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Linda Duong  
*University of St. Augustine for Health Sciences*

Megan Flores  
*University of St. Augustine for Health Sciences, mflores@usa.edu*

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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

Linda Duong, PT, DPT¹,²; Megan Flores, PT, MPT, PCS¹

¹University of St. Augustine for Health Sciences, Doctor of Physical Therapy Program

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:

Functional Impairments
• Generalized hypermobility
• Decreased strength and balance

Activity Limitations
• Walking
• Squatting
• Jumping

Participation Restrictions
• Spots (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

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
• Reduced need for ankle stabilizing orthotics (only worn during sports)
• 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

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 intrinsicis</td>
</tr>
<tr>
<td>Flexibility (Weeks 1-6)</td>
<td>Hamstring stretches, incline board stretches</td>
<td>Improve lower extremity flexibility in light muscles</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 contraction</td>
</tr>
<tr>
<td>Balance Training (Weeks 2-6)</td>
<td>Tiltable, 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

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


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