**TACSM Abstract**

**Effects of a Carbon-Plated Racing Shoe on Running Economy at Slower Running Speeds**

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ABSTRACT

Advancements in running shoe technology, such as the inclusion of a carbon-fiber plate along with new, thicker midsole foams, have been shown to improve running economy. Running economy can be defined as the oxygen consumption (VO₂) or caloric expenditure at a fixed running speed. Specifically in the Nike Vaporfly line of racing shoes, running economy improvements have been shown in the 2.7-4.2% range at running speeds of 14-18 km·hr⁻¹. These previously tested speeds are relevant for runners completing the marathon distance in 3 hours and faster. However, it is unclear if the same running economy benefits are conferred at slower running paces.

**PURPOSE:** Determine the effects of the Nike Vaporfly Next% 2 (NVF2) on running economy at 10 and 12 km·hr⁻¹.

**METHODS:** NVF2 was compared to a mass-matched, control (CTRL) shoe, the Asics Hyper Speed. Sixteen runners (8 male: 29 ± 15 years, 68.8 ± 10.9 kg, 17.2 ± 4.7 % body fat, 5-km best: 19.1 ± 2.6 min; 8 female: 38 ± 7 years, 58.5 ± 7.4 kg, 23.6 ± 3.0 % body fat, 5-km best: 20.3 ± 2.2 min) completed 4 x 5-minute trials at 10 km·hr⁻¹, followed by another series of 4 x 5-minute trials at 12 km·hr⁻¹ on the same day. There was a 5-minute seated rest between trials. Each shoe was tested twice at each speed in a mirrored sequence with the order counterbalanced across subjects. Metabolic and running mechanics data were collected and averaged. Data were analyzed by a two-way (shoe x speed) repeated measures ANOVA. Significant interactions were followed up with paired sample t-tests.

**RESULTS:** There was a significant shoe x speed interaction for VO₂ (p = 0.021). At 12 km·hr⁻¹, VO₂ (ml·kg⁻¹·min⁻¹) was lower (-1.4 ± 1.1%; p < 0.001) for NVF2 (35.8 ± 1.7) relative to CTRL (36.4 ± 1.7). This was greater in magnitude than the differences observed at 10 km·hr⁻¹ (-0.9 ± 1.8%; p = 0.065) between NVF2 (29.4 ± 1.9) and CTRL (29.6 ± 1.9). Mechanics data showed main effects for shoe condition (p < 0.05) with a decreased cadence (~1.1 step·min⁻¹) and increased vertical oscillation (~0.17 cm) in NVF2 relative to CTRL.

**CONCLUSION:** From these data, it appears that the NVF2 still provides benefits to running economy at 12 km·hr⁻¹ (~3.5-hour marathon pace), however these benefits may be smaller in magnitude (1.4%) compared to previous research (2.7-4.2%) at faster speeds of 14-18 km·hr⁻¹. These benefits may be reduced even further (0.9%) at 10 km·hr⁻¹ (~4.2-hour marathon pace).