



## Introduction

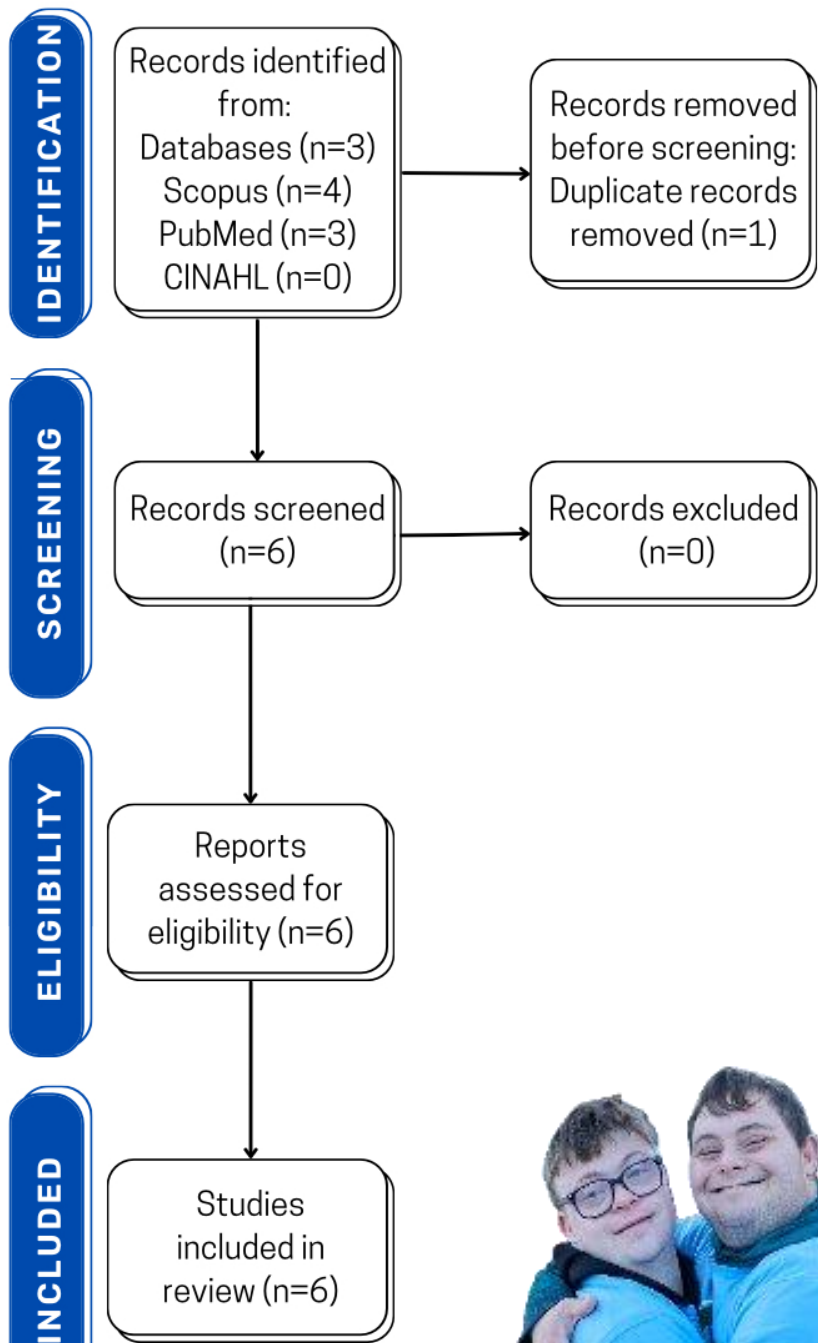
**Background:** Down syndrome is a genetic condition associated with physical impairments that impact physical activity and exercise, yet guidance on footwear and orthotics is limited.

**Objectives:** Summarize the existing research and highlight gaps on shoe and orthotic recommendations for individuals with Down syndrome.

## Methods

**Search Terms:** "Down syndrome, tie sneaker, supra malleolar brace, Foot orthoses, orthotic insoles, Activities of daily living, Psychomotor performance, "Postural balance, endurance, "Walking speed, Gait speed

**Exclusion Criteria:** < 3 years or > 35 years, articles without full-text access, and articles containing participants who did not have foot abnormalities or who had a recent traumatic injury



## Results

Study	Type	Population	Intervention	Testing Measures	Findings
Endo et al., 2020	Case Study	22-year-old	Insoles	Knee joint angle during gait	<ul style="list-style-type: none"><li>Insoles <u>improved stability</u> of the knee by reducing pronation and decreasing tibial internal rotation.</li><li>Improved stability of the knee by use of insoles may contribute to <u>improved gait stability</u>.</li></ul>
Hassan et al., 2019	RCT	33 children and adolescents	Custom-fitted footwear (Clarks)	Physical activity levels	<ul style="list-style-type: none"><li>Participants wearing custom-fitted footwear had 20 more minutes of physical activity per day at 6 weeks and 8 more minutes at 12 weeks</li><li>Custom-fitted footwear was associated with <u>increased steps per day</u> and <u>decreased sedentary activity</u></li></ul>
Hassan et al., 2020	RCT	30 children/ adolescents	Measurement of foot dimensions	3D foot scanning	<ul style="list-style-type: none"><li>Measurement of foot dimensions of children and adolescents with Down syndrome using 3D scans is reproducible.</li></ul>
Looper et al., 2012	Repeated Measure Study	6 children	Supramalleolar orthoses and off the shelf orthoses	Gait Analysis utilizing the GaitRite system	<ul style="list-style-type: none"><li>SMOs led to longer gait cycle time and decreased cadence, indicating a potential <u>destabilization of gait</u></li><li>Weight, height, leg length, and hypermobility have the best correlation with gait parameters for orthotic recommendations</li></ul>
Martin, 2004	Clinical Trial	14 children	Supramalleolar orthoses	Gross Motor Function Measure (GMFM)	<ul style="list-style-type: none"><li>SMOs resulted in immediate and long-term <u>improvement in standing, walking, running and jumping</u>.</li><li>SMOs resulted in significant long-term <u>improvement in balance</u>.</li></ul>
Selby-Silverstein et al., 2001	Repeated Measure Study	26 children	Customized foot orthoses	Standing foot posture gait parameters using video and force plate pressure	<ul style="list-style-type: none"><li>FOs decreased calcaneal heel eversion in standing</li><li>FOs increased internally rotated transverse plane foot angle, decreased variability of foot function parameters and walking speed, and increased variability of ankle moment during ambulation.</li></ul>

### In Summary:

- Combining foot orthotics with sneakers enhances mobility in flat feet, as this combination better corrects pronation than neutral shoes.
- Understanding impairments in individuals with Down syndrome aids in making evidence-based recommendations for orthotics, insoles, and footwear with studies confirming their effectiveness.
- SMOs enhance standing, walking, running, and jumping in children with Down syndrome but may over-correct alignment and restrict movement, potentially affecting gait.
- Insoles can contribute to increased shock absorption and rotational stability of the knee, which is crucial for joint protection and may prevent osteoarthritis as an individual ages.
- Educating patients on the benefits of foot orthotics enhances adherence, enabling clinicians to better address gait and biomechanical impairments in individuals with Down syndrome.

## Discussion:

This scoping review resulted in six articles that matched the criteria and highlights the lack of studies and little evidence regarding orthotic and shoe recommendations for individuals with Down syndrome.

## Clinical Relevance for Future Research

Future research should investigate:

- The impact of footwear and orthotics on functional mobility, activities of daily living, and participation.
- The impact of musculoskeletal imbalances and foot deformities as the person with Down syndrome ages.
- The effects of footwear and orthotics on functional mobility across the lifespan.
- The impact of a tie, slip on or Velcro closure sneaker.



## References

