

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 (VO_2) 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 $\text{km}\cdot\text{hr}^{-1}$. 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 $\text{km}\cdot\text{hr}^{-1}$. **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 $\text{km}\cdot\text{hr}^{-1}$, followed by another series of 4 x 5-minute trials at 12 $\text{km}\cdot\text{hr}^{-1}$ 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 VO_2 ($p = 0.021$). At 12 $\text{km}\cdot\text{hr}^{-1}$, VO_2 ($\text{ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$) was lower ($-1.4 \pm 1.1\%$; $p < 0.001$) for NVF2 (35.8 ± 1.7) relative to CTRL (36.4 ± 1.7). This was greater in magnitude than the differences observed at 10 $\text{km}\cdot\text{hr}^{-1}$ ($-0.9 \pm 1.8\%$; $p = 0.065$) 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 $\text{step}\cdot\text{min}^{-1}$) 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 $\text{km}\cdot\text{hr}^{-1}$ (~ 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 $\text{km}\cdot\text{hr}^{-1}$. These benefits may be reduced even further (0.9%) at 10 $\text{km}\cdot\text{hr}^{-1}$ (~ 4.2 -hour marathon pace).