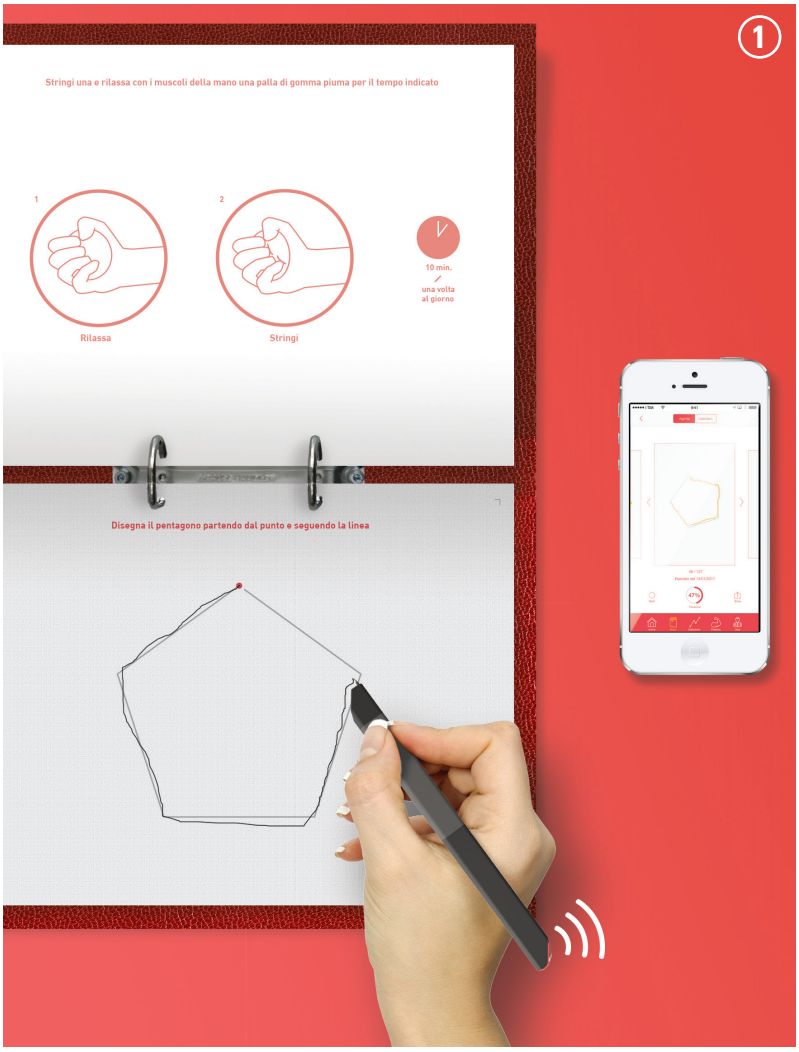
Category: **Healthcare, Student Work**

Project: **Penta - Interactive neuromotor rehabilitation**



What was the challenge?

Patients suffering from neuromotor diseases need a specific treatment path with exercises and tools useful to have, in the long run, an improvement of the capacity of movement.

The tools available to doctors and patients, to date, have deficiences such as: do not give an objective feeedback about the patient's progress; they do not give the possibility to be used outside of a medical clinic; the few existing interactive tools are very expensive.

In general, then, there is a difficult communication between specialist and patient, thus bringing to lengthen therapy, with a consequent loss of time.

Eventually, the current rehabilitation and most commonly adopted method, does not stimulate the patient to a positive and challenging approach and therefore is performed in a mostly automatic way, which leads to a less rapid recovery.

What was the solution?

During the rehabilitation, the hard part is to recover the upper limb use.

We therefore concentrated on developing an all-in-one solution that patients can do complementarily alongside the therapy that they already face.

The idea is that the most common action people make with the arm is writing.

Focusing on neurocognitive theories, people with neurological diseases should reactivate the "mental paths" they have lost, in order to perform a certain action again.

We want to use writing as a way to reactivate the mental paths relative to the entire upper limb.

We then designed a kit composed of three main elements: an interactive pen, a binder for collecting the exercises and an app.

The pen is a smartpen that, through a camera, detects the mark written in the book and, through a Bluetooth connection, sends the data to the app. The technology is already widely used, but never exploited in the field of well-being.

The pen has interchangeable ergonomic supports: so that the patient, who initially experience difficulties even to hold the pen, will gradually reduce the size of the support for the hand with the progress of his recovery.

The notebook may contain bundles of preprinted exercises sheets.

The bundles shall be distinguished according to the patient's pathology, the degree of progress, and they are designed to gradually reactivate all the arm's muscles, starting from the shoulder up to the fingers of the hand.

The app is responsible for receiving the data from your smartpen and process them in real time. The mark left by the patient is compared to the assigned exercise to assess the precision of the execution. All data are processed to create a statistical

graph of progress over time. All exercises performed are stored in the app in the form of a diary, and can be sent and shared with the patient's doctor via an integrated chat.

What was the effect?

The advantages produced by this kit are numerous.
The graph drawn by the app allows the patient to view the progress in the rehabilitation path, providing objective data for self-improvement and helping the patient to positively deal with the treatment path and push it to improve more and more.
Numerous scientific publications demonstrate in this way the importance of a positive therapeutic approach in a long-term path.
The data collected from the pen are processed by an algorithm and they form a basis to give an objective assessment.
The doctor can provide a more specific and targeted therapy.
In this way we solved the problem of the rehabilitation nowadays: the subjectivity of the assessments given by the patients to the doctors about the progress.
The integrated chat in the app allows the doctor to follow more patients at a time and closer without leaving the clinic, suggesting in real time targeted exercises.
The patient insetad can practice in the comfort of his own home.
The ultimate goal of our project is make who has suffered of neuromotor diseases writing again, as well as to recover the arm to the maximum of the capacity.

1

Kit. The kit that is given to the patients: smartpen, binder and app.

2

App mockup. Some of the sections of the app, from left to right: splashscreen with logo, diary, statistics, homepage, complimentary exercises and chat with the terapist.

3

Storyboard. The medic gives to the patient the kit and the exercise bundle. The patient does the exercises and the smartpen sends the data collected to the app that elaborates in graphic statistics.

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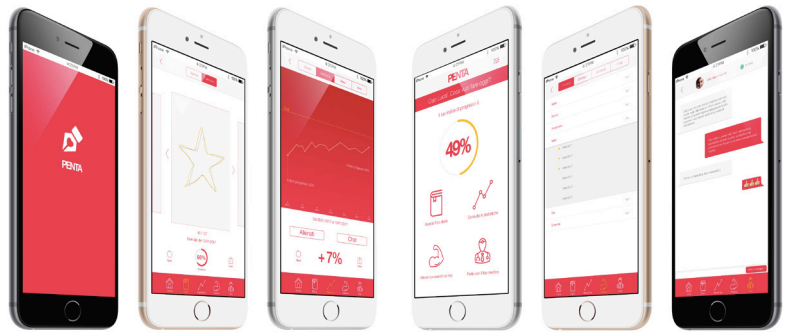

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