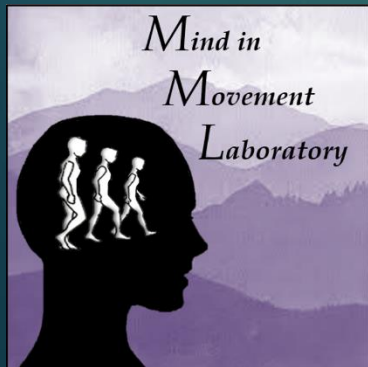
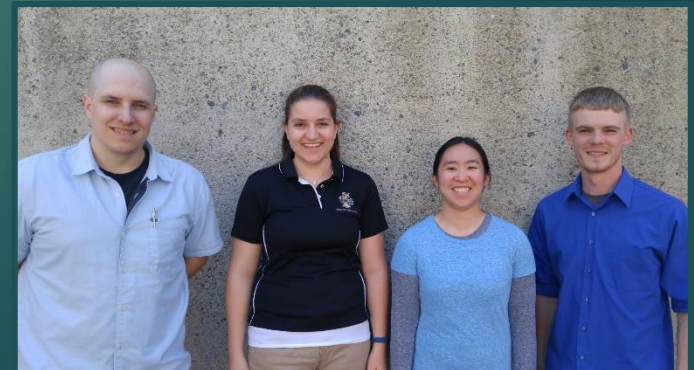


Measurement of Human Trunk Stiffness and Stability



ROBERT REGENT
JACQUELIN REMALEY
SALLY MEI
AUSTIN STEINER
ADVISOR: DR. JOEL PERRY

SPONSOR: DR. RAJAL COHEN
MIND IN MOVEMENT LABORATORY



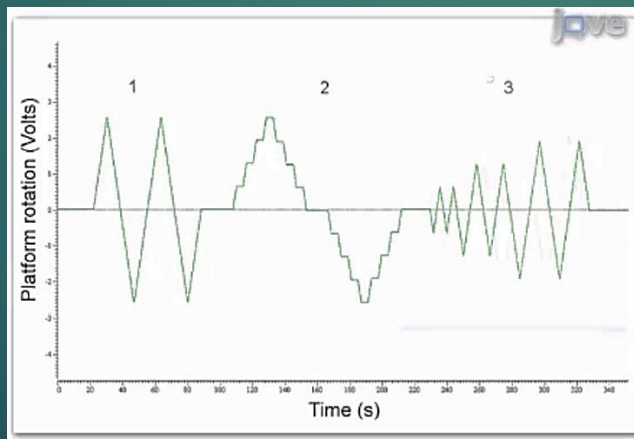
Project Overview

- ▶ Proposal
 - ▶ Set up the donated device “Twister” and add an additional piece to measure axial force
- ▶ Deliverables
 - ▶ Functioning device compatible with current lab setup and data acquisition system
 - ▶ Accommodate heights up to 6'3" while fitting inside the 8' lab space
 - ▶ Weight system for up to 7% subject body weight
 - ▶ Ergonomically safe and user friendly - mobility



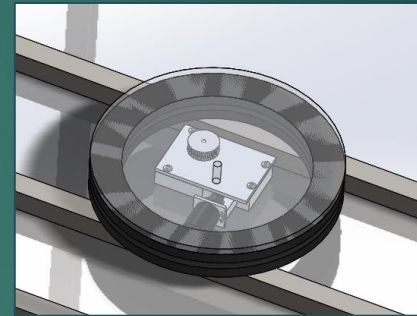
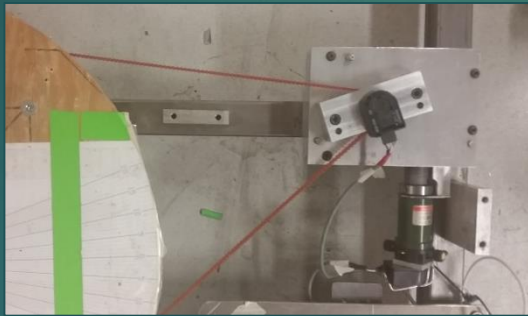
Twister Functionality

- ▶ Given
 - ▶ Twister was created in early 2000s at Oregon Health and Science University
 - ▶ Before axial force mechanism could be added, the existing system required upgrades and some part replacement



Upgrades

▶ Motor + Baseplate



▶ Harness

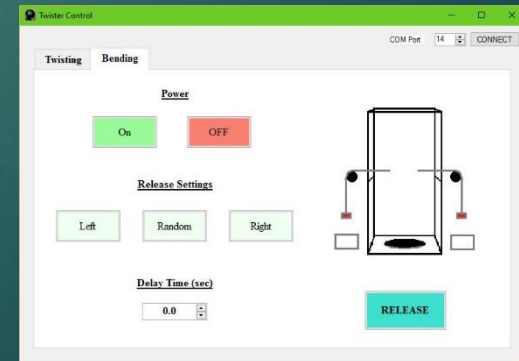
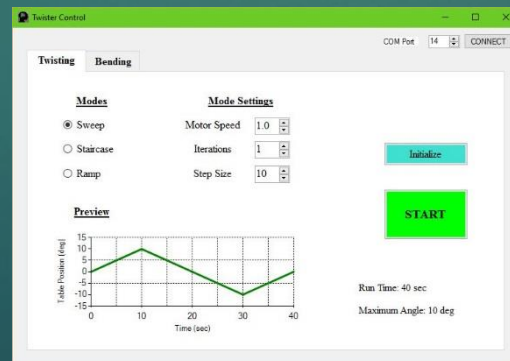
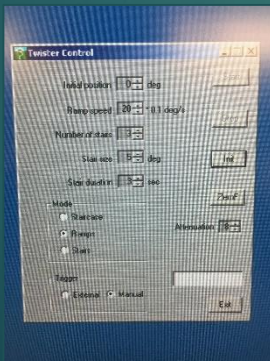


Upgrades

- ▶ Headpiece + Torque Arm

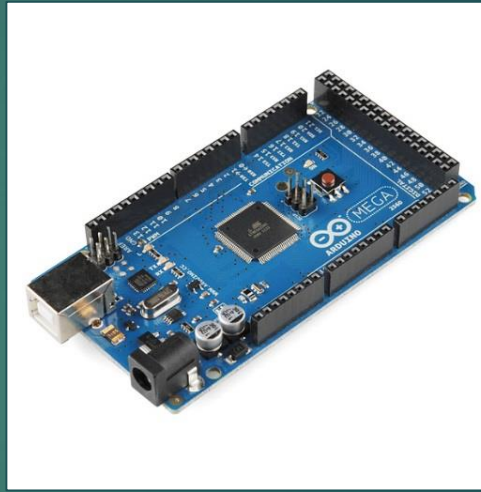


- ▶ User Interface (GUI)

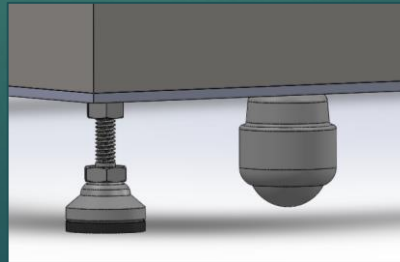


Upgrades

▶ Circuits

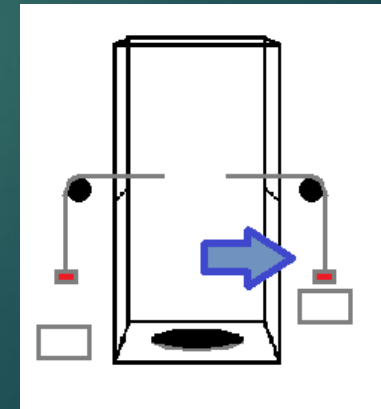
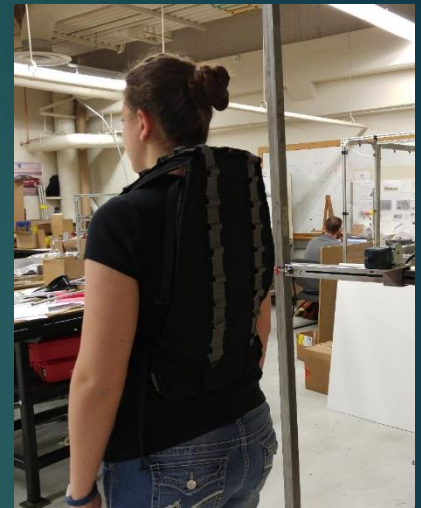


▶ Twister Mobility + Height



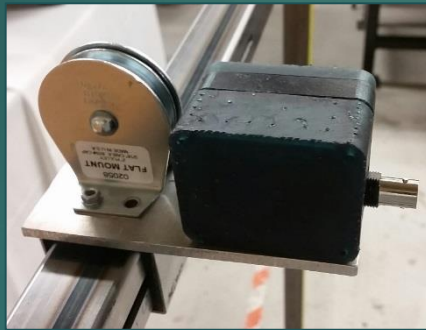
Axial Force Addition

- ▶ Lateral force Harness
 - ▶ Loops for cable attachment on front and back
 - ▶ Pull the subject's core
- ▶ Electromagnets + Weights



Axial Force Addition

- ▶ Pulley attachment



- ▶ Potentiometer sensors



Budget

| Ordered | Arrived | Where | Description | Part # | Price | Unit | Quantity | Shipping | Total | Balance |
|------------|------------|------------------------|-------------------------|----------------------|---------|------|----------|----------|----------|------------|
| - | - | - | - | - | - | - | - | - | - | \$2,200.00 |
| 10/29/2015 | 11/6/2015 | REI | Harness | 879434 | \$16.68 | ea. | 1 | \$5.99 | \$22.67 | \$2,177.33 |
| 11/10/2015 | 11/16/2015 | McMaster Carr | Toggle Clamps | 5004A11 | \$11.08 | ea. | 2 | \$12.79 | \$50.63 | \$2,126.70 |
| | | | Adhesive Back Rubber | 8463K62 | \$15.68 | ft. | 3 | | | |
| 11/10/2015 | 11/16/2015 | Arduino USA | Arduinio Mega 2560 | MEGA2560 | \$45.95 | ea. | 1 | \$3.74 | \$49.69 | \$2,077.01 |
| n/a | 11/10/2015 | Jo-Ann Fabric | 3/4" Straps | | \$2.49 | yd. | 2 | \$0.00 | \$9.72 | \$2,067.29 |
| | | | Buckles | | \$3.99 | ea. | 2 | | | |
| n/a | 11/10/2015 | Moscow Building Supply | Forney Head Gear | 55674 | \$8.19 | ea. | 1 | \$0.00 | \$13.68 | \$2,053.61 |
| | | | U Joint | | \$5.49 | ea. | 1 | | | |
| 11/17/2015 | 11/23/2015 | Mouser | Potentiometer | 3590S-2-502L | \$13.68 | ea. | 2 | \$7.99 | \$43.96 | \$2,009.65 |
| | | | connectors | 28-91057 | \$2.87 | ea. | 3 | | | |
| 11/17/2015 | 11/23/2015 | Ebay | Electromagnets | XRN-XP40x20 | \$15.36 | ea. | 2 | \$0.00 | \$30.72 | \$1,978.93 |
| 11/17/2015 | 11/23/2015 | AndyMark | String Pot Hardware Kit | am-2618h | \$2.50 | ea. | 2 | \$5.95 | \$10.95 | \$1,967.98 |
| | 11/17/2015 | U-Idaho Facilites | Structural Steel Tube | | \$0.88 | lbs. | 16 | \$0.00 | \$20.56 | \$1,947.42 |
| | | | Steel Flat Stock | | \$1.08 | lbs. | 6 | | | |
| n/a | 12/8/2015 | Jo-Ann Fabric | 2" Straps | | \$4.49 | yd. | 3 | \$0.00 | \$30.92 | \$1,916.50 |
| | | | 1" Straps | | \$2.49 | yd. | 2 | | | |
| | | | 2" Buckle | | \$6.49 | ea. | 1 | | | |
| | | | 1" Buckle | | \$3.99 | ea. | 1 | | | |
| | | | 1" Adjuster | | \$1.99 | ea. | 1 | | | |
| 12/14/2015 | 12/21/2015 | McMaster Carr | Swivel Leveling Feet | 611K55 | \$9.62 | ea. | 4 | \$7.33 | \$95.93 | \$1,820.57 |
| | | | Stud Mount Ball Roller | 6460K61 | \$12.53 | ea. | 4 | | | |
| 1/15/2016 | 1/20/2016 | Amazon (Sainsmart) | DC-DC 5 Amp SSR | GJ-5FA-L | \$25.99 | ea. | 1 | \$7.58 | \$33.57 | \$1,787.00 |
| 2/1/2016 | 2/8/2016 | McMaster Carr | Shaft Coupling | 5395T412 | \$12.06 | ea. | 1 | \$6.37 | \$54.63 | \$1,732.37 |
| | | | Steel Pulley | 3099T34 | \$7.02 | ea. | 2 | | | |
| | | | Toggle Clamps | 5004A11 | \$11.08 | ea. | 2 | | | |
| 2/26/2016 | 3/1/2016 | Metals4Uonline | 1.125x.058 Alum Tube | ART611125058 | \$37.10 | 72" | 1 | \$15.94 | \$82.27 | \$1,650.10 |
| | | | 1.250x.058 Alum Tube | ART611250058 | \$36.60 | 72" | 1 | | | |
| 3/2/2016 | 3/5/2016 | Mouser | Male AMP Connector | 571-14450224 | \$0.39 | ea. | 4 | \$7.99 | \$107.06 | \$1,543.04 |
| | | | Female AMP Connector | 571-2-1445093-4 | \$1.05 | ea. | 4 | | | |
| | | | E-Stop | 123-51-252.026 | \$26.65 | ea. | 1 | | | |
| | | | Op-Amp | 584-AD622ARZ | \$5.91 | ea. | 4 | | | |
| | | | Potentiometer | 652-3590S-2-502L | \$13.68 | ea. | 2 | | | |
| | | | Voltage Regulator | 863-NCP4623HSNADJT1G | \$1.13 | ea. | 6 | | | |
| | | | BNC Connectors | 571-1-1634622-0 | \$2.22 | ea. | 4 | | | |

Final Device



Old



New



Thank you!

QUESTIONS?