# Expanding the scope of human factors in upper-limb prosthetic technology

D.A. Baker and Patrick M. McGurrin

**The Problem:**
Users of upper limb prosthetic technology (ULPT) often discontinue using their devices

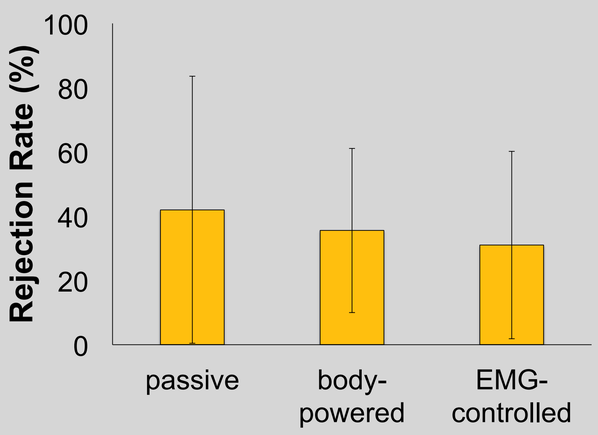
+

Little consensus about the cause(s) of ULPT abandonment despite current efforts

→

Suggest a deficiency in identifying the underlying determinants of ULPT use and abandonment

## 5%-90% abandonment rate for ULPTs[1]

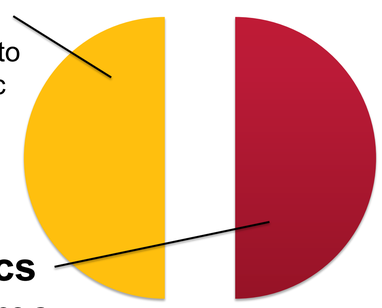



- **Passive:** anthropomorphic replica of the hand with no moving parts
- **Body-powered:** operated using cable and harness systems controlled by body movements (e.g. moving the shoulders or the arm)
- **EMG-controlled:** operated using electromyographic (EMG) signals recorded from residual limb muscles

**why?**

## Evaluation and research primarily focus on:

**Kinesthetics**
the ability of the user to control the prosthetic device



**Anthropometrics**
making prosthetic devices a replica of the human model

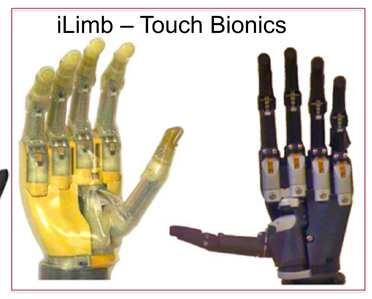
Examples:

- Assessment of Capacity for Myoelectric Control[2]
  - assesses ability to perform 24 bimanual activities.
- Prosthetic Upper Extremity Function Index[3]
  - assesses ability to perform upper extremity activities with a ULPT.

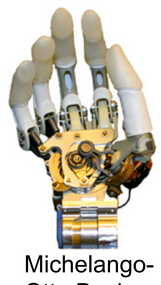
## Design and development

**More time, energy, and resources to advance prosthetic technology[4]**


Vincent


iLimb – Touch Bionics


Bebionic – RSL Steeper


Michelango-Otto Bock

**High abandonment rates persist despite using current metrics to assess and build "better" ULPTs**

# So what's missing?

## Hypothesis

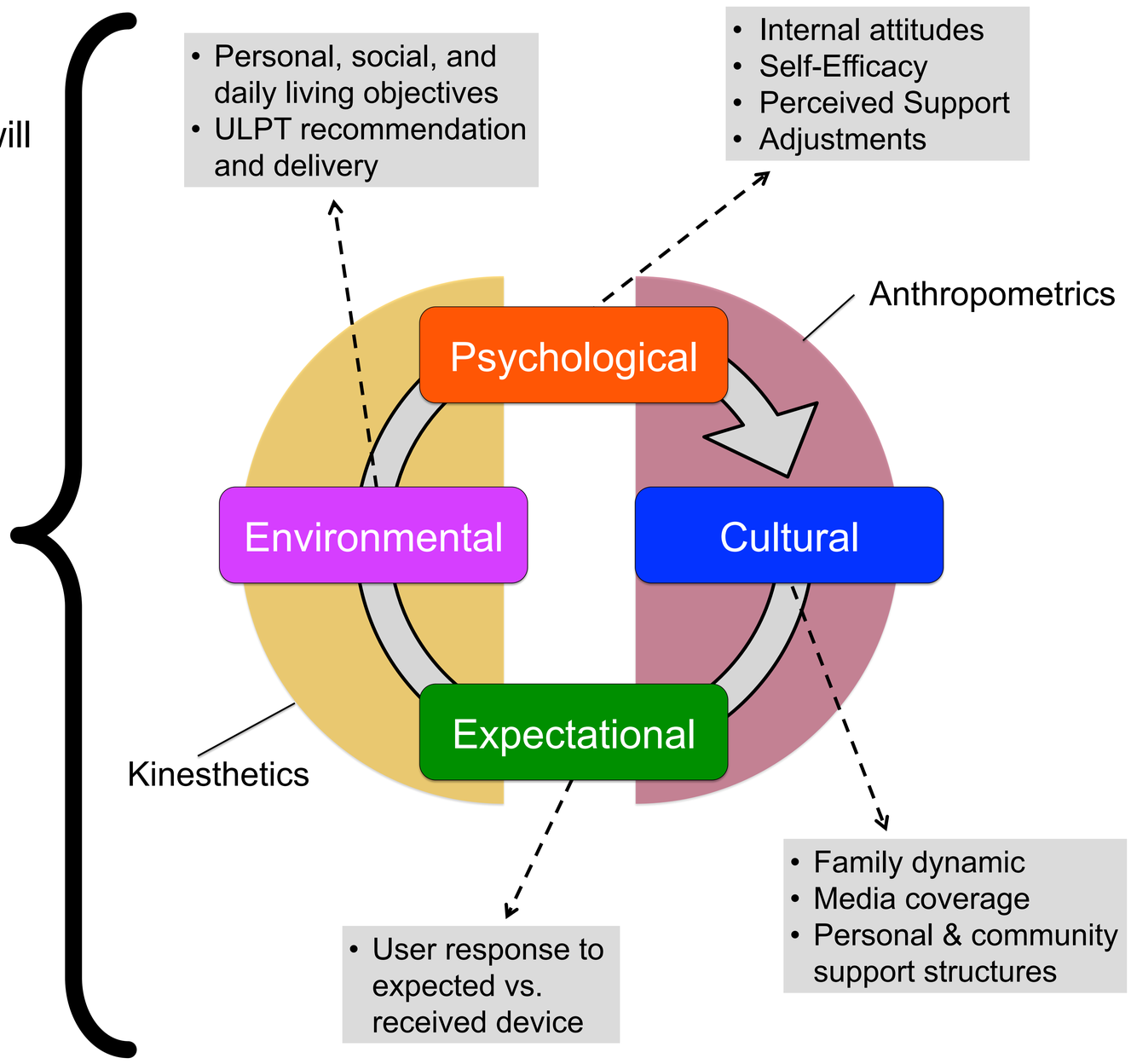
**Broadening the current "human factors" model** beyond (while including) anthropometric and/or kinesthetic aspects will clarify the relationship between ULPT design and evaluation processes and user needs.

## Methods

- Identify:
  - existing measures that predict technology adoption, healthcare outcomes, healthcare behaviors, etc.
  - psychosocial factors that relate to ULPT use/ abandonment.
- Embed these psychosocial factors in to current ULPT design and evaluation processes.

## Potential Outcomes

- Better predictability of ULPT use and abandonment.
- Guide future ULPT R&D and regulatory processes.




Please scan the QR code for references, contact info, and copy of poster: