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Conference Abstract

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Two riders, one output: how ability and position shape tandem performance

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1 Abstract

Tandem cycling requires two riders to coordinate their effort while operating under shared mechanical constraints. Previous research has shown that tandem cyclists produce less power than expected from their individual solo performances, but the influence of partner matching and rider position remains unclear. This study examined whether differences in individual cycling capacity affect tandem performance and whether rider position (pilot or stoker) influences physiological, perceptual, and pacing responses. Twenty-three trained cyclists without tandem experience completed 10-minute time trials in three conditions: solo, equal-capacity tandem (≤25 W difference in solo power output), and unequal-capacity tandem (≥40 W difference). Mean power output, heart rate, cadence, rating of perceived exertion (RPE), and pacing behaviour were recorded. Pilot and stoker positions were counterbalanced as far as possible. Linear mixed-effects models and time-dependent analyses were used to assess the effects of pairing condition and rider position. Compared with solo cycling, equal-capacity tandems showed lower power output (-3.9%), heart rate (-2.3%), and RPE (-11.5%). Unequal-capacity tandems showed only a small reduction in heart rate (-2.7%), with no significant reduction in power output. Stokers

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produced less power than during solo cycling (-5.3%) and less than pilots (-3.7%), while reporting lower perceived exertion (-13.9%). Pilots maintained power output comparable to solo cycling despite lower heart rates (-2.9%). Cadence did not differ between conditions. Combined tandem power averaged 95.6% of the summed solo power outputs, and differences in partner capacity were not associated with combined performance. Pacing profiles were broadly similar across conditions, whereas perceived exertion was lower during tandem cycling, particularly during the early phase of the trial. These findings indicate that short-duration tandem performance was influenced more by rider position and shared mechanical constraints than by differences in cycling capacity between partners. Tandem performance therefore appears to reflect how individual capacity is expressed within a mechanically coupled rider–bicycle system, rather than the simple summation of two solo performances.