Developing an Inexpensive Prosthetic Hand

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A major issue facing people in developing countries is a lack of resources to pay for trauma care. One of the most expensive components of trauma care lies in prosthetics. In fact, a single prosthetic hand is too cost-prohibitive for many Americans. A hand-socket combination costs roughly $60,000. The goal of this research project was to design a simple, inexpensive, and modular prosthetic hand to bring prosthetics and their benefits to less-affluent areas. The goals of this project included building a simple electromyography-controlled (EMG) prosthetic hand with at least two fingers and an opposable digit, with a total material cost of less than $100. The design for the hand was created using a combination of 3-D Autodesk Inventor modeling and 2-D AutoCAD modeling. The metacarpus was created using 3-D printing, and the phalanges were created by using laser-cut pieces of acrylic. The EMG sensor was calibrated to the test wearer's arm and the digits were attached to servos. The electronics were controlled using an Arduino UNO development board. At the end of the project, the engineering goals were met. The hand in its current state has the ability to read EMG signals from the wearer's arm and actuate the fingers based upon the amplitude of these signals. With more research and development, 3-D printed prosthetics might eventually become a viable option for those in developing nations.

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