

Effects of Stride Rate Manipulation in Shoes with Different Drop Heights

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ABSTRACT

Runners who land with a more dorsiflexed ankle (i.e., an increased angle of the foot relative to the ground) at heel-strike may be at an increased risk for injury. PURPOSE: To determine whether rearfoot strike runners can reduce foot angle at contact without increasing metabolic cost, heart rate, tibial acceleration, or perceived exertion while running by using a lower drop height shoe. METHODS: Twelve healthy recreational runners (20.8±1.2 yrs, 64.2±7.3 kg) with a mean VO₂ max 47.9 (8.3) ml*kg⁻¹*min⁻¹ and who regularly ran with a rearfoot strike pattern were recruited and provided informed consent prior to participation. Tibial acceleration, foot angle, VO₂, HR, and RPE, were recorded when the participant reached steady state during treadmill running at a constant speed at preferred step frequency (PSF), PSF+7.5% and PSF+15% in two shoes; Asics Gel-Flux (13 mm drop height and 11.7 mm, for men and women, respectively) and Gel-Lyte (5.4 mm drop height and 4 mm, for men and women, respectively). RESULTS: VO₂ and RPE were not significantly different between shoes and among stride frequency conditions. Foot angles were lower in the Gel-Lyte (p=0.005) and during the +15% PSF condition compared to +0% and +7.5% PSF (p=0.005 & p=0.01, respectively). HR was significantly higher in the +15% PSF condition than in the +7.5% PSF condition (p=0.048), and was not significantly different between the two drop height conditions (p=0.327). Tibial acceleration was significantly higher in the lower drop height condition when compared to the higher drop height condition (p=0.04), and was significantly higher at +7.5% PSF when compared to +15% PSF (p=0.01). CONCLUSION: Running in a lower drop height shoe can decrease foot angles at contact, as can increasing the stride frequency by +15%. Such changes may help diminish injury risk with no increased metabolic cost or perceived physical exertion.

Table 1 – Mean (SD) for tibial acceleration (TA; g's), foot angle (FA; degrees), VO₂ (ml*kg⁻¹*min⁻¹), HR (bpm) and RPE for each shoe and step frequency condition.

	Asics Gel-Lyte				Asics Gel-Flux			
	PSF	+0%	+7.50%	+15%	PSF	+0%	+7.50%	+15%
VO ₂	29.8±0.2	30.0±3.4	29.7±2.8	29.8±2.9	29.9±0.2	29.9±3.4	29.8±3.6	30.1±3.6
RPE	8.4±0.3	8.1±1.4	8.5±1.2	8.7±1.3	9.1±0.4	9.1±2.2	8.7±1.8	9.4±2.0
FA	12.4±1.7	13.9±4.8	12.7±5.2	10.5±4.0	14.3±0.5	15.0±4.2	14.3±5.1	13.7±4.9
TA	3.4±0.9	3.5±1.1	3.4±0.9	3.2±0.9	2.7±0.5	2.8±0.6	2.7±0.6	2.6±0.4
HR	148.0±12.0	148.4±12.0	146.4±13.0	149.1±11.0	150.3±10.0	150.4±9.9	147.8±10.1	152.7±10.1