

EARLY INITIATION OF MOVEMENT THERAPIES FOR CHILDREN WITH POTENTIAL INFLUENCE OF HEREDITARY FACTORS

Eva NECHLEBOVÁ, Monika van ROOIJ

Abstract

This case study highlights the importance of preventive monitoring of a child's musculoskeletal system considering family medical history. Movement therapy should ideally start at an early age to promote healthy development and prevent future injuries or dysfunctions. The case study reveals a family history of hypermobility and improper axial alignment of the lower limbs. As a result, preventive monitoring and a tailored movement regimen were necessary to ensure proper axial development for the youngest family member.

Keywords

axial alignment of lower limbs, hypermobility, heredity

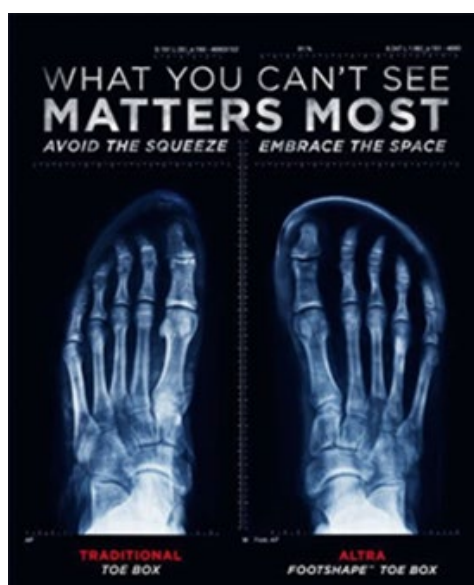
INTRODUCTION

Freely movable and well-centered joints are essential for the proper sensorimotor development of children (Burgath, 2016). Unfortunately, more than 95 % of children entering the first grade suffer from foot deformities, although only a small percentage are born with them.

Such damage can be caused by various factors, such as:

- Improper shoe size—not only in length but also width.
- Tight socks that restrict free toe movement and may compress small bones and joints.
- Insufficient movement and muscle stimulation (Fyzioklinika, 2023).

Figure 1: Foot position in footwear



Source: <https://www.conradstoltz.com/index.php/caveman-goes-altra-running/altra-running-shoes-conrad-stoltz-foot-shaped-toe-box-xray/>

To support the healthy development of the entire musculoskeletal system, it is crucial to incorporate as much natural movement as possible, such as walking barefoot, walking on sand, over pebbles, running in shallow water, and performing balance exercises. These activities and proprioceptor stimulation also help prevent flat feet.

When selecting footwear for a child, it is important to ensure adequate width and length to allow free movement of the child's foot.

Attention should also be paid to how the child is handled—for example, during dressing and diaper changes. Rapid unilateral movements or overly forceful limb stretches can disrupt the proper alignment of partner joints and their associated structures, ultimately affecting the quality of foot-to-ground contact (Burgath, 2016).

In adults wearing conventional footwear, acquired foot deformities (e.g., hallux valgus, claw toes, mallet toes, or hammer toes), overall stiffness, and reduced foot function during walking can be observed. These deformities significantly influence overall posture.

Adults can modify their foot alignment by focusing on bio-physical loading forces. Thanks to the spiral and wedge principles, the feet remain stable under load throughout life. The heel bone ideally aligns, and the base joint of the big toe remains in contact with the ground. The middle part of the foot, strengthened

spirally between these points, forms a stable arch—aided by the wedge bones and resilient forefoot muscles. This configuration supports anatomically correct foot loading (Lauper, 2018).

If significant postural changes occur, joint dysfunction should be investigated and addressed. Once all joint connections are centered, their positions can be stabilized through independent exercises and further foot stimulation using generally recommended methods.

OBJECTIVE

To support the healthy development of a child's lower limbs considering family medical history and to identify suitable movement activities.

METHODOLOGY

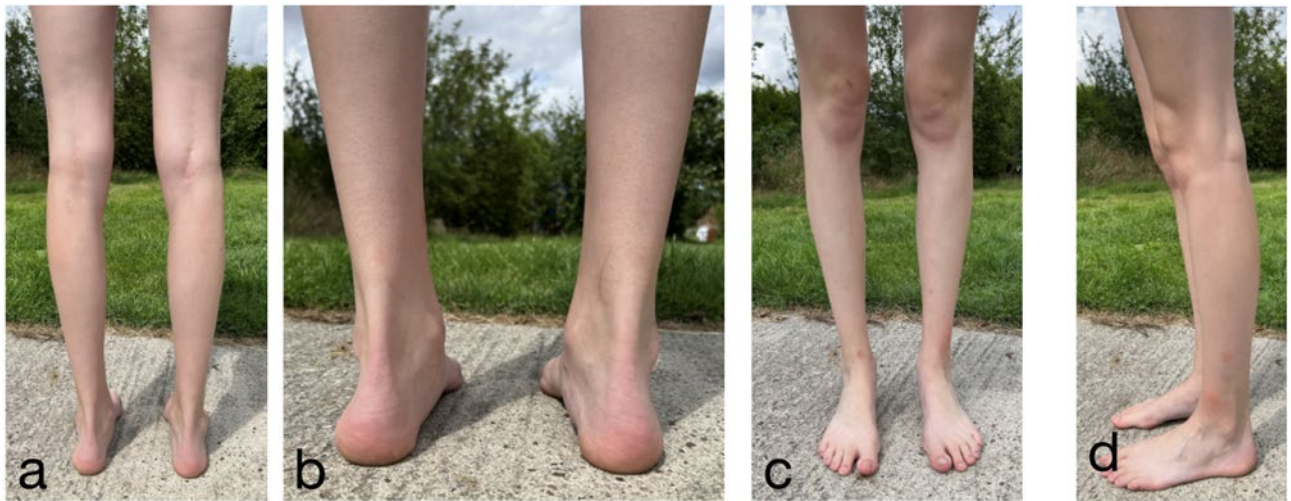
Analysis of lower limb alignment within family members, comparison through photographs, preparation of a therapeutic plan for the youngest family member, and recommendations for others.

Case Study

- Personal History
 - Gender: Female
 - Age: 4 years
 - Fall History: Frequent falls during play, especially when fatigued. Movements occasionally uncoordinated. Most falls occur due to tripping or slipping, impacting hands, knees, coccyx, and head.

Family History:

Figure 2: a, b, c, d: Position of the proband's sister's (18 years old) legs



Source: own

Description: Noticeable inward knee alignment, with the popliteal fossae angling obliquely downward. Slight inward alignment of foot axes forming an "A" shape, insufficient spiraling, and the heel

and base joint of the big toe slightly lift the right big toe off the ground. Increased mobility in the right knee joint. Significant balance difficulties during exercises. While cycling, the knees touch, worsening the already disrupted body centration.

Figure 3: a, b, c, d: Position of the proband's brother (15 years old) legs



Source: own

Description: Uneven weight distribution on the lower limbs, with more pressure on the left leg. Pronated foot, outward foot

stance, and flattened arches. Hypermobility evident.

Figure 4: a, b, c, d: Position of the proband's father's (47 years old) legs



Source: own

Description: Pronated foot, more pronounced on the right. Reduced weight-bearing on the base joint of the left big toe. Flattened foot arch. The left knee is more outwardly rotated compared to the right, originating from improper

positioning of the left hip joint and shortened hip flexors on this side. Hypermobility is apparent. Complaints of left hip and bilateral knee pain, especially under higher loads.

Figure 5: a, b, c, d: Position of the proband's mother's (47 years old) legs



Source: own

Description: Both heel bones tilt outward. The Achilles tendon runs in a curved line. Increased loading on the outer sides of the feet. Previously elevated arches are now more pronounced. Knees point outward. Hypermobility not present

sister (father's child) in a family house with a garden. The brother lives with his biological mother elsewhere.

- Social History
The child lives with parents and an older

- Sports History
Daily outdoor activities. No participation in organized sports.

- Rehabilitation History
No prior therapies.

Figure 6: Leg position at age 2 years



Source: own

Aspection: Age 2 years: Valgus knee alignment, outwardly rotated feet, and flattened longitudinal arches due to improper loading. Pronated feet. The popliteal fossae are angled, and the entire leg rotates inward, disrupting the arch alignment and overall stability. Up to the age of six, such leg alignment is considered normal (Larsen et al., 2010).

Age 4 years: The outwardly rotated foot position has shifted to the opposite position. Initial photos show

uncontrolled foot alignment with visible oblique popliteal fossae lines. Later photos reveal improved heel alignment and Achilles tendon lines, though foot positioning is still suboptimal. The left knee rotates inward more than the right, and the right leg bears more weight. Toes turn inward. Hypermobility and reduced foot arches are evident. Improvements in joint alignment of knees and ankles are visible with corrective attempts.

Figure 7: a, b, c, d: Leg position at the age of 4 years



Source: own

Intervention Description

Leg Length and Pelvic Position Alignment:

- Assessed daily for the first month, then monthly. Immediate correction using Dorn Method techniques for discrepancies.
- Applied pressure on the outer thigh beneath the greater trochanter at a 45-degree angle towards the pelvis,

repeated 5-6 times with passive limb movement. Followed by pelvic bone alignment through pressure applied forward and downward on the elevated pelvic bone.

Exercises: Daily playful exercises (1-2 times, 20 minutes). Used balancing aids to strengthen the deep stabilization system.

Figure 8: Exercises to promote proper development



Source: own

Example Daily Exercise:

Balance on a beam—walking forward or sideways at various speeds, aiming not

to “fall into the water” below (5-10 minutes).

Figure 9: Exercise on a log



Figure 10: Balancing and concentration training with silicone flasks



Source: own

- Jumping on a trampoline to strengthen the feet (5 minutes).
- Balancing and concentration exercises using silicone cups—standing on four cups to distribute pressure evenly (5 minutes).

After 14 days, the program shifted to:

- Barefoot walks in natural settings (forest, beach, garden) 2-3 times per week for about 20 minutes with breaks.
- Spiral stabilization exercises (Dr. Smíšek's method) three times daily (5-10 minutes for two months).

Stand facing, back to, and side to the rope, with one foot on a platform. See Figure a, b, c. During the preparatory phase, the arms are relaxed in front of

the body, palms facing down towards the floor, and the body is relaxed. In this phase, inhale.

Now execute the pull on the rope, transferring the entire weight onto the front foot. Tighten the glutes, abdomen, and pelvic floor while drawing the elbows toward the center of the waist. Maintain a neutral position of the neck and head. The knee of the supporting leg is straight. Palms and forearms rotate upward. Throughout the pull, exhale smoothly. The shoulders are now to the side and down, and the neck remains relaxed. The head is elongated upward in the body's axis, and the stance is firmly on the front foot.

Figure 11: Spiral stabilization exercises



Source: Spiral stabiliation - CD Smíšek

Repeat the exercise 5-10 times on both the right and left foot.

Stand facing the rope, with one foot on a platform. During the preparatory phase, the arms are relaxed in front of the body; see Figure d.

Pull the rope while simultaneously transferring the entire weight onto the front foot and lifting the opposite knee. Tighten the glutes of the supporting leg, pelvic floor, and abdomen. Draw the elbows toward the center of the waist while maintaining axial alignment of the neck and head. The knee of the supporting leg is straight. Palms and forearms rotate upward. The shoulders are now to the side and down, and the neck remains relaxed. The head balances freely along the body's axis, with a firm stance on the front foot.

The knee of the supporting leg remains straight. Palms and forearms rotate upward. The shoulders are now to the side and down, and the neck remains relaxed.

Activities blended with initial exercises to maintain attention.

Emphasis was also placed on wide shoes allowing free foot movement and daily outdoor activities in natural environments (Smíšek, 2011).

Outcome Measurements

Comparisons of photos taken at ages 2 and 4 showed improvements in foot alignment. Natural foot development was maintained through movement activities, with visible stability improvements in knee joints. Monitoring and tailored exercises will continue.

Figure 12: a, b, c : Output comparison of photographs from 2 years and 4 years



Source: own

DISCUSSION AND CONCLUSION

Proper development of the pediatric musculoskeletal system requires considering family medical history and introducing preventive exercises to instill correct movement patterns. Regular monitoring of leg length and axial alignment is essential, as discrepancies

should be promptly addressed. Equal leg length is crucial for balanced and stable joint function, preventing degenerative joint diseases. Regular physical activities strengthen muscles, maintain optimal joint environments, and improve quality of life.

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CONTACT

Mgr. Eva Nechlebová, Ph.D.
VŠTVS PALESTRA
e-mail: nechlebova@palestra.cz

Monika van Rooij, MSc.
Holistic Body Therapist, Kromme-
elleboog 2e laan 1A, Finsterwolde,
Netherlands
e-mail: info@monikatherapeut.nl