

**Abstract Title:**

Design and Implementation of External Plantar Plate Orthosis

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**Abstract:**

The plantar plate is a fibrocartilage ligament shaped as a broad ribbon like disc that covers the metatarsophalangeal (MTP) joint heads of the feet. The plantar plate performs the main role in maintaining joint stability in the sagittal plane<sup>1</sup> as well as playing an important role in the foot's weight bearing function and is the insertion point of tendons and ligaments. An intact plantar plate and normal MTP joint allows the toes to dorsiflex passively and the fat pad of the metatarsal head moves with the plantar plate to cover the head of the metatarsal as a shock-absorbing cushion<sup>2</sup>. When the MTP joint is pathologic, the instability allows excessive hyperextension of the proximal phalanx which in turn causes tears, or injury, to the plantar plate that results in pain, inflammation, and deformities. Our external orthosis seeks to provide stability for such affected MTP joint and reduce pain for the user. The design and implementation of this orthosis needs to consider the target demographic, comfort and ease of the designed orthosis, construction of the prototype, and verification/validation of the orthosis.

**Keywords:** Plantar Plate Injury, Low-Grade Injury, Turf Toe, Orthotic,

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[2] Maas, Nico M. G., Margot Van Der Grinten, Wichor M. Bramer, and Gert-Jan Kleinrensink. "Metatarsophalangeal Joint Stability: A Systematic Review on the Plantar Plate of the Lesser Toes." *Journal of Foot and Ankle Research* 9.1 (2016): n. pag. Web.