

2-2017

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Recommended Citation

Duong, Linda and Flores, Megan, "The Effects of Closed Kinetic Chain and Endurance Exercises on Reducing Pain in a Child with Ehlers-Danlos Syndrome: A Case Report" (2017). *Physical Therapy Collection*. 16.

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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:



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



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Exercises Utilized During Treatment Sessions:

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

LBPPT = Lower Body Positive Pressure Treadmill

Results

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

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.

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