

Does the current research show a relationship between Joint Hypermobility Syndrome/Ehlers-Danlos Syndrome Hypermobility Type and altered gait mechanics?

A Critical Literature Review
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Introduction

Ehlers-Danlos Syndromes (EDS) are a genetically heterogeneous, frequently under diagnosed, group of heritable connective tissue disorders (HCTD). Primary manifestations include joint hypermobility, muscle weakness, frailty and hyperextensibility of tissues, including the skin, ligaments and blood vessels [1], [2].

Current diagnosis is assessed via the Beighton Scale and Brighton Criteria; however, the Beighton Scale gives no indication of the precise degree of joint laxity [1], [3]. Additionally, **the Brighton Criteria are accepted for the diagnosis of JHS/EDS-HT in adults, but not in children and young people.** Neither criteria mention the predominance of hypermobility in females and the frequent presence of **dysautonomic symptoms, gastrointestinal involvement and psychological manifestations** [6].

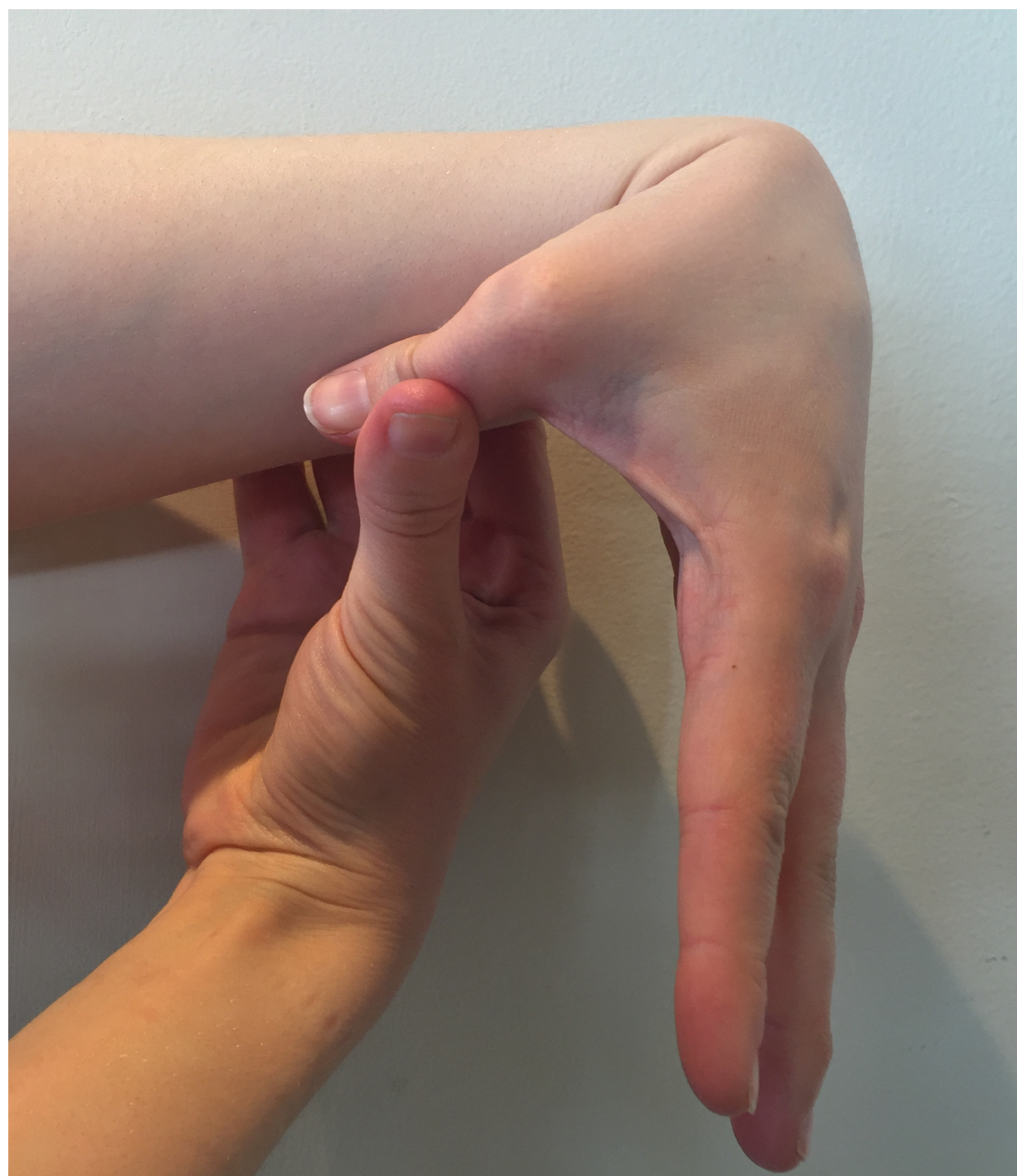
Research indicates that pre-surgical gait analysis can influence surgical recommendations, and is associated with a decreased incidence of unnecessary surgery, detrimental outcomes and reduced surgical costs [5], [12]. Gait analysis may change or reinforce a treatment decision, with greater outcomes achieved when treatment follows the recommendations formed from the gait analysis [12]. As individuals with JHS/EDS-HT are reported to have a higher incidence of surgery; 70% [7] and 90% [11]; **gait analysis is proposed as a pre-surgical or surgical outcome measure for individuals with JHS/EDS-HT.**

Results

Nine studies, involving a total of 568 participants, were included for review. Seven found that those with JHS/EDS-HT have altered gait patterns. One study found that altered gait is negatively correlated with fatigue levels. The remaining study reported that those with JHS/EDS-HT have altered plantar pressure patterns in static standing and walking. The current literature indicates that there is low to moderate evidence to suggest that individuals with JHS/EDS-HT have a reduced anterior step length, normal walking velocity and a symmetrical gait pattern, as found in four studies.

Discussion

Increased ankle plantar flexion during gait, reported in three studies, may lead to a reduced anterior step length, reported in four studies. This may lead to a lowered arc of knee flexion, as reported in two studies. Lowered knee flexion is commonly due to quadriceps weakness, plantar flexor spasticity, knee pain or impaired proprioception [5]. **A weakness of the quadriceps muscle in those with JHS/EDS-HT found in the current literature, may highlight a relationship between these values** [4], [8]. Additionally, a recent systematic review found that individuals with JHS/EDS-HT have reduced lower limb joint proprioception [9].



Areas in need of future research

1. Gait analysis investigating quadriceps weakness in relation to plantar flexion and peak knee flexion in those with JHS/EDS-HT.
 2. Gait analysis studies evaluating the efficacy of exercise regimes, orthotics and in exploring the complex relationships between fear of falling, fatigue and muscle weakness in those with JHS/EDS-HT are needed.
 3. Pilot studies investigating gait analysis as a pre-surgical measure or as a diagnostic tool for individuals with JHS/EDS-HT are needed in addition to a revision of the current diagnostic criteria.
- A 2016 study investigating the risk of falls in those with JHS/EDS-HT is currently being conducted.

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