



The effects of block training periodization on pacing during 20-km cycling time trial

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Background

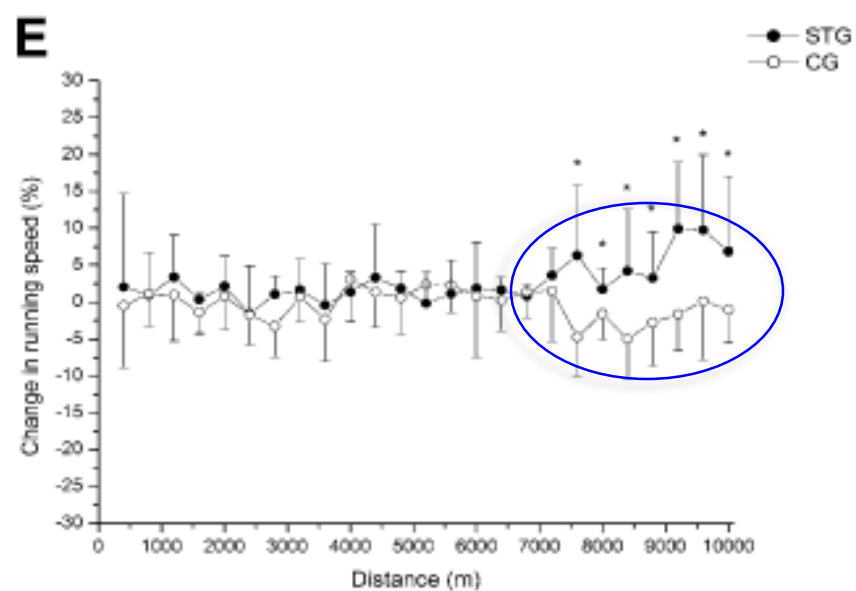
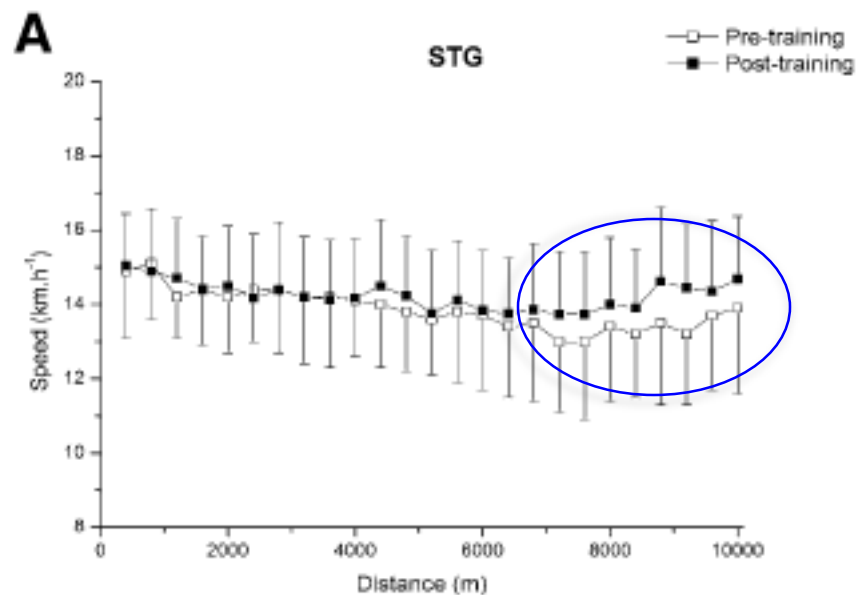
- Pacing (Roelands, et al., 2013; Abbiss; Laursen, 2008).
- HIIT (Costa et al., 2014)
 - Sub-maximal 80 - 95% VO_2 max
 - Maximal 95% - 105% VO_2 max
 - Supra-maximal > 105% VO_2 max
- Block training periodization (Breil et al., 2010; Rønnestad et al., 2012).



Effects of resistance training on neuromuscular characteristics and pacing during 10-km running time trial

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Background: objective

- The aim of this study was to determine the effects of block training periodization on pacing during a 20-km hilly cycling TT in trained cyclists.



Methods: Subjects

Table 1. Characteristics of the participants.

Variables	Control group	Block training group	<i>p</i> value	ES
Age (years)	36.2 ± 8.9	33.2 ± 10.9	0.26	-0.30
Weight (kg)	76.6 ± 8.7	74.8 ± 6.0	0.26	-0.24
Height (cm)	177 ± 5.8	177 ± 4.9	0.45	0.00
Fat (%)	12.8 ± 5.9	11.8 ± 6.3	0.38	-0.16
PPO (watts)	338 ± 48	335 ± 27	0.44	-0.08
VO ₂ max (L.min ⁻¹)	4.7 ± 0.6	4.6 ± 0.5	0.15	-0.18
VO ₂ max (ml.kg ⁻¹ .min ⁻¹)	61.6 ± 10.4	61.4 ± 5.1	0.18	-0.03
HRmax (bpm)	183 ± 6	180 ± 9	0.27	-0.40
[La]max (mmol.l ⁻¹)	9.7 ± 1.8	8.4 ± 1.1*	0.04	-0.90
OBLA (watts)	297 ± 38	293 ± 33	0.38	-0.11
OBLA (bpm)	167 ± 6	165 ± 7	0.30	-0.31

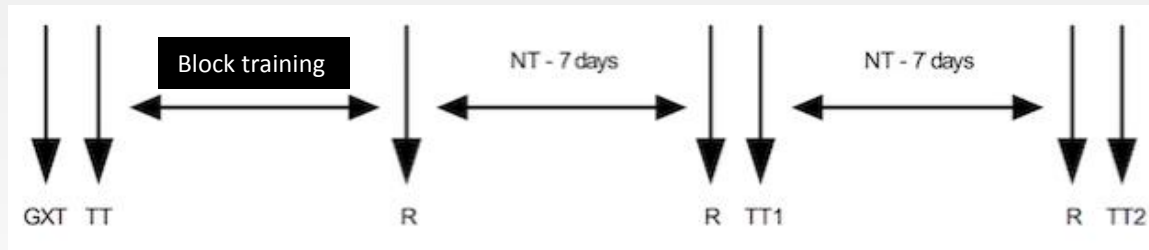
PPO: peak power output; VO₂max: maximal oxygen uptake; HRmax: maximal heart rate; [La]max: maximal blood lactate concentration; OBLA: onset blood lactate accumulation; ES: Effect size. * *p* < 0.05



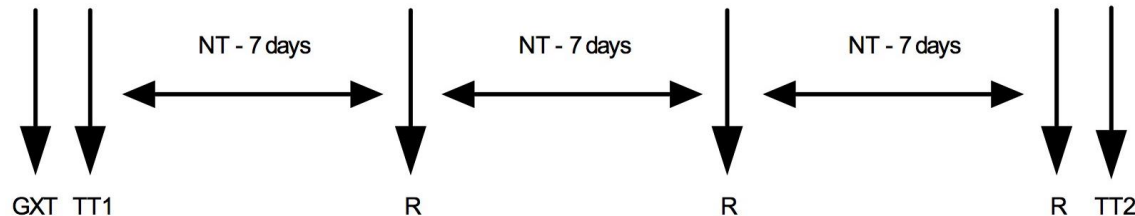
Methods: Experimental design

Block training

TT
Familiarization



Control group





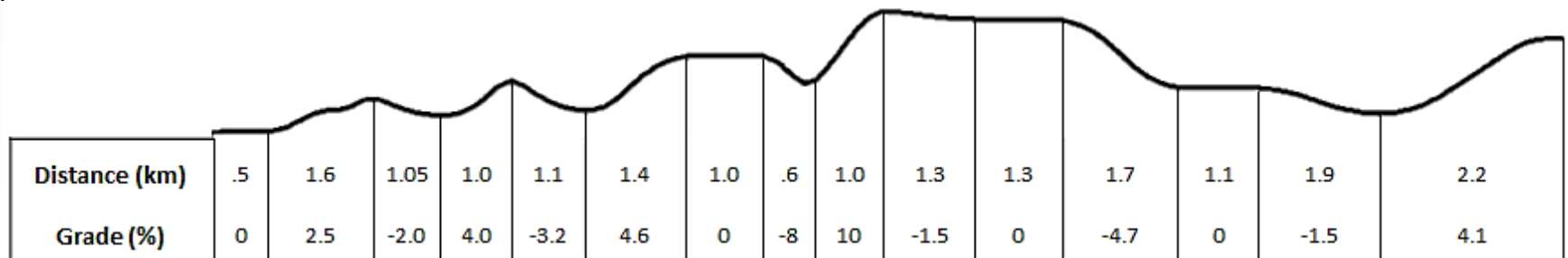
Methods: 20-km hilly TT

20 minute warm up: 2min. at 2-2.5 W.kg⁻¹, followed by 2min. at 3-3.5 W.kg⁻¹ and 1min. at 4-4.5 W.kg⁻¹ and repeated consecutively.

Cyclists were able to view their progress over the course, distance and gear selection; all other information was blinded to remove any potential pacing effect.

No verbal encouragement was provided.

Self-selected pacing as fast as possible with no restriction on gear selection, cadence or cycling posture.





Methods: Training

- Indoor (Velotron) and outdoor (PowerCal)
- Block training: 30 all out sprints per training session
- 10 sets
 - 15":45"
 - 30":150"
 - 45":225"
- Control group: The C group training was covered between 10 and 12 hours per week, spread across between 5 and 6 sessions, which typically included only up to 1 or 2 sessions of HIT.

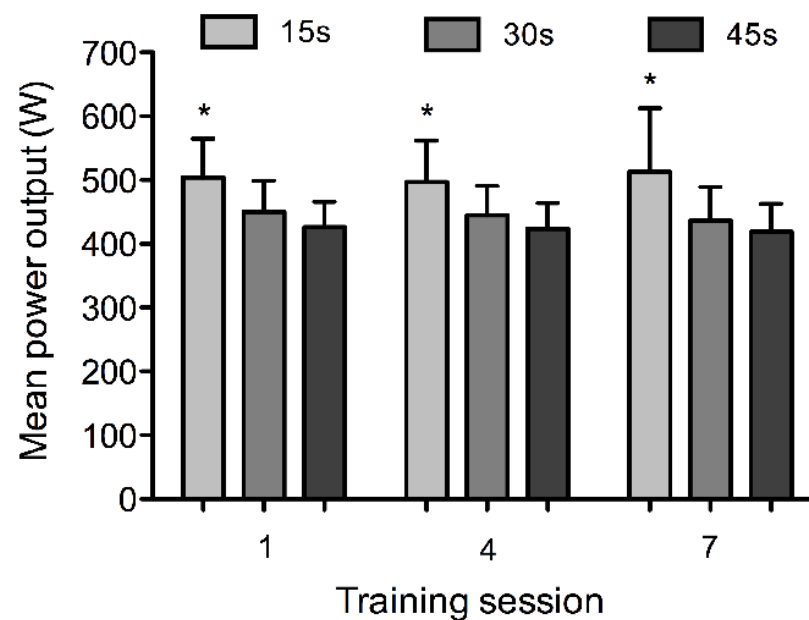
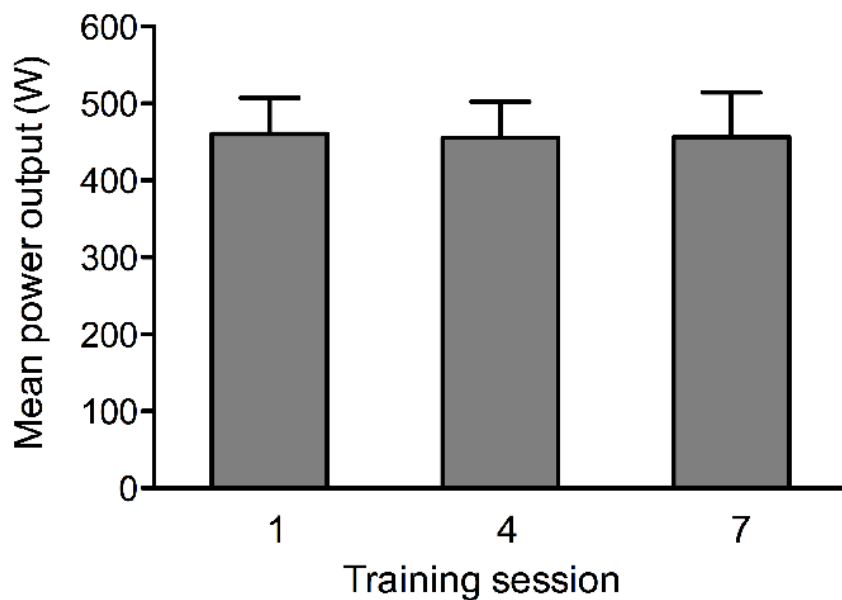


Methods: Statistics

- T test;
- Anova one way;
- Anova two way;
- Magnitude based approach (Hopkins, 2006);
- Effect size.



Results: Power output during training sessions





Results: Measures of the TT in the control group

	Control group			
	TT		ES	<i>p</i> value
	TT1	TT2		
Time (min)	37.7 ± 3.3	38.0 ± 3.4	0.09	0.06
PO (W)	292 ± 41	287 ± 38	-0.13	0.06
RPM	91 ± 8	89 ± 9	-0.24	0.12
HR (bpm)	166 ± 11	164 ± 12	-0.17	0.08



Results: Measures of the TT in the block training group

	Block training group								
	TT			TT – TT1		TT – TT2		TT1 – TT2	
	TT	TT1	TT2	ES	<i>p</i> value	ES	<i>p</i> value	ES	<i>p</i> value
Time (min)	38.4 ± 2.2	37.4 ± 2.1*	36.8 ± 1.8**	-0.45	0.03	-0.78	0.002	-0.31	0.07
PO (W)	277 ± 26	288 ± 28*	296 ± 25**	0.41	0.04	0.75	0.003	0.30	0.07
RPM	94 ± 9	90 ± 5*	88 ± 5**	-0.57	0.03	-0.86	0.01	-0.40	0.06
HR (bpm)	166 ± 8	168 ± 10	168 ± 10	0.23	0.16	0.22	0.16	0.00	0.47



Results: % Changes in mean performance measures between groups

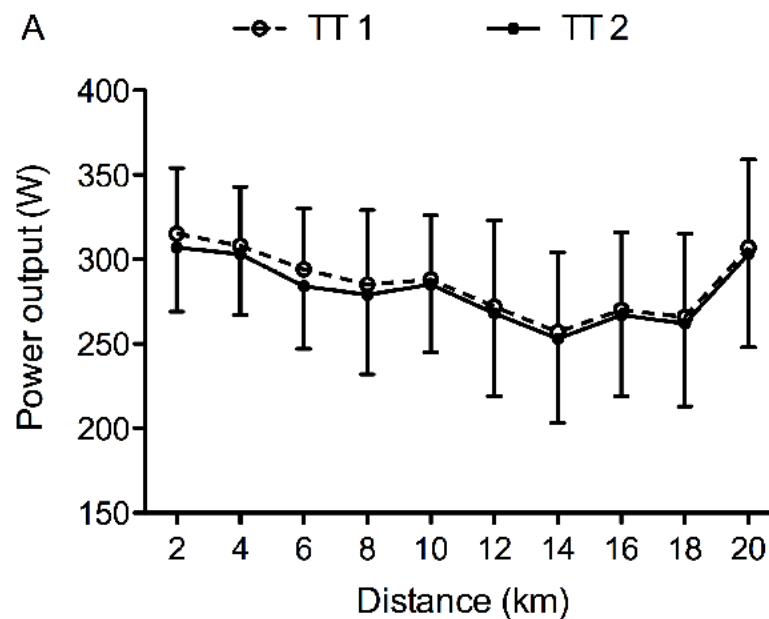
Table 3. Comparison of changes in performance measures as percents between the groups.

	Time	Power output	Cadence	Heart rate
BLTT1 – C	- 3.4 ± 2.2	5.7 ± 2.6	2.0 ± 2.1	2.4 ± 2.2
% Difference (ES)	(- 0.68)	(0.69)	(- 0.38)	(0.28)
BLTT2 – C	- 5.0 ± 2.8	8.6 ± 3.2	4.2 ± 2.6	2.4 ± 2.2
% Difference (ES)	(- 0.85)	(0.91)	(-0.59)	(0.28)

BL: Block training; TT: time trial; ES: Effect size

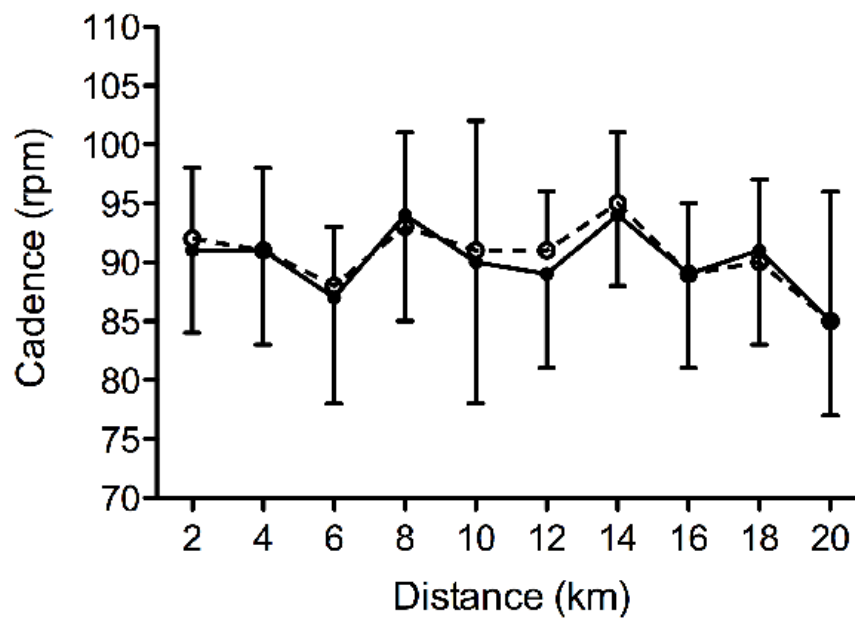


Results: Control group – Power output



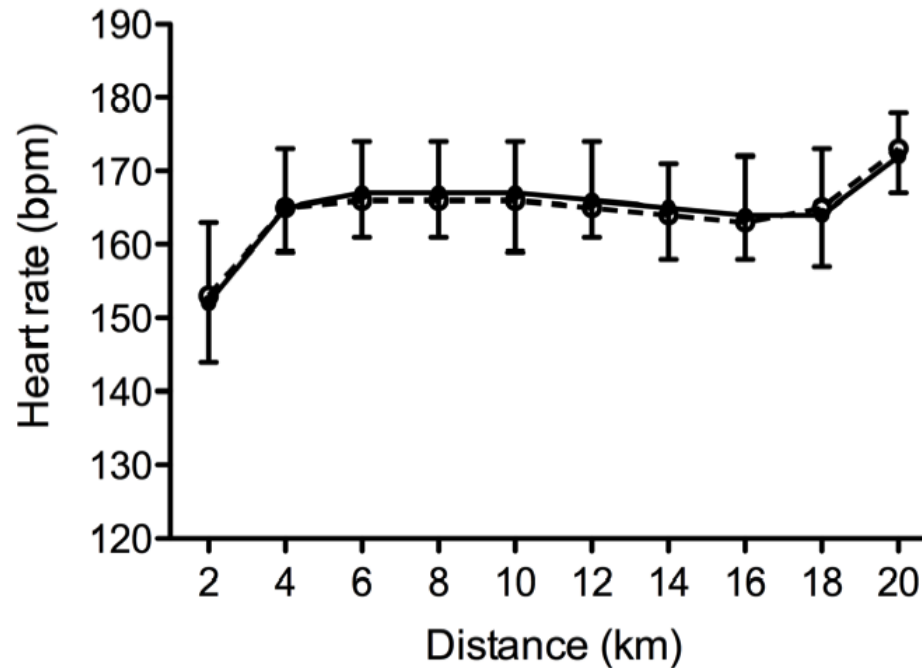


Results: Control group - Cadence



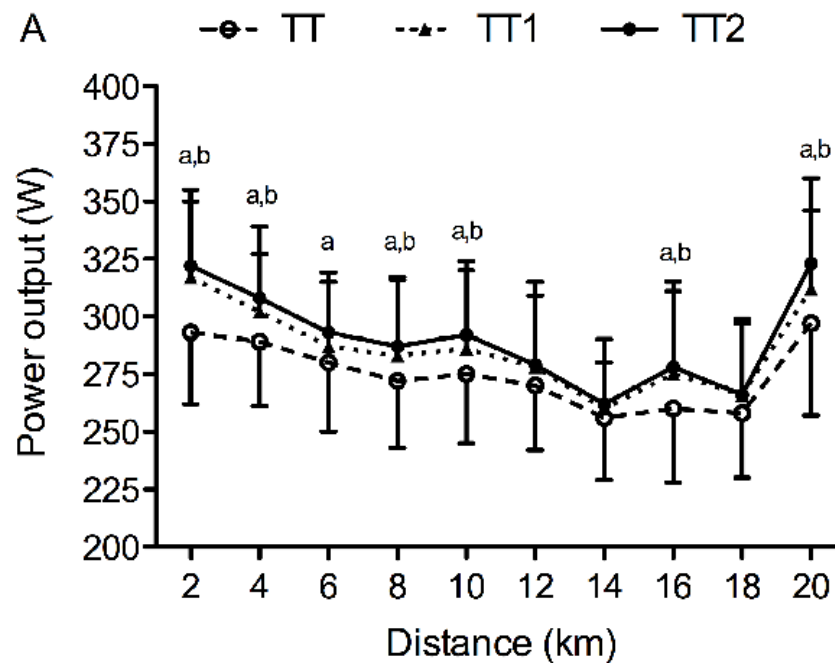


Results: Control group – Heart rate



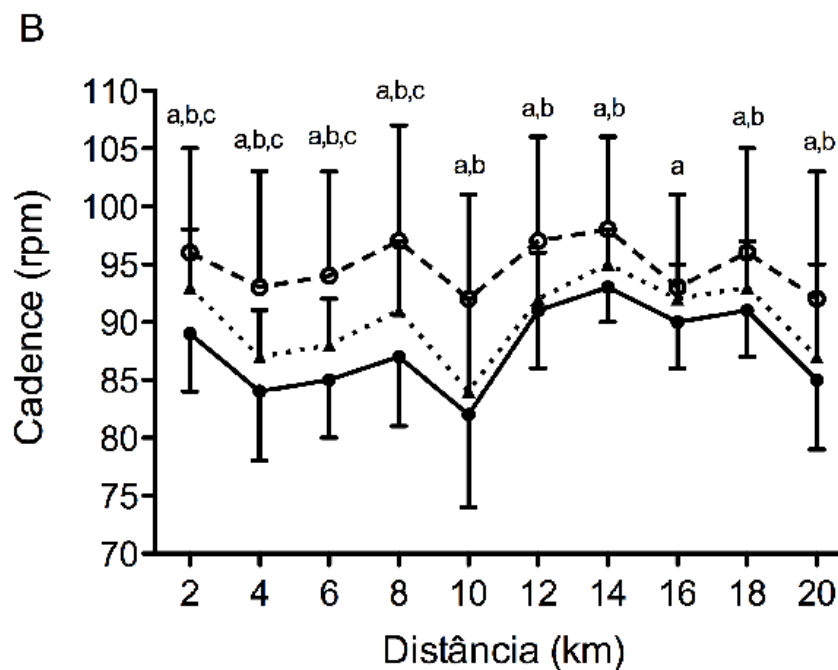


Results: Block training group – Power output



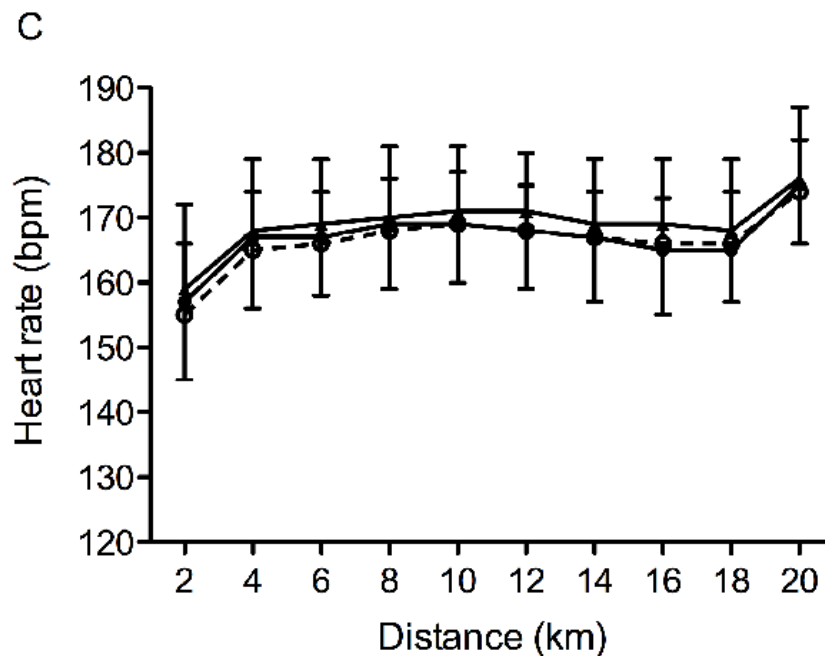


Results: Block training group – Cadence



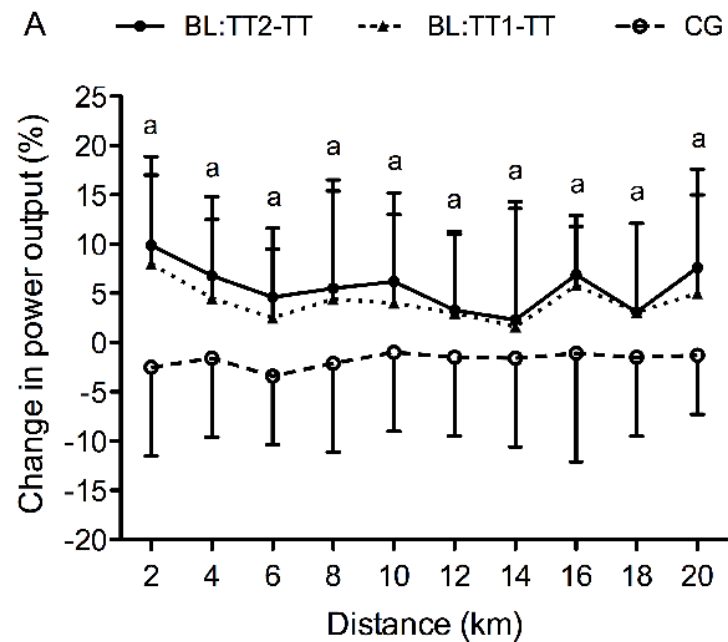


Results: Block training group – Heart rate



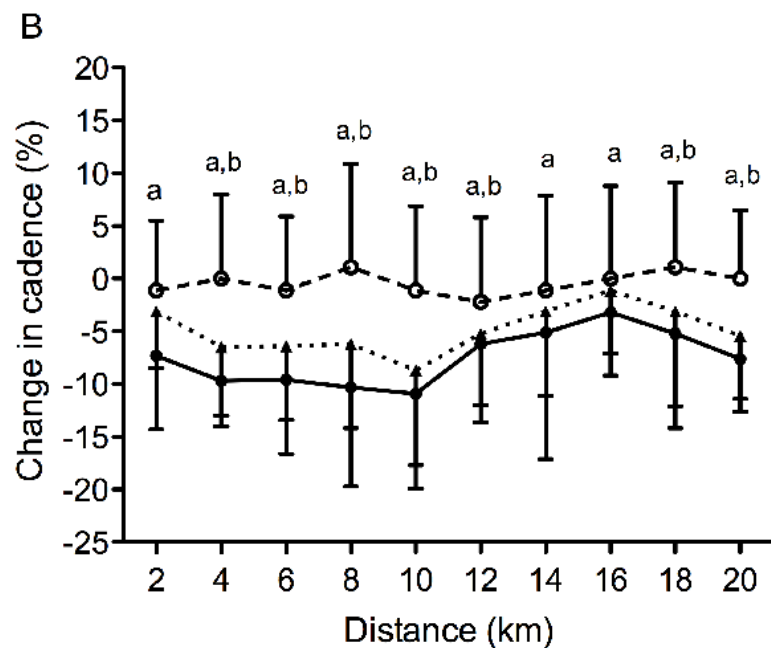


Results: % Changes in performance between groups – Power output



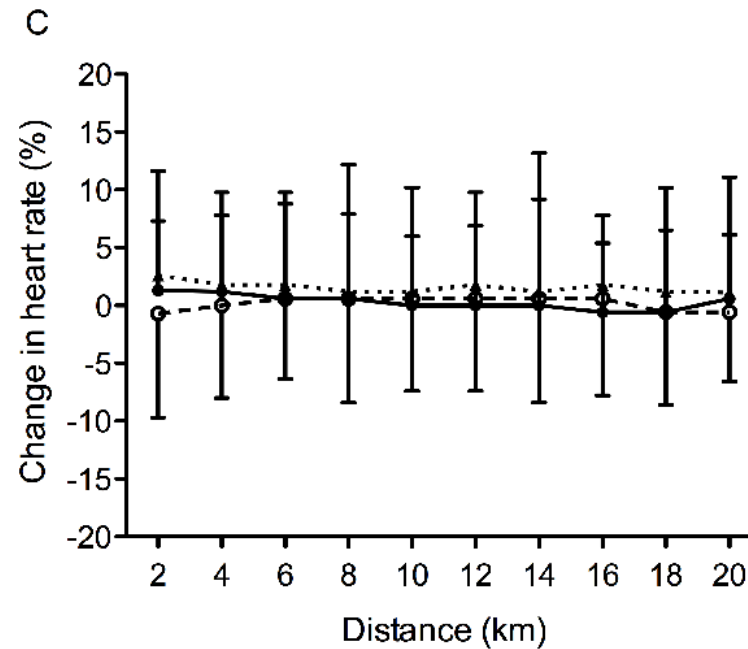


Results: % Changes in performance between groups - Cadence





Results: % Changes in performance between groups – Heart rate





Conclusion

- Short period of HIIT provide substantial positive effects during a self-paced computer-simulated varying grading cycling.
- The training intervention led the cyclists displayed a higher power output during the first half of the task and a higher end spurt while cadence was lower over the cycling TT compared to the baseline period and control group.
- Analyse the course profile before and after training intervention could provide important insights showing the possible performance enhancement over a task since the beginning throughout the end point.
- This study gives an opportunity for coaches to include a short-term of HIT in the cyclists training program for rapid improvements on pacing profile and consequently on performance during cycling TT.



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Thank you very much!

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