



Body-powered Prosthesis Design for a Patient with a Partial Hand Amputation

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Overview

3D-printing technology enables designers to help amputee patients by creating low-cost, customizable prosthetics to meet patients' specific needs.

The current study explored the use of 3D-printing in developing a prosthetic design for a patient with a partial hand amputation. A body-powered design was chosen because the hand could sustain enough power and movement for the prosthetic to function dependently.

After an initial visit, the following design goals were established to meet the patient's preferences:

Function: the prosthetic could enable the patient to write and perform basic tasks.

Realistic: the prosthetic resembles the form and color of natural fingers.

Comfort and wearability: the prosthetic could be easily secured and utilized without interference to the rest of the hand.

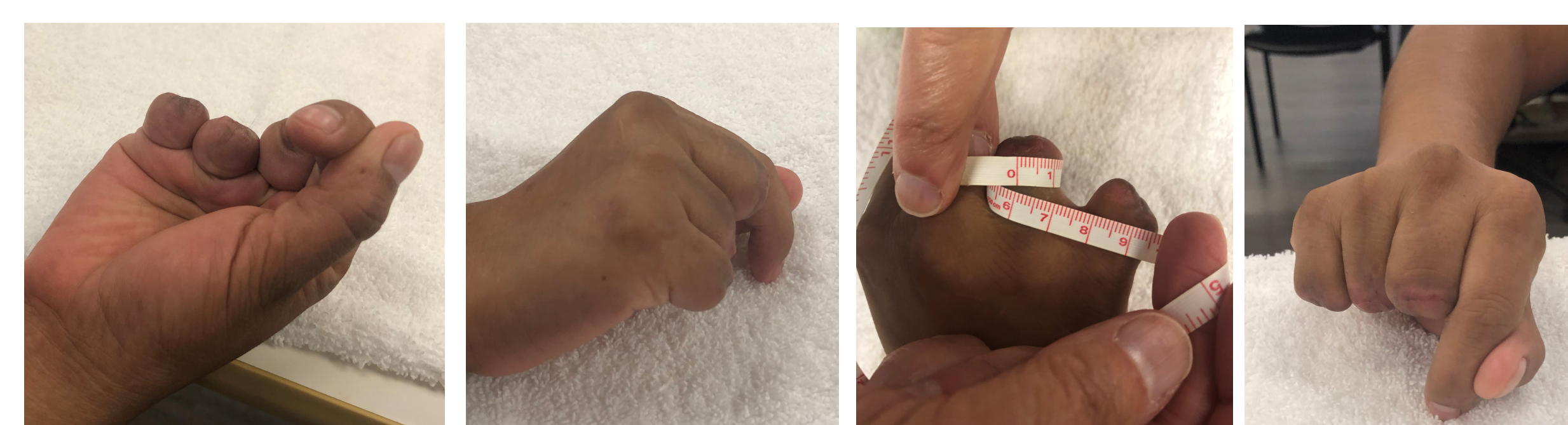
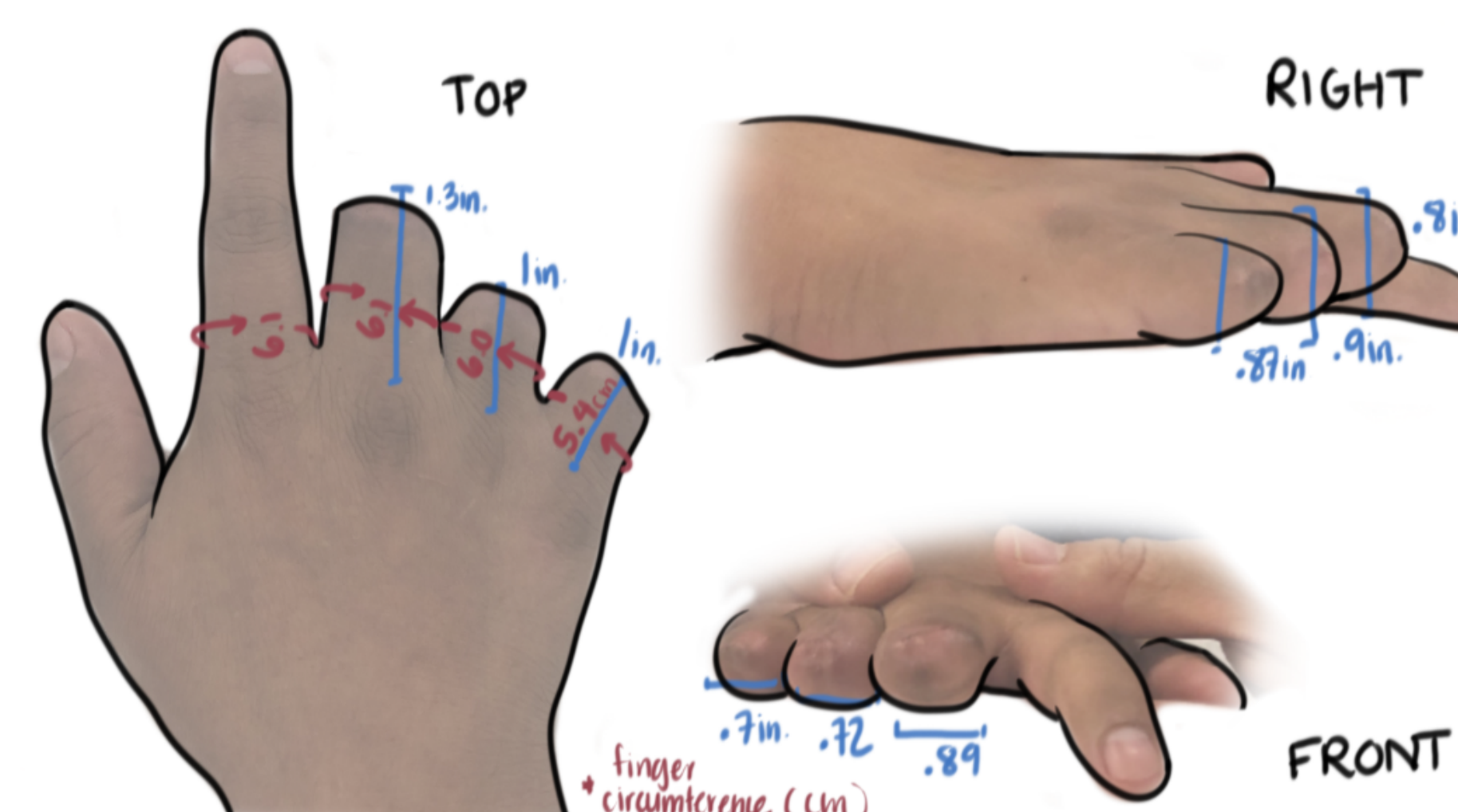


Wrist wrap to secure prosthesis to hand

Methods and Process

Rapid 3D-printing technology was used to create each prototype and test the durability, functionality, and range of motion of each iteration.

The research efforts included on-site visits with occupational therapists and the patient. Careful measurements and pictures were taken to document the specific needs of the patient, and these findings were used in each stage of the the design development process.

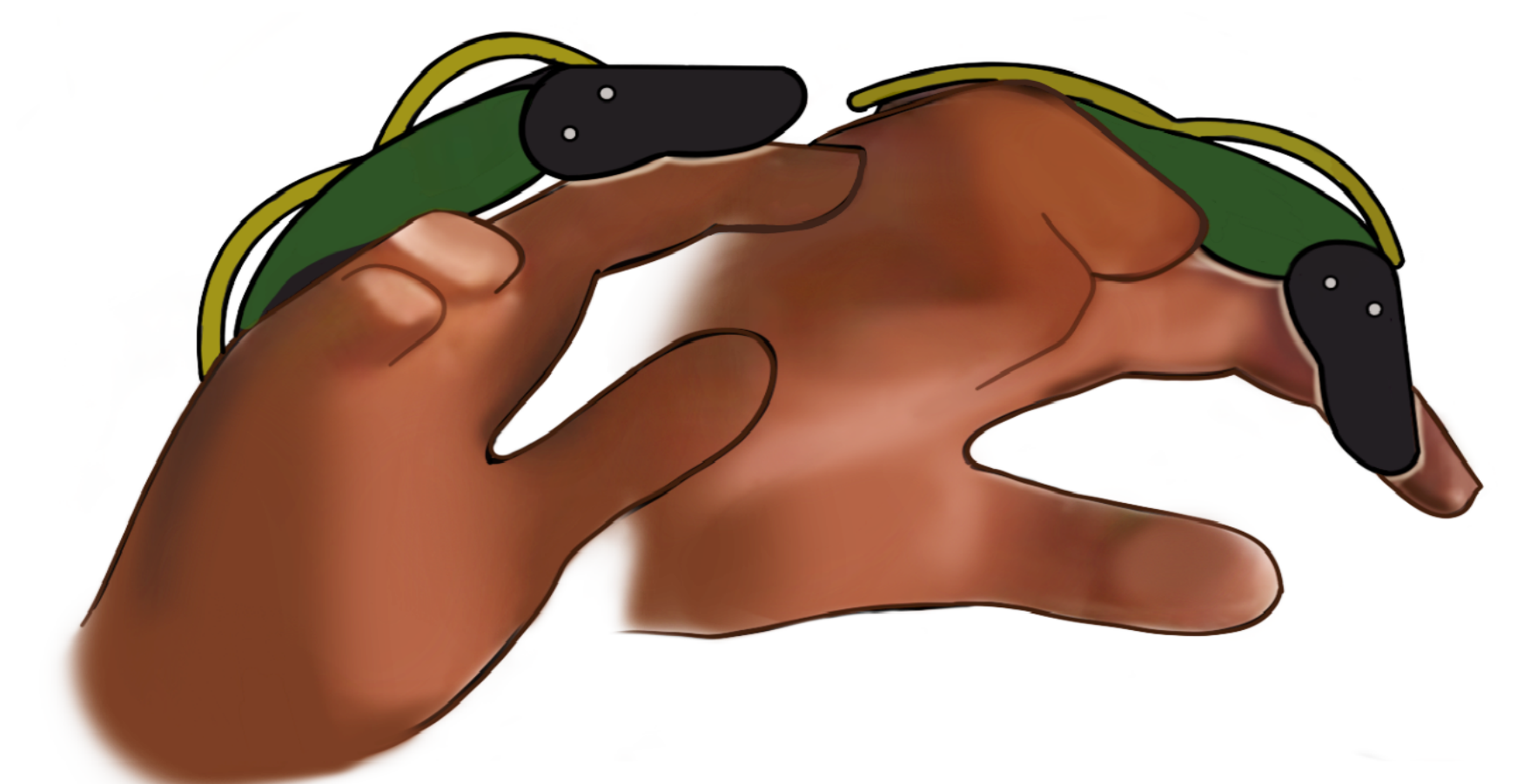


Further Study

In continuation of this study, the prosthesis design could achieve a greater range of motion by using specific parts the hand's natural movements in its body-powered mechanism.

Results

The design of the hand prosthesis was developed using an iterative design process. Different iterations explored variations of the 4-bar mechanism system, options for a ring to fit the prosthetic to the hand, and multiple points of contact to the back of the hand.



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