

Accelerating stroke rehabilitation thanks to a customized 3D printed orthotic swimming fin.

ABOUT Pedro

Pedro is a sixteen years old guy from Barcelona who loves sports. In August 2012 he suffered a stroke, a left ganglion basal hemorrhage, which paralysed half part of his body. After a long period of rehabilitation, Pedro recovered a great part of the mobility, except in his right hand, affected by spasticity. Spasticity is a disorder of the central nervous system that causes an increase of the muscular tone hindering totally or partially the movement of the affected muscles.

COMPANY

Hospitalet Swimming Club
<http://cnlh.es/>

INDUSTRY

Product Design, Education,
Medical Use

APPLICATION

Functional Parts: End-use parts
and functional validation



CHALLENGE

The project was focused on 3D printing technology (FFF), for its advantages when producing. A design process has to pass through different stages until finished. Normally in the stages of product development, prototyping and testing is where more time and money is spent. Before launching a product, this has to be used and improved by using prototypes. In traditional industry, the time of making those prototypes is too long and some companies just make a few versions of the product affecting the final result. The fewer prototypes, the more possibility of errors in the final product.

Nowadays, thanks to the 3D printing technology, companies and professionals are able to carry out a more efficient product development, not just by making more prototypes in less time, but also making them with materials that have very similar properties to those that will have the commercialized product.

SOLUTION

Marc and Iñigo, two industrial designers from Barcelona, by using BCN3D printers, developed the product for Pedro in less than four weeks. During this time they made ten functional prototypes trying different shapes and materials with a budget of 100 €. After running out different test, they decided to manufacture the swimming fin in Nylon, an extensively used material for its unique mechanical and chemical properties. Thanks to characteristics like durability, flexibility and resistance to corrosion, Nylon is ideal for multiple applications in the 3D printing field, like end-use parts or custom jigs and fixtures.

To print the part in Nylon correctly, they used PVA material as a support material in the second extruder. This filament is a water soluble polymer, ideal to work as support material for printing complex geometries, large overhangs or intricate cavities. PVA supports allow achieving better surface quality and to orientate the part to get better mechanical properties.

RESULT

Thanks to the immediacy that 3D printing offers, Pedro had his personalized 3D printed swimming fin in a very short period, generating, among others, the following advantages:

- Improvement in body position, facilitating stroke and movement.
- An increase of the musculature in the upper part of the body.
- Due to the improvement in the swimming position, Pedro spent more time in the pool without getting tired. That improved muscle tone throughout the body.

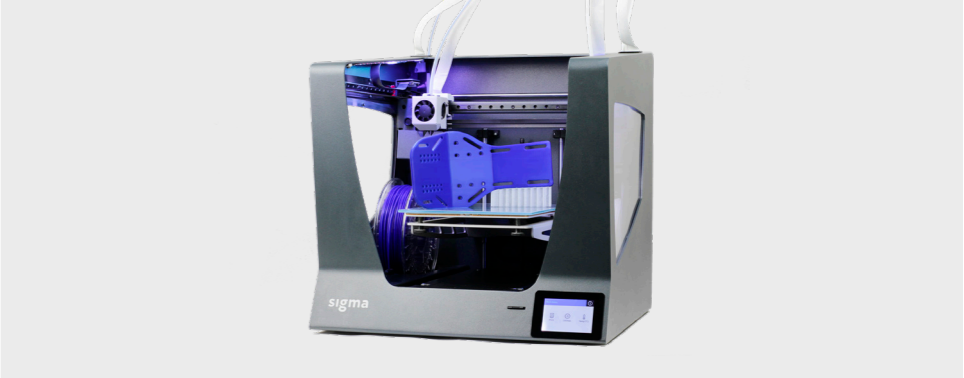
Pedro's case is a great example of the benefits that 3D printing offers in projects that require the creation of several prototypes in order to see how they fit in the patient.



COSTS

Thanks to 3D printing desktop technology, these two industrial design engineers have been able to produce up to 10 different versions of the swimming fin with a low budget and in less than four weeks. Traditionally, the cost of this kind of products depends on the method of fabrication and the material chosen. Labor and materials usually are above 200€ due each prototype is created from scratch or the mold needs to be modified. Furthermore, each design iteration takes longer when using external suppliers.

	EXTERNAL SUPPLIER	BCN3D PRINTERS
ITERATION/PRODUCT	1	10
COSTS <i>(labor, materials and service fee)</i>	200€- 1000€/part	10€/part
LEAD TIME/PART	2 weeks	1 day



About BCN3D technologies
 BCN3D Technologies is one of the leading manufacturers of desktop FFF 3D printers worldwide. Based in Barcelona, the activity of BCN3D began in 2012 and its aim is to help innovators and creatives to change the world, by offering them the best possible experience to materialize their unique ideas.

<https://www.bcn3dtechnologies.com>
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