

REHABILITATION IN MOTION: MANUFACTURING ORTHOSIS WITH 3D PRINTING



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Y. Mendoza

Universidad Privada del Este, Paraguay

S. Rodas

Universidad Privada del Este, Paraguay

ABSTRACT: Three-dimensional (3D) printing includes a group of technologies through which it is possible to generate three-dimensional objects from binary information. Orthopedics and traumatology is one of the fields of medicine in which 3D planning has had the greatest impact, especially in trauma and oncological orthopedics. Applications of this technique include diagnosis, surgical planning, creation of intraoperative guides, personalized implants, surgical training, printing of orthoses and prostheses, and bioprinting. Advantages have been demonstrated in its use such as greater technical precision, shortening of surgical times, decreased blood loss and less exposure to rays. Although the process is increasingly optimized and accessible due to advances in software and automation, it is a technique that requires adequate training. The objective of this review is to offer an approach to this technology and its basic principles.

KEYWORDS: 3D preoperative planning; 3D printing; personalized intraoperative guides

INTRODUCTION

Rehabilitation is an essential process for the recovery of patients with disabilities, injuries or illnesses. Which affects your mobility and ability to perform daily activities. Orthoses are medical devices used in rehabilitation to correct or improve the patient's function and mobility, are designed and adapted by physiotherapy and orthopedics professionals. Manufacturing custom orthotics can be an expensive process and prolonged, which limits patient access to these devices. However, 3D printing technology offers an innovative and efficient alternative for the manufacture of personalized orthoses.

The goal of this project is to use 3D printing technology to manufacture personalized orthoses and improve the efficiency of the rehabilitation process. To achieve this, joint work will be done between the Engineering major. Electromechanics, in charge of the design and use of the 3D printer, and the Bachelor's Degree in Kinesiology, in charge of adapting orthoses and rehabilitation. In this project, norms and

standards established by regulatory agencies will be used. Standardization and regulatory authorities to ensure the quality and safety of 3D printed orthoses. Yeah It will carry out a detailed and systematic record of the 3D printed orthoses for clinical evaluation and follow-up.

MATERIALS AND METHODS

The study focused on implementing a design program that uses artificial intelligence to Optimize and facilitate the design of orthoses that can perfectly adapt to unique needs and characteristics of the patient, using this procedure an analysis of biometric data can be generated, such as scans three-dimensional images of the body, to generate personalized designs and improve the efficiency of the process, so it can also be used to improve the functionality of the orthosis, improving ergonomics of the device. The application of 3D printing technology in the field of medicine and health was due to the fact that it allows us to produce orthoses more efficiently compared to traditional methods, which can reduce costs of production, as well as optimize time since they can be manufactured quickly, which can be feasible especially in cases where a quick solution is needed, it also covers a wide variety of areas, being ast an optimal technology option in the field of medicine, offering benefits such as customization, cost-effectiveness, speed of manufacturing and innovative designs. In relation to the low-cost analysis, research was carried out guided by professionals with experience in the area of medicine, physiotherapy and kinesiology and various comparisons of the costs of different orthosis models.

Modification of the injection system.



Figure 1. TECHMED3D body scanner software



Figure 2. XLELET software with which the designs for the research were tested, also available for smartphone. In terms of costs, there are several applications with various payment costs for image import, from 7 dollars in advance



Figure 3. Lower cost 3D printer, with disadvantages of lower printing speed but also with a utility of printing quality. In costs it could be acquired from 1,700,000gs, varying according to the model and brand.

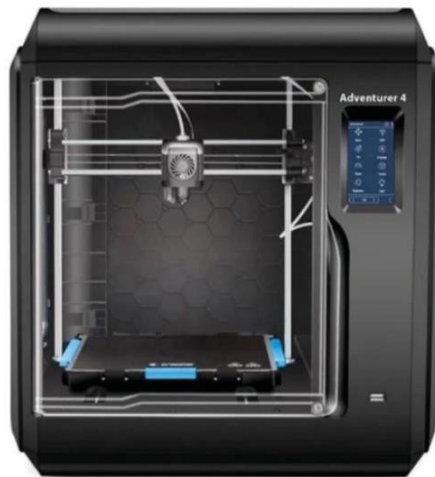


Figure 4. Better quality 3D printer with faster printing speed and better neatness results.

CONCLUSIÓN

The research carried out as an extension program in community projects allowed us to assimilate a great possibility of collaboration with the community, providing a more effective process for their specific needs and with lower cost and optimizing manufacturing time, guaranteeing high quality and safety if carried out correctly. correct, with the evaluation and monitoring of health professionals specialized in physiotherapy and kinesiology. Providing society with an innovative and efficient solution with a necessary investment of between four or six million guaraníes for the 3D printer and a software or application with paid permission from seven dollars.

DISCLOSURE

3D printing has taken orthopedics to a new level, and the future promises even more exciting advances. As technology advances, the possibilities for producing custom orthopedic solutions are becoming more diverse and individualized. The combination of precision, speed and customization makes 3D printing the engine of the orthopedic revolution. Exciting times lie ahead for the sector as 3D printing continues to expand the possibilities for patient treatment and care.

REFERENCES

- Dirección General de Estadística, Encuestas y Censo (2012). Características sociodemográficas de los hogares particulares con personas con discapacidad. Asunción: Dirección General de Estadística, Encuestas y Censo.
- Manual de Impresión 3D em Cirugía Ortopédica y Traumatología.-P Andrés Cano.(3ra Edición)
- Impresión 3D -Sergio Gómez González (2da Edición)