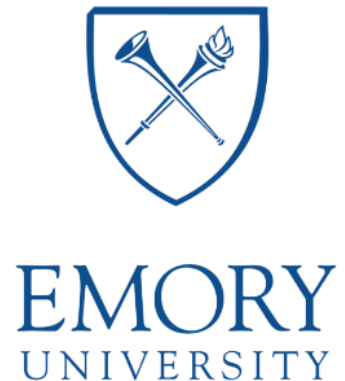


Acoustic Emission Based Assessment of Temporomandibular Joints

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BACKGROUND

- Sounds from the TMJ are a common but poorly understood clinical sign.
- The TMJ is difficult to examine, and diagnosis depends heavily on imaging.
- Joint sounds have previously been shown to correlate with pathologies in the knee.¹

PURPOSE

- **Record and analyze TMJ sounds (acoustic emissions, AE).**
- To develop an instrumented headset for recording sounds from the TMJ.
- To determine sound features that could help screen for pathologic conditions in the jaw.

MATERIALS AND METHODS

Study design

- Case-Control

Inclusion criteria

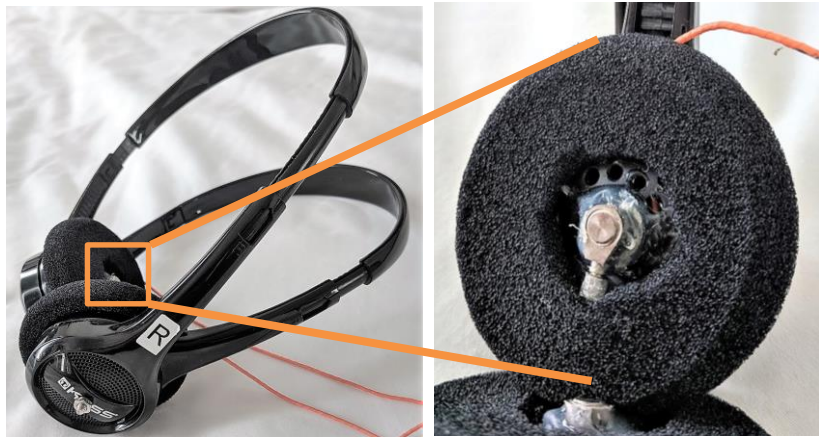
- Age 6-18
- No history of jaw disease, damage, or orthodontics
- No history of craniofacial syndromes affecting the TMJ
- No systemic disease affecting the TMJ

Statistical Analysis

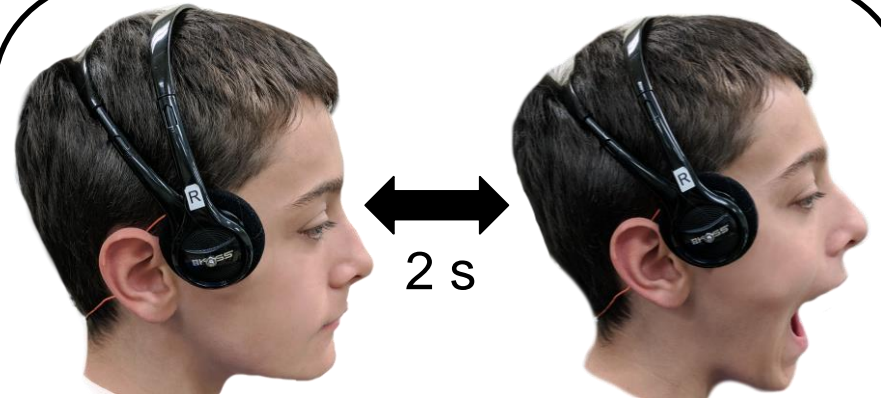
- 2 tailed unmatched t-test ($p < 0.05$)

MATERIALS AND METHODS

- Ten maximal incisal openings (MIO) and lateral excursions while wearing headset



TMJ Sound Recording Headset with Integrated Contact Microphones



TMJ sound recording headset is worn while performing jaw exercises.

Study Demographics

TMJ +

TMJ -

Enrolled

3 male
12 female

5 male
15 female

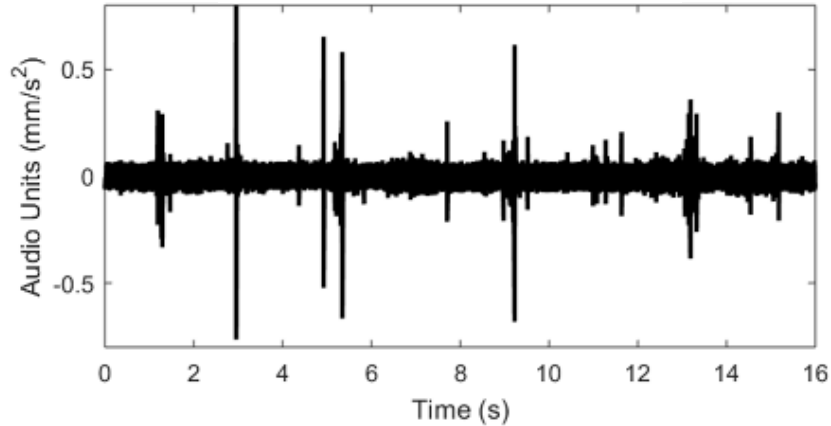
Age (years)

14.3

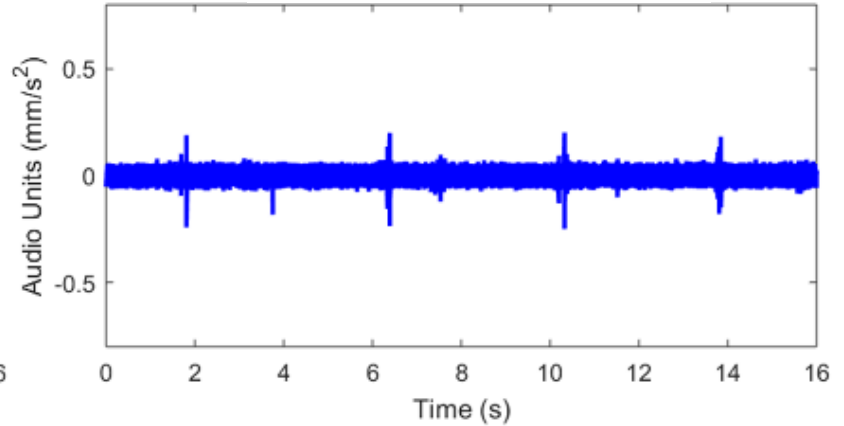
11.9

RESULTS – Time Domain Signals

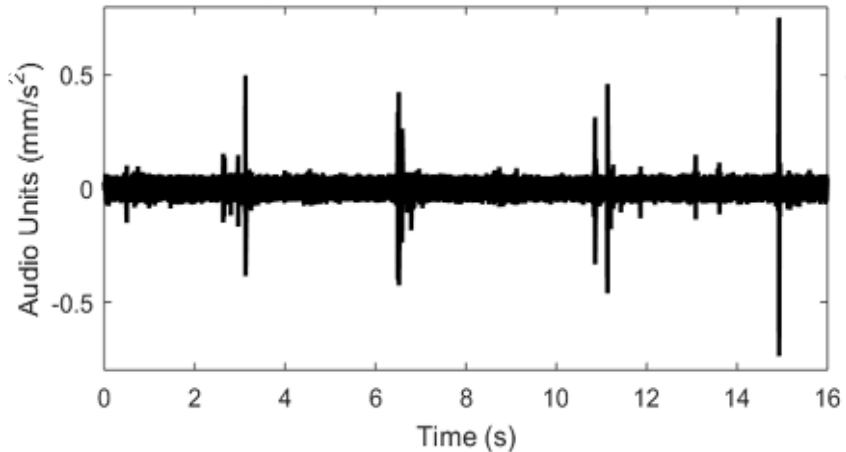
Medial-Lateral



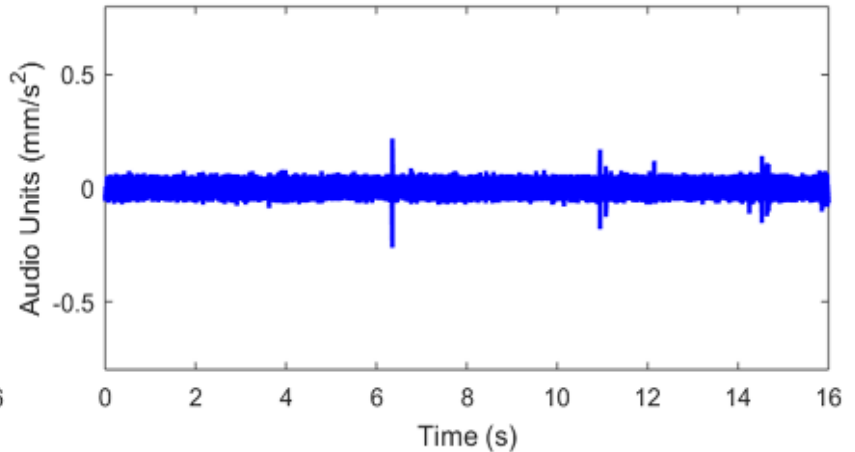
Medial-Lateral



Open-Close



Open-Close

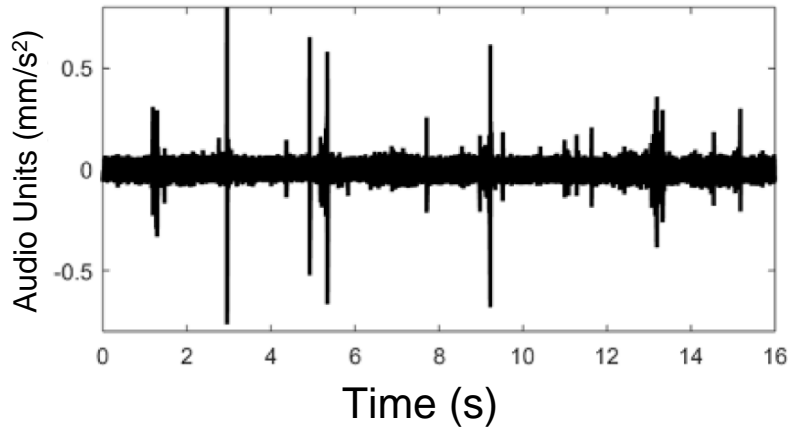


TMJ Sounds

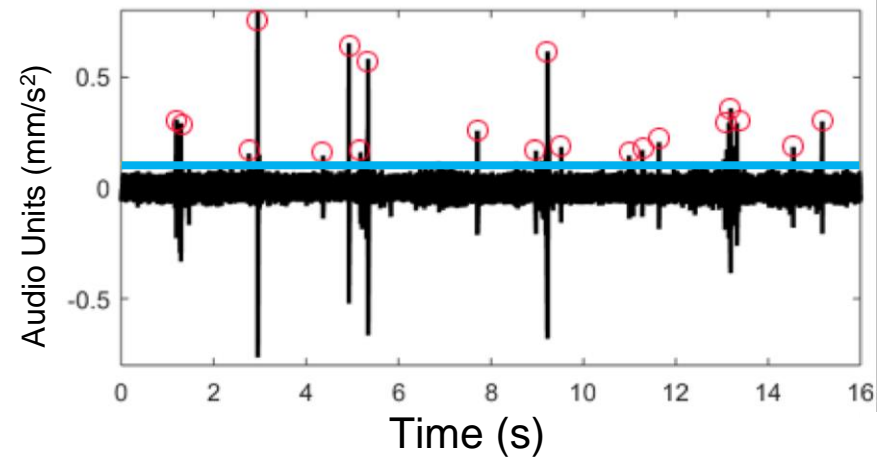
No TMJ Sounds

DATA ANALYSIS METHOD: b-Value Analysis

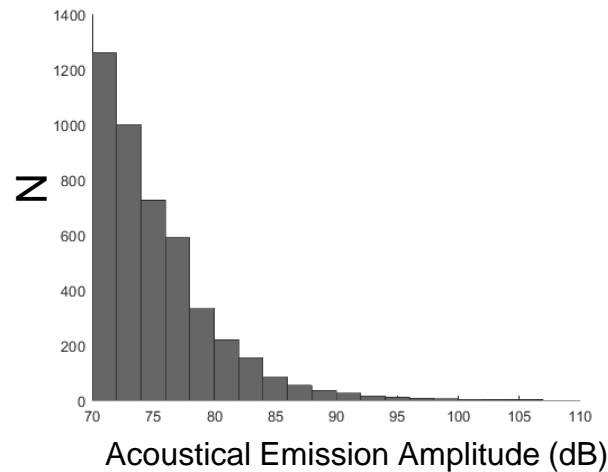
(i) Bandpass Filter



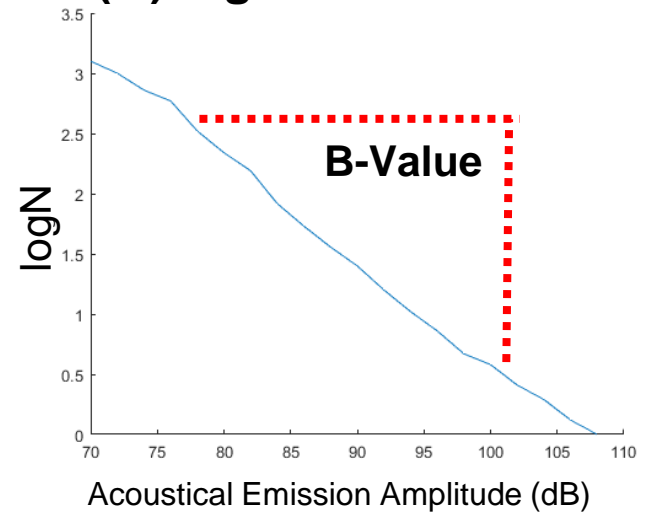
(ii) Peak Detection



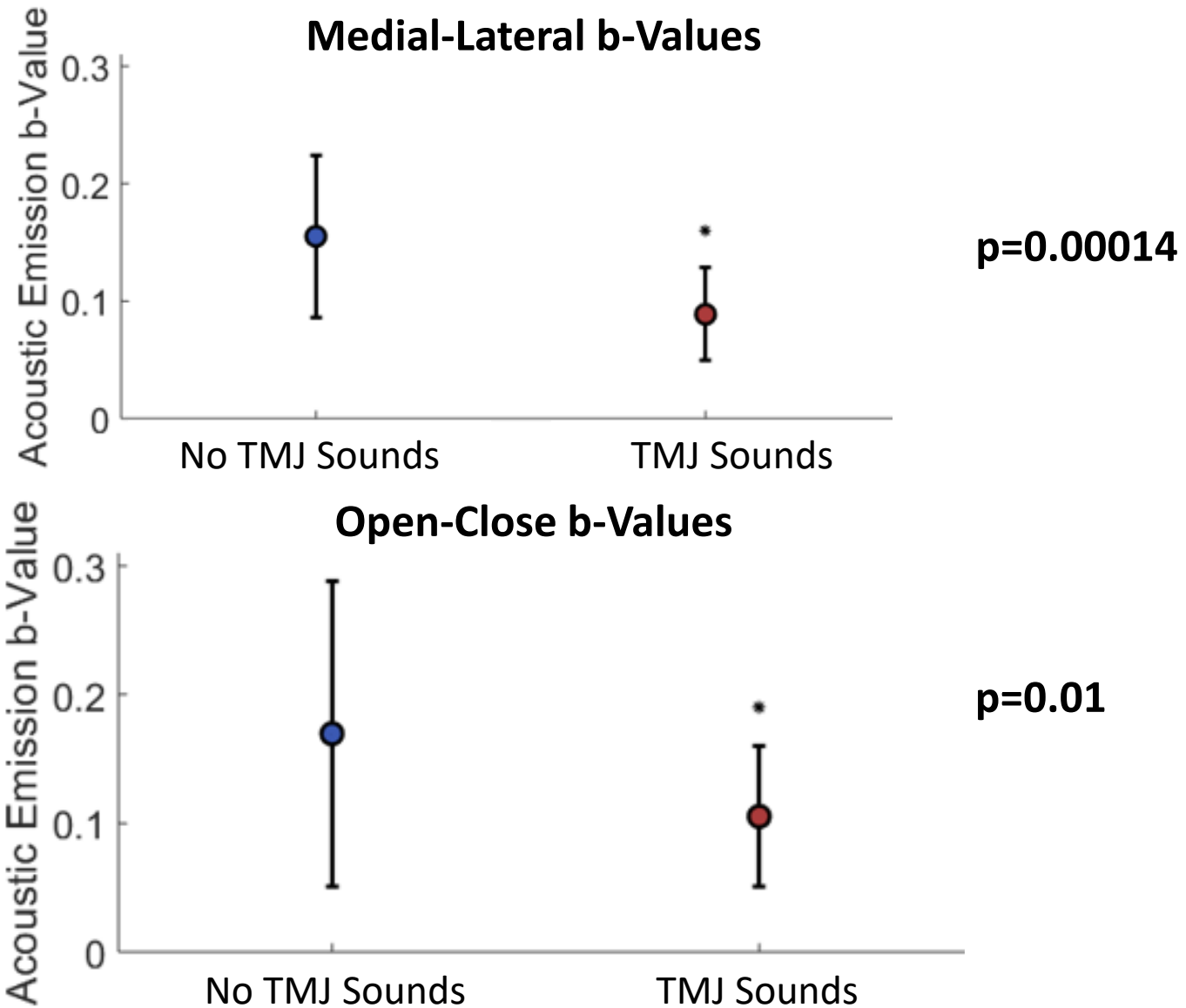
(iii) Peaks w.r.t. Amplitude



(iv) log of Ordered Peaks



b-Value Comparison



CONCLUSIONS

- Time-Domain AE signals are more chaotic in patients with TMJ sounds.
- The b-Value showed significant differences between the two groups.
- In the future, TMJ AEs could serve as a non-invasive biomarker of TMJ health.