Should the para-cycling classification system be reclassified?

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Introduction

Para-cycling athletes compete on bicycles (C1–5), handcycles (H1–5) and tricycles (T1-2) in classes based on their functional disability. Higher classes reflect less functional impairment. Para-cycling classification is governed by the Union Cycliste Internationale (UCI). The system aims to promote participation in the sport, by controlling for the impact of impairment on the outcome of competition.

Recently, the separation between adjacent handcycling classes for official UCI events was described—providing benchmarks for active and potential athletes. Unfortunately, similar evaluation of the bicycling and tricycling disciplines has not been considered.

This study aimed to described the separation between adjacent classes, based on performance, in UCI road race events for bicycling and tricycling. It was hypothesized that adjacent classes in each discipline would be statistically different.

Methods

A total of 3,243 road race results from 523 athletes were analysed. Results from events between 2011 and 2019 were obtained from the UCI website. Mean race velocity was calculated for each result because race distance varied within each class.

Race velocity was modelled with Bayesian hierarchical regression. The model adjusted for 'event', 'age' and 'distance', and included 'sex', 'class' and 'sex x class' as fixed factors. A random intercept term was included for each participant.

Markov chain Monte Carlo methods generated posterior estimates of interest—namely, the mean (95% credible interval, CI) velocity for each class, and the mean difference (MD) and standardised difference (i.e., Cohen's *d*) between classes. The probability that adjacent classes were different (Pr |MD| > 0) was also calculated.

Results

- The number of men in C1, C2, C3, C4 and C5 was 32, 76, 63, 76, and 87, respectively. Nineteen men competed in T1 and 58 in T2. The age range of men was 14–62 years.

- The number of women competing in C1, C2, C3, C4 and C5 was 4, 18, 16, 20 and 28, respectively. Eleven competed in T1 and 15 in T2. Women's age ranged 17–55 years.

- Road race velocity for the bicycling and tricycling is shown in Figure 1. Comparisons between adjacent classes for men and women are displayed in Table 2.

- With the expectation of C4 and C5 for women, the analysis showed that men's and women's road race performance was statistically different between adjacent classes for bicycling and tricycling.

Table 1. Pairwise comparisons between adjacent bicycling and tricycling classes for men and women. * indicates statistically different.

Discipline	Comparison	Mean difference (MD)	MD 95% CI [lower, upper]	Pr |MD| > 0	Cohen's *d*	Cohen's *d* 95% CI [lower, upper]
	Men					
Bicycling	1 vs. 2	1.35 km·h⁻¹	[0.75, 1.96] *	1	4.41	[2.46, 6.38]
	2 vs. 3	1.07 km·h⁻¹	[0.58, 1.58] *	1	4.19	[2.25, 6.16]
	3 vs. 4	1.60 km·h⁻¹	[1.00, 2.20] *	1	5.21	[3.25, 7.17]
	4 vs. 5	0.86 km·h⁻¹	[0.29, 1.43] *	.999	2.97	[1.01, 4.94]
Tricycling	1 vs. 2	2.67 km·h⁻¹	[2.03, 3.31] *	1	8.19	[6.23, 10.14]
	Women					
Bicycling	1 vs. 2	1.74 km·h⁻¹	[0.19, 3.28] *	.986	2.20	[0.24, 4.15]
	2 vs. 3	1.17 km·h⁻¹	[0.18, 2.14] *	.989	2.33	[0.37, 4.29]
	3 vs. 4	1.64 km·h⁻¹	[0.46, 2.80] *	.997	2.73	[0.78, 4.68]
	4 vs. 5	0.77 km·h⁻¹	[-0.31, 1.84]	.919	1.39	[-0.56, 3.34]
Tricycling	1 vs. 2	2.99 km·h⁻¹	[2.02, 3.96] *	1	6.07	[4.11, 8.04]

Conclusion

The current study has established benchmarks for para-cycling road race events for the disciplines of bicycling and tricycling.

There was little indication that women's C4 and C5 classes were statistically different. The magnitude of difference between T1 and T2 was greater than adjacent bicycling classes.

Future research should explore the reasons for a lack of difference between women's C4 and C5 and consider whether a third class in the tricycling discipline for both men and women is necessary.
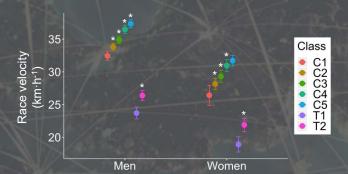

Figure 1. Posterior mean and 95% credible interval road race velocity for men's and women's bicycling (C) and tricycling (T) classes. * indicates statistically different to the preceding classes in the same sex and discipline.

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