



Standard Test Method for Comparison of Rearfoot Motion Control Properties of Running Shoes¹

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INTRODUCTION

During a typical running step, the foot first makes contact with the ground on the rear lateral border of the shoe. At first contact between the foot and the ground, the foot is normally in a supinated or neutral position relative to the lower leg. During the first 50 to 150 ms of the period of ground contact, the foot rotates about the ankle and subtalar joints to a more pronated position. Pronation is a combination of eversion and abduction of the subtalar joint and dorsiflexion of the ankle joint.

Excessive pronation and possibly an excessive rate of pronation are believed to be risk factors in common overuse injuries among runners. Other risk factors include a runner's anatomical predisposition, (for example, joint alignment, bone curvature, joint laxity) previous injury history and training errors (for example, a sudden increase in the duration or intensity of training). Running shoes have been shown to influence pronation. Shoe design factors which have produced measurable effects on lower extremity motion under laboratory conditions include sole hardness, sole height and width, sole geometry and the presence or absence of orthotics and stabilizing devices.

1. Scope

1.1 This test method covers the measurement of certain angular motions of the lower extremity during running, specifically, the frontal plane projection of the pronation and supination of the lower leg relative to the foot ("rearfoot motion") and methods by which the effects of different running shoes on rearfoot motion may be compared.

1.2 As used in this test method, footwear may refer to running shoes, corrective shoe inserts (orthoses) or specific combinations of both. The effects of orthoses may vary from shoe to shoe. Therefore, comparisons involving orthoses shall be qualified by the specific style of shoes in which they are tested.

1.3 This test method is limited to the measurement of the two dimensional, frontal plane projection of the relative angular motion between the lower leg and the foot ("rearfoot motion"). It is not a direct measure of pronation or supination, which are three dimensional motions.

1.4 This test method is limited to running motions in which the heel makes first contact with the ground during each step.

1.5 This test method is applicable to measurements of rearfoot motion made while subjects run on a treadmill or while they run overground under controlled conditions.

1.6 The values stated in SI units are to be regarded as the standard. The inch-pound units given in parentheses are for information only.

1.7 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

- 2.1 *ASTM Standards*:²
F539 Practice for Fitting Athletic Footwear

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *ankle joint*—the joint between lower leg and foot formed by the articulations of the tibia and fibula with the talus.

3.1.2 *footstrike*—initial contact between the foot and the ground at the beginning of the stance phase.

¹ This test method is under the jurisdiction of ASTM Committee F08 on Sports Equipment, Playing Surfaces, and Facilities and is the direct responsibility of Subcommittee F08.54 on Athletic Footwear.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.