

Theme:

Technology makes its entry

Physiotherapists have spotted the robotic scientists, programmers, engineers and designers in the development of technologies for rehabilitation.

The Physiotherapist has searched the country for applied technologies. What functions? How can advanced technology help change the self-perception of the therapist? What benefit does the physiotherapist have from the cooperation with robotic scientists? And finally the Ethics Committee will give their view on the consequences of the technological development, seen from the patient's point of view.



Playing with robots

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At the Funen Hospital the rehabilitation became more fun and purposive through robotic technology

The Funen Hospital searches new paths in the rehabilitation. Through advanced robotic technology, originally intended for Playware for children, cardiac patients have throughout the last year chased each other and flashing colors on an electronic tiles mat. And Development Physiotherapist at the Funen Hospital, Tonny Jaeger Pedersen, is convinced that the tiles have enormous potential.

“It unites play with meaningful rehabilitation and at the same time makes it possible for the therapist to, in a larger extend, direct the rehabilitation towards the individual patients”, says Tonny Jaeger Pedersen.

Enthusiasm

Twenty cardiac patients at Svendborg Hospital participated in 2006 in a prototype test of the tiles. The results are now available as documentation in a report and are supported with video footage and interviews. The excitement among the patients has been great, and the new intelligent exercise equipment is a part of the circulation training today combined with other exercise-tools.

“When patients enter the tiles, something happens in their facial expressions; then it is fun”, Tonny Jaeger Pedersen says and continues:

“The physical contact with the other patients on the tiles creates a lively atmosphere in the gym. Furthermore, it is much more motivating to do the exercises with a competitive aspect. Several of our patients are former athletes and it has been very giving to be able to use the tiles as a rehabilitation tool”.

As a patient expresses it in the report:

“When doing rehabilitation not everything is as much fun. Then it is nice to have a little competition. When having gone through a heart attack it is not always desired to go down to the gym and exercise. There has to be something to “spice it up”, and I think that the tiles makes this possible”.

The benefit of the tiles is, according to Tonny Jaeger Pedersen, that the rehabilitation takes place in controlled environments like on the exercise bike or the treadmill.

“It is much more fun to exercise on the tiles. Patients forget the physical work when the lights flash and the game is on”.

He experiences that cardiac patients in general feel insecure when the heart rate rises, out of fear of collapse. But on the tiles they give in because it happens in a controlled setting.

Meaningful exercise

The tiles contains numerous possible exercises at all levels. Tonny Jaeger Pedersen pushes the “master tile”. The tiles starts to flash red, yellow, green and blue colors. He chases his own color in the game Colorrace. The heart rate increases. After only a few minutes of hard work he stops his movement. He pants and tells:

“Through the tiles we are able to direct the rehabilitation towards each individual patient. E.g. a big motivation factor is for a former handball player to do lunges that resembles movements in an actual handball match. That is meaningful rehabilitation because the tiles, with its artificial intelligence can comply with the patient’s reality”. And Tonny Jaeger Pedersen welcomes this.

“In the classic training, especially on hospitals, this element has been missing. No attention has been paid to finding individual rehabilitation-choices that makes sense and thereby motivates the patient to follow the rehabilitation course”.

The development Physiotherapist thinks that the electronic tiles is based on the mindset behind the ICF classification system as it motivates on user level and at the same time exercises on body and activity level.

“The patient’s interests are the point of departure when planning the exercises. Whether it is golf, tennis, badminton or fishing, then it is possible to program the tiles in order to meet the individual patients”, he says.

The potential of the tiles

According to Tonny Jaeger Pedersen, the flashing, electronic tiles are an option for a wide range of patient groups. The Lunges is especially interesting for the knee and hip patients who has to better their balance via the controlled movement patterns on the tiles. For apoplectic patients who need to better their coordination and cross-movements, a floor and wall based tiles are a good alternative exercise-tool.

“Furthermore, apoplectic patients can do weight carrying training, as sound and light signals can tell how much weight they put on the leg”. He explains.

Tonny Jaeger Pedersen also sees the tiles as an obvious choice for geriatric patients.

“For elderly patients it is not about making quick movements on the tiles like in the game Colorrace. It is on the contrary important that the patients train their balance and their memory skills. And also here the tiles are a brilliant exercise-tool. The patients are challenged when they have to keep track of different color signals that constantly pops up in different combinations”, Tonny explains.

Under further development

The Funen Hospital is developing the prototype.

“First we wish to develop the software that to a larger extend makes it possible for the therapist to program the exercises and connect it to the automatic collection of data when carrying out the exercises. In the future we wish to be able to let the patient use the tiles on alone and see the individual data by entering a personal code on the computer”, says Tonny Jaeger Pedersen and stresses: “while developing the prototype, we have constantly kept in mind to create an exercise

course directed towards the individual patients needs and thereby meet the physiotherapists increasing demands on individualized rehabilitation methods”.

It is not only within physiotherapy, but also in the pedagogic sector that the electronic tiles can be used. The municipality of Svendborg, appointed Team Denmark municipality, has made the tiles available on selected schools and institutions, where it supports play and movement.

A matter of money

Presently it is a matter of locating the funds needed for further development of the tiles. The prototype has cost around 900.000 Danish Kroner during the development period, but Tonny Jaeger Pedersen expects that an actual production of the tiles would mean that the tiles can compete with other exercise-tools like e.g. the treadmill.

“Each tile consists of a printed circuit board and it is connected with other tiles through infrared connections. A technology that does not have to be very expensive when the production is initiated and running”, Tonny estimates.

<http://www.sygehusfyn.dk/wm216477>

Fact box:

Facts about the tiles

The electronic tiles at the Funen Hospital are developed in cooperation with the Maersk McKinney Moeller Institute, University of Southern Denmark and the Entertainment Robotics. The project was initiated in 2006 and involved 20 cardiac patients.

The mat of tiles consists of 30 floor- and wall based flexible tiles. Each tile contains a little independent computer, which reacts on inputs from the patient and communicates with the so called master tile. The mat of tiles consists of e.g. the games Colorrace, Lunge and Stepper.

What is a robot?

A robot is more and something else than an advanced machine with arms taking care of human tasks at the assembly line. A robot can be defined as a programmable machine that autonomously can undertake a variety of tasks. The behavior of a robot differentiates itself from a computer program by being able to interact and respond to the physical surroundings through sensors and effectors.

Source: Henrik Hautop Lund, professor, Center for Playware at the Maersk McKinney Moeller Institute, SDU and co-developer on the tiles at The Funen Hospital.