

# A lifelike and functional passive prosthetic hand for infants

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**Bloorview**  
RESEARCH INSTITUTE



## SHARING OUR WORK

Our student team won first place for their novel hand design at the IEEE EMBS ISC 2016 Design Competition in Ottawa, May 29-31<sup>st</sup>, 2016.

Our work was presented at the IBBME Scientific Day at the University of Toronto in May 2016, and was awarded Best Poster.

The project was presented at the Orthotics/Prosthetics Conference in August 2016.

## WHAT WAS THIS STUDY ABOUT?

For children with congenital upper limb differences, the early fitting of an artificial limb is an important step in addressing the potential limitations in the child's ability to function in their daily activities. However, prosthetic choices for small infants and toddlers are very limited. No parts exist that provide the both the level of functionality and appearance wanted by parents and clinicians.

The purpose of our work was to address this need by developing an innovative lifelike and functional non-motorized prosthetic hand for infants and small children. In particular, this hand needs to be durable, easy to clean, lifelike in appearance, and should provide support for crawling and sitting, and be able to hold toys and other objects.

## WHAT DID WE DO?

We used feedback from the clinical team to design a new small-size hand prosthesis to meet functional specifications. It can also be used with commercially available prosthetic gloves to provide a lifelike appearance.

Our student team developed a new technique to 3D print a flexible plastic over a wire-frame skeleton to provide structural support and grasping abilities.

A pilot study was conducted at Holland Bloorview to evaluate the prosthesis performance in both a clinical setting and during a take-home session.

## IMPACT FOR CLIENTS, FAMILIES AND CLINICAL PRACTICE

Our prosthetic hand is the first to combine affordability with lifelike appearance, small-size, and grasping ability. Since commercial prosthesis companies are not currently producing prosthetic hands for children this small, our project is directly addressing the needs of Holland Bloorview clients that would not otherwise be met.

## WHAT DID WE LEARN?

- *3D printing flexible materials over a wire skeleton can be used to create low-cost and customizable passive hand prostheses.*
- *The current design is able to passively grasp and hold a variety of objects placed in the hand, and can support the user's weight during playtime activities.*
- *This design provides an excellent short-term prosthesis, but more work is needed to ensure durability and long-term safety.*

## NEXT STEPS

*We will work to continue to improve the design safety, durability, and function of the current design while exploring alternative approaches and materials. These improvements will be guided by feedback from our pilot study.*

## TO LEARN MORE ABOUT THIS STUDY, PLEASE CONTACT:

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## WHO ARE WE?

### Clinical Team:

Sandra Ramdial: Certified Prosthetist  
Lisa Artero: Occupational Therapist

### Research Team:

Jan Andrysek: Engineer, Scientist  
Matt Leineweber: Engineer, Postdoctoral Fellow

### Engineering Students:

James Klein  
Ian McKenzie  
Gabrielle Sebaldt  
Angela Yoo

## THANK YOU!

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