

# Wii-Hab: Using the Nintendo Wii as a mode of physical therapy

By Sarah Ross

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Imagine walking through a hospital corridor past the room of a teenager who is confined inside due to a serious disease. A 17-year old boy at the American Family Children's Hospital in Madison, Wisconsin with cystic fibrosis may be that person.

Although he talked to his physical therapists about his dreams of becoming a tattoo artist, he still was doing very little physical therapy, which is essential for patients with cystic fibrosis. He was getting thinner and weaker which discouraged him from wanting to do therapy in the first place.

He has every right to be angry about his disease, about the confinement to his room due to risks of infection if he leaves, and nurses and other hospital staff coming in at all hours of the day and night to make him perform breathing exercises he thinks are ridiculous.

But now, because of the donation from "The Friends of the UW Hospital and Clinics", there is hope for a new method of physical therapy- a method that reaches out to patients of all ages and abilities- the Nintendo Wii.

The 17-year old boy, Kyle, with cystic fibrosis (CF) had constantly been admitted and readmitted to the hospital several times throughout his life due to lung infections and other CF complications. Pediatric physical therapists Wendy Stewart and Marcella Andrews had been working with him for a few years and little by little they were able to reach out to him.

"It was troubling. He kept getting readmitted and you could just see this was why. He was in a vicious cycle", says Andrews.

CF is a multi-system disease affecting electrolytes found in sweat, the gastrointestinal tract, and the lungs. It is an autosomal recessive disorder which means you need 2 copies of a defective gene in order to have the disease.

The defective protein in CF leads to abnormal transport of chloride ions, negatively charged chlorine particles. This results in very thick mucus production that blocks ducts in the body and obstructs the function of organs. Chloride helps to thin out mucus and keep the body functioning normally.

Cystic fibrosis (CF) is the most common fatal genetic disease among Caucasians. The life expectancy of someone with CF used to be 14 years old. In 2006, it almost doubled to 36 years of age.

The increase in life expectancy is due to improvements in medical care such as inhalable antibiotics which decrease incidences of lung infections and mechanical means of clearing mucus from the patient's lungs. This can be done manually by percussion of the patients back with someone's hands for example, or through a special vest that vibrates at a constant rate to break up the thick globs of mucus.

The most serious consequences with cystic fibrosis are the lung infections that accompany it. This leads to frequent respiratory infections that can become chronic and is the number one cause of rapid pulmonary decline. Pulmonary disease with CF usually begins as mild infections and becomes worse during adolescence, accounting for more than 80% of deaths related to CF.

“Exercise abilities in patients with cystic fibrosis really vary from patient-to-patient”, says Dr. Huichuan Lai, an associate professor in the Nutritional Sciences department at UW-Madison.

“Most can still manage exercise well; even during lung disease it is manageable if their FEV<sub>1</sub> is above 80%”.

CF patients have to do several pulmonary (lung) function tests (PFT) to see what airflow limitations they may have. FEV<sub>1</sub> indicates the amount of air volume that a patient can force out in one second. These types of tests are what Kyle becomes annoyed with, discouraging him from participating in therapy.

The Wii was presented to the pediatric therapy unit at the American Family Children’s Hospital through a donation from “The Friends of the UW Hospitals and Clinics”. It was donated in 2007, shortly after the Wii was released in the fall of 2006.

When the therapists were presented with the Nintendo Wii, they were puzzled at first on how this video game console could be used for physical therapy. But the Wii has broken some stigmata surrounding video games.

Video games made their appearance in the 1970s and became known over the years as an activity that was for couch potatoes. Most video games are played with complicated controllers which use a combination of buttons to make your character, or shapes if you are playing Tetris, move in the desired direction.

But not the Nintendo Wii.

The Wii uses a motion-sensing remote that detects bodily movements. Players move the cursor on the screen with motions of the hands and wrists. By using bodily movements to control the game, this creates accessibility for players of all ages and abilities.

“With the Wii, investment for developing skills with the controllers is low”, says David Shaffer, UW-Madison educational psychology professor, “which makes it easier to engage physically”.

Physical therapy at the hospital uses Wii Sports and Wii Fit. Wii Sports includes baseball, basketball, tennis, boxing, golf, and even bowling. Returning a tennis serve on the game mimics the arm movements of returning the ball in a real tennis match. The Wii Fit uses a device that looks like a bathroom scale for the players to stand upon to detect shifts in weight when they are performing movements like walking a tight rope or striking a yoga pose.

Although the Wii is very effective at engaging the player physically, what is going on inside their heads?

“There are two things that are central to understanding computer games”, says Shaffer, “first is flow psychology and the second is how computer games let us build simulated worlds”.

As Shaffer explains it, “flow” is about the mental state that one enters when playing a game. It is when the player becomes so engaged that they lose awareness of time and difficulty. It is the balance between challenge and reward- the sweet spot.

“Not only is there a physical benefit, but there is also a mental benefit”, says Shaffer, “there is success and mastery of something that is important to you- it makes you feel energized”.

One of the great things about video gaming is that it allows the player to slip into a virtual reality. Virtual reality is defined as an immersive, interactive, 3-dimensional computer experience occurring in real time. Basically, this lets the player escape from normal life.

According to the Journal of the American Physical Therapy Association, “Virtual reality systems offer clinicians the control over exercise duration, intensity, and environments that real-world tasks do not”.

With virtual reality, players may be able to perform tasks, or play sports for example, that they are not able to in real life. The journal notes there have been gaming systems designed specifically for rehabilitation. This includes upper-extremities, lower-extremities, and balance rehabilitation.

The problem with these designs, however, is that they are very expensive and often not commercially available. It is for this reason that gaming systems such as the Nintendo Wii are being studied for clinical use.

One of the areas of medicine that first took hold of the Wii was rehabilitation medicine. The University of Wisconsin Hospitals and Clinics has integrated the Wii into its in-patient rehabilitation program.

Recreational Therapist Kristine Kravik speaks very highly of the usefulness of the Nintendo Wii.

“We don’t use the Wii all the time for therapy, it’s just a different way to meet the same goal in a different format”, says Kravik, “patients can get really competitive and excited; they really have fun”.

Dave Maiers, the UW rehab program supervisor, was skeptical at first about using the Wii as a useful means of therapy. But seeing the versatility of the Wii throughout multiple disciplines has since changed his mind.

“The great thing about the Wii is that it is not discipline specific”, says Kravik, “recreational therapy, physical therapy, occupational therapy, and even speech therapy can use it. We can all work more as a team even though each group may have a different set of goals”.

Although the Wii is a very enjoyable method of therapy, people of all abilities can see results. By simply flicking your wrist one can get a bowling ball moving and receive instant feedback.

Kravik points out, “you can be two or 102 to play; a grandma could play with her grandson”.

“Controllers, even including your arms, legs, and body, help the person learn to make a connection between what they are doing and what they want”, says Shaffer, “as you get better, it starts to come naturally”.

Now, manufacturers are coming out with equipment that is adaptive for those who are unable to move their hands. These people may be paralyzed and have lost control of their arms. With this new equipment, although it is very expensive, is showing just how versatile the Wii can be.

The idea of using a video game console such as the Wii received praise from Dr. Lai as well.

“The Wii is not just about the exercise. It is a way of communication. This is a great way to get energy out of them in a small space, such as when they are confined to their rooms”.

At the National Cystic Fibrosis Convention held in October of this year, Dr. Lai mentioned that the use of the Wii for CF patients was brought to the boards’ attention as well. This technological advance in therapy could be a great addition to CF Centers across the nation with more evidence to support its usefulness- as well as funding.

With all this positive feedback, the Wii looks like it has the potential to become the new face of physical therapy, right?

The answer to this question is no.

“I think there’s a bit of a risk for Wii to become the focus of therapy instead of being a piece of it”, says Kravik. “Patients enjoy the Wii, so they tend to want to do that, and not as much of the other things they need to”.

Some therapists use it as a reward for completing required exercises and let the patients play for a few minutes at a time. But a reward system could lead to problems as well. It seems that practitioners may be getting ahead of the research that needs to be done on the Wii with physical therapy.

But for now, the rehab program is working on developing guidelines for using the console but there is one rule that is always followed: never leave the Wii unattended in a patient’s room.

“People tend to get carried away”, says Kravik, “and if it’s not the patient, it’s the family member”.

A recent study on using the Wii as a supplement to rehabilitation for an adolescent with cerebral palsy has also proven to be beneficial. This study was published in the Journal of the American Physical Therapy Association in October of 2008.

The purpose of the study was to see if using the Nintendo Wii, which is a low-cost commercially available gaming system, would benefit the adolescent during a summer-school session. The

patient participated in 11 training sessions, 2 of which included playing with others using Wii Sports.

The study showed that augmenting the patient's rehabilitation with the Wii had positive outcomes at the impairment and functional levels. This was demonstrated by using three main outcome measures: visual-perceptual processing, postural control, and functional mobility using gait distance. This study shows similar results to what the staff at UW-Hospital is also observing in their patients.

The UW-Rehabilitation program is hoping to participate in a study down the road about the effectiveness of the Wii in therapy as well.

In late 2007, Stewart and Andrews decided to do a small study with the Wii using two different groups of patients: children undergoing bone marrow transplants and cystic fibrosis patients being treated with IV-antibiotics. These groups were chosen based on the fact that they are confined to their rooms due severe risk of infection if they leave.

Part of this group was Kyle, who was reluctant to participate in therapy in the first place.

Andrews approached him with the idea and asked him "Can you be my Wii guy?"

He agreed. Kyle really started making improvements. He did a physical fitness assessment on the Wii and found that he actually enjoyed it.

"From that point on, he was ready for us", says Stewart, "I think part of it was he was helping us learn about something and he was making a contribution. And yes, it was benefiting him too".

At this point, they began to see the Wii not only as a way of having fun but getting the patients to participate in physical therapy through sports they were familiar with. This tends to lessen the focus on physical therapy as exercise and more as a way of learning.

The small study revealed that the Wii did in fact help patients to regain strength and increased their participation in physical therapy. But this wasn't the only benefit.

An equally important outcome was a boost in self-esteem. For a 17-year old boy facing an illness that confines him to hospital rooms and destroys dreams of playing sports, this was finally something he was able to master.

“Patients are quick to succeed at this, even within 15-30 minutes of playing. This really makes them feel good”, says Kravik.

He was not only able to knock out his opponents at tennis during physical therapy, but he found that this was something he could beat his friends at back home.

“The thing that's special about the Wii is the extent to which you interact with it- its similar to what you could do in the real world- there is more of a direct physical connection”, says Shaffer.

What if there was a way for hospitalized patients to connect with their friends and family outside the hospital through the Wii?

The answer here is that, there is.

The Wii has the ability to use an internet connection to hook up with others players through the Wii. This can allow patients to play with family members or friends across town or across the country.

“If someone is in isolation, connecting through the internet with a friend would be a great way for people to connect”, says Kravik.

Although the chance of connecting the internet through the Wii has not really been discussed as a possibility in the hospital, it is a way to get everyone thinking about the endless possibilities the Wii holds.

“The Wii has been wonderful because it’s always necessary to engage someone before healing is possible”, says Stewart.

So, where are Wii going with this?

Video games have always had the ability to teach their players skills. But it took a while for technology to advance to a level of teaching their players more than just how to shoot at a target.

“With the Wii, the interface is much more natural; the psychological advantage is that there is a much more rich connection between the body and the screen”, says Shaffer.

As games have become more advanced, society’s attitude toward video gaming has as well.

Kravik has not yet faced any negative attention regarding using the Wii to help patients. Even a 10-year old Amish boy who was severely burned was able to catch onto the Wii, even though he had no concept of what video games were even about.

Some are worried about the novelty of the Wii wearing off for the patients. But the Wii is not just about beating bosses, slaying mythical creatures, or rescuing a princess. The Wii is about engaging in activities that one may have never thought possible and opening up lines of communication for those that may have trouble expressing their feelings.

“Computer games let us build simulated worlds where people can do things that they couldn’t do in real life”, says Shaffer, “now, they have an opportunity to do them”.