

FormthoticsTM
Foot Science

Foot Orthoses and The Knee



Since the mid-1970's podiatrists and other clinicians have used foot orthoses in an attempt to modify conditions affecting the knee. Pathologies around the knee, which have names such as Patello-Femoral Pain Syndrome (PFPS) or Ilio-Tibial Band Syndrome (ITB), were and are frequent presentations, affecting runners, footballers, basketball players and even cyclists. In runners in particular, these symptoms were often lumped together in the lay-term, "runner's knee" and there was a widespread belief during the 1970's

(and beyond) that distance running would lead to an epidemic of knee arthritis in the decades to come.

This forecast has thankfully been proven to be in error¹. Data now clearly show that despite relatively high levels of knee symptomatology amongst athletes, there is, absent direct trauma to the knee, no higher incidence of damage to knee cartilage compared to sedentary individuals, and in fact there is good data that supports the use of exercise in remediation of knee arthritis symptoms².

But what about the balance of knee pain? Can orthoses help, even prevent knee pain from developing?



The answer is clearly yes, especially if one focuses on PFPS. For ITB the data is a bit less supportive, but still rather positive^{3,4}. The mechanical basis for these outcomes follows from an understanding that as the hindfoot undergoes eversion movement (pronation), the talus rotates inward (medially). The tibia, directly above this bone, moves along the same plane of motion so that a significant rotation force is created at the knee, many

centimetres above the site of excessive or abnormal motion. The knee, which is essentially a hinge-type joint, is therefore subjected to rotation forces during normal flexion and extension, which causes pain within the knee, under the patella, as it attempts to track linearly over the distal femur, and at the lateral side of the knee joint where stabilising structures (ITB) become compressed.



Orthoses work⁵ here because of their ability to reduce the extent and/or velocity of tibial rotation. Based on careful physical assessment of the patient, clinicians may modify and calibrate the orthotic “effect” on the tibia with varying levels of wedging and “control” built into the device. And to some extent these efforts can be augmented by selected athletic footwear which may also restrain or control foot motion.



Knee Arthritis

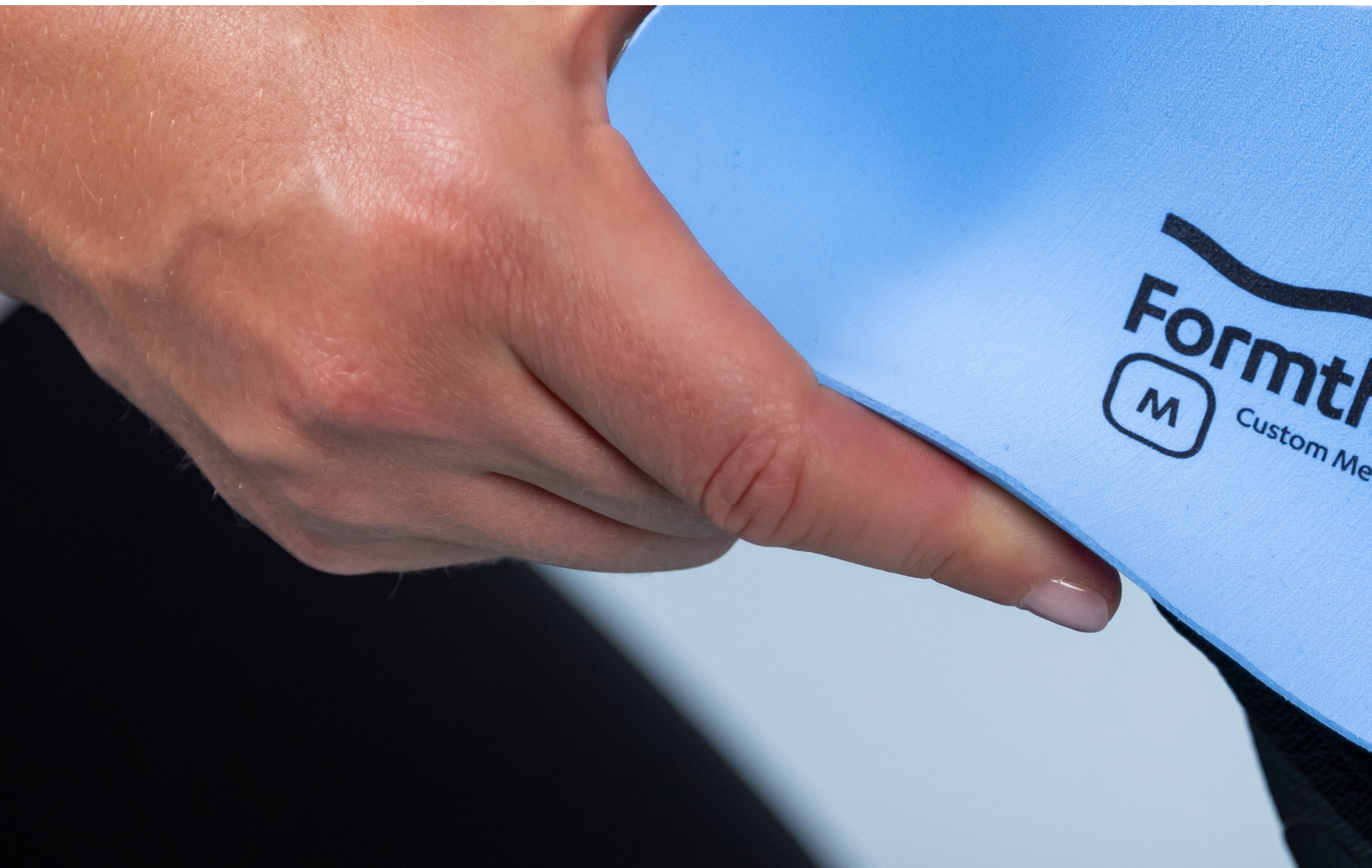
Circling back to knee arthritis, it is fair to say that there is a global epidemic of knee osteoarthritis. In Australia for example, the lifetime risk for knee replacement surgery amongst women is 1:5, for men, 1:7⁶. The burden of this condition on the world-wide medical economy is staggering; in the US, there is a projected increase in the rate of implantation (compared to 2014) of over 400% to the year

2040^{7,8}, with annual costs exceeding 4.1B for revision knee implantation alone. There is therefore, a need for non-operative solutions which address at least the pain and disability of the condition; the cost of knee implantation (USD \$25,000-\$40,000) when viewed against the number of people with degenerative knee conditions will put this option out of reach for many people.



Two methods are proposed; the first option, based on an association between knee osteoarthritis and pes valgus⁹ utilises foot orthoses to modify the position and rotation of the tibia (again) to reduce stress on the medial side of an arthritic knee joint. The second method is aimed at the common and most frequent precursor to total knee replacement, the Varus knee. In this application,

an eversion force is applied to the tibia/knee joint through the use of an everted foot orthosis. Again, careful calibration of wedging and construct against physical examination findings allow for the most optimum results. Mechanically, this method creates a modest decompression at the medial knee compartment and therefore a reduction in pain¹⁰.





Whilst knee implantation resolves a large percentage of pre-operative pes valgus¹¹, there may even be value in the use of foot orthoses after knee implantation, where it has been shown that a residual valgus or everted foot position is associated with higher rates of implant failure^{12, 13}.

So in the end, clinicians should have a high level of confidence in their ability to intervene at the knee. Careful application of orthotic devices based on physical assessment will offer protective and rehabilitative effects for athletes and others who suffer from overuse or degenerative symptoms at the knee.



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