3D-PRINTED PATIENT-ADAPTIVE PELVIC SEAT

PATENTED TECHNOLOGY

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ABSTRACT

The **Engineering Design and Technological Development** (DIDET in Spanish) group from the ArtefactosLAB laboratory of the University of Alicante has developed a pelvic seat that can be moulded on the patient, in a comfortable, fast and economical way for the patient and which reduces the number of professionals involved in the manufacturing process.

This device, manufactured by 3D printing, allows the appropriate postural control for a correct physiological development of children with motor functional diversity, which allows them to perform daily seated activities.

The group is looking for companies or institutions interested in continuing with this work of social innovation by developing the device or in the design and manufacture of new ones.

ADVANTAGES AND INNOVATIVE ASPECTS

MAIN ADVANTAGES OF THE TECHNOLOGY

It is an **adaptable and evolving** pelvic seat, since in short periods of time, especially in the case of pediatric patients, it is necessary to obtain several pelvic seats in a short space of time (caused by their own growth and changes in clinical and/or day-to-day needs), with the developed device it is possible to re-conform the critical parts of the pelvic seat to adapt to growth or clinical changes as many times as necessary, adjusting to the patient's body and the needs specified, with minimal impact on the patient and in a few minutes.

In addition, it is important to emphasise the **portability** of the seat, justified by its light geometry, **low weight** thanks to the lightness of its materials, its **quick installation** on any chair or surface by means of non-invasive fastening systems and its non-slip system. If required by the patient, the ergonomics and comfort of the seat can be improved by attaching comfortable material to the inside of the seat.

In addition, the seat includes in one of the front sides a housing that corresponds to a **universal 90º turn locking system** for interchanging the user's personal aid accessories, which have the same universal 90º turn locking system incorporated, so that they can be housed in it, for example, an accessory device for a bottle, pencil or glass of water, allowing certain elements to be within the user's reach while carrying out other activities or movements, even with difficulties in the mobility of one or both upper limbs, minimising the external aid of another person.

The material in which the **seat and backrest are made is rigid and mouldable**, allowing it to adapt and reconform to the physiognomy of the body, and, as soon as it cools, it stabilises the patient's posture. As for the spine and the abductor block, it is made of **materials with a high resistance to pull and tear strenghts**, providing stability and resistance to the whole.

In detail, the clinical problems solved by the use of the seat, and the objectives sought by the pelvic seat are:

- *General*:
  - o Control the progression of musculoskeletal deformities.
  - o To reinforce the therapeutic objectives.
  - o To improve postural control.
  - o Minimise abnormal reflexes, postures and tone.

- o Postural adjustment training.

- *Specific*:
  - o Avoiding the kyphotic position that they tend to acquire with incorrect postures that they adopt.
  - o To avoid possible alterations at hip level, such as dislocation.
  - o To leave the upper limbs free to manipulate, discover their environment or play, as they do not have to control their base of support with them.
  - o Ensure that the patient sits in such a way that the weight of their body is symmetrical on both sides of the pelvis.

INNOVATIVE ASPECTS

Both the design and the manufacturing process of the pelvic seat have been optimised so that it can be produced using a 3D printer which, together with the use of three-dimensional models, has become an alternative manufacturing process to the conventional one. Its application within assistive technologies opens up endless possibilities for improving the quality of life of people with functional diversity, mainly due to four factors:

- Low cost of materials and equipment needed.
- Speed of manufacture.
- Freedom of design that allows to approach the personal and intrinsic needs of the user, going beyond the clinical needs (on which the conventional prosthetic production sector focuses due to issues of final costs and number of units).
- Potential worldwide manufacturing, giving the user or rehabilitation professional the possibility of self-manufacturing and customising their own device, which also means savings in logistics and distribution.

MARKET APPLICATIONS

It is mainly aimed at the assistive technology sector and improving people's quality of life and, more specifically, at the field of **pediatric neuro-rehabilitation**.

3D printing or additive manufacturing is a technique that can be applied to satisfy any need, in any field, that a person may have. It is especially useful for people with functional diversity with very personal problems in fields such as medicine, education, work or mobility.

COLLABORATION SOUGHT

From ArtefactosLAB, the DIDET group is looking for companies or institutions interested in supporting the development of the pelvic seat or in the design and manufacture of other new devices for social purposes.