data from health games are fed back to individuals to motivate or reward them. But they can also have other uses. “We can tie the data back to insurance and benefits,” he says—or even feed the data into a personal or electronic health record. From there, online coaching or text messaging could yield an “integrated health promotion platform,” Donner says. Beyond that, aggregated data, stripped of any identifica-

tion tying the data to specific individuals, could easily be relayed to payers, drug companies, or agencies like the CDC seeking information about the health or risk profiles of populations. To be viable in the long term, health games must fit into a larger

framework in health care—such as electronic health records—he says, and “be more than just a stand-alone play. As vehicles for data capture, we see great potential in leveraging games, along with other technologies, such as online coaching and text messaging, to create a holistic and integrated health promotion platform,” says Donner. *Re-Mission* may not fit into such a platform.<sup>11</sup>

So attractive is the long-run potential that in May 2008, Donner was one of a group of venture capitalists who put up \$14 million to back a new company called *ExpressoFitness*. The firm builds videos and simulation software to enhance a player’s experience of riding on a stationary bicycle, with the objective of helping people exercise longer. But although many kinds of health games show promise, Donner says, not all represent investment opportunities. It’s not clear, for example, how big a market there will be for brain fitness games, or those like *Glucoboy* aimed at helping people manage their diseases. The operative questions, he says, include these: “What will consumers open their wallets for? Will moms buy a game about cancer for their kids? How many of those moms are there?” Amid doubts that markets for such products will be large, private investment in these areas is unlikely. So

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the money to advance development of many of these health games will probably have to come from foundations like the RWJF—and it's a real question mark how sustainable an enterprise they will be if and when foundations pull out.

**A**T THE MOMENT, though, the foundation has no intention of pulling out. Nor is it especially concerned about reaping any return on its investment, program officer Tarini says. “In some ways you can look at philanthropy as risk capital,” says Tarini. “We can invest in earlier-stage development. The potential will only be realized if we can help build the evidence base. If the research shows that games don't work better than other approaches, we'll try something else.” Meanwhile, at Humana's “guidance centers,” game devotees like Janet Shanta and her Dancetown partners seem well on their way to getting healthier—and getting a bit more fun out of life to boot.

#### NOTES

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