Performance indicators in female professional cycling

Teun van Erp & Robert Lamberts

Department of Sport Science, Faculty of Medicine and Health Sciences, Stellenbosch University, Stellenbosch, South Africa.

Performance indicators in female professional cycling

Load, intensity and performance in professional cycling is mainly described in male cycling, with limited scientific publication within female cycling.

- Race categories (FLAT, SMT, MT & TT)
- Race levels (WT, HC & Level.1)
- Single-day vs Multi-day events
- Grand Tours
- Case studies

Sanders & van Erp 2021

Performance indicators in female professional cycling

1. Demands of professional female cycling races: influence race level and race duration (single or multi-day events).

2. Training and race characteristics and the relationship to performance in professional female cyclists.

3. Performance characteristics of TOP5 vs NOT-TOP5 races in female professional cycling.

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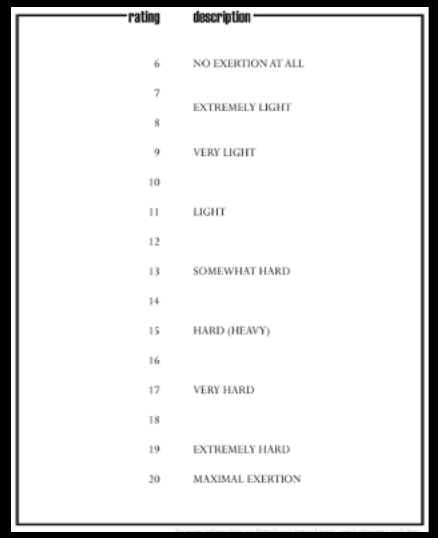
Training logbook with RPE 6-20



rating	description
6	NO EXERTION AT ALL
7	
8	EXTREMELY LIGHT
9	
10	VERY LIGHT
11	
12	LIGHT
13	
14	SOMEWHAT HARD
15	
16	HARD (HEAVY)
17	
18	VERY HARD
19	
20	EXTREMELY HARD
	MAXIMAL EXERTION

Power meter

Volume and load parameters:
Duration
Sessions
sRPE (Duration*RPE)
RPE

kJ spent (energy)
Mean Power Output
TSS

Performance measures:
Mean maximal power output (MMP)

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In male cycling:

- Higher ranked races (WT) are presented with higher load.
- Short duration MMPs tend to be lower in higher ranked races (WT) probably caused by a blunting effect of fatigue.
- Single races have a higher volume, load and intensity compared to multi-day races.

Study:

- 1349 races are analysed from which 554 WWT, 493 Level.1 & 240 Level.2
- 1349 races from which 509 single-day and 840 multi-day.

van Erp & Sanders 2020, Rodriguez-Marroyo 2009

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	Race Level			Cohen's d					
	WWT	Level.1	Level.2	WWT vs Level.1		WWT vs Level.2		Level.1. vs Level.2	
Distance (km)	126 (21)	116 (23)	118 (18)	0.42	S	0.41	S	0.07	T
Duration (m)	203 (37)	188 (31)	190 (28)	0.45	S	0.41	S	0.07	T
AVG PO ($W \cdot kg^{-1}$)	2.90 (0.4)	2.90 (0.4)	3.0 (0.3)	0.07	T	0.21	S	0.29	S
RPE	15.8 (1.9)	15.4 (1.7)	15.3 (1.6)	0.26	S	0.29	S	0.03	T

	Race level			Cohen's D					
Total work (kJ)	2048 (485)	1880 (373)	1984 (336)	0.39	S	0.16	T	0.29	S
TSS	214 (55)	208 (45)	218 (41)	0.11	T	0.08	T	0.22	S
sRPE	3238 (781)	2919 (612)	2928 (560)	0.46	S	0.46	T	0.02	T

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	Race Duration		Cohen's d
	Single-day	Multi-day	Single-day vs Multi-day
Distance (km)	128 (17)	117 (23)	0.54 S
Duration (m)	208 (31)	189 (34)	0.58 S
AVG PO ($W \cdot kg^{-1}$)	3.0 (0.3)	2.9 (0.4)	0.51 S
RPE	16.0 (1.8)	15.3 (1.7)	0.39 S

	Race Duration		Cohen's d
Total work (kJ)	2189 (412)	1855 (384)	0.84 M
eTrimp	760 (139)	603 (108)	1.27 L
TSS	239 (46)	199 (44)	0.88 M
sRPE	3346 (694)	2907 (659)	0.65 M

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Conclusions

- No substantial (small) difference between the different race levels for load, intensity and performance (MMP) in female cycling.
- Substantial differences between single day and multi day.

Discussion

- Race regulations, participation of World Class athletes.
- Races goals (more aggressive races style)
- Fatigue (more controlled racing, lower heartrate)

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In male cycling:

- Unkown training loads per season in male professional cyclists.
- Small differences between professional riders from different levels when comparing their power curves.

Study:

- Data collected and analysed from 14 female cyclist, 43 seasons
- Devided in Successful and not-Successful based on PCSpoints

Pinot 2011

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Total amount per season

	Successful	N successful	d
Sessions per season	264 ± 20	250 ± 25	0.59 S
Total duration (h)	753 ± 100	635 ± 74	1.36 L
Total sRPE x10^5(A.U.)	5.7 ± 0.5	4.9 ± 0.6	1.29 L

Average value per session

	Successful	N successful	d
Duration (h)	2.7 ± 0.2	2.4 ± 0.2	1.93 L
Distance (km)	84 ± 5	74 ± 5	1.71 L
Mean PO (W·kg-1)	2.4 ± 0.1	2.4 ± 0.2	0.02 T
Mean RPE (A.U.)	13.0 ± 0.6	12.8 ± 0.7	0.35 S
Total work (kJ)	1454 ± 176	1289 ± 122	1.13 M
sRPE (A.U.)	2199 ± 160	1898 ± 165	1.85 L

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	MMP	10 s	30 s	60 s	3 m	5 m	10 m	20 m	60 m
Successful	**PO ($W \cdot kg^{-1}$)**	14.8	11.1	9.0	6.4	5.8	5.3	5.0	4.3
N-Successful	**PO ($W \cdot kg^{-1}$)**	14.5	10.4	8.3	6.0	5.4	4.8	4.6	4.0
	Cohen's d	0.22 S	0.80 M	1.14 M	1.29 L	1.15 M	1.64 L	1.63 L	1.29 L

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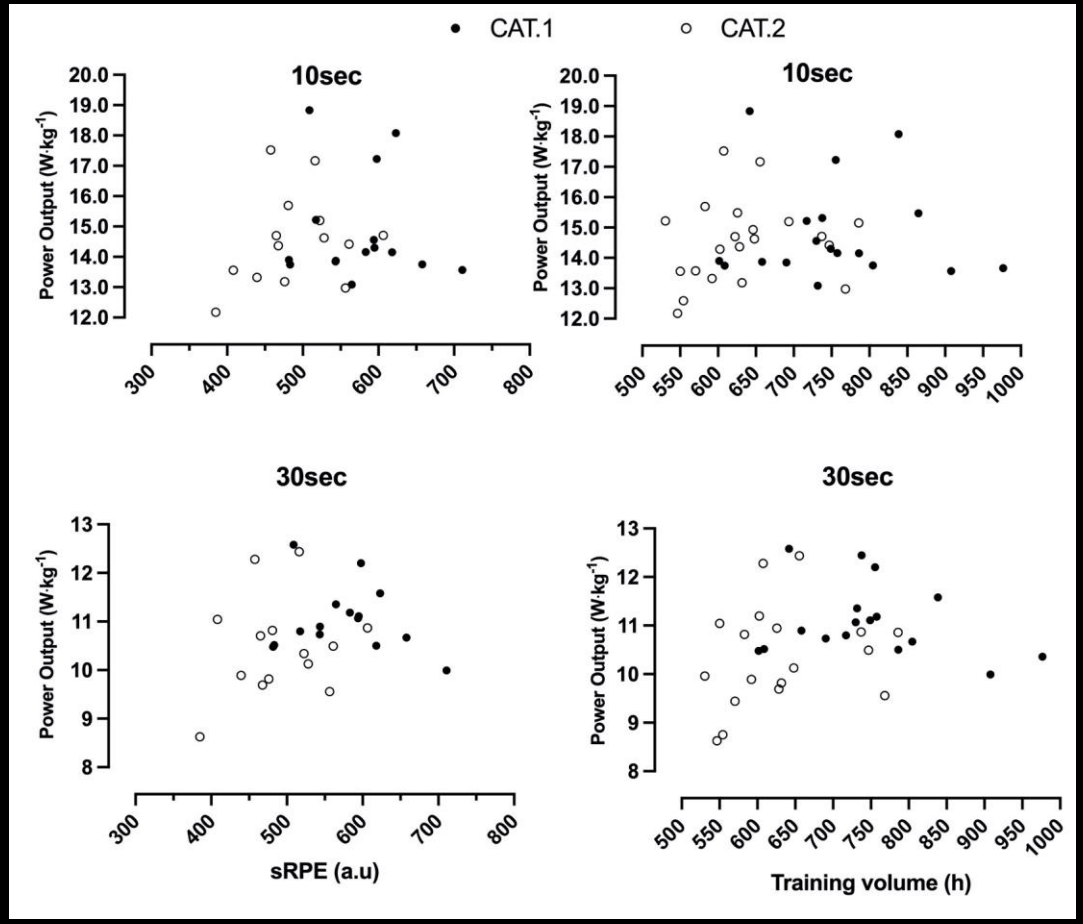

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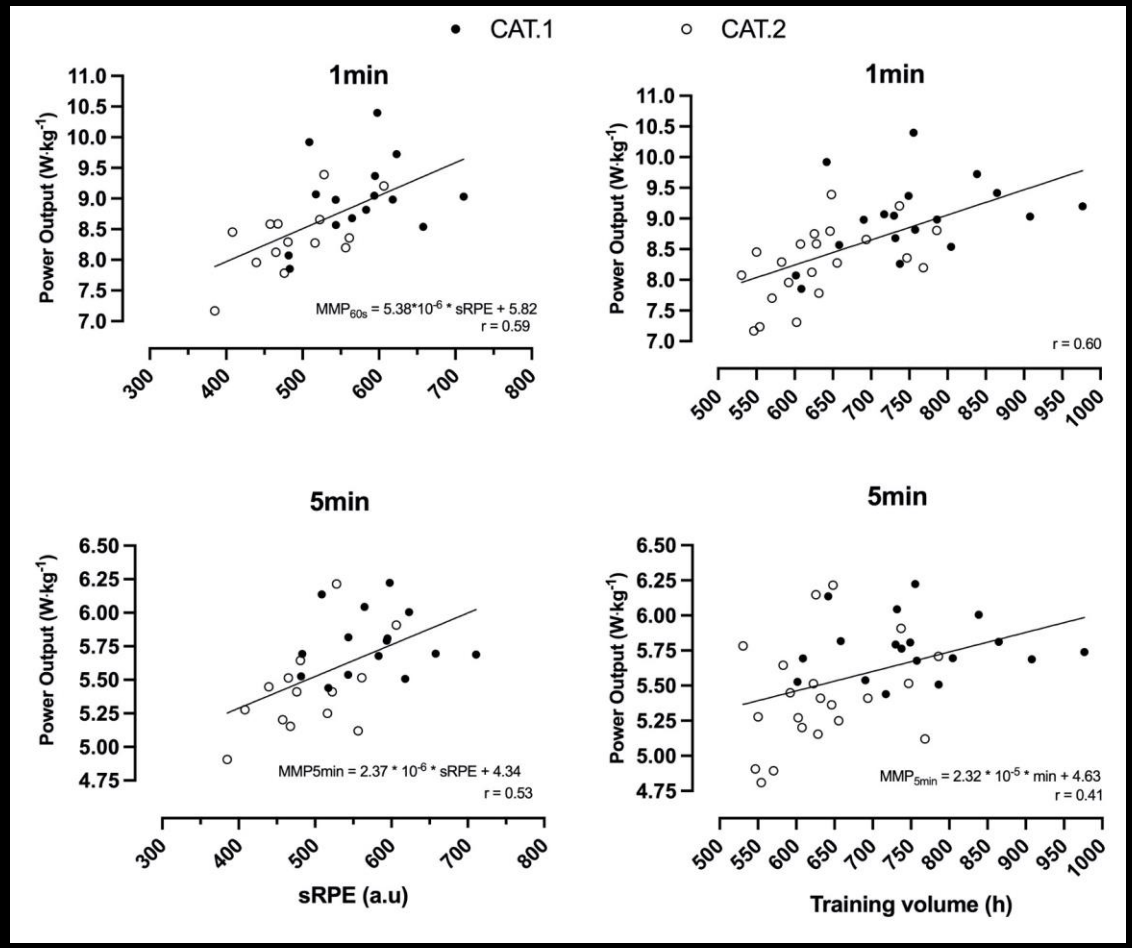

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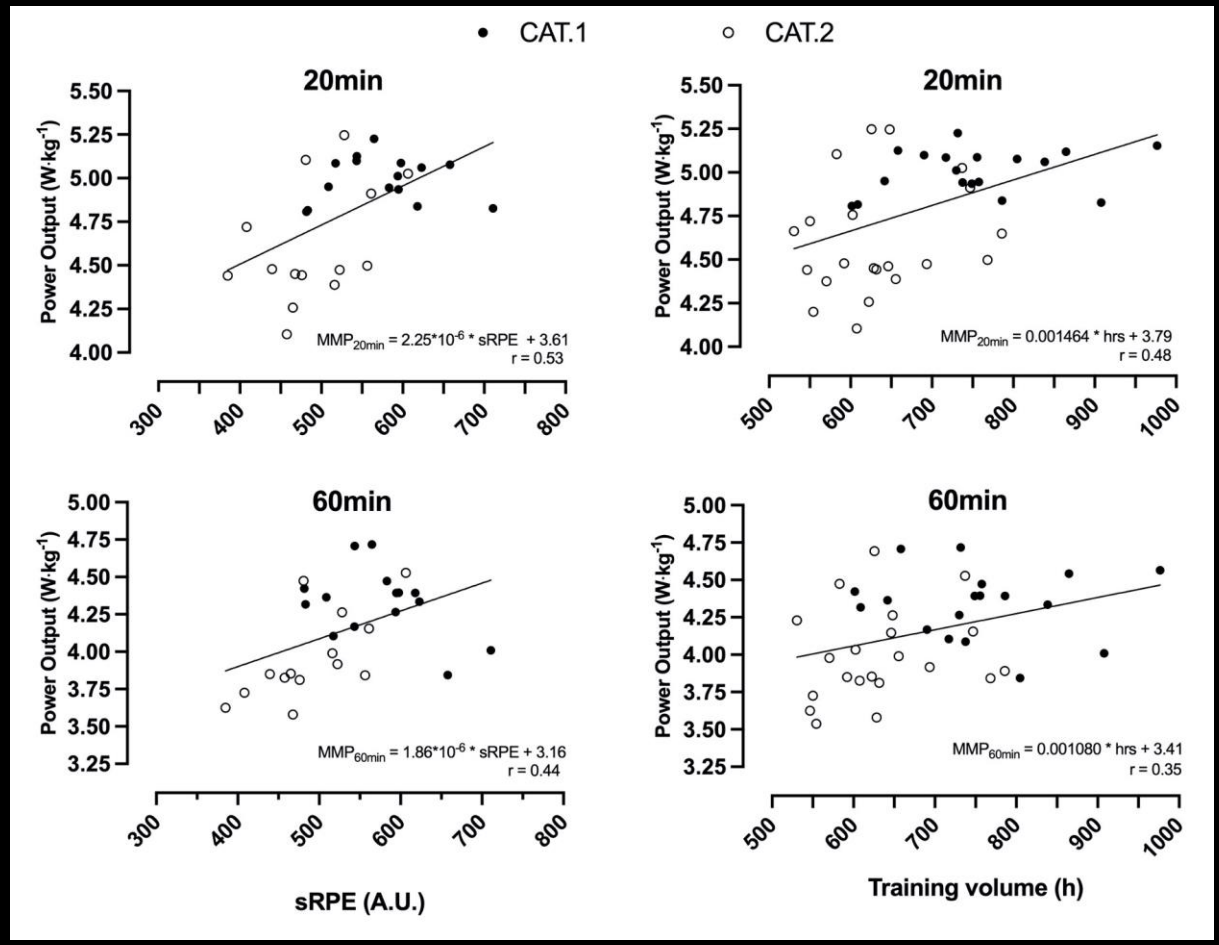

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Conclusions:

- First study to present total volume and load within female professional cycling.
- Successful cyclists train more compared to less successful cyclists.
- Relationship between training volume and MMPs.

Discussion:

- Young cyclists?
- Period of data collections.
- No relation with high explosive MMPs (strength training and muscle fibre type)

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In male cycling:

- Multiple studies which present the Powercurve of succesfull cyclists, only 1 study in femal cycling.
- The ability to reach high power output after accumulating load is highly important for succes.

Study:

- A total of 1 324 PO-files were collected from races
- Races are classified as successful (TOP5) or not successful (NOT-TOP5) races.

Menaspa 2017, Leo 2021, van Erp 2021, van Erp 2020

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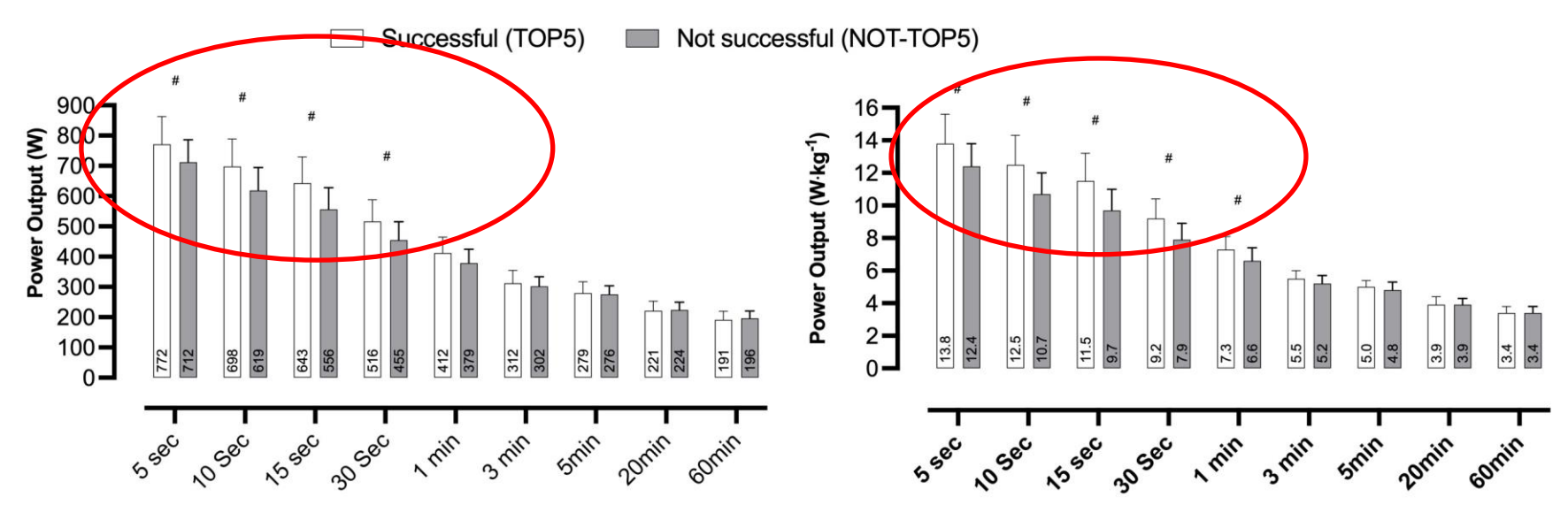
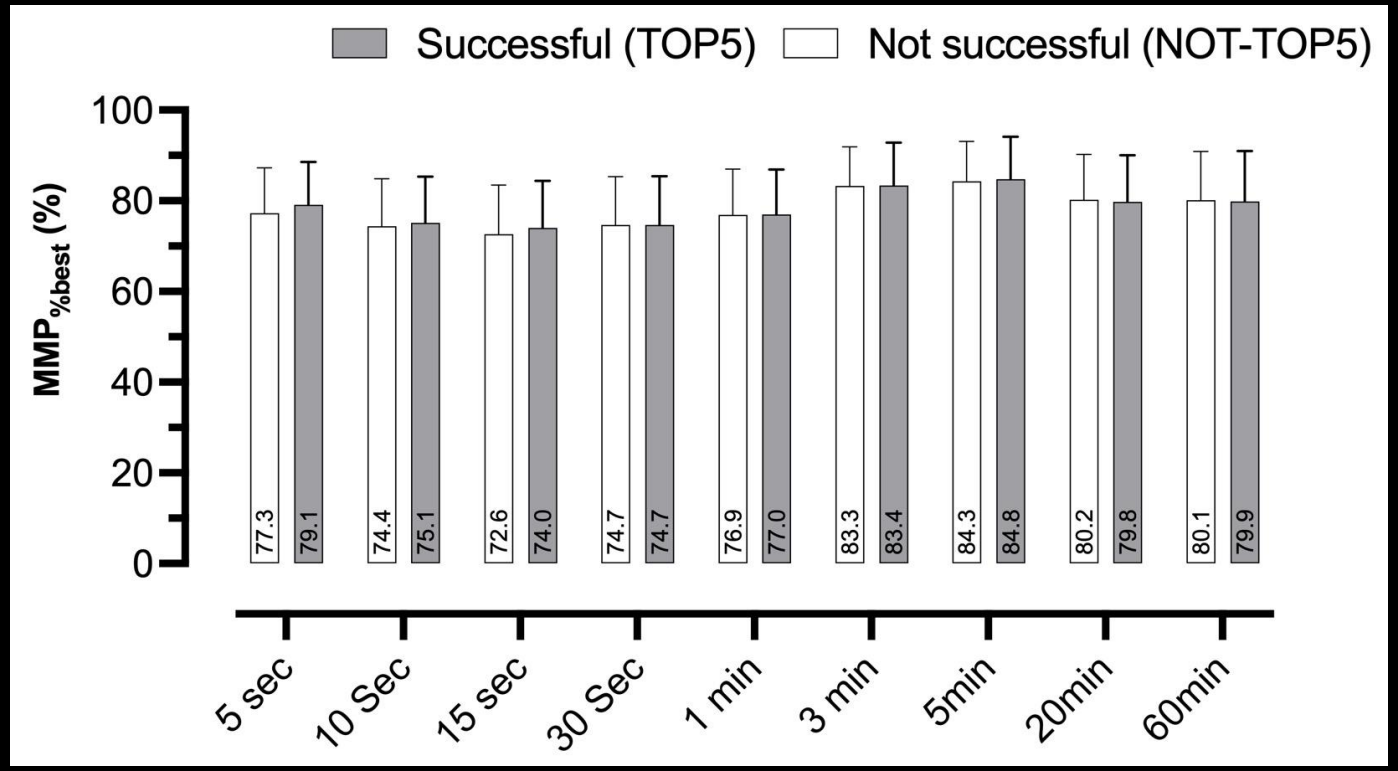


#Moderate difference

Performance indicators in female professional cycling



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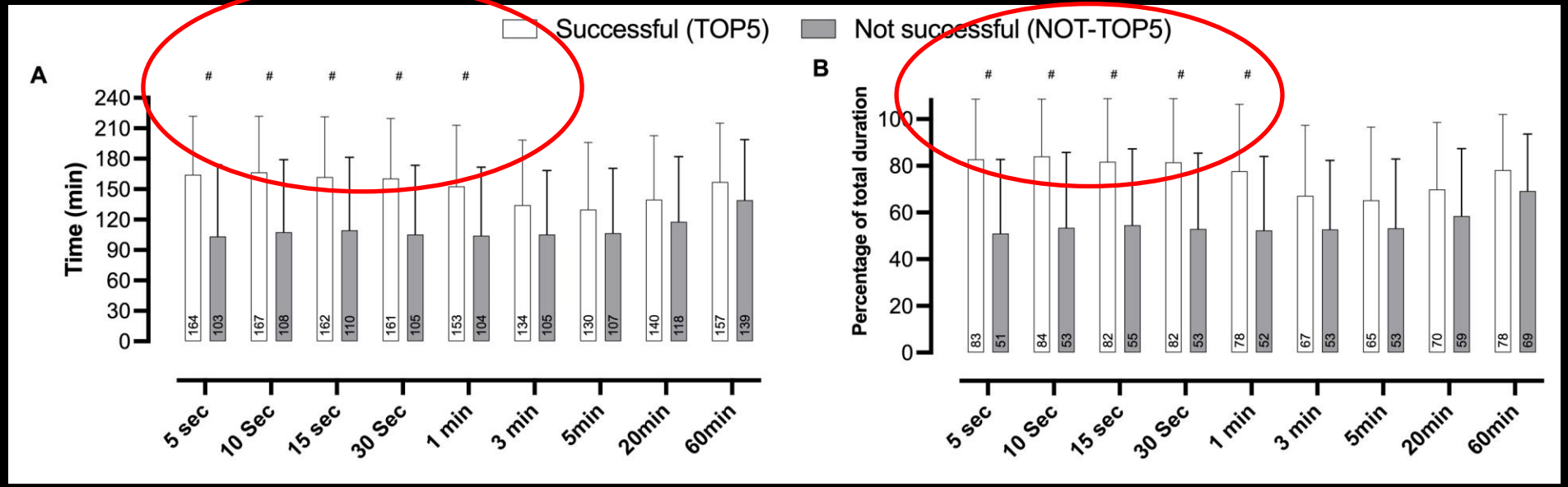

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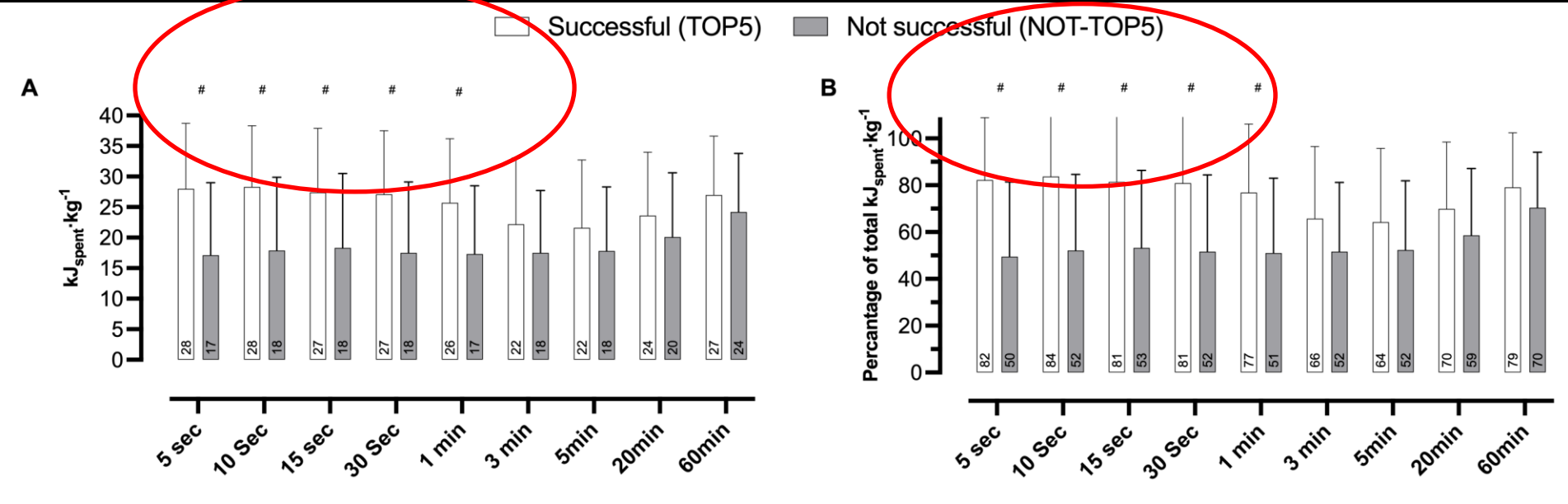

#Moderate difference

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Conclusions:

- Successful races are done with higher short duration MMPs
- $MMP_{\%best}$ not higher in successful races
- MMPs are done later and after more kJ in a successful races.

Discussion:

- Can we determine success based on MMP%best?
- Successful female cyclists have higher MMPs?

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Take home message:

- No differences in demands of different race levels (WT vs Level.1 vs Level.2).
- Differences in demands of race duration (Single vs Multi day events).
- Successful female cyclists have higher MMPs.
- Successful female cyclists have a higher seasonal load.
- Successful female cyclists can produce the their highest MMP later and after more kJ spent.

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Robert Lamberts

Contact: teunvanerp@hotmail.com

@the_teun