Movement-Based Examination and Treatment of Temporomandibular Joint Disorder

Combined Sections Meeting 2017

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Session Learning Objectives
1. Describe altered movement patterns of the Temporomandibular joint (TMJ).
2. Describe impairments of alignment & movement of the thoracic, neck and shoulder girdle, when corrected, result in improved TMJ function.
3. Discuss the rationale for movement based treatment of the TMJ and adjacent regions.
4. Describe a movement based examination of the neck, shoulder and TMJ.
5. Describe movement based treatment strategies for management of patients with Temporomandibular Disorder (TMD).

Disclosure
• The speakers do not have any relevant financial disclosures

Today
• Present key concepts related to movement based examination and treatment of Temporomandibular Disease (TMD)
• Provide specifics regarding our exam of the Temporomandibular Joint (TMJ) and the Adjacent Regions.
• Provide two Case Studies that illustrate the application of the concepts related to movement based examination and treatment.
Temporomandibular Disease

• Temporomandibular Disease (TMD) is a collective term, which describes clinical problems that involve the function of the masticatory muscles and the jaw joint.

Temporomandibular Disease

Lack of consensus regarding etiology, diagnosis & management of TMD.

Various types of physical therapy treatments have shown to be effective especially with focus on posture, active exercise and manual therapy.


Temporomandibular Disease

TMD is a public health problem and a main source of chronic orofacial pain that interferes with daily activities.

Gremillion HA 2000

TMD is commonly associated with symptoms in the head and neck region including headaches, ear and neck pain.

Gremillion HA, deWijer A, 1996

Temporomandibular Disease (TMD)

Recent systematic review in PTJ regarding effectiveness of manual therapy (MT) & exercise reported poor quality of evidence. Uncertainty of the effectiveness of exercise and MT with TMD.

Armijo-Olivo S et al. PTJ. Jan 2016
• Our focus in managing patients with TMD has an emphasis on addressing patient specific movement impairments at the TMJ along with alignment and movement impairments of the upper quarter.

• Create an exercise / functional activity program based on our assessment of the patient specific impairments.

Typical patient
• Complaints of pain in the TMJ, facial region, headaches and neck pain.

• Complaints of pain and/or clicking popping with eating, speaking and mouth opening.

• Limited mouth opening

• Associated poor posture including:
  • Forward head position
  • Forward shoulders
  • Thoracic kyphosis
  • Scapulae that are abducted and/or depressed
  • Typically younger – teens and older adults

Muscle Considerations for TMJ function

Key Muscles
• Opening
  • Suprahyoid
  • Infrahyoid
  • Lateral Pterygoid

• Closing
  • Masseter
  • Temporalis
Muscle Considerations for TMJ function

**Suprahyoid Muscles**

- Mylohyoid
- Geniohyoid
- Stylohyoid
- Digastric

Attaches from mandible to hyoid

Depress and Retract the Mandible with mouth opening.

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**Infrahyoid Muscles**

- Sternohyoid
- Sternothyroid
- Thyrohyoid
- Omohyoid

- Attaches from sternum, clavicle, & scapula to the hyoid

Depress and Retract the Hyoid with mouth opening.

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**Lateral Pterygoid**

**Attachments:**
- superior & inferior heads: from sphenoid bone and pterygoid plate traveling horizontally to the neck of mandible, articular capsule and disk of the TMJ

Mouth Opening - anterior translation of condyle of the mandible

Controls backward gliding of disk and condyle during closing

Ipsilateral deviation of mandible if acting with temporalis

Contralateral deviation of mandible if acting with medial pterygoid

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Novartis 1997

Netter
Muscle Considerations for TMJ function

**Masseter and Temporalis**

**Masseter**
- Elevates mandible with closing
- Lateral deviation of the mandible
- Trigger Points common with clenching/grinding
- Stiff/Short? Contribute to limited opening?

**Temporalis**

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**Normal Mandible Depression / Mouth Opening**

- **Early phase** – 1st 35% - 50% of ROM, involves **primarily rotation [rolling]** of the condyle. The mandible moves inferiorly and posteriorly during this phase.
- **Late phase** – final 50% - 65% of the total range of motion, transition of primary rotation to **primary translation**. Can be palpated at the condyles.

Neumann DA. 2010

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**Muscle Considerations Mouth Opening – Mandible Depression**

- **Suprahyoid and Infrahyoid muscles**
  - Mandible depression and retraction

- **Lateral Pterygoid muscle**
  - Anterior translation

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**Palpation of condyle movement**
Normal Mandible Depression / Mouth Opening

- **Early phase** – 1st 35% - 50% of ROM, involves primarily rotation (rolling) of the condyle. The mandible moves inferiorly and posteriorly during this phase.

- **Late phase** – final 50% - 65% of the total range of motion, transition of primary rotation to primary translation. Can be palpated at the condyles.

Neumann DA. 2010

Two Components of Normal Movement of Mandibular Depression – Mouth Opening

- **Condylar Rotation**
  - Condylar movement about a frontal axis – sagittal rotation of the condyle
  - Primary muscles responsible for rotation of condyle = **supra & infra hyoid muscles**

- **Condylar Translation**
  - Forward translation of the condyle.
  - Primary muscles responsible for translation = **lateral pterygoid**

Specific Movement Impairment of the TMJ - Translation

- **Greater motion of anterior TRANSLATION of the condyle than anterior sagittal rotation of the condyle.**

- **Early Translation, lack of condylar rotation**
Movement Impairment of the TMJ Translation

**INCREASE** 
& early recruitment of the **Lateral Pterygoid (LP)**

and

**INSUFFICIENT recruitment** of the mandible depressors – **Supra and Infra Hyoid muscles.**

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**Dx: TMJ Anterior Translation**

**Preferred Pattern**

Preferred – Early condylar translation.

Limited opening, clicking, pain

**Corrected Pattern with Mandible Retraction**

Corrected with mandible retraction > early condylar rotation & delayed translation

Less pain & clicking

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**MOVEMENT IMPAIRMENT OF THE TMJ**

Associated movement impairments

- Upper cervical extension during mouth opening
- Neck pain & headaches
- Correction – “do not lift nose during mouth opening”
TMD – Consideration of Adjacent Regions

Considerations of adjacent regions – cervical spine, thoracic spine and scapulae are critical when managing TMD.

TMD commonly associated with cervical spine disorders and cervical impairments. La Touche R 2009

Weakness and reduced endurance of the cervical flexor muscles in pts with TMD. Armijo-Olivo, 2010

Effect of poor posture on TMJ ROM and pain > patient with increase thoracic kyphosis, scapulae abducted and forward head position

Opening with poor posture = 30 mm and pain

Corrected posture = 37 mm and decrease pain

TMJ opening AROM normal opening = 45 -55 mm

Effect of Adjacent Regions - TMJ

• Pilot work demonstrating effect of shoulder girdle alignment & the weight of the extremities on TMJ function.

• Passively elevating & supporting the shoulder girdle improves TMJ Range of Motion (ROM) and decreases pain.
  • Muscles attaching to clavicle, scapula and neck to the mandible may have a similar effect of decompression on the TMJ.

Effect of Adjacent Regions - Cervical

• Effect of shoulder alignment & weight of the upper extremities on neck function.

• Passively elevating the shoulder girdle & supporting the weight of the upper extremities results in improved neck rom & decrease pain.

• Mechanism - decreasing compressive loads on the neck by unloading the weight of the extremities through the attachments of the cervicoscapular muscles.
Mouth Opening with Passive Scapular Elevation

**Preferred Posture**
Limited & painful opening

**Passive Elevation**
Increased rom & decrease pain

Treatment Considerations for TMD

**Effect of Adjacent Regions**
- Findings from elevated shoulder girdle test directs treatment
- Treatment will include support of the upper extremities & correction of thoracic / scapulae alignment during exercises and functional activities.

**Treatment of TMJ Movement Impairment**
- First address trunk, scapulae and cervical alignment and movement impairments

Then
- Improve function of mandible depressors to restore early condyle rotation – partial opening with RETRACTION of the mandible towards front of neck
**Program in Physical Therapy**

**Good alignment**

**Effect of slumping**

Correction of the Forward head posture allows improved tmj alignment and recruitment of anterior muscles in the correct length.

*Olmos SR 2005*  
*Uritani D 2014*

**Tongue in roof of mouth, open by pulling chin towards adam’s apple > no clicking or popping**

Hand assist for *opening with mandible retraction*  
> improve anterior condylar rotation  
> early phase of movement

**Key Exercises to address adjacent regions & TMJ movement impairment**

- Correct alignment – Lumbar, thoracic, scapulae & neck  
- Perform limited opening with correct strategy  
- Tongue in roof of mouth, open by pulling chin towards adam’s apple > retract mandible > limited opening

**Patient Specific Exercises to address adjacent regions**

- Depressed scapulae – scapulae elevation - shrugs
- Capital flexion – stretch posterior neck structures & engage deep neck flexors
- Forward shoulders – short pectoral muscles
• If unable to do in sitting can do all exercises in supine

- Capital Flexion
- Decrease EMG activity of Lateral Pterygoid in supine
- Shoulder flexion
- Limited opening with retraction

Significant change in ROM
- Opening ROM before treatment = 39.03mm ± 8.66
  - Follow up = 42.04mm ± 6.22 (alpha = .01, mean diff 3.01mm, 95% CI 1.47 to 4.55)

Subset of 16 pts with joint signs reported no clicking or clicking that came on later in the range
- Initial rom before clicking = 29.12mm ± 10.76
- Follow up = 39.94mm ± 6.65 (alpha = .001, mean diff 10.82mm, 95% CI 8.90 to 12.74)

All patients reported a reduction in pain, 42% were pain free at follow-up & 50% of pts with joint signs reported no clicking or popping on follow-up.

A patient performed exercise program of precise jaw movements and instruction of proper alignment of the head, neck, shoulder girdle and trunk may provide a low cost effective option for TMD management.

SUMMARY

• Evaluation and Treatment for TMD should include:
  - CONSIDERATION OF THE SPECIFIC MOVEMENT IMPAIRMENT OF THE TMJ
  - CONSIDERATION OF THE EFFECT OF ADJACENT REGIONS – Cervical, Thoracic, Scapulae & Lumbar

• Next
  - Description of our Examination
  - Two Case Studies
• Acknowledgements

• Dr. Debra Fink – orthodontist

• Colleagues at Washington University in St. Louis

• Dr. Shirley Sahrmann PT, PhD, FAPTA

• Dr. Linda Vandillen PT, PhD, FAPTA

Washington University
Program in Physical Therapy Opportunities:

• PhD in Movement Science
• Movement System Clinical Fellowship
• Clinical Residency in Women’s Health
• Movement System Impairment Syndromes Courses

Contact: jennifer.brown@wustl.edu
Visit Booth # 936
Movement-Based Treatment of Temporomandibular Joint Disorder: Case Example

Vanessa Lanier, PT, DPT, OCS

Patient – Chief Complaint

- **Age:** 44
- **Gender:** Female
- **Chief Complaint:**
  - TMJ pain, popping, clicking
  - Headache
  - Neck pain
  - Pain in the past week – Best 3/10, Worst 8/10, Average 6/10
- **History:**
  - Initial onset at age 22 after braces (>20 years)
  - Initially pain, progressing to popping, clicking
  - Neck pain – posterior, suboccipital
  - Headache 2x/week, Posterior, L ear, L side of face

Patient – History

- **Medications:** Naproxen/Ibuprofen every other day
- **Diagnostic test/results:** none
- **Previous treatment:** Custom night splint
- **Work activities:** Veterinary technician – lifting animals
- **Recreational activities:** Prior to increased pain – cycling and weight lifting 4x/week.

Patient – Chief Complaint

- **Activities/positions increase symptoms**
  - Eating – hard or chewy foods
  - Dental care
  - Yawning
  - Driving to various job sites
  - Lifting animal cages
- **Activities/positions that decrease symptoms**
  - Rest
  - Medication
  - Soft tissue massage
Initial Examination – Alignment

- **Alignment**
  - Forward head, increased flexion at C-T junction, upper cervical extension
  - Thoracic kyphosis
  - Depressed, internally rotated scapulae

Initial Examination – TMJ Range of Motion

<table>
<thead>
<tr>
<th>Movement</th>
<th>Pain/Location</th>
<th>Faulty Movement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mouth Opening</td>
<td>50mm</td>
<td>L TMJ</td>
</tr>
<tr>
<td></td>
<td>R deviation L</td>
<td>Excessive anterior</td>
</tr>
<tr>
<td></td>
<td></td>
<td>translation L&gt;R</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R deviation</td>
</tr>
</tbody>
</table>

Initial Examination – Key Tests/Findings

- **Cervical ROM**
  - Pain with extension and R rotation
  - Excessive anterior translation with cervical flexion and rotation

- **Cervical – Passive shoulder girdle elevation**
  - Improved ROM/pain with elevation

- **Shoulder flexion**
  - Insufficient scapular elevation and external rotation
Initial Examination – Length Tests

- Pectoralis Minor
  - Short/stiff
- Sternal Pectoralis Major
  - Short/stiff
- Latissimus Dorsi
  - Short/stiff

Movement Impairments

- TMJ: Translation
- Cervical: Extension/Forward Head
- Scapular: Depression, Internal Rotation
- Thoracic: Flexion/Kyphosis

Functional Activities

- Driving
- Lifting Animal Cages
- Yawning
- Dental Care
- Eating
- Exercise – Bicycling and Weight Lifting

TREATMENT
EXERCISE

MOUTH OPENING: Tongue to the roof of your mouth. Open your mouth, pulling your chin back toward your Adam's apple. Use your finger to help guide the movement.

SHOULDER ABDUCTION/LR: Start with arms raised to 90 degrees, forearms facing each other. Bring arms apart by squeezing your shoulder blades UP and back.

WALL SLIDES: Slide your arms up the wall, shrugging your shoulder blades toward the ceiling when your arms reach shoulder level.
Standing Posture

<table>
<thead>
<tr>
<th>Alignment Cue</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lumbar/thoracic spine</td>
<td>Tighten abdominals and lift your sternum slightly</td>
</tr>
<tr>
<td>Scapulae</td>
<td>Lift shoulder blades UP and back</td>
</tr>
<tr>
<td>Cervical Extension/Forward Head</td>
<td>Lengthen the back of your neck</td>
</tr>
<tr>
<td>TMJ</td>
<td>Tongue to the roof of the mouth, lips together, teeth slightly apart</td>
</tr>
</tbody>
</table>

Driving

Taping
Visit 2

- Pain
  - Visit 1 – average 6/10, best 3/10
  - Visit 2 – average 2/10, best 0/10 while taped

- Function
  - Dentist’s visit
  - No headaches after driving

Lifting

- Preferred
- Corrected

Mouth Opening

<table>
<thead>
<tr>
<th>Visit 1</th>
<th>Visit 2</th>
<th>Visit 3</th>
<th>Visit 4</th>
<th>Visit 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hooklying</td>
<td>Hooklying</td>
<td>Sitting/Standing</td>
<td>Sitting/Standing</td>
<td>Sitting/Standing</td>
</tr>
</tbody>
</table>
Shoulder Abduction/LR

<table>
<thead>
<tr>
<th>Visit 1</th>
<th>Visit 2</th>
<th>Visit 3</th>
<th>Visit 4</th>
<th>Visit 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hooklying</td>
<td>Hooklying, slide arms overhead</td>
<td>Standing</td>
<td>Standing, Yellow TB</td>
<td>Standing, Green TB</td>
</tr>
</tbody>
</table>

Wall Slides

<table>
<thead>
<tr>
<th>Visit 1</th>
<th>Visit 2</th>
<th>Visit 3</th>
<th>Visit 4</th>
<th>Visit 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standing</td>
<td>Standing, Yellow TB</td>
<td>Standing, Green TB</td>
<td>Standing, Green TB</td>
<td>Standing, Green TB</td>
</tr>
</tbody>
</table>

Functional Activities – Cycling

Functional Activities – Weight Lifting
Outcomes - Pain

Outcomes – TMJ ROM

<table>
<thead>
<tr>
<th>Visit</th>
<th>Opening</th>
<th>Protrusion</th>
<th>R deviation</th>
<th>L deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50mm</td>
<td>R translation</td>
<td>R=L</td>
<td>R=L</td>
</tr>
<tr>
<td>2</td>
<td>45mm</td>
<td>No translation</td>
<td>R=L</td>
<td>No pain</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>R=L</td>
<td>R=L no pain</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>R=L</td>
<td>R=L no pain</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Outcomes – Function

- No pain with lifting animals/cages at work
- No pain with driving
- No pain with eating or yawning
- 8 headaches/month → 1 headache in 6 weeks of treatment
- Returned to weight lifting, cycling

Key Concepts

- Improve TMJ rolling/retraction in the early phase of mouth opening
- Address adjacent regions with all exercise and functional activities
  - Lumbar/thoracic spine
  - Scapulae
  - Cervical Spine
- Taping → correction of scapulae and reduction in TMJ symptoms
Movement-Based Treatment of Temporomandibular Joint Disorder:
Case Example #2

Jesse Civello, PT, DPT

Patient – History

- **Age:** 18
- **Gender:** Female
- **Medications:** None
- **Diagnostic test/results:** None
- **Previous treatment:** Custom night splint
- **Work activities:** High school senior
- **Recreational activities:** Field hockey and cello. Not continuing in college.

Patient – Chief Complaint

- **Chief Complaint:**
  - Bilateral TMJ pain, popping, clicking, and locking
  - Pain at rest and worsened with movement
  - Best: 1/10
  - Worst: 8/10
  - TMD Disability Index: 35/40
  - Headache
  - Neck pain
  - Shoulder pain
- **History:**
  - 1-year history of jaw pain
  - Pain is worse with stress, studying, and exams
  - Pain is constant
  - Grinding/clenching

Patient – Chief Complaint

- **Aggravating Factors**
  - Talking
  - Eating
  - Stress
  - Yawning
  - Sleeping on stomach
  - Wearing backpack
- **Relieving Factors**
  - Soft tissue massage

Initial Examination – Alignment

- **Forward head**
- **Depressed scapulae**
- **Scapular internal rotation and anterior tilt**
- **Kyphosis / depressed chest**

Initial Examination – Key Tests/Findings

**Movement**

- **Bilateral Shoulder Flexion**
  - **Scapular internal rotation**
  - **Insufficient scapular elevation**
  - **Thoracic flexion with posterior sway**
Initial Examination – Key Tests/Findings

**Movement**
- Cervical AROM
  - Pain with extension
- Passive shoulder girdle elevation
  - Six abolished during cervical extension

<table>
<thead>
<tr>
<th>Movement Impairments</th>
<th>Cue</th>
</tr>
</thead>
</table>
| TMJ Translation      | Open your mouth drawing your chin back toward your Adam’s apple
                    | Rest tongue on top of mouth
| Cervical Extension   | Roll your chin downward
| Scapular Depression  | Lift your shoulder blades up and back
| and Anterior Tilt    |     |

Initial Examination – TMJ Range of Motion

<table>
<thead>
<tr>
<th>ROM</th>
<th>Pain/Location</th>
<th>Faulty Movement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening with preferred alignment</td>
<td>30mm</td>
<td>Early condyle translation</td>
</tr>
<tr>
<td>Opening with correction of movement</td>
<td>30mm</td>
<td>No pain/popping</td>
</tr>
<tr>
<td>pattern</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passive Elevation of Shoulder Girdle</td>
<td>35mm</td>
<td>No pain/popping</td>
</tr>
</tbody>
</table>

Initial Examination – Length Tests

**Muscle Length**
- Short/stiff:  
  - Pec minor
  - Latissimus
  - Scapulohumeral muscles
  - Suboccipitals

**Strength**
- Intrinsic Cervical Flexors: 3-/5, anterior translation

Movement Impairments

- **TMJ**: Translation and Hypomobility
- **Cervical**: Extension
- **Scapular**: Depression, Anterior Tilt
- **Thoracic**: Flexion

TREATMENT
Treatment Goals

- Improve mouth opening mechanics
- Improve resting alignment of cervical spine and scapulae
- Improve movement pattern with cervical and shoulder movement

Treatment – Patient Education

- Pain relief
  - Support arms when possible
  - Decrease cervical extension/forward head with resting posture

Studying / Classroom Sitting

- Support arms when possible with shoulders resting up and back
- Keep chin level
- Practice gazing eyes from desk to white board without forward head alignment
  - "Check in" and relax jaw muscles, consider doing 3-5 reps of mouth opening exercise

Standing Posture

- Slightly lift sternal
- Bring shoulder blades up and back
- Roll chin downward / level with the ground
- Tongue on roof of mouth, jaw relaxed
Sleeping

- Pillow under axilla to prevent scapular depression
- Small towel roll under neck
- Decreased forward head in resting alignment

EXERCISE

Alignment Cues

<table>
<thead>
<tr>
<th>Scapulae</th>
<th>Lift shoulder blades up and back without arching low back</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical Spine</td>
<td>Roll your chin downward, may feel slight stretch in back of neck but no pain</td>
</tr>
</tbody>
</table>

Hooklying, Tongue resting on roof your mouth. Roll your chin downward until you feel a stretch in back of neck, but no pain.

Alignment Cues

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<td>TMJ</td>
<td>Keep jaw relaxed and tongue on roof of mouth</td>
</tr>
</tbody>
</table>

Hooklying, Tongue resting on roof your mouth. Bring arms overhead keeping elbows turned forward (lateral rotation). Elevate scapulae throughout movement.

Alignment Cues

<table>
<thead>
<tr>
<th>Lumbar/thoracic spine</th>
<th>Lift your sternum slightly and prevent sway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scapulae</td>
<td>Roll your chin downward and gaze straight ahead</td>
</tr>
<tr>
<td>TMJ</td>
<td>Tongue to the roof of the mouth, jaw relaxed</td>
</tr>
</tbody>
</table>

Slide your arms up the wall, shrugging your shoulder blades toward the ceiling when your arms reach shoulder level.
EXERCISE PROGRESSION

Alignment Cues

- Lumbar/thoracic spine: Tighten abdominals and lift your sternum slightly. Avoid extending lumbar spine.
- Scapulae: Bring shoulders slightly up and back
- TMJ: Keep jaw relaxed and tongue on roof of mouth

Sitting back to the wall. Tongue resting on roof your mouth. Bring arms overhead keeping elbows turned forward (lateral rotation). Elevate scapulae once elbows reach level of shoulders.

Outcomes - Pain

<table>
<thead>
<tr>
<th></th>
<th>Visit 1</th>
<th>Visit 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best (in 2 weeks)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Worst (in 2 weeks)</td>
<td>8</td>
<td>3</td>
</tr>
</tbody>
</table>

Outcomes – TMD Disability Index

- Initial: 35/40
- Discharge: 15/40

Outcomes – TMJ ROM

<table>
<thead>
<tr>
<th>Opening</th>
<th>Visit 1</th>
<th>Visit 2</th>
<th>Visit 4</th>
<th>Visit 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>30mm Pain/ popping</td>
<td>44mm no pain/ popping</td>
<td>45mm no pain/ popping</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Outcomes – Function

- No headaches over last month
- Joint and face pain
  - Initial: constant
  - Discharge: less than 2x/week

Summary

- Freq/Duration
  - 1x/week, 4 visits
  - 2x/month, 3 visits
  - 1 month follow up
- Focus on quality of movement
  - Improved early phase rotation
- Addressed adjacent regions