

Relationship between Anthropometric Characteristics and Success in Different Cycling Terrains

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To the Editor:

Dear Sir,

In a recent article, Walsh et al carried out a literature search to explore the body mass index (BMI) in master athletes of different sports disciplines [1]. Regarding cycling, the authors interestingly concluded that no definitive conclusions can be made on specific anthropometric characteristics of these professional athletes.

Success in professional cycling is essentially determined by a complex interplay among somatotype components, physiological variables (e.g., aerobic power and muscle strength), air resistance and gravity when riding uphill [2]. Although there is a common perception that small cyclists may be advantaged in mountain stages, whilst larger cyclists may be more favoured in sprint stages, the relationship between anthropometric characteristics and success in specific cycling contests (i.e., overall standing, mountain and sprint stages), remains largely debated. This aspect is of vital importance since elite teams and athletic trainers are strongly persuading their athletes to modify their anthropometric

characteristics for succeeding in different terrains and racing conditions [3]. Earlier published biophysical data suggests that the energy expenditure of riding the bike uphill should favour large cyclists, since the balance between their weight and that of the bicycle would give them a relative advantage. However, this evidence is counterbalanced by the fact that a lower body mass may confer to small cyclists an advantage in climbing, whilst the energy output required for winning a sprint stage would apparently favour larger athletes [4]. No definitive evidence has instead been published on top-class athletes succeeding in long stage events, such as the Tour de France.

The uncertainty that still surrounds the relationship between anthropometric characteristics and success in different cycling terrains has prompted us to perform an electronic search in the Sport Reference database and related Web resources (<https://www.sports-reference.com/>), for retrieving information on mean somatotype components (i.e., height, weight and BMI) of the winners of the overall (Yellow jersey), point (Green jersey) and mountain (Polka Dot jersey) classifications at the Tour de France (i.e., the most important worldwide professional cycling competition) during their professional career, between the years 1980 and 2008. The anthropometric characteristics of the winners of each classification were expressed as median and (interquartile range; IQR), and were then compared with Mann-Whitney test. The statistical analysis was carried out with Analyse-it (Analyse-it Software Ltd, Leeds, UK).

Complete information on anthropometric characteristics

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could be retrieved for 20/20 (100%), 19/25 (76%) and 17/20 (85%) winners of the overall, mountain and point classifications in the Tour of France between the years 1980 and 2008. The median values of height, weight and BMI were 1.77 m (IQR, 0.1 m), 68 kg (IQR, 8 kg) and 21.3 kg/m² (IQR, 2.8 21.3 kg/m²) for the winners of overall classification, 1.75 m (IQR, 0.05 m), 65 kg (IQR, 8 kg) and 20.8 kg/m² (IQR, 2.3 kg/m²) for the winners of mountain classification, 1.78 m (IQR, 0.1 m), 73 kg (IQR, 14 kg) and 22.9 kg/m² (IQR, 2.2 kg/m²) for winners of the point classification, respectively. In multiple comparisons (Fig. 1), the weight was found to be significantly higher in winners of point classification compared to both overall ($p = 0.024$) and mountain classifications ($p < 0.001$) winners, and was also higher in winners of the overall classification compared to mountain classification winners ($p = 0.020$). Similarly, the BMI was significantly higher in winners of the point classification compared to both overall ($p = 0.004$) and

mountain classifications ($p < 0.001$) winners, but was found to be similar between winners of the overall classification compared to mountain classification winners ($p = 0.217$) (Fig. 1). Notably, no significant difference in height values were found across the three groups (Fig. 1).

Taken together, the results of our analysis of recent winners of overall, mountain and point classifications at the Tour de France attest that succeeding in different cycling terrains is seemingly dependent on specific somatotypes. More specifically, success in mountain stages seems independent from the height of the athlete, but would require a substantially lower body weight and, possibly, a lower BMI. On the other hand, athletes succeeding in sprint stages are more frequently characterized by substantially higher weight and BMI than those winning the overall and mountain classifications. Interestingly, overall classification winners have a higher body weight than those who win the mountain classification, although their BMI is comparable.

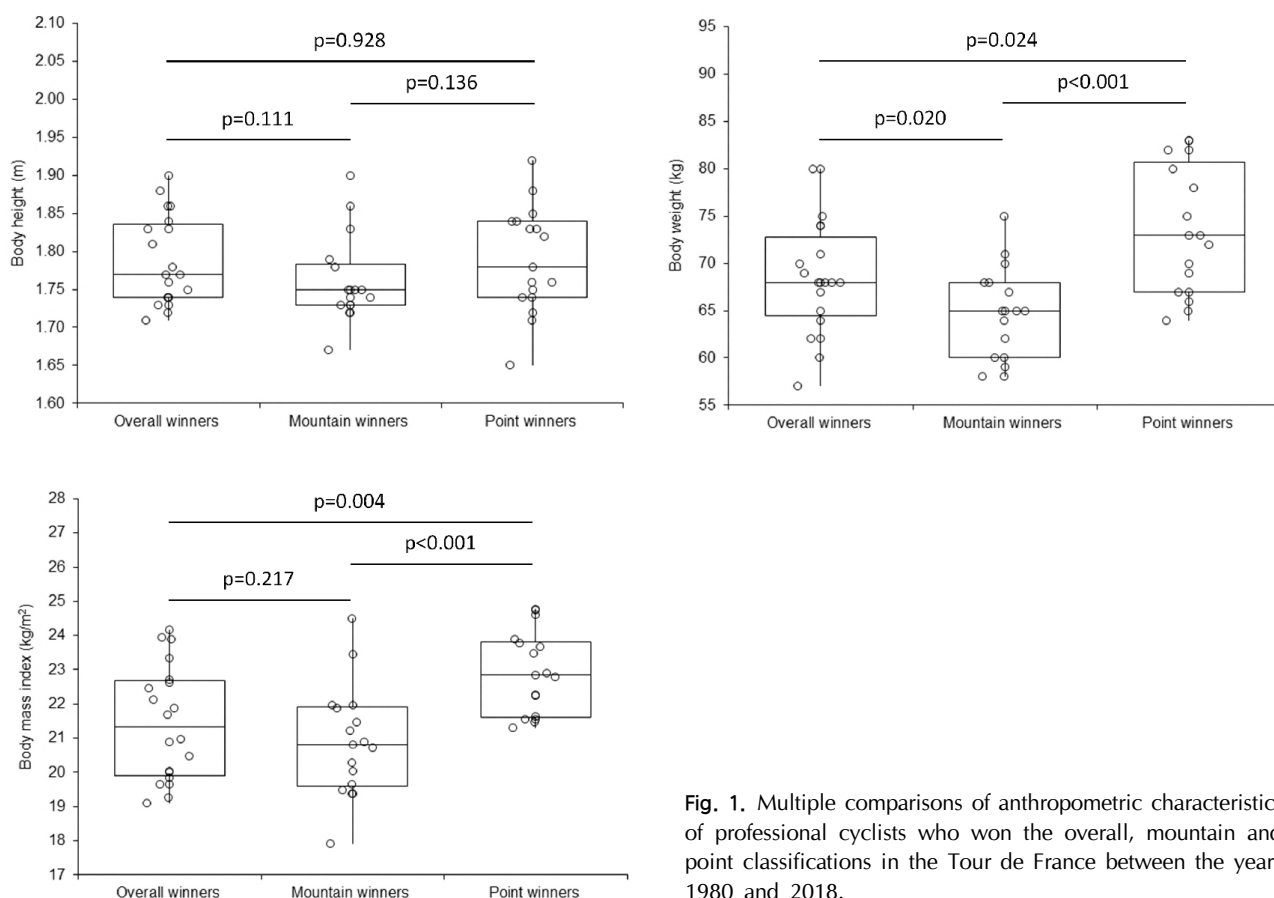


Fig. 1. Multiple comparisons of anthropometric characteristics of professional cyclists who won the overall, mountain and point classifications in the Tour de France between the years 1980 and 2018.

This is not really surprising since individual time trial (ITT) performance, which has a strong impact on the chance of succeeding in the overall standing of 3-week cycling events (especially in the Tour de France), is associated with higher values of maximal workload and muscle mass [4,5].

It seems hence reasonable to conclude that professional cyclists who aim to be successful in one specific cycling contests (i.e., overall standing, mountain and sprint stages) shall modify their anthropometric characteristics, especially their body weight accordingly.

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