The Effects of Closed Kinetic Chain and Endurance Exercises on Reducing Pain in a Child with Ehlers-Danlos Syndrome: A Case Report

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The Effects of Closed Kinetic Chain and Endurance Exercises on Reducing Pain in a Child with Ehlers-Danlos Syndrome: A Case Report

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Background and Purpose

- Children with Ehlers-Danlos Syndrome hypermobility type (EDS) are prone to developing long-term musculoskeletal pain and fatigue from joint laxity.1
- Physical therapy with emphasis on weight-bearing exercises can improve stability and proprioception in individuals with hypermobile joints.2,3

The purpose of this case report was to describe the effectiveness of closed kinetic chain (CKC) and endurance exercises on reducing pain in a child with EDS.

Case Description

Subject: 9-year-old girl with EDS (hypermobility type) PT Diagnosis: bilateral posterior tibialis tendonitis

International Classification of Functioning model4:

- Generalized hypermobility
- Decreased strength and balance
- Activity Limitations
  - Walking
  - Squatting
  - Jumping
- Participation Restrictions
  - Sports (basketball, softball)
  - Running

Methods

- Six-week physical therapy program focused on dynamic stability and improving joint control
- 45-60 minute sessions, twice a week
- Use of a Lower Body Positive Pressure Treadmill (LBPPT) to address cardiovascular endurance5
- Child and family education on proper body mechanics and joint protection

Exercises Utilized During Treatment Sessions:

<table>
<thead>
<tr>
<th>Targeted Exercises (Weeks Performed)</th>
<th>Exercise Type</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ankle Strengthening (Weeks 1-2)</td>
<td>Toe-heel raises, towel scrunches, marble pick-ups, foot intrinsic series</td>
<td>Strengthening of ankle dorsiflexors, plantarflexors, foot intrinsics</td>
</tr>
<tr>
<td>Flexibility (Weeks 1-6)</td>
<td>Hamstring stretches, incline board stretches</td>
<td>Improve lower extremity flexibility in light tissues</td>
</tr>
<tr>
<td>Lower Extremity Strengthening (Weeks 1-6)</td>
<td>Bridges on swiss ball, mini wall squats, terminal knee extensions and sidesteps with theraband, leg press</td>
<td>Incorporate weight-bearing exercises to engage multiple joints and muscle co-contraction</td>
</tr>
<tr>
<td>Balance Training (Weeks 2-6)</td>
<td>Tiltboard, circleboard, single leg balance, tandem walking (even and uneven surfaces)</td>
<td>Improve balance and proprioception, static/dynamic stabilization, neuromuscular re-education</td>
</tr>
<tr>
<td>Cardiovascular Training (Weeks 3-6)</td>
<td>Recumbent bike, LBPPT</td>
<td>Improve endurance, improve high-impact weight-bearing tolerance</td>
</tr>
</tbody>
</table>

LBPPT = Lower Body Positive Pressure Treadmill

Evaluation:

- Lower Extremity Functional Scale (LEFS) score of 42/80
- Reported pain of 7/10 on Faces Pain Scale
- Child wore ankle stabilizing orthotics at all times
- Knee hyperextension posture in standing
- Unable to participate in sports and running

Discharge:

- Increased LEFS score to 53/80
- Decreased pain to 2/10 on Faces Pain Scale
- Reduced need for ankle stabilizing orthotics (only worn during sports)
- Neutral knee extension posture in standing
- Child returned to sports and running

Results

Discussion

- Interventions which utilize CKC exercises can help children with EDS achieve more functional outcomes.6
- The use of a LBPPT can allow children with joint pain to improve their cardiovascular endurance by progressing weight-bearing tolerance over time.5,7
- The child in this case report demonstrated improved strength, proprioception, and balance through participation in physical therapy
- The child and parents reported satisfaction with overall mobility and safe return to recreational activities.

Conclusion

- The findings from this case report support the use of strengthening and endurance exercises to improve joint stability and prevent further injury in children with EDS.
- Future studies should investigate additional treatment strategies towards promoting functional outcomes in this population.

References


This case report was required for partial fulfillment for the Doctor of Physical Therapy degree (DPT) at the University of St. Augustine for Health Sciences.