Pediatric Dynamometer
Using Piezoresistance Sensors

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Need for the Pediatric Dynamometer

- Bone growth and Development
  - Bone disease is a prevalent cause of injury
  - Bone is developed primarily in childhood
  - Impact of exercise on bone density

- Current ways to study bone growth and development
  - Survey Data
  - Accelerometer
  - Force Plate

http://www.brighton.ac.uk/sohp/research/resources/mov_lab.php
Past Work

- PVDF Sensor
- Piezoelectret Sensor
Piezoresistance

- Change resistance based on applied mechanical stress
- Made using a variety of metals and silicon
- Change in conductance is linear with force
Goals

- Build a working circuit that is as small as possible.
- Modify the existing microprocessor program to take the necessary data and relay it to the computer.
- Calibrate the sensor.
- Modify the existing user interface to work with the new system.
$V_1 = \left( \frac{R_1}{R_2} \right) V_2$
Circuit Layout
Device Construction

- Developed a protocol to use LPKF circuit board plotter
- Solder components to board
Testing

- Verification of sensor viability
- Accuracy
- Temperature Sensitivity
- Preliminary Device Walking Test

### Basic Sensor Accuracy Test

![Graph showing the relationship between Force (lb) and Voltage Output (mV) with a linear regression line and R² = 0.96839.](image)
Conclusions

- Built a working circuit
- Modified existing software
- Demonstrated potential for the device
Future Work

- Software
- User Interface
- Shoe Integration
- Device Testing

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