What is an Orthosis?

An ankle-foot orthosis (AFO) is an assistive technology device that provides its user with dynamic support. Using pneumatics, an orthosis provides torque to assist with plantarflexion and dorsiflexion, allowing a patient with neuromuscular weaknesses to achieve a more normal gait cycle.

A Little Bit About Gait...

In a normal gait cycle:

- The foot *plantarflexes* (points toes down) during the last part of the stance phase
- The foot *dorsiflexes* (brings toes up) during the swing phase

If a patient is not physically capable of performing either or both of these gait actions, then an AFO could assist in the execution of these tasks.

Project Goals

**Ultimate Project Goal**
- Create an untethered, compact orthosis that is capable of providing portable power
- Allow for more flexibility by providing torque to assist with motion as opposed to a motion restrictive brace

**Summer Intern Project Goal**
- Improve existing AFO
- Create a more compact, efficient, and lightweight second-generation model

Implemented Hardware

**Circuit Board (for controlling AFO actuation)**
- Needed for untethered configuration
- Original configuration bulky; rewiring was necessary
- New model uses a smaller printed circuit board with pins directly soldered to board
- Used EagleCAD to compare circuit layouts

**Pressure Transducer Housing**
- Pressure transducers required for tethered (data collecting) AFO configuration
- Housing designed in Autodesk Inventor
- Rapid prototyped on Objet Eden 350
- Currently implemented on tethered AFO model

**Circuit Board Housing**
- Housings needed to protect circuit boards and to attach them to the AFO
- Designed in Autodesk Inventor
- Rapid prototyped on Objet Eden 350

Integrating Hardware: Seeing the Difference

**First Generation:** Shown in Tethered Configuration

**Second Generation:** Shown in Untethered Configuration

**Circuit Boards** (Original and New models)