

Ultrasound Imaging of the TMJ: Exploring Relationship to Therapeutic Interventions

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BACKGROUND

- Physical therapy is prescribed to patients with temporomandibular disorders (TMD) to relieve pain, reduce inflammation and restore function¹
- Evidence of effectiveness of PT for individuals with TMD is limited²
- Musculoskeletal Ultrasound (US) imaging is within the scope of practice for physical therapists
 - US machines can be easily accessible to PTs
 - Images may contribute to clinical examination^{3,4}
- Research of US imaging for the temporomandibular joint (TMJ) to view real-time anatomy and motion is limited
- Problem Statement:** Research on US imaging for the TMJ is limited in scope and clinical implication. There are little to no standard operating procedures for optimal visualization of TMJ anatomy or joint mechanics

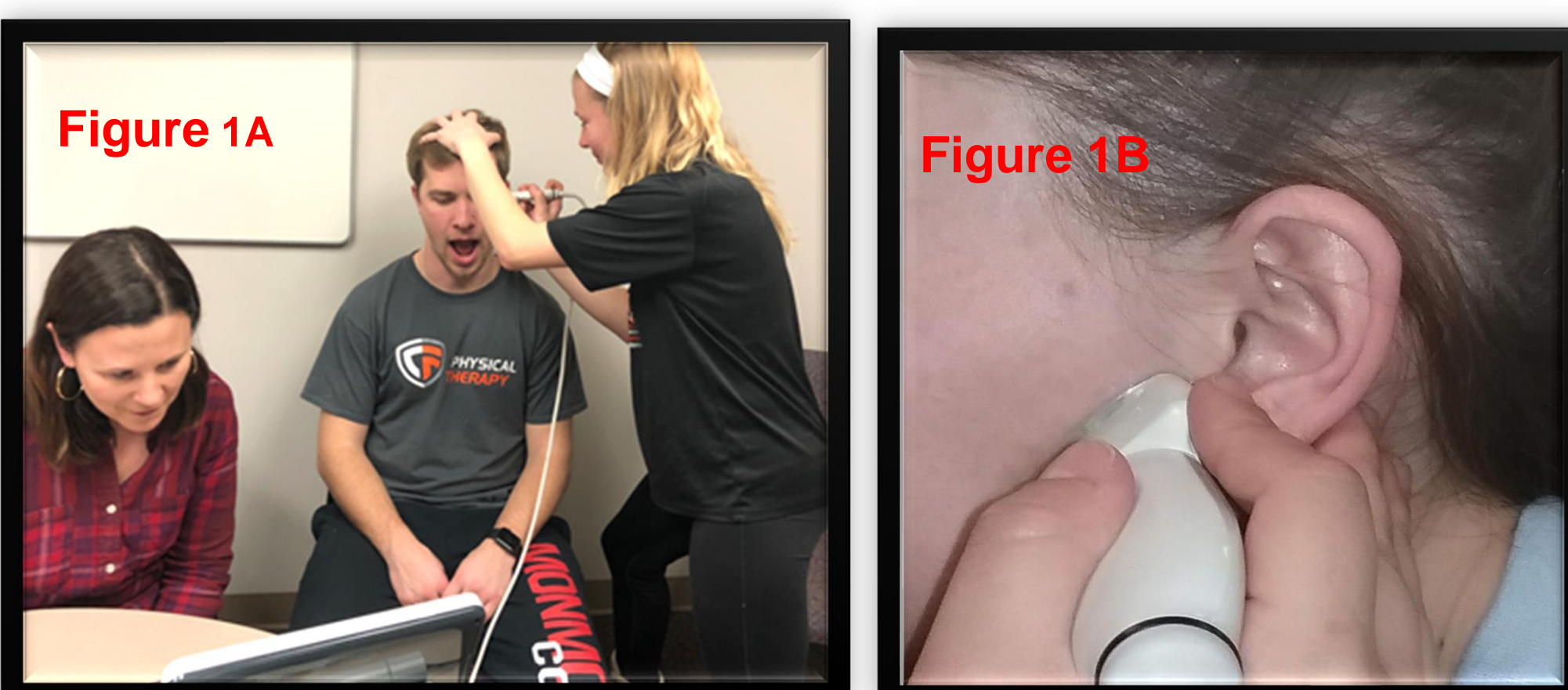


Figure 1A: Positioning of the investigator, participant and ultrasound transducer for assessment & evaluation
Figure 1B: Close up of transducer position

PURPOSE

- Understand and visualize TMJ anatomy at rest and with motion using positions of commonly prescribed TMJ exercises
- Add to existing literature regarding US settings for optimal visualization of the TMJ at rest and with motion in healthy subjects.

MATERIALS AND METHODS

Materials

- Terason uSmart 3200T ultrasonography machine
- Linear, flat, 2-inch transducer
- Therabite™ Measurement Tool
- US Gel
- Probe Covers

Methods

- Researchers examined imaging techniques and procedures on themselves first
- Cross-sectional descriptive analysis of 4 healthy subjects (age >18) with no history of TMD
- Subjects were seated in an upright posture and maximal mouth opening was measured.
- Researchers then placed the US transducer parallel to the zygomatic arch to examine the left TMJ in multiple positions



Figure 2A; Therabite™ Measurement Tool
Figure 2B: Terason uSmart 3200T ultrasonography machine

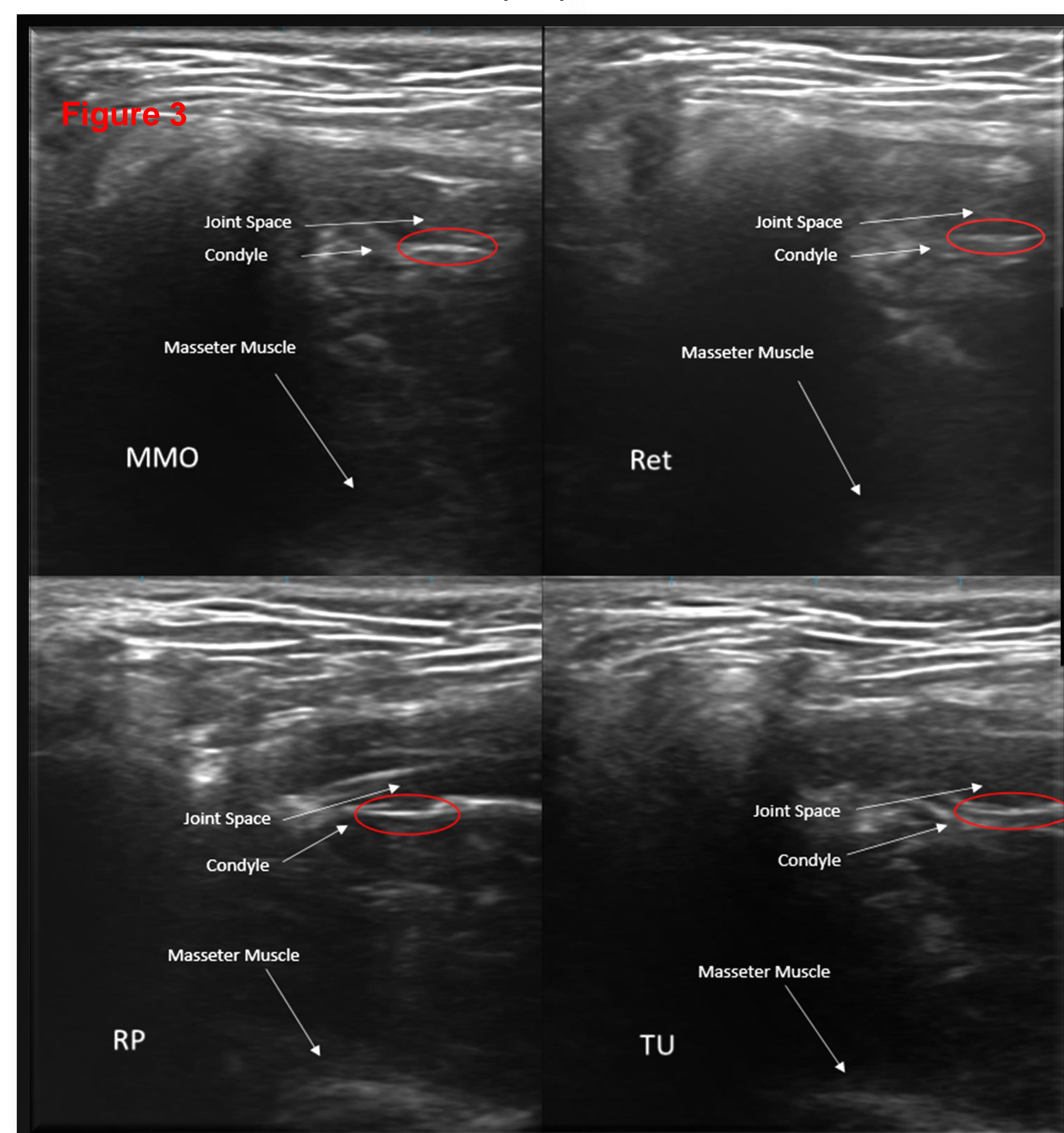


Figure 3: US images with mandibular condyle circled in red. Joint space immediately above condyle. Masseter inferior to condyle. MMO: Maximal mouth opening, Ret: Retrusion, RP: Resting position, TU: Tongue up.

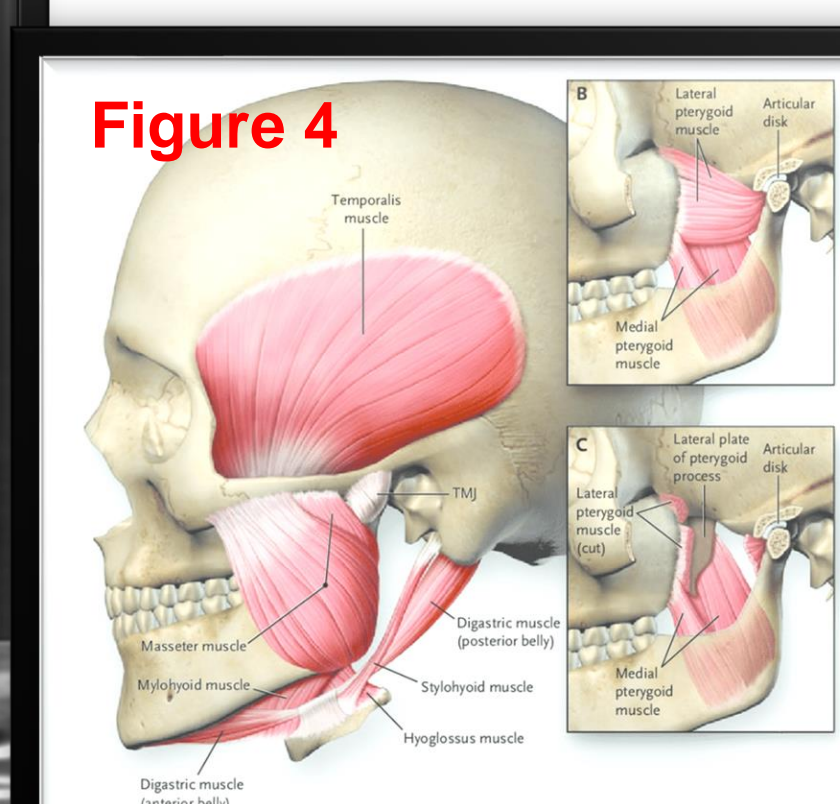


Figure 4: Anatomical reference for US images
Scrivani et al⁶

RESULTS

- Recruitment of participants was limited due to the impact of the COVID-19 pandemic
- Ideal transducer position:** parallel to the zygomatic arch allowing visualization throughout ROM
- Settings:** Depth, 5cm; frequency, 15 Hz; dynamic range, 63; focal range, 2
 - Slight adjustment for each participant required for optimal visualization
 - Parameters for the US imaging were established by a trained professional, Dr. Dominguese.
- Biomechanics:**
 - Descriptions were based on visual observations without measurement
 - Mandibular condyle translated anteriorly as expected with opening
 - Greatest anterior translation seen with maximal mouth opening
 - Opening with retraction had the least translation
 - Variable condylar movement occurred with lateral deviation, however, a small amount of anterior translation of the contralateral condyle was noted
 - In some participants, the mandibular condyle moved so far anteriorly it was out of view for the US transducer

CONCLUSIONS

- US transducer position and parameters required some individual modification to obtain clear images
- Anterior translation was visualized with all motion
- Most translation with MMO; least with retracted positions
- Further research is needed to establish standard protocols in examination of the TMJ

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