Bike fit practices do not match scientific evidence

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Introduction

Many bike technicians optimise bike fit using experience, look and feel, and 2D videos rather than 3D methods or scientific evidence. Therefore, cycling communities and scientists have different measures and views in regards to optimal bike configurations[1].

The most controversial component of bike fit is saddle height, leading to many studies on the topic. An optimal saddle height is vital as affects both performance and injury risk[1].

Aims

- Compare 2D and 3D motion capture measures from road bike fit analyses (Fig 2).
- Verify the alignment between current bike set ups in the cycling community and evidence-based recommendations.

Methods

Recreational road cyclists (8 males, 3 females; age 39.7 ± 9.7 y; mass 72.4 ± 14.1 kg; frame size 54.2 ± 2.8 cm; cycling 7.1 ± 4.4 h/week) cycled on a Cyclus 2 ergometer with their own bikes at 150 W for 90 s. Cycling motion was recorded at 120 Hz in 3D (Qualisys AB) and 2D (Sony RX10 II). Data were extracted using Visual 3D and Siliconcoach softwares, respectively.

Bike fit measures were also recorded based on 4 methods used to set saddle height identified in a systematic search of the literature[2,3,4] (Table 1).

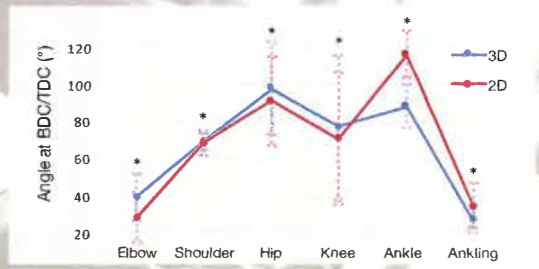

Fig 1 Mean 2D vs 3D angles at BDC/TDC. *Paired t-test $p < 0.05$
BDC, bottom dead centre. TDC, top dead centre.

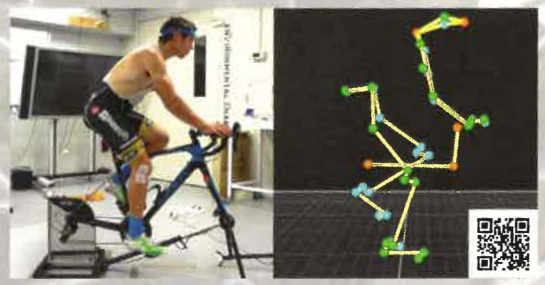

Fig 2 Set-up for 2D and 3D analyses. Scan QR code to play videos

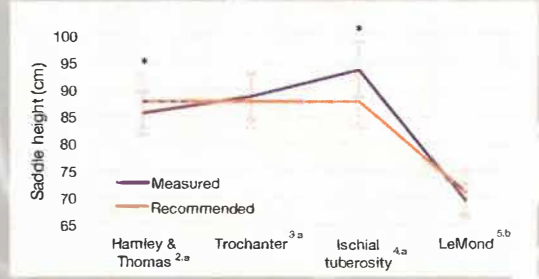

Fig 3 Measured vs recommended saddle heights for 4 different evidence-based methods. *Paired t-test $p < 0.05$
[a] Saddle to pedal axis distance used for setting saddle height
[b] Saddle to centre of bottom bracket distance used for setting saddle height

Results

Table 1 Bike fit measures (mean ± SD) from recreational cyclists ($n = 11$)

Bike fit measures	
Standing height (cm)	170.2 ± 6.7
Sitting height (cm)	133.2 ± 2.9
Inseam leg length (cm)	78.7 ± 3.6
Trochanter length (cm)	88.7 ± 4.4
Ischial tuberosity length (cm)	82.9 ± 4.5

All 2D angles significantly differed from 3D (Fig 1). The most similar was the shoulder (3.1 ± 1.9°) and the least was the ankle (27.9 ± 4.0°).

On average, the absolute difference between measured and recommended saddle heights was 3.4 ± 2.0 cm (Fig 3). Measured heights most aligned with the LeMond[5] (2.1 ± 1.8 cm) and least with the ischial tuberosity method[4] (6.0 ± 2.8 cm).

Conclusions

These findings indicate that 2D and 3D measures differ *significantly*, meaning that the two methods should not be used interchangeably. Further, current bike fit practices in New Zealand most aligned with the LeMond method[5], although the agreement was not perfect. Incorporating 3D methods into current bike fit practices and aligning saddle heights to match scientific evidence could optimise performance and reduce injury risk in recreational road cyclists.

References
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