Orthopedic Manual Therapy for the Pediatric Patient

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Learning Objectives

The attendee will:

• Understand the specific precautions and the relative risk of performing orthopedic manual therapy on pediatric patients.

• Identify pediatric patients who are appropriate for orthopedic manual therapy.

• Use orthopedic manual physical therapy to minimize pain and maximize function in pediatric orthopedic patients.
Pediatric Physical Therapy
This is the Pediatric I Mean
Kids Need PT Too!
Pediatric Pain is Not Benign

• Injury in childhood may lead to increased risk of pain in adulthood.\textsuperscript{23}

• Pain does not go away on its own
  – 2/3 of adolescents with low back pain will have chronic or recurrent symptoms 6 months later.\textsuperscript{38}
Clinical Practice Guidelines Recommend use of Manual Therapy

**A **INTERVENTIONS – MANUAL THERAPY
Clinicians should consider utilizing thrust manipulative procedures to reduce pain and disability in patients with mobility deficits and acute low back and back-related buttock or thigh pain. Thrust manipulative and nonthrust mobilization procedures can also be used to improve spine and hip mobility and reduce pain and disability in patients with subacute and chronic low back and back-related lower extremity pain.

**INTERVENTION – PROGRESSIVE LOADING/ SENSORIMOTOR TRAINING PHASE – MANUAL THERAPY
Clinicians should include manual therapy procedures, such as graded joint mobilizations, manipulations, and non-weight-bearing and weight-bearing mobilization with movement, to improve ankle dorsiflexion, proprioception, and weight-bearing tolerance in patients recovering from a lateral ankle sprain.

**A **INTERVENTIONS – CERVICAL MOBILIZATION/ MANIPULATION
Clinicians should consider utilizing cervical manipulation and mobilization procedures, thrust and non-thrust, to reduce neck pain and headache. Combining cervical manipulation and mobilization with exercise is more effective for reducing neck pain, headache, and disability than manipulation and mobilization alone.

**C **INTERVENTIONS – THORACIC MOBILIZATION/ MANIPULATION
Thoracic spine thrust manipulation can be used for patients with primary complaints of neck pain. Thoracic spine thrust manipulation can also be used for reducing pain and disability in patients with neck and neck-related arm pain.
Alright, Let’s Do Manual Therapy! Wait…

<table>
<thead>
<tr>
<th>Table 2. Relative precautions to performing thrust joint manipulation (TJM)</th>
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</thead>
<tbody>
<tr>
<td>Adverse reaction to previous TJM</td>
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<tr>
<td>Inflammatory joint processes</td>
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<tr>
<td>Minor osteoporosis</td>
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<tr>
<td>Disc herniation and disc protrusion</td>
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<tr>
<td>Spondylolisthesis</td>
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<tr>
<td>Hypermobility or ligamentous laxity</td>
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<tr>
<td>Arterial calcification</td>
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<tr>
<td>Arterial hypertension</td>
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<tr>
<td>Serious degenerative joint diseases</td>
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<tr>
<td>Growing children</td>
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<tr>
<td>Serious kyphosis and scoliosis</td>
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<tr>
<td>Herpes zoster on the thoracic spine</td>
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<tr>
<td>Vertigo</td>
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<tr>
<td>Systemic infections</td>
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<tr>
<td>Psychological dependence upon manipulation</td>
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<tr>
<td>Pain with a psychological overlay</td>
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<tr>
<td>No change or worsening of symptoms after multiple manipulations</td>
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</table>
Contraindications and Precautions

• **Contraindication**: A circumstance which absolutely rules out the use of a therapeutic method which would otherwise be indicated.

• **Precaution**: The risks of a treatment have to be carefully assessed before treatment is initiated, and it can only be administered if its benefits to the patient are greater than its risks.
Why are Children a Precaution for Manual Therapy?

**Controversial**: Not all authors agree that a growing child is a precaution.

- Growth plates and cartilage endplates
- Ability to give informed consent
- Lack of research
## Growth and Cartilage End Plates

<table>
<thead>
<tr>
<th>Growth Plates</th>
<th>Age of Ossification</th>
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<tbody>
<tr>
<td>Wrist</td>
<td>17-19 years</td>
</tr>
<tr>
<td>Elbow</td>
<td>15-18 years</td>
</tr>
<tr>
<td>Shoulder</td>
<td>19-25 years</td>
</tr>
<tr>
<td>Hip</td>
<td>18-25 years</td>
</tr>
<tr>
<td>Knee</td>
<td>19-25 years</td>
</tr>
<tr>
<td>Foot and Ankle</td>
<td>18-20 years</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>End Plates</th>
<th>Age of Ossification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical</td>
<td>16-18 years</td>
</tr>
<tr>
<td>Thoracic</td>
<td>16-18 years</td>
</tr>
<tr>
<td>Lumbar</td>
<td>16-18 years</td>
</tr>
<tr>
<td>Sacrum</td>
<td>18-25 years</td>
</tr>
</tbody>
</table>

Females 1-2 years sooner than males
Forces of Manual Therapy vs Normal Activity
What is the Risk MT will damage a growth plate?

- **Unknown**: No documented case of growth plate injury has occurred due to manual therapy.
  - 10,000,000 manual therapy interventions performed on children every year.
  - 2.3 million performed in the US alone.\(^{31}\)
Gaining Informed Consent from a Child

- A minor cannot provide informed consent
- Discussion of the risks and benefits of manual therapy becomes a family discussion
Risks from Lack of Research

- Children are not tiny adults, many research results are not generalizable.
- We don’t know what we don’t know
Children are Not Tiny Adults

I wish I had hair
Skeletally Mature
Avoids Activity
90% Non-Specific LBP
????

I have hair
Growth Plates
Remains Active
< 50% Non-Specific LBP
????????
Ruling out Cancer for Back Pain

- Negative on all 4 of these = 100% sensitive
  - Age ≥50 years of age
  - Previous history
  - Unexplained weight loss
  - Failure to improve with conservative management

Mean age of population assessed: 39.5 years ± 15 years
Age <20 suggested as nonmusculoskeletal cause for back pain
Rely on your Red Flags

- Persistent pain
- Increases at rest
- Progressive neurological deficits
- Associated fever
- Night pain
- Bowel or bladder incontinence
Ruling out Fractures

- Ottawa Ankle Rules\textsuperscript{28} \text{OK!}
- Ottawa Knee Rules\textsuperscript{37} \text{OK!}
- Canadian C-Spine Rules \text{STOP!}
  - Patients $\geq$ 10 years\textsuperscript{12} \text{OK!}
  - Patient $< 10$ years\textsuperscript{12} \text{Not Sensitive Enough}
Can we use CPR’s to guide manual treatment?

• Manipulation for low back pain\(^\text{14}\)
  – Pain for <16 days
  – No pain distal to the knee
  – 1 Lumbar segment hypomobile
  – Hip IR >35 degrees
  – FABQ work subscale score <19

???

10-30% more hip IR motion in children
Can we use a Modified CPR for Lumbar Manipulation

Patient meets 3 out of the 4
- Pain for <16 days
- No pain distal to the knee
- 1 Lumbar segment hypomobile
- Hip IR >35 degrees

OR

Patient have both of the following
- Pain for <16 days
- No pain distal to the knee

In a RCT assessing lumbar manipulation in adolescents, only 5% met either of these modified rules. Unable to assess the effectiveness of these CPR's.38
How to Identify Appropriate Patients for Manual Therapy

Does the clinician think the patient would benefit from MT?

- Yes
  - Contraindications?
    - Yes
      - No
    - No
      - Do risks outweigh the benefits?
        - Yes
          - No improvement
        - No
          - Trial MT

- No
  - No improvement

Manual Therapy Not Appropriate
Positive Outcome. Continue as Indicated
Case of Low Back Pain

13-year-old female
- 2-month hx of LBP
- Insidious onset
- Has not improved over past 4 weeks
- No report of pain, NT, or weakness in LE’s
- No red flags noted during evaluation
Case of Low Back Pain

13-year-old female with 2-month hx of LBP

- Recreational dancer (Hip Hop and Ballet) 4 hours of class a week.
- Pain is worse with activity (2/10 at rest 6/10 pain during dance)
- Pain increases by 2/10 with lumbar extension
- Scored a 14/30 on Patient Specific Functional Scale
  Dance 4/10
  Bending backwards 5/10
  Walking for >20 minutes 5/10
Should We Utilize Manual Therapy with this Patient?
Treatment Consideration for the pediatric lumbar spine

- Much of pediatric back pain has an anatomical cause, some can be precautions or contraindications to manual therapy.

- Up to 50% of adolescent athletes with low back pain have a spondylolysis or spondylolisthesis.⁴³
# Spondylolysis

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Pathogenisis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>Dysplastic</td>
<td>Congenital abnormalities</td>
</tr>
<tr>
<td><strong>Type II</strong></td>
<td>Isthmic</td>
<td>Stress fracture in the pars interarticularis</td>
</tr>
<tr>
<td>Type III</td>
<td>Degenerative</td>
<td>Degeneration of the intervertebral discs</td>
</tr>
<tr>
<td>Type IV</td>
<td>Traumatic</td>
<td>Acute fracture in areas other than pars</td>
</tr>
<tr>
<td>Type V</td>
<td>Pathological</td>
<td>Bone disease, tumor, or infection</td>
</tr>
</tbody>
</table>
## Grades of Spondylolisthesis

<table>
<thead>
<tr>
<th>Grade of Listhesis</th>
<th>% Slippage of the Vertebral Body</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade I</td>
<td>1-25%</td>
</tr>
<tr>
<td>Grade II</td>
<td>26-50%</td>
</tr>
<tr>
<td>Grade III</td>
<td>51-75%</td>
</tr>
<tr>
<td>Grade IV</td>
<td>76-100%</td>
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</tbody>
</table>
Pediatric Spondylolytic Injury

**Acute Lesion**
- Increased uptake (SPECT) or edema (MRI) noted in the symptomatic region
- **Active fracture**
- Manual Therapy is contraindicated in region

**Chronic Lesion**
- Lesion diagnosed but no signs of active healing noted on imaging
- Fibrous lesion, unlikely to achieve bony union. Manual Therapy is a precaution

**Lesion with anterolisthesis**
- Grade I-IV
- Can be determined by X-ray, CT, MRI
- **Precaution or Contraindication**
- Depending on Grade and stability of listhesis
Are there contraindication for manual therapy?

13-year-old female with 2-month hx of LBP

- Imaging
  - X-ray - Negative
  - MRI - Negative
Risk and Benefits of Manual Therapy with this Patient?

- Physical therapy, including manual treatment, results in significantly better outcomes in children with back pain.¹

- Lumbar manipulation does not increase risk of an adverse event in adolescents with non-specific low back pain.³⁸
Trial Manual Therapy!
A Case of Neck Pain

9-year-old male injured his neck 3 days ago while tackling in youth football.

- Current patient (left shoulder)
- Reports 7/10 right mid-cervical pain
- No report of numbness or tingling
- Significant TTP of R C3-4
A Case of Neck Pain

9-year-old male injured during youth football

- Patient maintained consciousness
- Not a helmet-to-helmet collision
- Active cervical ROM
  - Flexion 65 deg. Ext 20 deg.*
  - Rotation L 75 deg. R 50 deg*.
- Difficulty sleeping at night due to pain
- No signs or symptoms of concussion
Should We Utilize Manual Therapy with this Patient?
Are there contraindications for manual therapy?

- Unable to rule out cervical fracture.
  - No imaging to rule out fracture.
  - Canadian C-spine Rules not sensitive enough.
Thumbs Down
A Case of Swimmers Shoulder
11-year-old female with R shoulder pain

- Clinical diagnosis of secondary GH impingement and multi-directional instability.
- Generalized hypermobility noted
  - Beighton score of 6 out of 9
A Case of Swimmers Shoulder

11-year-old female with R shoulder pain

+ Hawkins-Kennedy
+ Painful Arc
+ ER weakness
+ Excessive anterior GH joint laxity
+ Sulcus sign
- Apprehension
Should We Utilize Manual Therapy with this Patient?
Are there contraindications for manual therapy?

*Generalized Hypermobility* is considered a precaution by most, a few consider it a contraindication.

– When treating a patient with hypermobility, the therapist should examine opposite motions and neighboring segments to find out if any restrictions exist.
Risks vs Benefits

• **Risks:** Manual therapy done incorrectly could increase the patient’s hypermobility and multi-directional instability.

• **Benefits:** Restoring motion to neighboring segments could improve proper GH joint mechanics- 2 case studies support this theory.\textsuperscript{7, 27}
Trial Manual Therapy

Target restricted areas:
– Posterior Shoulder
– Pec Minor
– Thoracic Extension
– Scapular thoracic
A Case Acute Ankle Sprain
15-year-old male with L inversion ankle sprain

- 5-days post injury
- Does not participate in sports
- Fell off obstacle course and rolled his ankle
- No imaging performed
- Presents to clinic on crutches and ACE wrap
A Case of Acute Ankle Sprain

15-year-old male with L inversion ankle sprain

- Patient is able to walk in clinic without use of crutches with antalgic gait
- TTP at ATFL
- Talar Tilt, Anterior drawer + (pain)
- No tenderness at medial/lateral malleoli, navicular or base 5th metatarsal
- Mild swelling noted upon visual examination
Should We Utilize Manual Therapy with this Patient?
Are there contraindications for manual therapy?

- Rule out fracture with the Ottawa Ankle Rules.

- No other precautions or contraindications noted
Risks vs Benefits

**Risks:** Minimal. No adverse reaction noted in research for this population

**Benefits:** Short and long-term benefits noted with use of manual therapy for acute ankle sprain.\(^{44, 45}\)
Trial Manual Therapy!
Conclusion

• Manual therapy can be an effective way to minimize pain and maximize function in pediatric orthopedic patients.

• Weigh the risks and benefits before proceeding

• Rely on patient history, your clinical expertise, and the patient’s preference until there is better research to guide EBP.
References

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References


42. Riddle G, Ross O, Spellane V. Orthopedic issues and treatment strategies for the pediatric patient. Exercise Considerations for the pediatric patient. APTA. 2009

