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Patient fitting of splints and assistive technologies for clinical application via 3D printing

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Introduction: Three-dimensional (3D) printing can produce cost-effective, anatomically-accurate, and esthetic 3D items for various uses, e.g., medical use. Unfortunately, 3D printing is rarely used in clinics, mostly because the fitting of a virtual model to the anatomy of the patient requires technological skills.

Objectives: To create a tool that automatically fits a splint or assistive technology model, for patient-specific 3D-printing and to compare preparation time, product weight, and user satisfaction of occupational therapists between the manual preparation and the automatic 3D printing method.

Method: The software was coded using Lab view v19 and the models were created in Blender. Occupational therapy students (N=36) were asked to prepare a finger splint, once manually and once using the automatic fitting software. The weight of the splint, preparation time and the user satisfaction were noted.

Results: We created a virtual library that holds 3 designs of finger splints, one wrist splint, and two assistive technologies (pencil grip and spoon). Once an item is chosen, the occupational therapist is directed to insert several anatomical measurements of the patient and provide clinical decisions regarding the item's characteristics, e.g., the spoon's angle or the handle's thickness. The weight of the 3D-printed splint was significantly lower than that of the manual splint and the subjects were more satisfied with the fit, esthetics, overall process, and product of the 3D-printed splint.

Conclusion: Our automated software for the patient-specific fitting of splints and assistive technology for 3D-printing can be the missing link for integration of 3D-printing in the clinics.

Biography

Sigal Portnoy is an electronics engineer, who completed her M.Sc. and Ph.D. studies in Biomedical engineering at Tel Aviv University. In 2009, she constructed the Hadassah Gait and Motion Laboratory in Jerusalem, and she was the scientific director of the lab until 2017. She managed several researches that aimed to quantify the effect of different treatment methods and procedures on the movement pattern of patients with motor disabilities caused by neurological or orthopedic impairments. In October 2012, she has joined the Occupational Therapy Department at Tel Aviv University where she studies the different factors affecting motor function in healthy individuals and people with motor or cognitive disabilities. She also designs and creates computerized tools for evaluation and treatment of people with motor or cognitive disabilities.

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