U-M STUDENT DRAWS ON PERSONAL EXPERIENCE FOR PROSTHETICS RESEARCH (August 11, 2016)

The Rehabilitation Biomechanics Laboratory at the University of Michigan looks part playground, part film studio, part bionic woman.
A mechanical foot sliced off cleanly at the ankle sits on a shelf - a prosthesis for testing.

Twenty cameras on tripods of various heights are aimed toward the center of the room at a cluster of random objects: a door that opens into nothing. A desk phone on a table. A pitcher of water and a glass. A chair. A long, shallow sandbox.
Actually, these objects aren’t random at all, explains U-M doctoral student Susannah Engdahl. They’ve been carefully selected to measure and compare the range of motion of people who use prosthetics against those who don’t.
This is Engdahl’s area of research, and her own disability has proven helpful in setting up these experiments. Engdahl is missing both hands and most of both feet.

She shrugs and sips her coffee: “I was born this way. The doctors never nailed down a cause.” Engdahl, 25, earned her bachelor’s degree at Wittenberg University in Ohio, and says she decided on the U-M program in biomedical engineering because it “hit all the checkmarks” - health, math, science and the human body.

“Biomedical engineering is a broad field and prosthetics stood out because I already knew how important prosthetics can be in improving quality of life,” Engdahl says.

She has been in U-M faculty member Deanna Gates’ Rehabilitation Biomechanics Laboratory for three years. Part of the School of Kinesiology, the lab is tucked in the basement of the Central Campus Recreation Building in a converted racquetball court that still feels faintly humid.

Engdahl has been lucky with her own prosthetic hands, she says, because she’s had very little pain or awkwardness, which is a huge problem among prosthetic users. Hers is among the family of prosthetics called myoelectric, which work by capturing electrical signals from the body—in this case, her arms—to control her hands.
Other prosthetics are body powered - they’re held to the body by harnesses and move when cables are activated by body movement. Each has advantages and disadvantages, but one big upside of Engdahl’s is that at first glance you don’t even know she’s wearing them. She received her first pair of prosthetics when she was about 2.
“The cosmetic factor probably helped my parents make that decision,” Engdahl says, contemplating the flesh-colored stretchy sleeve that encases the hard plastic shell protecting the tiny electronics and motors that move the fingers of her hands.

But despite their natural look, the prosthetics can move only in one direction. The hands open with the thumb moving in opposition to the fingers, and close with the thumb moving towards the fingers. The thumb, index finger, and middle finger come together to create a “tripod” grip.

“Developing prosthetics that can move more similarly to a natural hand is an active area of research,” Engdahl says, gripping her cardboard cup.
Quantifying how people use different types of prosthetics is one of Engdahl’s dissertation research projects, and a career interest.

“It’s important because most of the current research on prosthetic function is from patient feedback,” says Gates, lab director and assistant professor with appointments in kinesiology and biomedical engineering.

“There’s no clear direction to focus on improvements in quality of movement or range of motion, and no clear way to convince insurance companies to pay for advanced prosthetic devices.”

It’s natural to wonder how people with prosthetics perform everyday tasks: How do you type? Open doors? Tie your shoes? Engdahl doesn’t even think about her own work-arounds, but compensations are a part of life for any prosthetic user.

Engdahl demonstrates one of these adaptations when she opens the prop door in the lab.
“It’s hard for me to stand in front of the door, so I take a step over,” she says. She doesn’t have any wrist motion, so she moves slightly to one side of the knob for leverage, then turns the handle.

From https://news.umich.edu/u-m-student-draws-on-personal-experience-for-prosthetics-research/

MCQ – Choose the correct option

1. What are all those common objects in the laboratory for?
   a) They are useful for cinema sets
   b) They satisfy a fervent collector
   c) They are furnishings of a big engineering studio
   d) They study the activity of people who use them

2. What’s the origin of Susannah Engdahl’s problem?
   a) Science has never known it
   b) It relies on lots of disciplines
   c) Doctors at the University of Michigan are studying it
   d) Biomedical engineering will be helpful to discover it

3. Where is Engdahl’s lab situated?
   a) In a dark but comfortable area
   b) In what once was a squash field
   c) On the first floor of a wet house
   d) In a building built three years ago

4. How does her prosthetics operate?
   a) With the help of her physical responses
   b) Thanks to a powerful source of energy
   c) With some microchips under her skin
   d) Thanks to sensors below each device

5. What is the immediate benefit of her prosthetics?
   a) Despite being old, they are still functioning
   b) They are easy to use
   c) No one understands they are prosthetics
   d) They aren’t unwieldy

6. How about the main disadvantage?
   a) All the fingers move together
   b) The grips are too much strong
   c) The hands are sometimes rigid
   d) They have very limited gestures

7. What’s the most important thing to do for the U-M?
   a) Collect the wearers of prosthetics’ experiences
   b) Identify the people wearing prosthetics
   c) Distinguish these people’s daily routine
   d) Plan a meeting about biomedical engineering

8. How do they usually manage their ordinary matters?
   a) They always need someone next to them
   b) They offset with different actions
   c) They repeat the same action lots of times
   d) They regularly call friends for help