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Mechanical Properties and Thermal Comfort of 3D Printed Hand Orthosis for Neurorehabilitation

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Abstract : Additive manufacturing is a manufacturing technique used in many fields as a tool for the production of complex parts accurately. This technique has a wide possibility of applications in bioengineering, mainly in the manufacture of orthopedic devices, thanks to the versatility of shapes and surface details. The present article aims to evaluate the mechanical viability of a wrist-hand orthosis made using additive manufacturing techniques with Nylon 12 polyamide and compare this device with the wrist-hand orthosis manufactured by the traditional process with thermoplastic Ezeform. The methodology used is based on the application of computational simulations of voltage and temperature, from finite element analysis, in order to evaluate the properties of displacement, mechanical stresses and thermal comfort in the two devices. The execution of this work was carried out through a case study with a 29-year-old male patient. The modeling software involved was Meshmixer from US manufacturer Autodesk and Fusion 360 from the same manufacturer. The results demonstrated that the orthosis developed by 3D printing, from Nylon 12, presents better thermal comfort and response to the mechanical stresses exerted on the orthosis.

Keywords : additive manufacturing, finite elements, hand orthosis, thermal comfort, neurorehabilitation
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