

Static Clinical Measurements

Assessment Reference: Static Biomechanical Tests for Orthotic Prescribing

Accurate clinical measurement underpins evidence-informed orthotic prescription. This reference covers the most clinically relevant measurements used in podiatric biomechanical assessment — how to perform them, what normal values look like, how to interpret findings, and how they directly inform orthotic prescribing decisions.

Static vs Dynamic Assessment Static measurements capture foot posture and range of motion under controlled, non-moving conditions. They are essential for understanding structural deformity, compensatory patterns, and joint range. Dynamic assessment (gait analysis, pressure plate) captures how the foot actually functions during movement — both are complementary. This reference covers static measures only. See M9 (Gait Analysis Reference) for dynamic assessment guidance.

1 Relaxed Calcaneal Stance Position (RCSP)

Aspect	Detail
Definition	The angle of the calcaneal bisection relative to the floor (or lower leg) when the patient is standing in their habitual, relaxed weightbearing position.
How to Measure	Patient stands naturally on both feet, equal weight distribution. Bisect the posterior calcaneus. Measure angle between bisection line and supporting surface (or vertical/lower leg bisection). Use a goniometer or inclinometer.
Normal Values	2–4° eversion (valgus) is considered normal for most adults.
Pronated Finding	>4° calcaneal eversion — indicates compensated pronation; STJ functioning in everted position.
Supinated Finding	Inverted calcaneus (varus position) — indicates compensated supination or pes cavus.
Orthotic Implication	Degree of RCSP eversion informs degree of medial heel skive/rearfoot varus post required. RCSP eversion = medial correction needed. RCSP inversion = lateral correction or accommodation needed.

2 Neutral Calcaneal Stance Position (NCSP)

Aspect	Detail
Definition	The angle of the calcaneal bisection when the STJ is manually held in neutral (1:2 medial:lateral talar head palpation) in a standing position.
How to Measure	From behind, palpate talar head medially and laterally. Reposition foot until talar head is equally palpable both sides (STJ neutral). Measure calcaneal bisection angle to floor. Compare to RCSP.
Normal Values	0–2° eversion.
RCSP minus NCSP	This difference = the degree of compensation occurring at the STJ. A large RCSP-NCSP difference indicates significant compensatory pronation.
Orthotic Implication	The RCSP-NCSP difference guides the degree of correction to prescribe. Full correction to NCSP is rarely appropriate — typically aim for 50–75% of the difference as a starting correction.

3 Forefoot-to-Rearfoot Relationship

Aspect	Detail
Definition	The angular relationship between the plantar forefoot plane and the rearfoot (calcaneal bisection) when the STJ is held in neutral NWB.
How to Measure	Patient prone or supine. Hold STJ in neutral. Load the lateral column (4th/5th metatarsals). Assess the angle between the forefoot plane and the perpendicular to the rearfoot bisection using a goniometer.
Forefoot Varus	Forefoot inverted relative to rearfoot — plantar aspect of forefoot tilts medially. Normal variant = up to 2–3°; clinically significant = >4°. Drives compensatory STJ pronation in late stance.
Forefoot Valgus	Forefoot everted relative to rearfoot — plantar aspect tilts laterally. Associated with pes cavus. Drives compensatory STJ supination or 1st ray plantarflexion/ankle supination.
Orthotic Implication	Forefoot varus → forefoot varus post (medial forefoot posting) to accommodate deformity and reduce compensatory pronation. Forefoot valgus → forefoot valgus post (lateral forefoot posting) to accommodate and reduce compensatory supination.

4 Ankle Dorsiflexion (ADF)

Aspect	Detail
Definition	The range of motion of the talocrural joint into dorsiflexion — assessed with knee extended (gastrocnemius) and knee flexed (soleus).

Aspect	Detail
How to Measure	Non-weightbearing (NWB goniometer): Patient supine or prone. STJ in neutral. Goniometer — stationary arm along fibula, moving arm along lateral border of foot. Measure with knee straight (gastrocnemius component) and knee bent to 90° (isolates soleus). Weightbearing knee-to-wall (Lunge test): Patient stands with foot flat on floor, toes against wall. Slide foot back until knee can just touch wall while heel remains on floor. Measure foot-to-wall distance in cm (or use inclinometer at tibia). Functional/weightbearing assessment of available ADF under load.
Normal Values	NWB knee straight: $\geq 10^\circ$ dorsiflexion. NWB knee flexed: $\geq 20^\circ$. Knee-to-wall: ≥ 10 cm distance (some references use ≥ 9 cm). Values below these thresholds indicate functionally limited ADF requiring clinical management.
Equinus (limited ADF)	$< 10^\circ$ with knee extended = gastrocnemius equinus. $< 10^\circ$ with knee flexed = osseous or combined equinus. Both significantly increase forefoot loading and compensatory pronation.
Orthotic Implication	Equinus → heel raise to reduce dorsiflexion demand; address with stretching. Limited ADF drives forefoot overload, early heel rise, and compensatory STJ pronation — must be addressed in prescription.

5 Supination Resistance Test

Aspect	Detail
Definition	A clinical test assessing the force required to supinate the midtarsal joint and STJ complex from a relaxed weightbearing position. Introduced by Kirby — quantifies the degree of pronatory force at the STJ axis, guiding the degree of orthotic control required.
How to Perform	Patient stands relaxed. Clinician places both index fingers beneath the talonavicular joint and applies a dorsal (upward) force attempting to supinate the midtarsal joint. Resistance is graded on a 5-point scale: 1 = very easy (low resistance), 3 = moderate, 5 = very difficult (high resistance).
Low Resistance (Grade 1–2)	Foot supinates easily — minimal pronatory force at STJ. Less orthotic control required. Standard or semi-rigid orthosis with mild posting typically sufficient.
Moderate Resistance (Grade 3)	Moderate pronatory force. Semi-rigid to rigid orthosis with rearfoot posting. Clinical mid-range — prescription guided by other assessment findings.
High Resistance (Grade 4–5)	High pronatory force — significant STJ loading. More aggressive orthotic control required: rigid shell, deep heel cup, medial flange, significant rearfoot post and/or medial heel skive. May indicate structural deformity requiring surgical review if orthotics are insufficient.
Orthotic Implication	Supination resistance directly informs required orthotic control force: low resistance → light control; high resistance → maximum control. Particularly useful when RCSP and FPI are borderline or when patient presents with high orthotic failure rate. Must be used alongside other measurements.

6 Leg Length Discrepancy (LLD) Assessment

Aspect	Detail
Definition	A measurable difference in the functional or structural length between the two lower limbs. May be structural (true bony difference) or functional (apparent LLD secondary to pelvic tilt, foot pronation, or hip/knee deformity). Clinically relevant from approximately 5mm discrepancy.
Structural LLD — Tape Measure	Patient supine. Measure from ASIS (anterior superior iliac spine) to medial malleolus bilaterally. Difference = structural LLD. Repeat from umbilicus to medial malleolus to cross-check. Less accurate than imaging but sufficient for clinical orthotic prescribing decisions.
Functional LLD — Standing Block Method	Patient stands on standardised blocks under the short limb until iliac crests are level (confirmed by palpation and visual assessment). Block height = functional LLD. More clinically useful for determining heel raise prescription height.
Apparent (Functional) LLD	Leg appears shorter due to pelvic tilt, scoliosis, hip adduction contracture, or excessive foot pronation on one side. Tape measure from umbilicus to malleolus will appear unequal. Correct the underlying cause — orthotic heel raise will not resolve functional LLD from pelvic or hip causes without addressing the primary driver.
Normal Values	Discrepancies of 0–5mm are common and generally asymptomatic. 5–10mm is clinically relevant and may warrant correction. >10mm usually requires graduated correction. Full correction (100%) is rarely indicated — typically prescribe 50–75% as initial correction and build up as tolerated.
Orthotic Implication	Prescribe heel raise to the short limb. Start at 50–75% of measured LLD. Bilateral raises may be needed if correcting >10mm to avoid creating a relative difference in the 'normal' limb. Review pelvic and spinal alignment at follow-up. Associated pathologies: GTPS, low back pain, sacroiliac dysfunction, hip OA, medial knee OA on longer limb side.

7 Foot Posture Index-6 (FPI-6)

Aspect	Detail
Definition	A validated clinical tool scoring foot posture across 6 criteria on a -2 to +2 scale. Total score = sum of all 6 items.
The 6 Criteria	1. Talar head palpation; 2. Supra/infra lateral malleolar curvature; 3. Calcaneal frontal plane position; 4. Prominence of talonavicular area; 5. Medial longitudinal arch height/shape; 6. Abduction/adduction of forefoot on rearfoot.
Scoring	Each item scored -2 (highly supinated), -1 (supinated), 0 (neutral), +1 (pronated), +2 (highly pronated). Total range: -12 (highly supinated) to +12 (highly pronated).
Normal Values	+1 to +7 (adults); +2 to +6 (children). Neutral = approximately +1 to +4.
Pronated Foot	Score $\geq +7$ (adults). Clinically significant pronation warranting intervention consideration.

Aspect	Detail
Supinated Foot	Score ≤ 0 . Pes cavus spectrum — lateral modifications and cushioning priority.
Orthotic Implication	FPI score guides the direction and degree of orthotic correction. High positive score → medial corrections. Low/negative score → lateral corrections or accommodation. Use alongside RCSP and forefoot assessment for complete picture.

8 Quick Reference: Measurement Summary

Measurement	Normal Range	Pronated Finding	Supinated Finding	Orthotic Direction
RCSP	2–4° eversion	>4° eversion	Inverted calcaneus	Medial (pronated) / Lateral (supinated)
NCSP	0–2° eversion	>2° eversion	Inverted	Guides degree of correction
Forefoot-to-Rearfoot	0–3° varus	>4° varus (compensated pronation)	Forefoot valgus	Forefoot varus post / Forefoot valgus post
Ankle Dorsiflexion (knee straight)	$\geq 10^\circ$	<10° = gastrocnemius equinus	N/A	Heel raise; address equinus
Ankle Dorsiflexion (knee bent)	$\geq 20^\circ$	<10° = osseous/combined equinus	N/A	Heel raise; address equinus
Supination Resistance Test	Grade 1–5	Grade 4–5 (high resistance)	Grade 1–2 (low resistance)	Grade → orthotic control level
Leg Length Discrepancy	<5mm (asymptomatic)	N/A	N/A	Heel raise to short limb (50–75% of LLD)
FPI-6	+1 to +7	$\geq +8$	≤ 0	Medial (high positive) / Lateral or accommodative (negative)

No single measurement determines the prescription. RCSP, NCSP, forefoot relationship, ankle dorsiflexion (NWB and knee-to-wall), supination resistance, leg length, and FPI-6 should always be interpreted together — alongside the patient's symptoms, activity level, and gait analysis findings. Clinical reasoning integrates all findings; measurements are tools, not diagnoses.