*TACSM Abstract*

# A Case Study Comparison of Two Carbon-Plated Running Shoes on Running Economy and Running Mechanics

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ABSTRACT

The advent of the carbon-plated running shoe, in support of the first, historic sub 2-hour marathon, has resulted in an arms race across various running shoe companies in hopes of providing a similar competitive advantage to their athletes and customers. Research has shown these new shoe technologies can significantly improve running economy. However, of the limited research, most is focused on just one brand and model of carbon-plated shoe. If athletes are to compete on a level playing field, further investigation is needed to determine that these new shoe technologies confer a similar competitive advantage across multiple brands and models. **PURPOSE**: Case study comparison on the effects of two carbon-plated running shoes (Hoka CarbonX vs. Nike Zoom Alphafly Next%) and a traditional running/racing shoe (Hoka Tracer 2) on running economy and running mechanics. **METHODS**: Data was collected on one male distance runner (age: 35 years, height: 178 cm, weight: 67.7 kg) on two separate days. On the first testing day, the Tracer 2 (TR) was compared to the Carbon X (CX). On the second testing day, the CX was compared to the Alphafly (AF). Following a 10-minute jog, a series of 4 x 6 minute trials (two trials per shoe, randomized) were completed at 13.84 km/hr (~7:00/mile pace) and at 15.29 km/hr (~6:20/mile pace) with a 4-minute break between trials. Oxygen consumption ($VO_2$) was recorded continuously throughout each trial and the final 3 minutes were averaged. Further, the two trials in a given shoe at a given speed were averaged to make comparisons between shoes. Similarly, heart rate (HR), ground contact time (GCT), cadence, and vertical oscillation (VO) were measured (Garmin, HRM-Tri). **RESULTS**: On day 1, comparisons (mean ± SD, %difference) of the TR to CX at 13.84 km/hr were as follows: $VO_2$ (ml/kg/min; TR: 46.9 ± 0.2, CX: 46.8 ± 0.6, -0.3%), HR (bpm; TR: 170 ± 0, CX: 169 ± 3, -0.7%), GCT (ms; TR: 201 ± 0.1, CX: 203 ± 1.8, 0.7%), Cadence (steps/minute; TR: 171 ± 0.8, CX: 172 ± 0.1, 0.3%), VO (cm; TR: 11.3 ± 0.2, CX: 11.2 ± 0.1, -1%) and at 15.29 km/hr: $VO_2$ (TR: 51.3 ± 0.1, CX: 51.2 ± 0.1, -0.1%), HR (TR: 179 ± 0.9, CX: 179 ± 1.9, 0%), GCT (TR: 195 ± 1.1, CX: 193 ± 0.5, -1.2%), Cadence (TR: 173 ± 0.4, CX: 172 ± 0.7, -0.3%), VO (TR: 10.8 ± 0, CX: 11 ± 0, 2%). On day 2, comparisons of the CX to AF at 13.84 km/hr were as follows: $VO_2$ (CX: 45.7 ± 0, AF: 43.9 ± 0.2, -3.8%), HR (CX: 170 ± 0.6, AF: 168 ± 1.9, -1.3%), GCT (CX: 202 ± 0.2, AF: 205 ± 1, 1.3%), Cadence (CX: 173 ± 0.6, AF: 169 ± 0.1, -2.3%), VO (CX: 10.4 ± 0.1, AF: 11.0 ± 0.1, 5.7%) and at 15.29 km/hr: $VO_2$ (CX: 50.8 ± 0.4, AF: 48.7 ± 0.1, -4.2%), HR (CX: 179 ± 0.2, AF: 177 ± 1.8, -0.9%), GCT (CX: 193 ± 0.2, AF: 197 ± 0.4, 1.7%), Cadence (CX: 175 ± 0.7, AF: 171 ± 1.8, -2.3%), VO (CX: 10.4 ± 0.1, AF: 11.1 ± 0.4, 6%). **CONCLUSION**: Compared to the TR, the CX did not result in meaningful differences in economy or mechanics in this case study. However, the AF improved economy by ~4% compared to the CX, while increasing vertical oscillation (6%) and decreasing cadence (2.3%). While statistical inferences cannot be made from this case study analysis, these findings do raise concerns on the relative advantages offered by new shoe technologies across different brands and models of shoes.