

Biomechanical and bioelasticity analysis of the hypermobile knee

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Abbreviations

3D	Three-dimensional
EDS	Ehlers-Danlos Syndrome
EDS-HT	Ehlers-Danlos Syndrome hypermobility type
GJH	Generalized Joint Hypermobility
HSD	Hypermobility Spectrum Disorder
JHS	Joint Hypermobility Syndrome

36.1 What is hypermobility?

The term “hypermobility” is a clinical feature description terminology rather than a diagnostic terminology. Based on the Beighton score for hypermobility, the knee joint is considered hypermobile if it moves beyond zero degree of extension of ≥ 10 degrees [1–3]. The hypermobile knee could be (1) asymptomatic, or (2) symptomatic and associated with chronic pain and possibly instability and frequent dislocation [2,4]. The asymptomatic hypermobile knee, in conjunction with another three or more joints that also show hypermobility, is termed generalized joint hypermobility (GJH), generalized joint laxity, or benign joint hypermobility [4,5]. In terms of symptomatic hypermobile knee, there are various diagnoses where the hypermobility term could be incorporated, including joint hypermobility syndrome (JHS) and hypermobility spectrum disorder (HSD), which includes four classifications of generalized HSD, localized HSD, peripheral HSD, and historical HSD [2,6]. Additionally, there is the term Ehlers-Danlos syndrome hypermobility type (EDS-HT) [4]. The term HSD was introduced in 2017 to replace the term JHS, which is the most common diagnosis associated with hypermobility [6,7]. There are also rare diagnoses where the hypermobility feature presents, including EDS classical type, EDS vascular type, Marfan syndrome, and osteogenesis imperfecta [4,8,9]. This chapter focuses on the most common hypermobility-related disorders of GJH and HSD, which were previously termed JHS or EDS-HT. HSD is defined as a connective tissue disorder characterized by symptomatic joint hypermobility in the absence of systematic inflammation as an autosomal dominant disease [6,7]. The etiology of hypermobility-related conditions is often related to mutations in the genes-encoding collagen and in the enzymes responsible for collagen production and modification [9,10].

36.2 Hypermobility is not uncommon

Hypermobility as a feature is not uncommon. There is a high percentage of people who have a range of knee motion that moves beyond the normative range. In terms of hypermobility as an asymptomatic clinical feature, the figures for prevalence are high. In 1999, a study explored the Singapore population and identified a