Demographic-Driven Electromyography Analysis: Advancing Personalized Biosignal Interpretation

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MOTIVATION

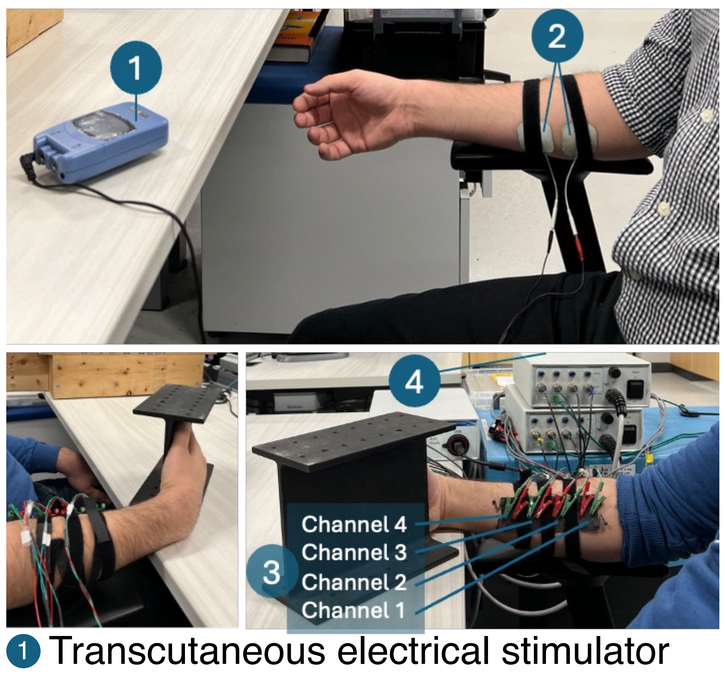
- **Fixed electromyography (EMG)** baseline may lead to inaccurate evaluations across different individuals in neuromuscular disorder assessment.
- **Personalized EMG baselines** account for individual variability, such as age, improving assessment accuracy.



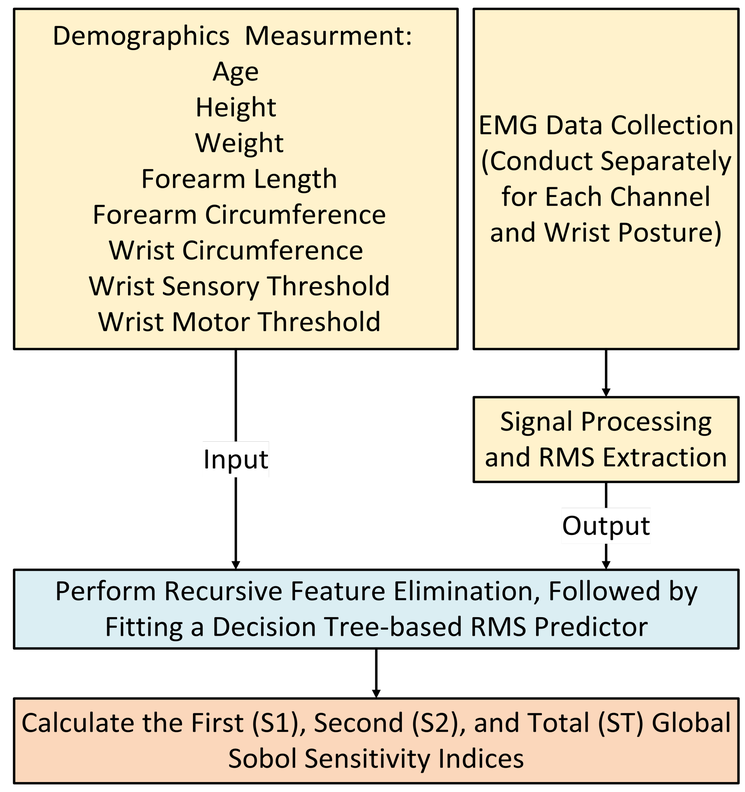
OBJECTIVE

To estimate baseline RMS values of EMG signals using demographic factors when direct measurement is not available for individuals with neuromuscular disorders

METHODS



1. Transcutaneous electrical stimulator
2. Stimulation electrodes
3. EMG electrodes
4. EMG data acquisition device

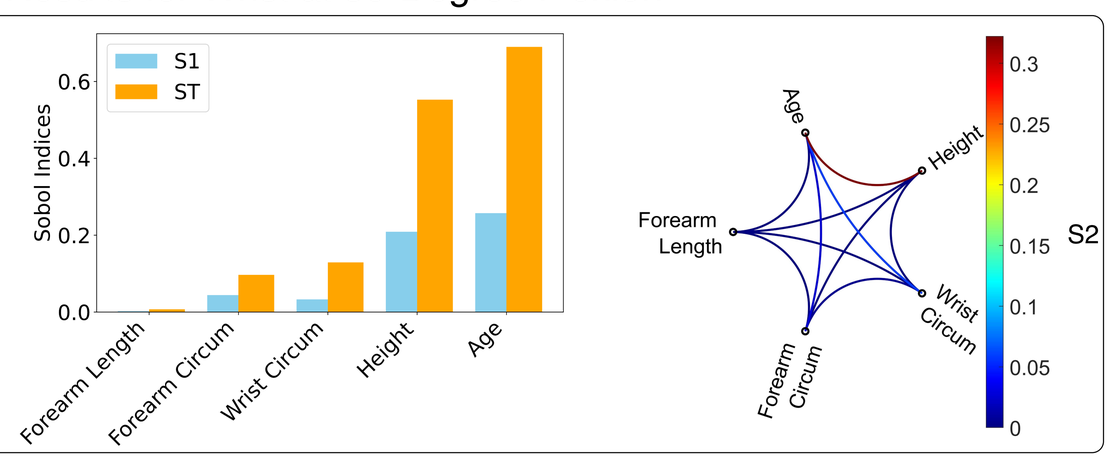


RESULTS

Results for Wrist at 30-Degree Flexion

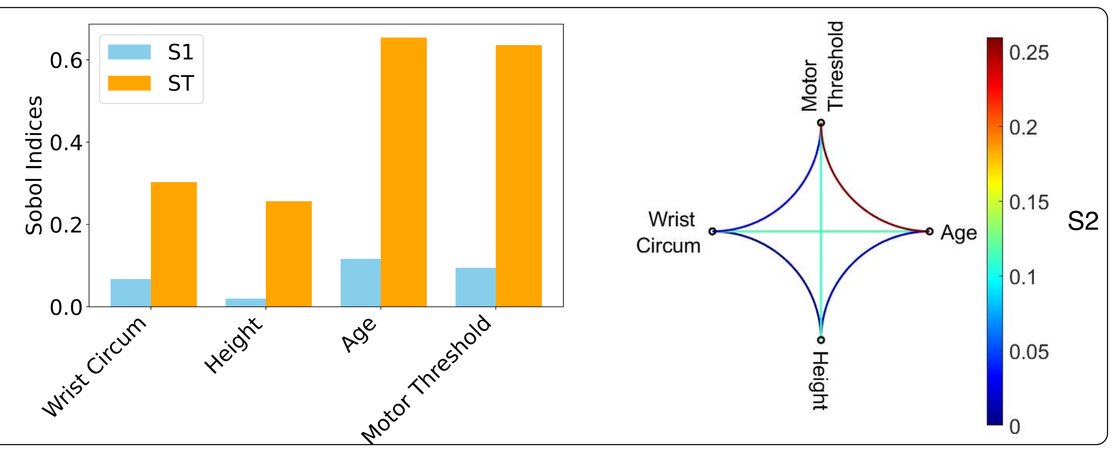
Channel 1

RMS Predictor Accuracy: 93.2%



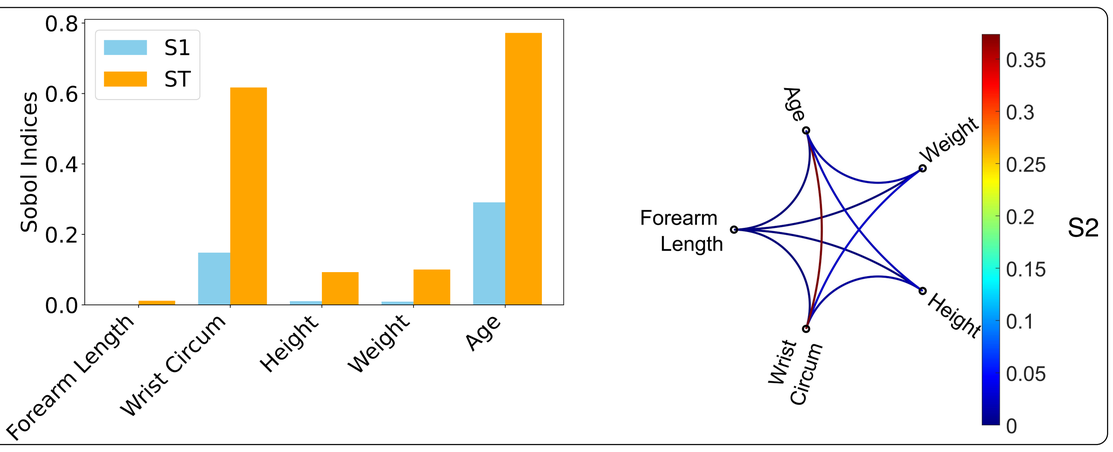
Channel 2

RMS Predictor Accuracy: 94.76%



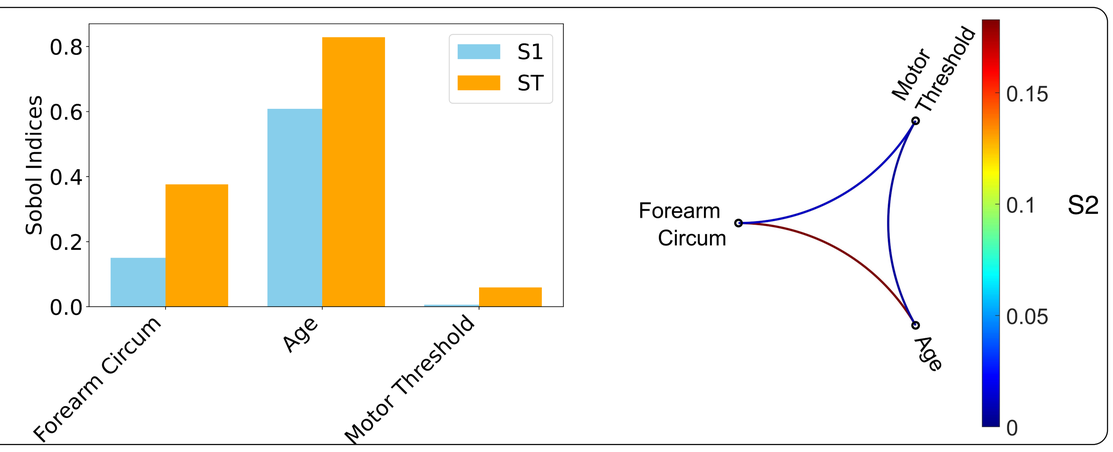
Channel 3

RMS Predictor Accuracy: 91.07%



Channel 4

RMS Predictor Accuracy: 88.81%



CONCLUSIONS

- The Decision Tree-based RMS predictors (a separate model was created for each of the four channels and each wrist posture) accurately predict individualized baseline RMS values across EMG signals, with accuracy ranging from 88.81% to 95.6%.
- A global Sobol sensitivity analysis was performed to investigate the significance of variation in each input demographic parameter on the variability of the RMS of the EMG signal.
- The Sobol analysis results offer valuable insights for future research, indicating that recruiting a more diverse population based on the identified factors could enhance model robustness.

ACKNOWLEDGMENT

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