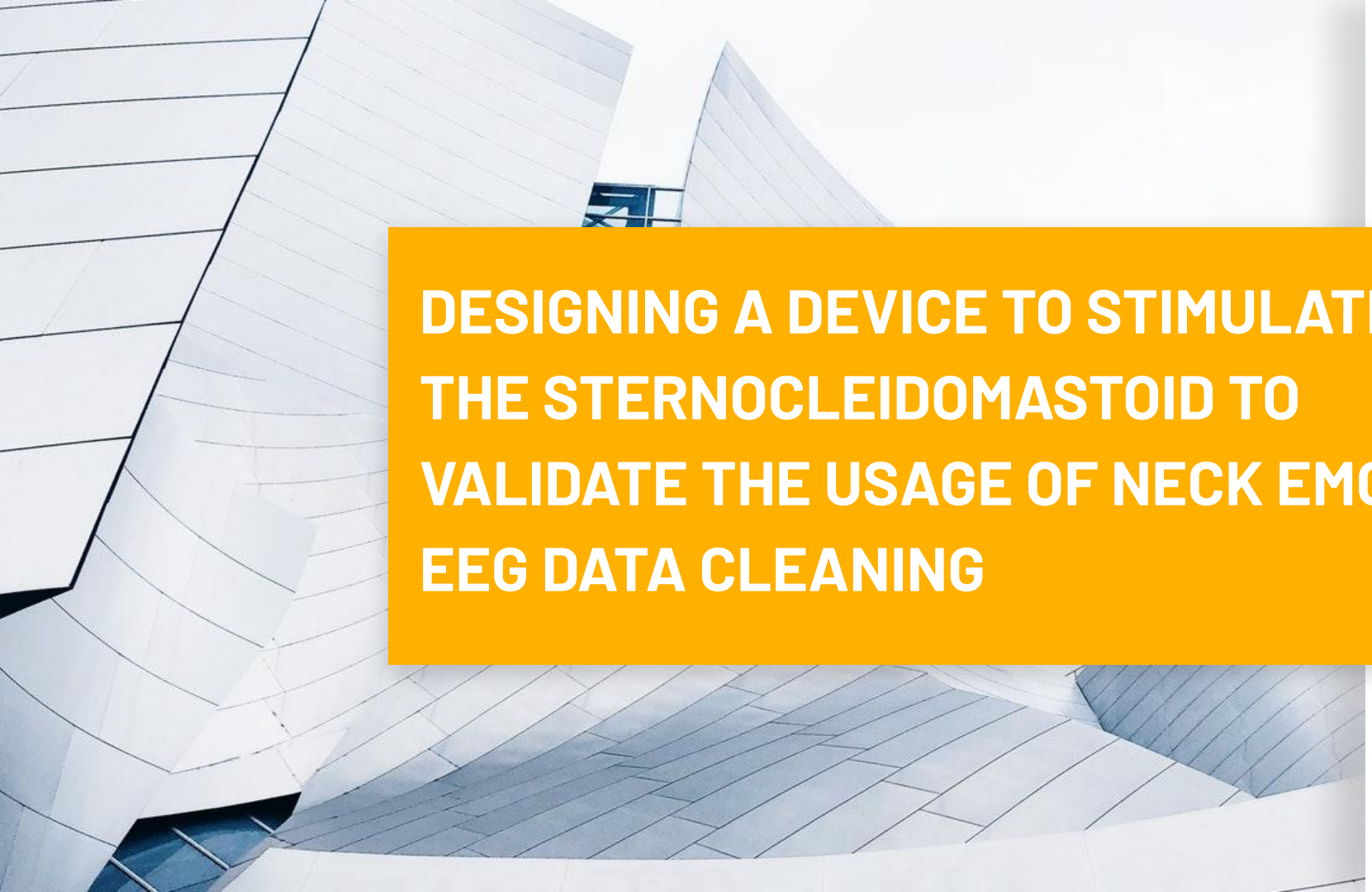


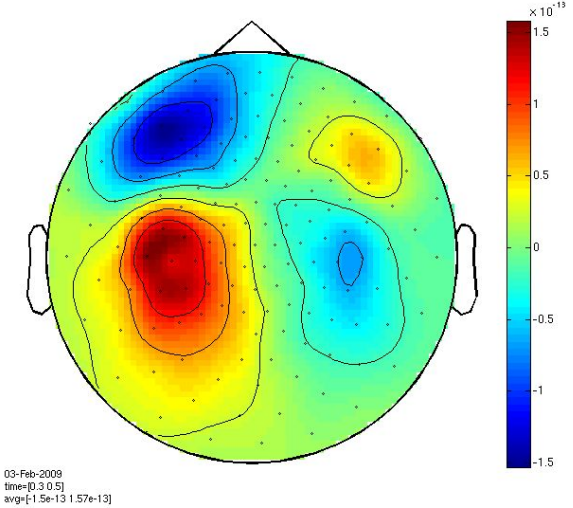
DESIGNING A DEVICE TO STIMULATE THE STERNOCLEIDOMASTOID TO VALIDATE THE USAGE OF NECK EMG IN EEG DATA CLEANING

DR. FERRIS' HUMAN NEUROMECHANICS LAB

Bionic Limbs

Exoskeletons

ELECTROENCEPHALOGRAPHY (EEG)



REMOVING NOISE ARTIFACTS

Independent Component Analysis

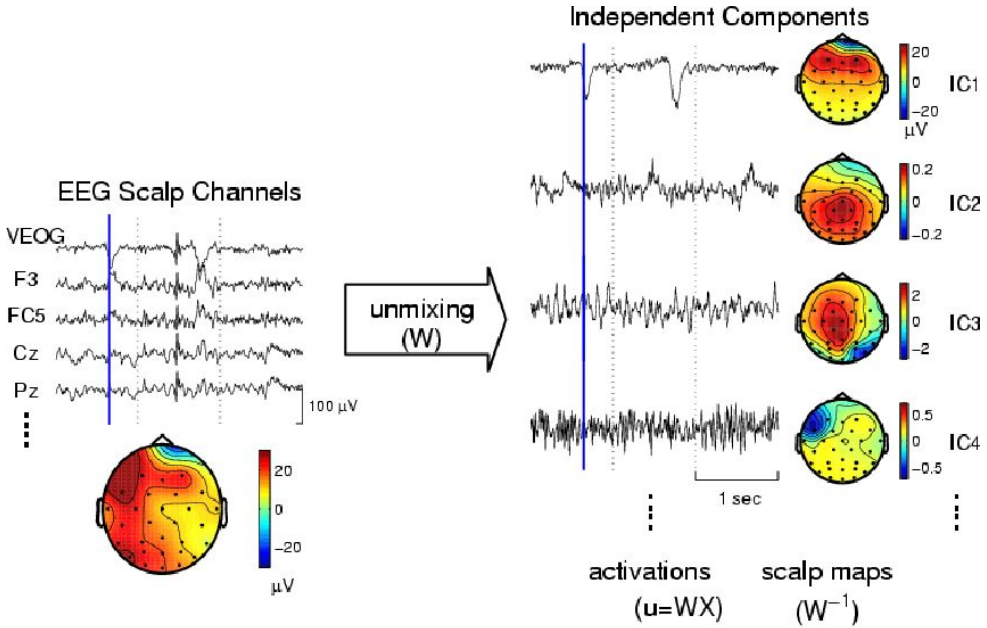


Fig. 1 EEG Signals being broken into ICs using ICA

LOCOMOTIVE EEG

THE STERNOCLEIDOMASTOID

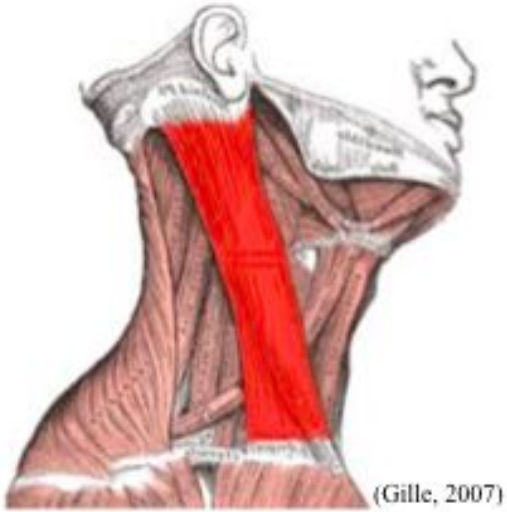


Figure 1. The sternocleidomastoid, highlighted in red.

DESIGN OBJECTIVES

Figure 2. Participants must wear an EEG cap and HD EMG patches during data collection.

DESIGN OBJECTIVES

Design Requirements

- ❑ No electrode interference
- ❑ 50% MVC muscle engagement
- ❑ High stability
- ❑ Size adjustability

Additional Considerations

- ❑ High tensile strength
- ❑ Low cost
- ❑ Comfort
- ❑ Safety

FINAL DESIGN

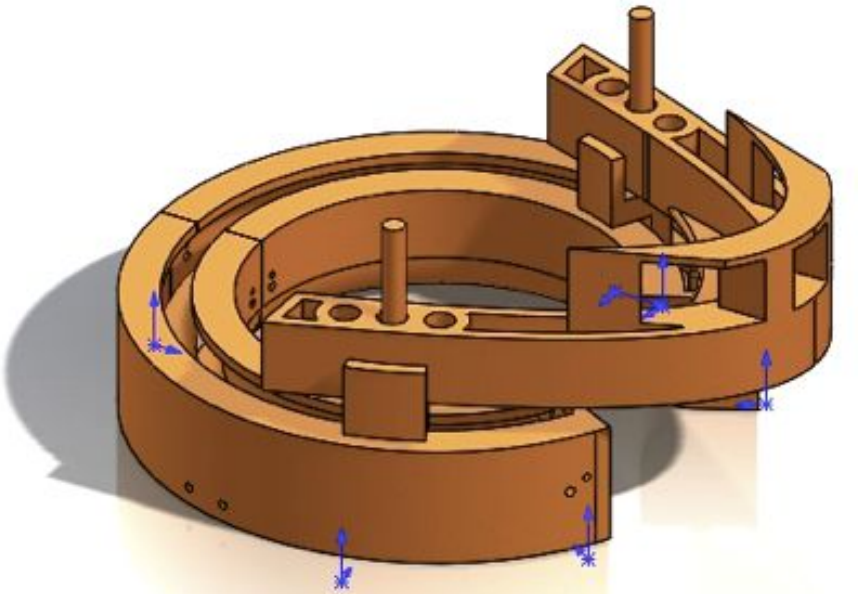
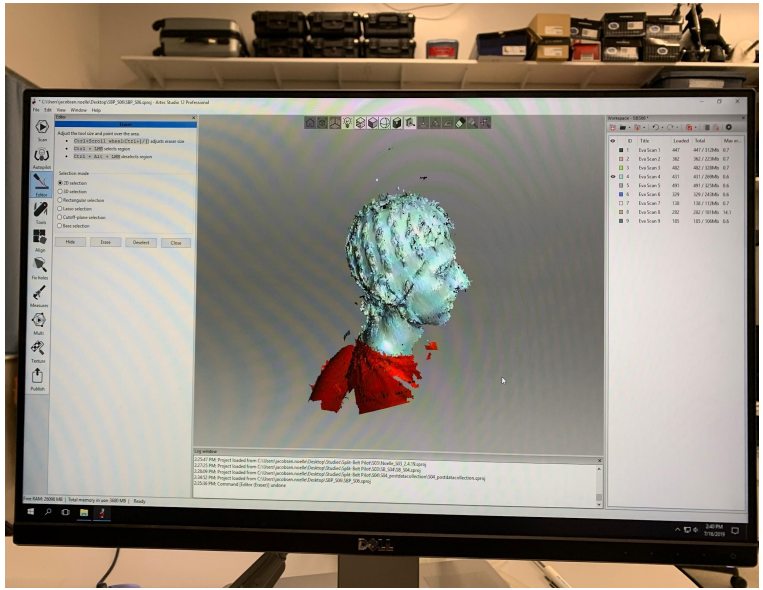


Figure 3. The device was designed in SolidWorks and 3D printed using nGen co-polyester filament. The final design includes an assembly of seven parts.

3D HEAD SCAN



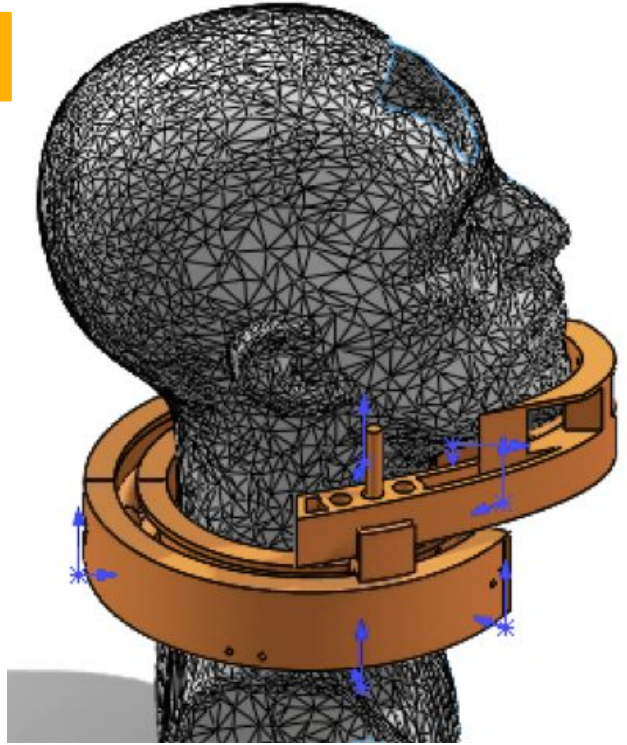


Figure 4. A 3D scan of a human head was imported to SolidWorks and used to make various sizing adjustments.

FEATURES

Jaw Support

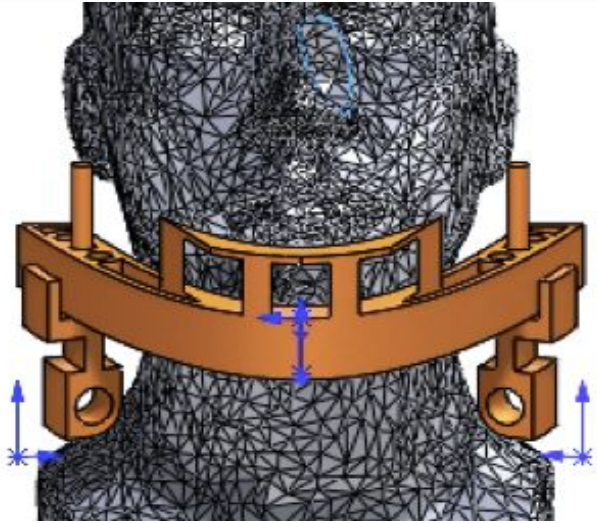


Figure 5. A jaw piece supports and moves with the jaw during head rotation. On each side, the jaw piece connects to a plunger.

FEATURES

Springs & Tracks

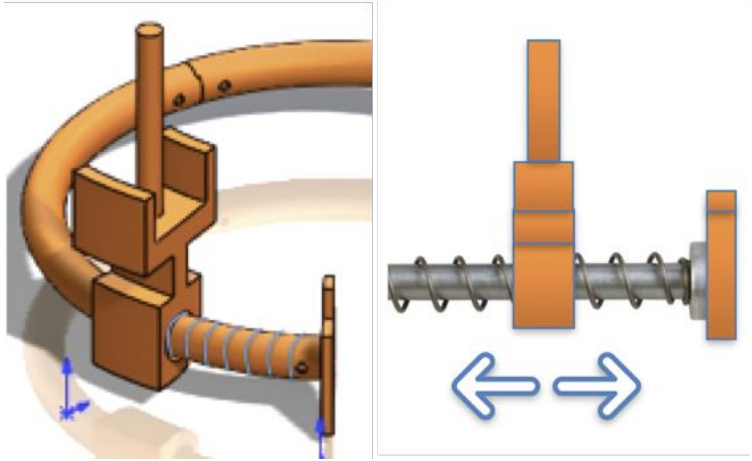


Figure 6. Inside the device, springs surround a cylindrical track. The springs are positioned so that they are stretched and compressed by the plungers as the user's jaw rotates.

FEATURES

Outer Shell

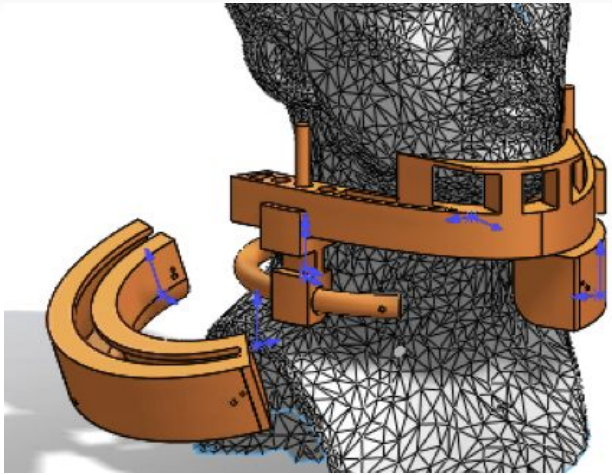


Figure 7. An exploded view of the device shows that the inner spring track is contained within an outer shell. This isolates spring movement.

FEATURES

Adjustability

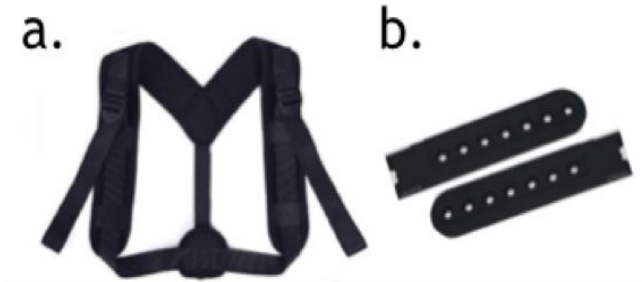


Figure 8. A) The outer shell of the device is anchored to a commercial back support product to promote stability. The straps are adjustable, making them suitable for all users. B) Plastic adjustable straps are used to fasten the device around the user's neck.

FINAL DEVICE

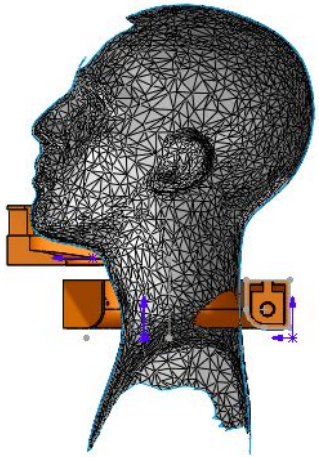
EVALUATION & CONCLUSION

Design Requirements

- ✓ No electrode interference
- ✓ 50% muscle engagement
- ✓ High stability
- ✓ Size adjustability

Additional Considerations

- ✓ High tensile strength
- ✓ Low cost
- ✓ Comfort
- ✓ Safety



THANKS!

Any questions?