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# Pacing in Race Walking

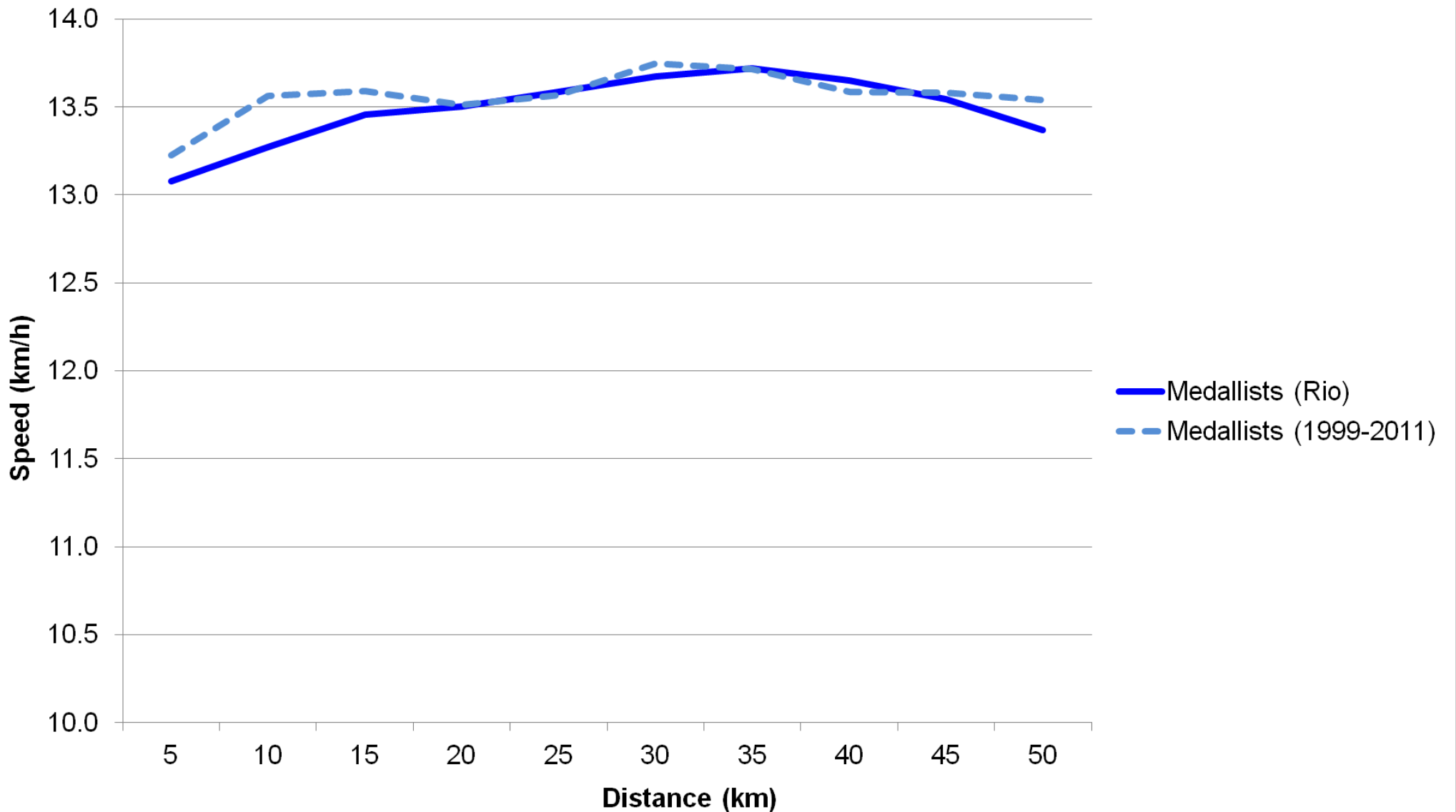


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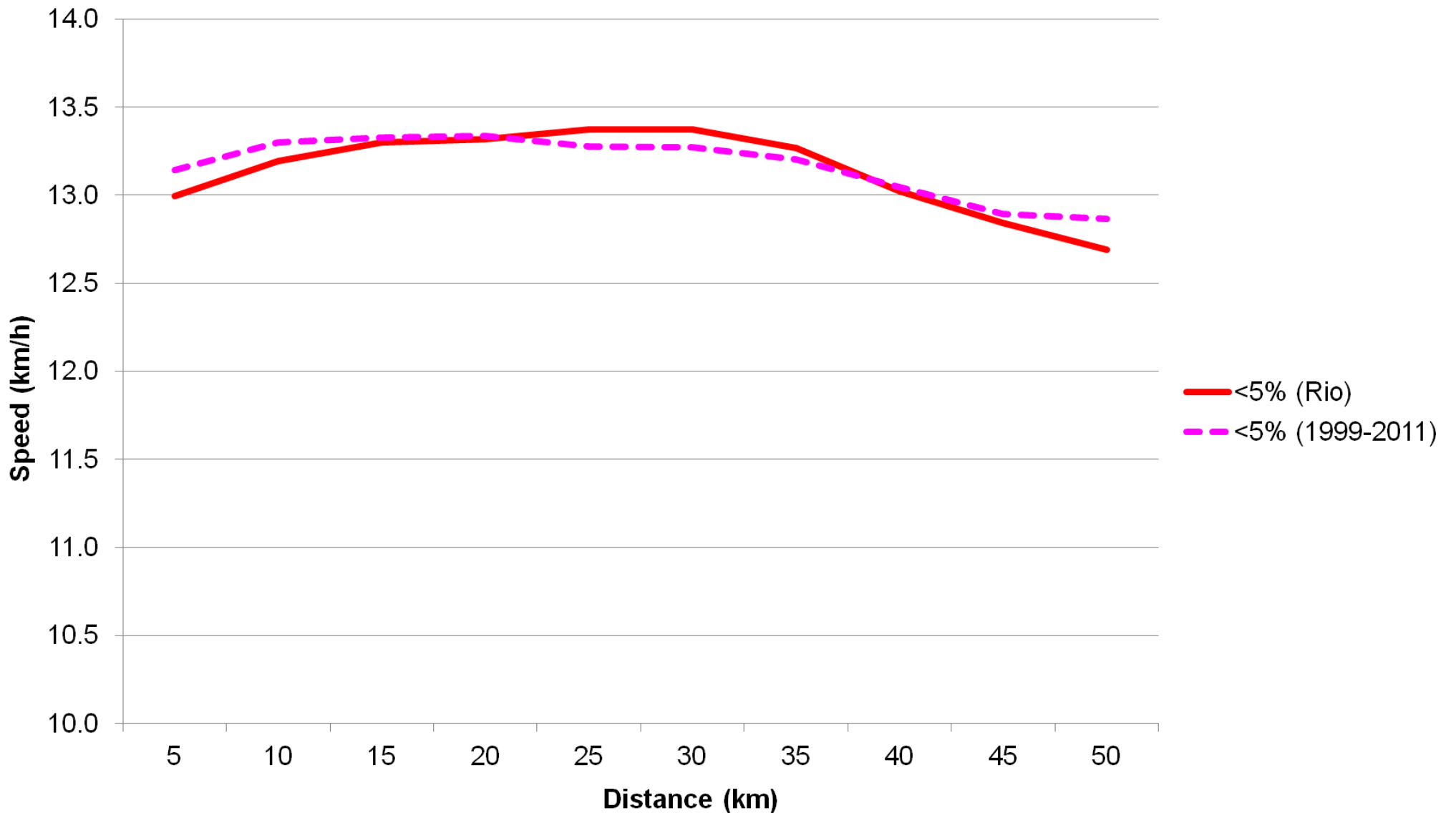
# Introduction

- Pacing an endurance event properly is one of the most important aspects to get right for success, whether that means winning a medal, achieving a PB, beating a particular rival, obtaining a qualifying time, or just getting to the finish.
- In general, an even pacing profile is considered the best approach from a physiological point of view. However, there are good tactical reasons to start quickly and then slow (positive pacing), whereas other athletes prefer to start slowly and speed up because of psychological reasons (negative pacing).
- As an example, we will look first at the pacing profiles of the 50 km race at the Olympic Games in Rio and how they compare to previous World Championship races (1999-2011).

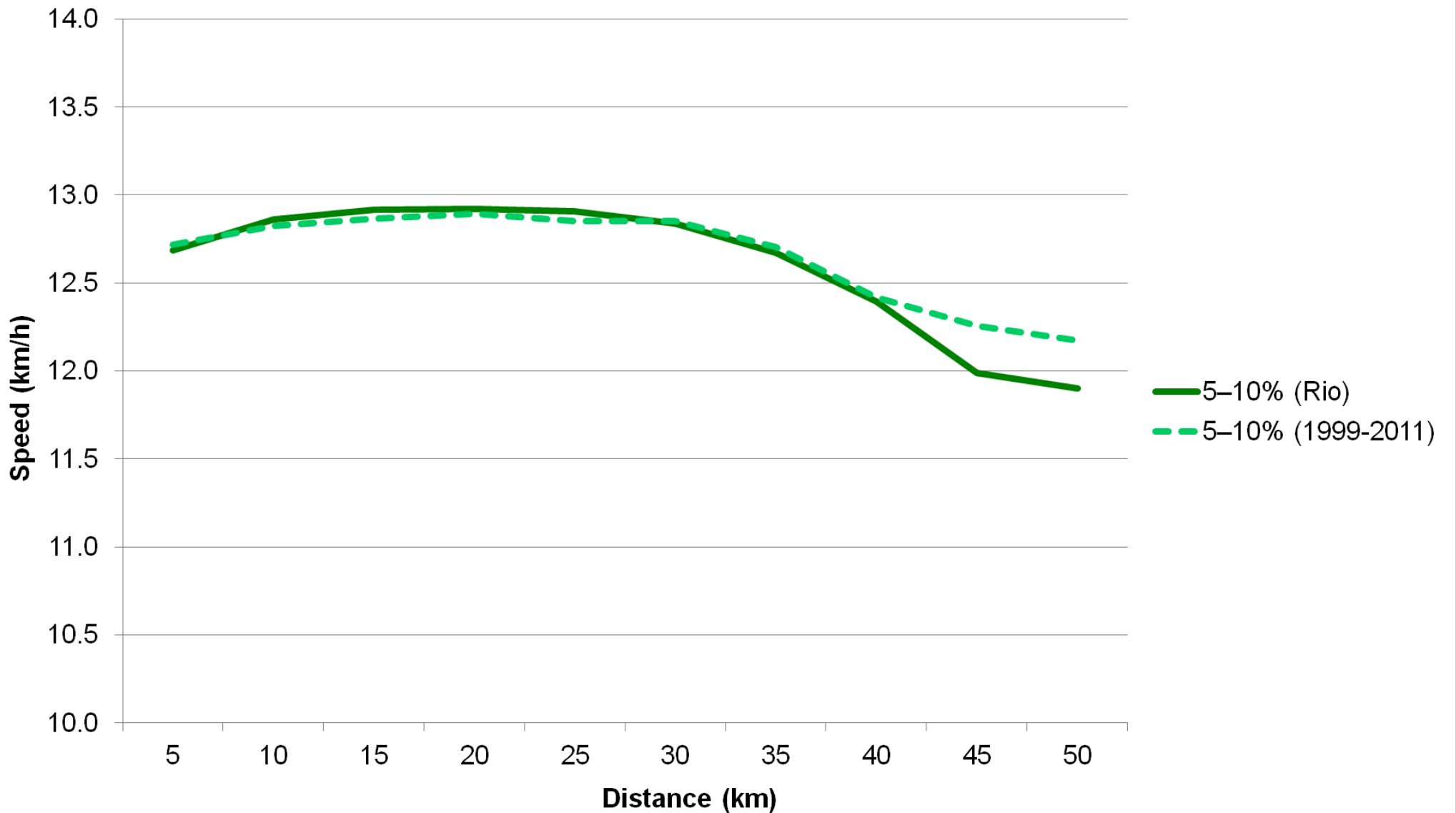
# Rio 2016 vs. World Champs – 50 km



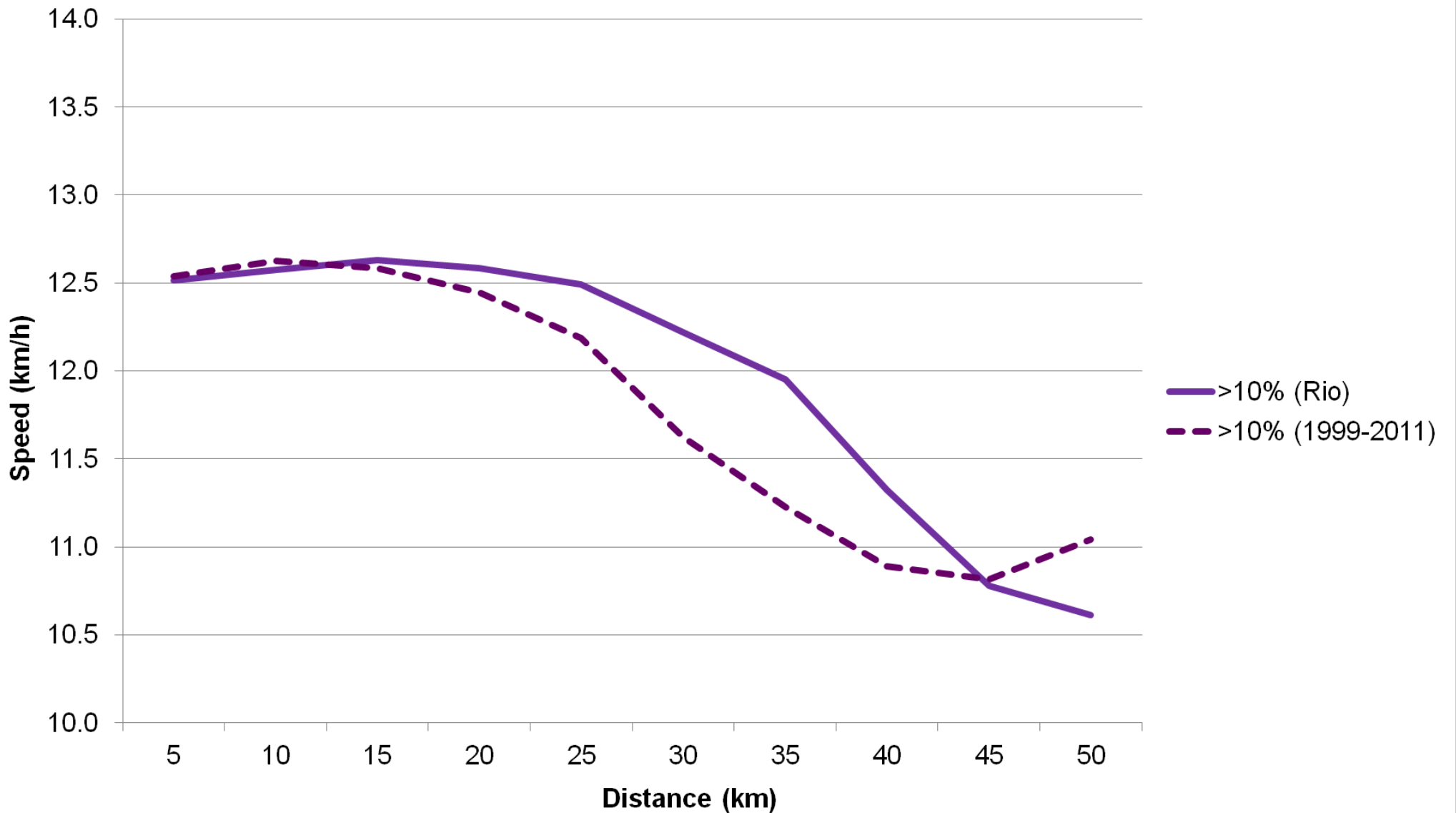
# Rio 2016 vs. World Champs – 50 km



# Rio 2016 vs. World Champs – 50 km

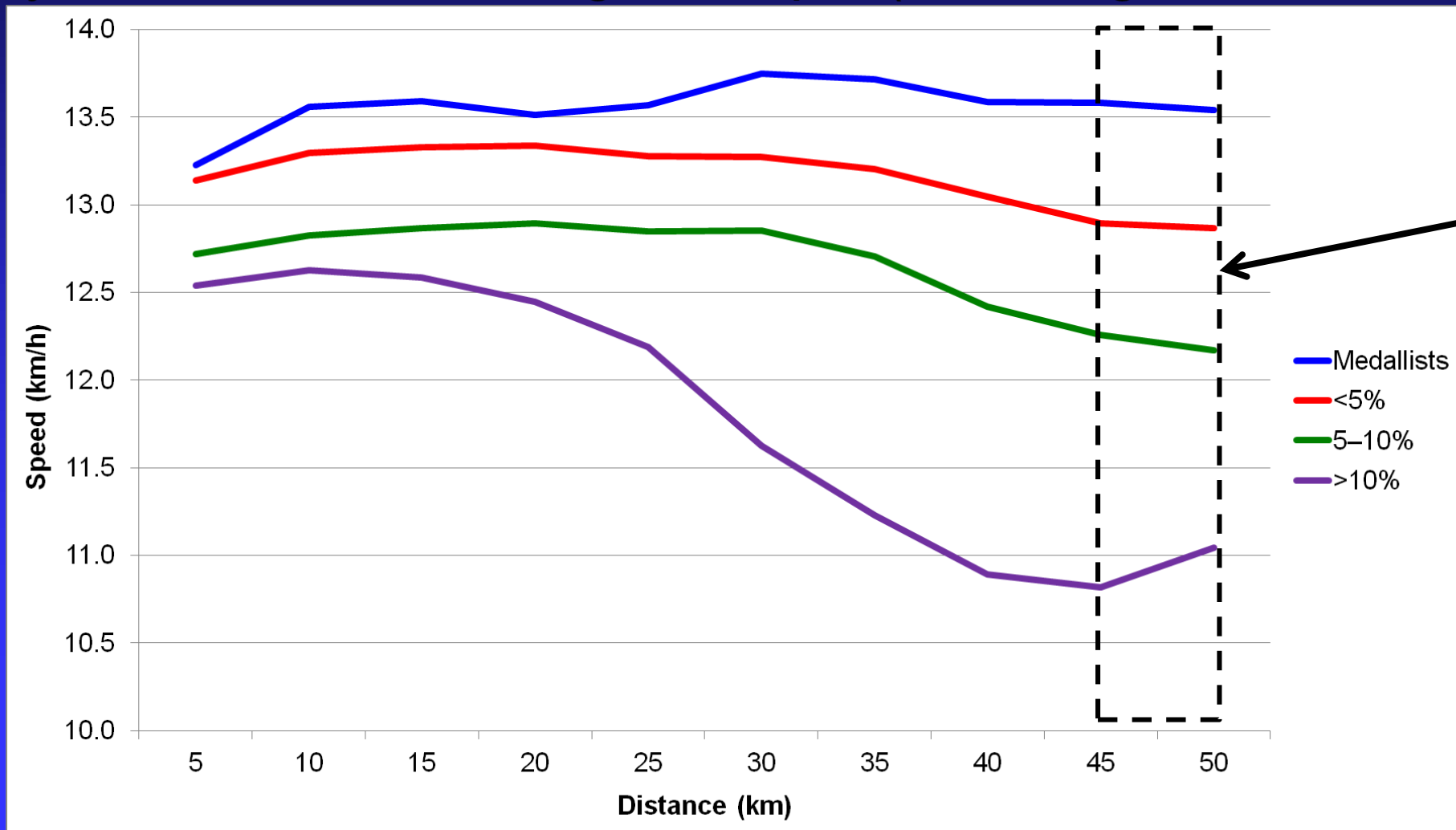


# Rio 2016 vs. World Champs – 50 km



# Rio 2016 – 50 km summary

- Overall, these athletes completed the second half 6.1% slower. Only 9 athletes had a negative split (including all three medallists)

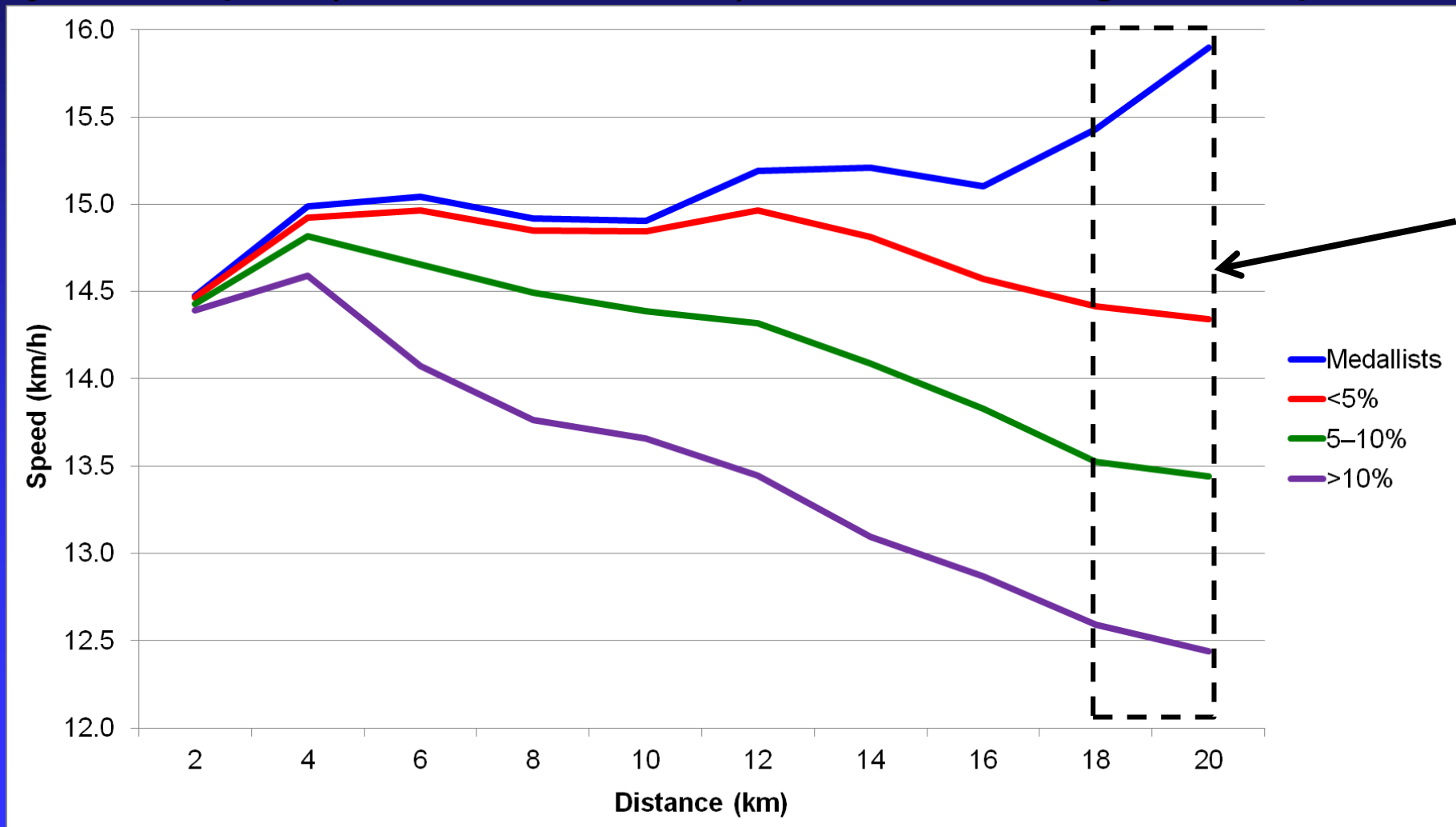


47%  
sped  
up in  
the last  
5 km



# Rio 2016 – 20 km men summary

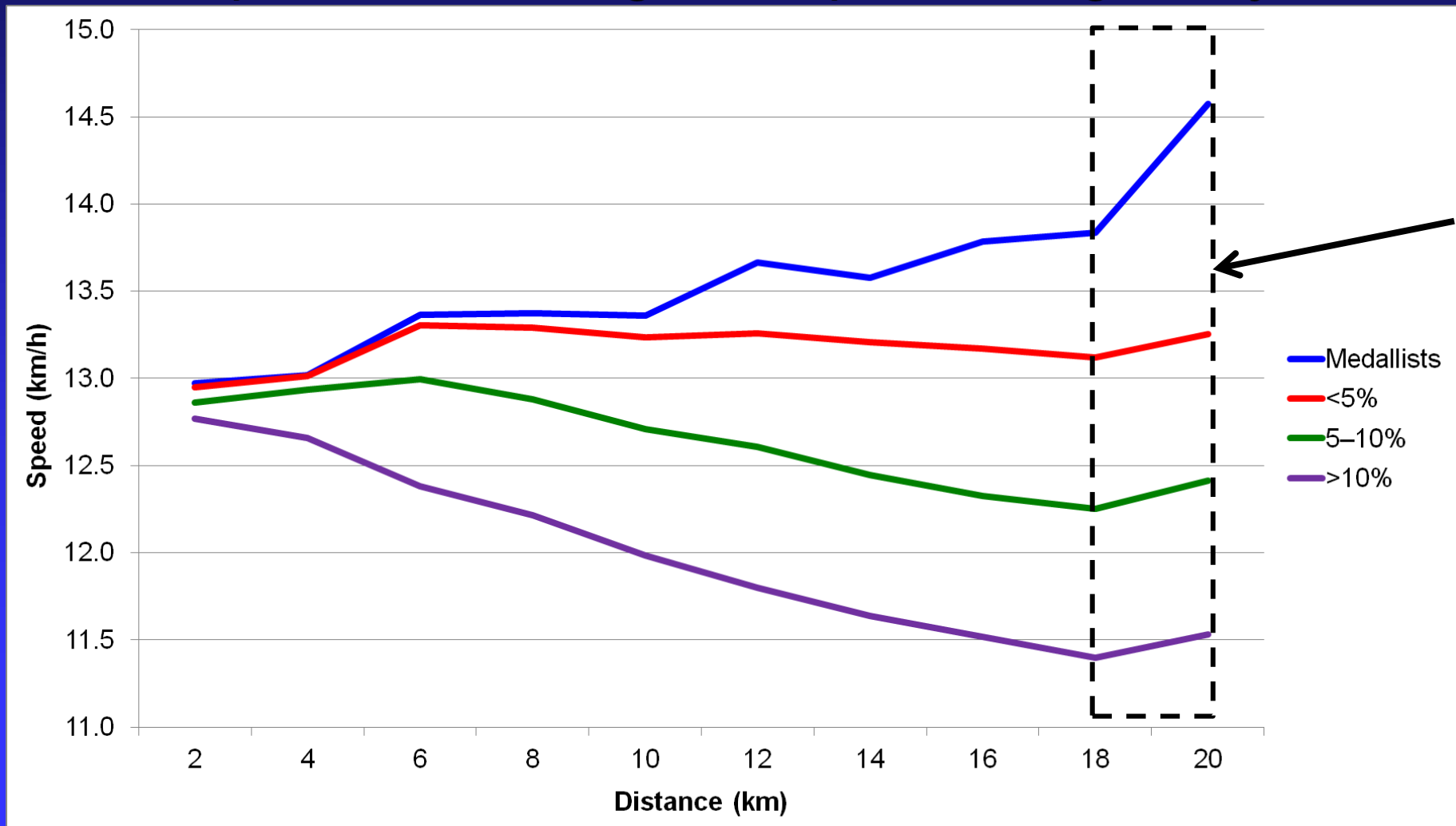
- Overall, the 20 km men were 4.1% slower in the second half. Only the top 9 (and two others) recorded negative splits.



51%  
sped  
up in  
the last  
2 km

# Rio 2016 – 20 km women summary

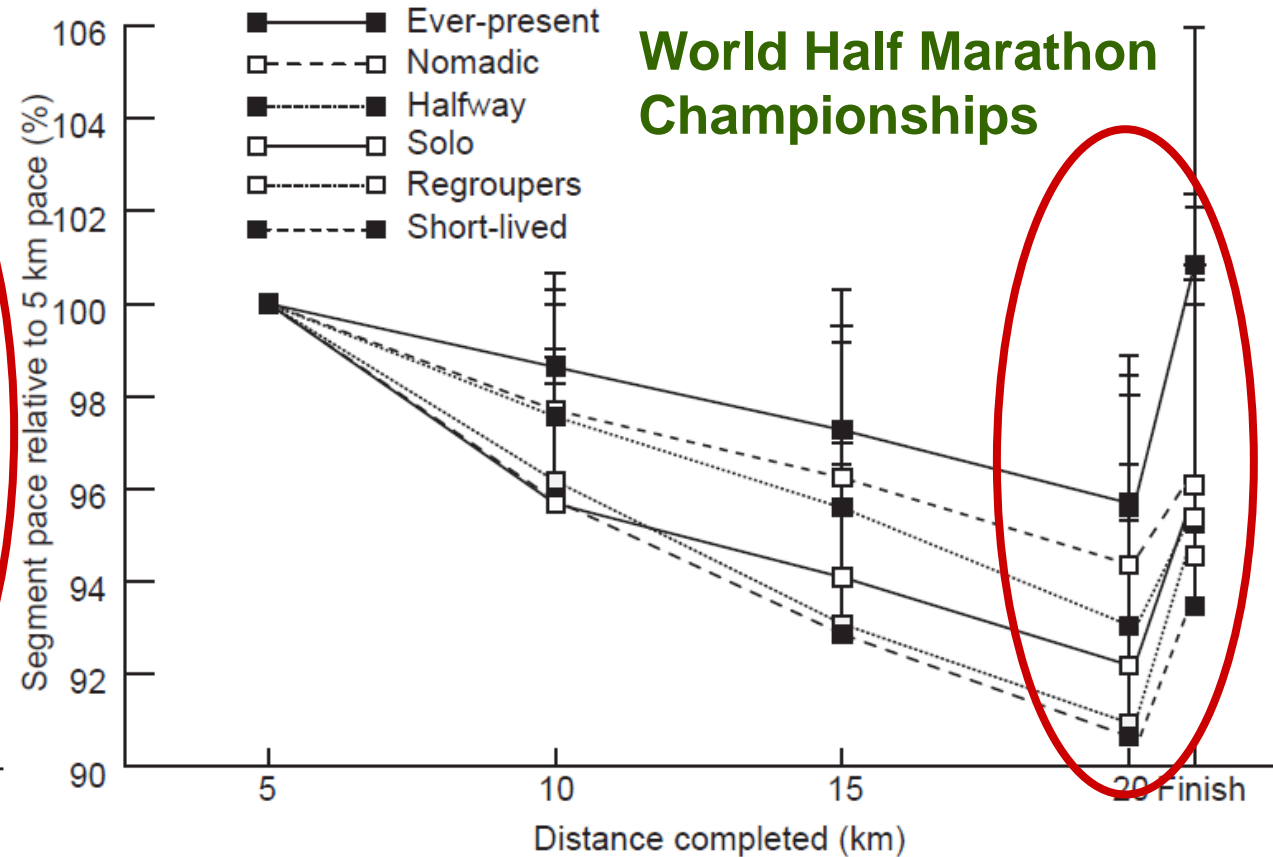
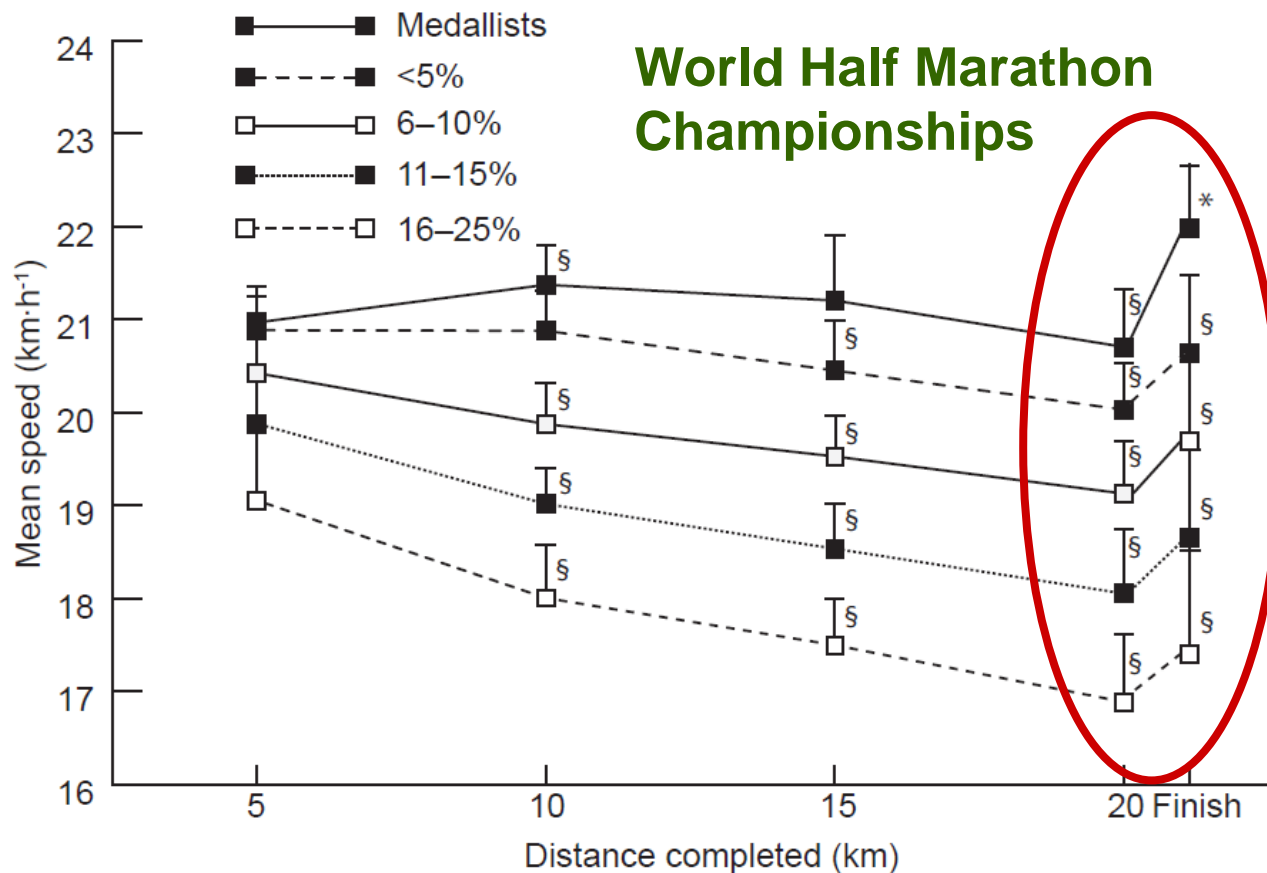
- The 20 km women slowed by an average of 3.7% in the second half. The top 10 all had negative splits, along with just two others.



75%  
sped  
up in  
the last  
2 km

# Knowledge of the endpoint

- It is quite normal for distance athletes to speed up in the final stages, and some deliberately slow down beforehand to aid this.



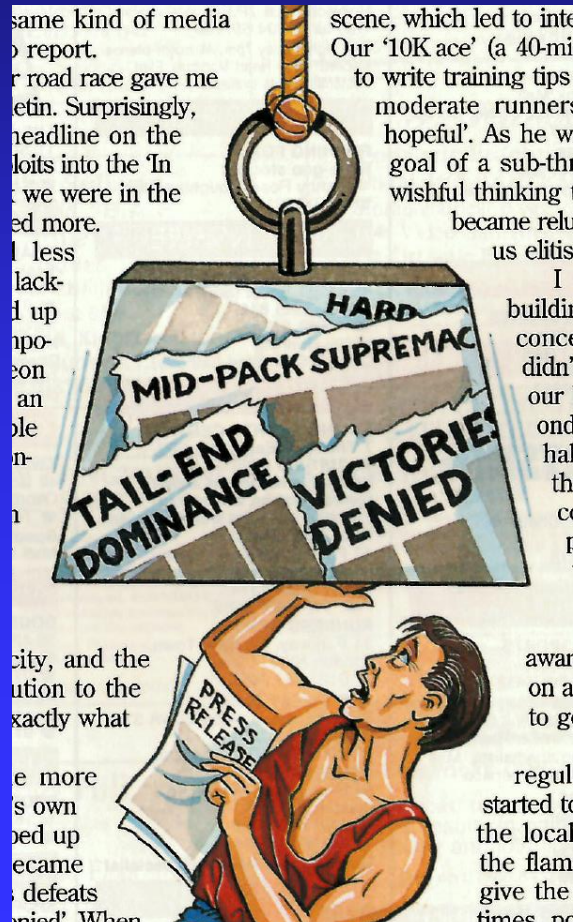
# Using other athletes as pacemakers

- One interesting phenomenon is how athletes use others as external references for pacing. Athletes who stay next to each other (as friend or foe) tend to have more even pacing.

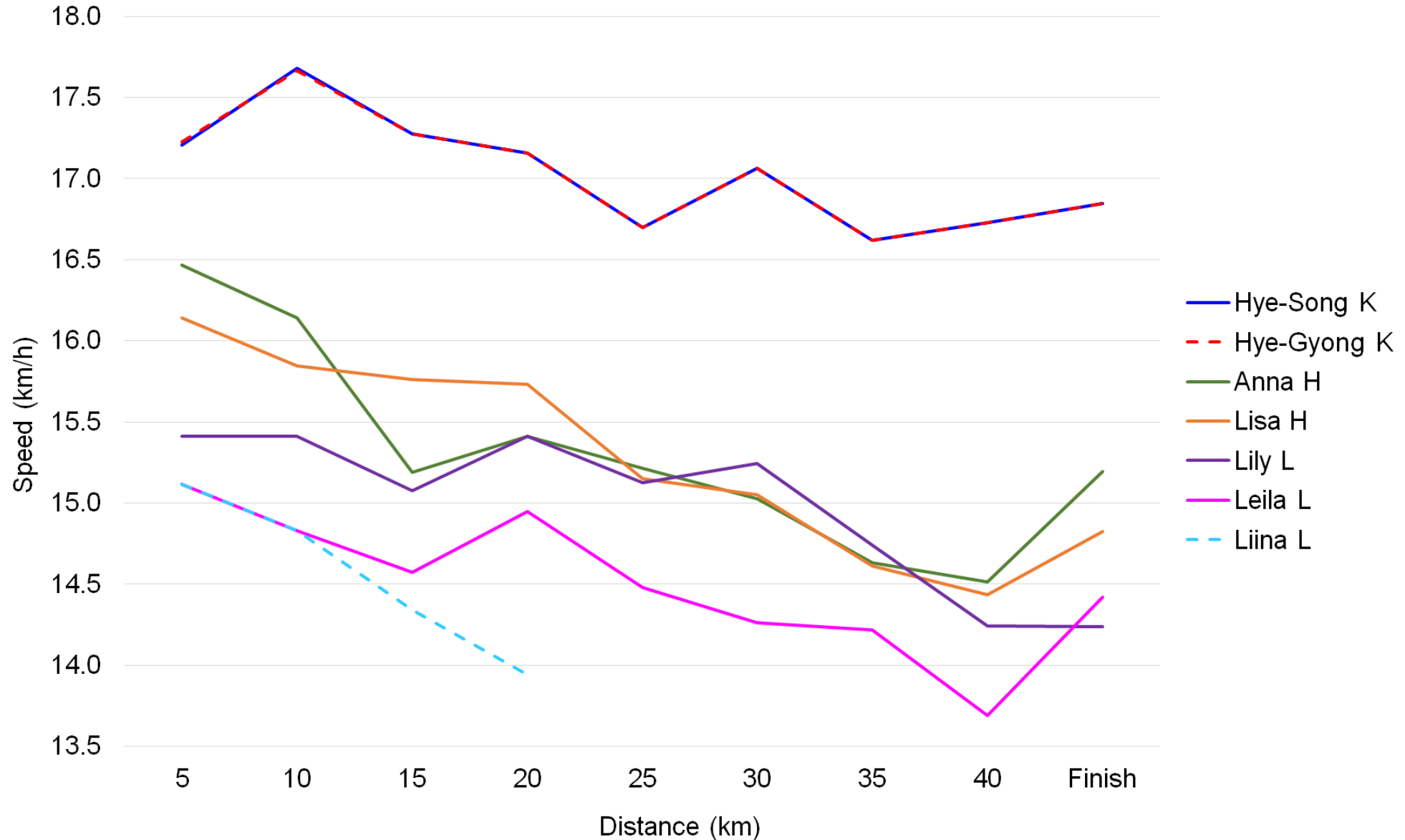


# Using other athletes as pacemakers

- However, the downside of sticking with other athletes is that it can affect overall race strategy. In effect, winning a private battle becomes more important than achieving the best possible time.



# Using other athletes as pacemakers



# Rating of Perceived Exertion (RPE)

- One reason given for why athletes start too fast is that their RPE is low. This means they base their starting speed on how they feel then rather than how they expect to feel later in the race. This can mean they later experience a high Hazard Score and have to slow down to avoid catastrophe.
- Being able to ignore RPE (and other emotions) and stick to a sensible pace is one of the key skills to develop in athletes.
- Athletes are advised to use previous best times to guide opening pace.

RPE	Description	Intensity Level
7	Easy	
8		
9	Very Light	
10		50% MHR
11	Fairly Light	
12		60% MHR
13	Somewhat Hard	
14		70% MHR
15		
16	Hard	80% MHR
17		
18	Very Hard	90% MHR
19	Very, Very Hard	
20		

# Pacing relative to personal best

		Men's 20-km	Women's 20-km	Men's 50-km
Medalists	Finishing time, mean (SD)	1:20:32 ( $\pm$ 2:05)	1:29:04 ( $\pm$ 1:32)	3:42:30 ( $\pm$ 3:51)
	% of personal best, mean (SD)	103.0 ( $\pm$ 2.6)	101.9 ( $\pm$ 1.4)	101.2 ( $\pm$ 1.5)
	Number of personal bests	3	3	8
5% group	Finishing time, mean (SD)	1:22:39 ( $\pm$ 2:07)	1:31:38 ( $\pm$ 1:35)	3:48:25 ( $\pm$ 4:32)
	% of personal best, mean (SD)	103.9 ( $\pm$ 2.8)	102.9 ( $\pm$ 2.2)	101.7 ( $\pm$ 2.0)
	Number of personal bests	11	6	19
5–10% group	Finishing time, mean (SD)	1:25:22 ( $\pm$ 2:12)	1:34:39 ( $\pm$ 1:57)	4:00:07 ( $\pm$ 4:30)
	% of personal best, mean (SD)	105.0 ( $\pm$ 3.1)	104.3 ( $\pm$ 2.7)	103.2 ( $\pm$ 2.5)
	Number of personal bests	2	3	10
10% group	Finishing time, mean (SD)	1:29:59 ( $\pm$ 2:51)	1:40:06 ( $\pm$ 3:19)	4:11:40 ( $\pm$ 7:42)
	% of personal best, mean (SD)	109.0 ( $\pm$ 4.7)	106.8 ( $\pm$ 3.9)	107.6 ( $\pm$ 3.6)
	Number of personal bests	1	2	0



# World Champs 1999-2011 – 50 km

- The slowest starters relative to personal best pace (over the first 10 km) were the medallists (103.6%) whereas the >10% group started the fastest at 102.2%.
- No medallists were ahead of personal best pace by 10 km.
- Twelve athletes in the >10% group were ahead of personal best pace after the same distance but ultimately none of these athletes achieved a personal best time.
- Eleven of the 49 athletes who dropped out were ahead of personal best pace after 10 km.
- Only 13 of the 51 athletes who completed the first 10 km at personal best pace achieved a personal best finishing time.
- Similar results were found over 20 km for men and women.

# The effects of the rules and judging

- One thing that restricts race walkers from starting too fast is the technique used (difficult to achieve speeds greater than  $v\dot{V}O_2$  max) and the fact that judges are monitoring for legality. Most disqualifications occur before halfway, and for some less experienced athletes this could be a result of poor pacing.

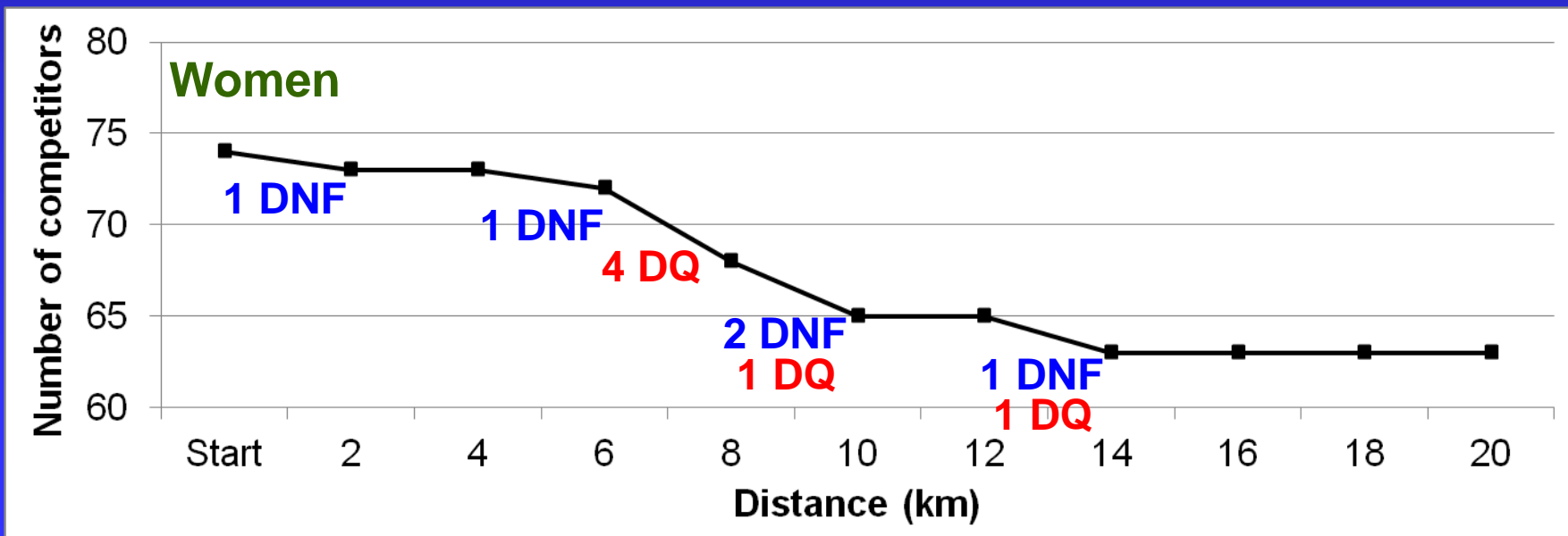
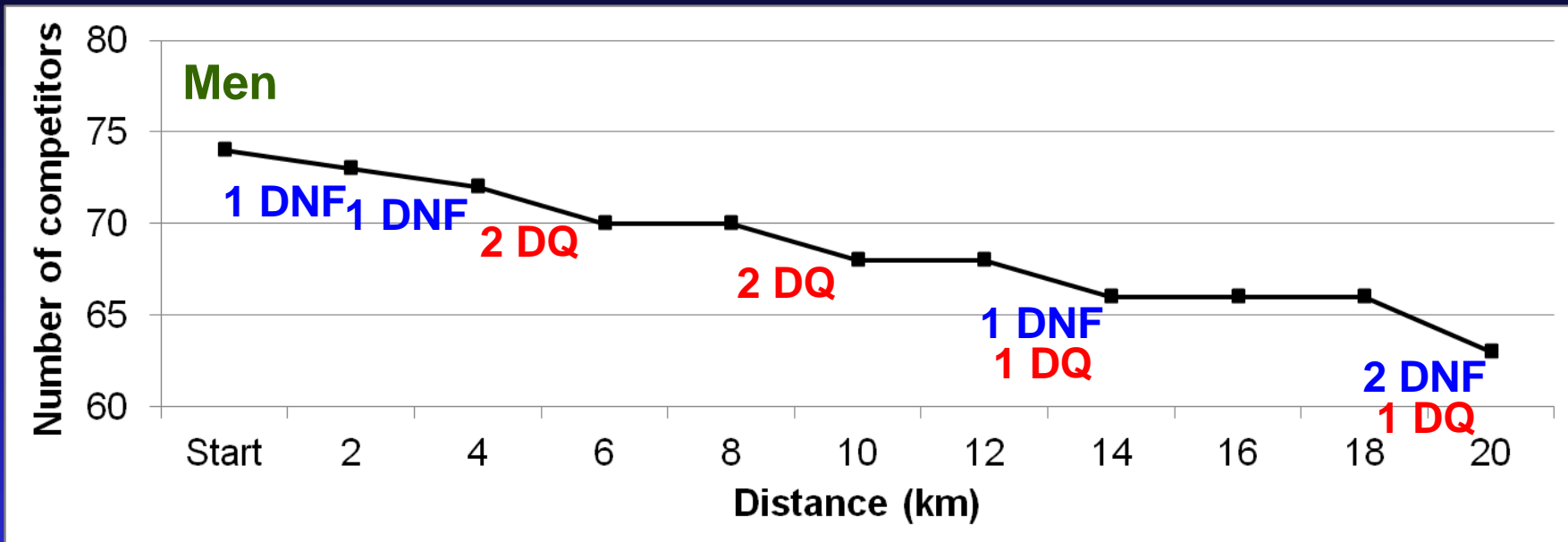


# The effects of the rules and judging

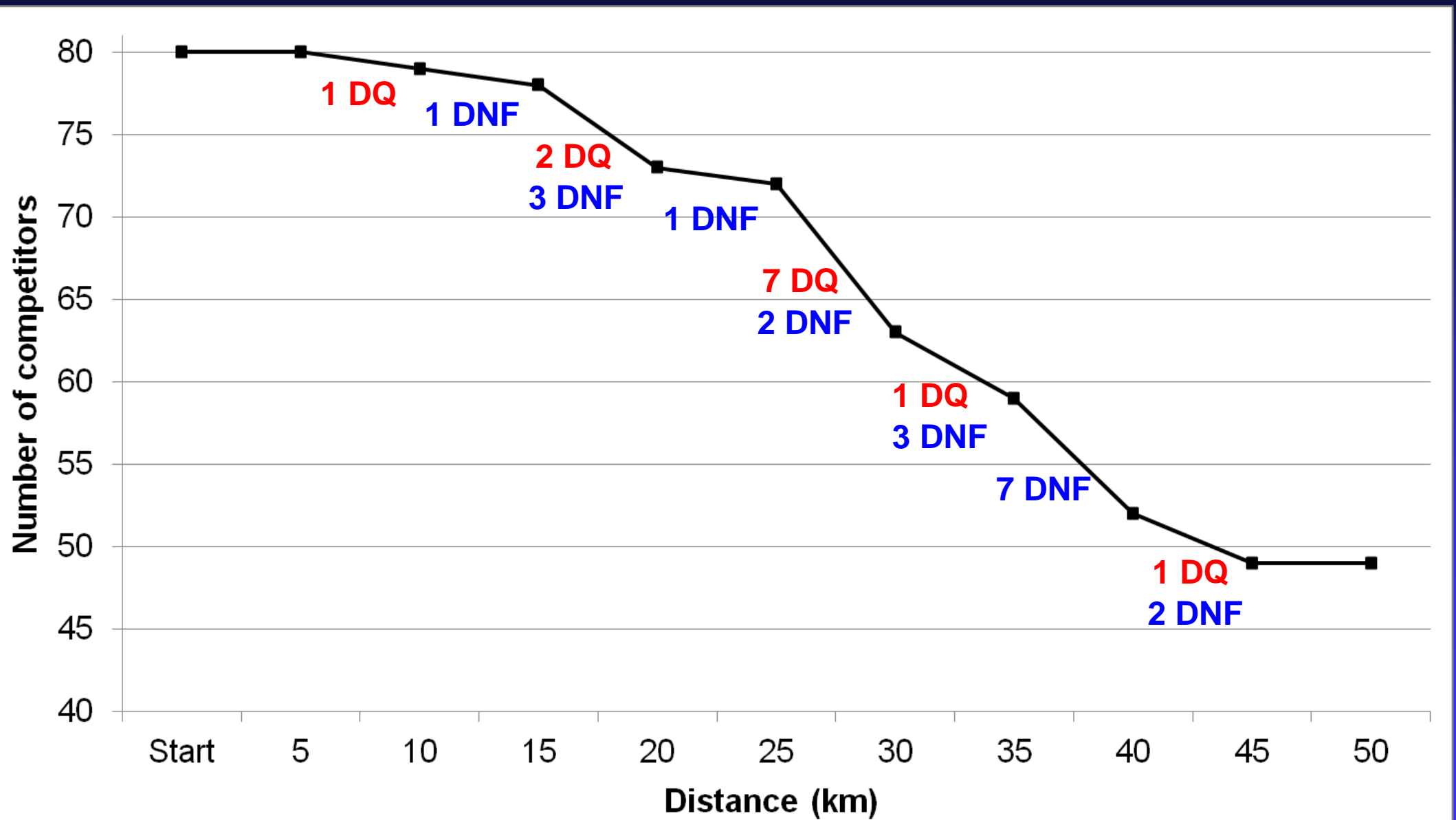
- There are two potential benefits from starting slightly too fast and sticking with a large group: being able to hide from judges; and being able to draft behind other athletes. However, middle and long distance runners reduce energy consumption by only 2 – 4% by shielding from the wind, and this will be lower for race walkers.



# Attrition in the 20 km – Rio 2016

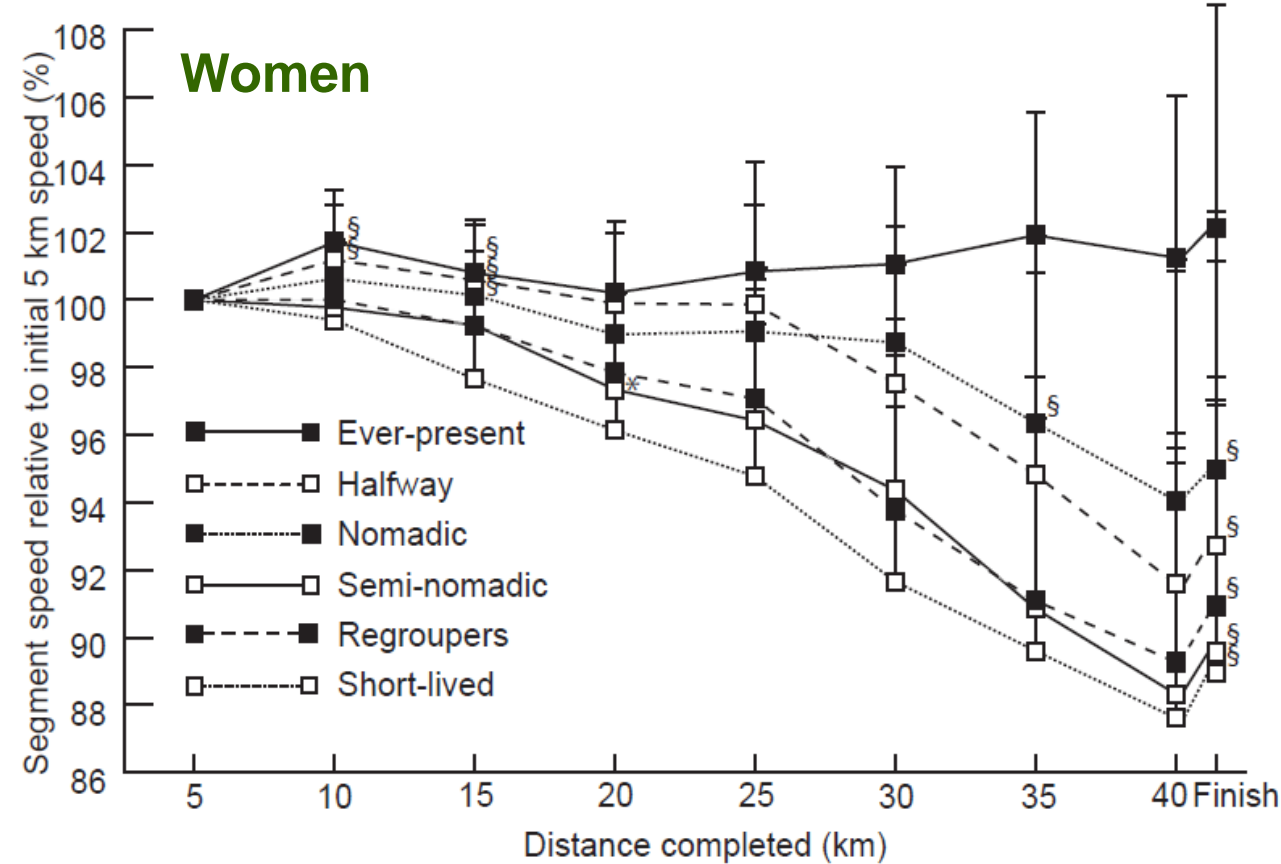
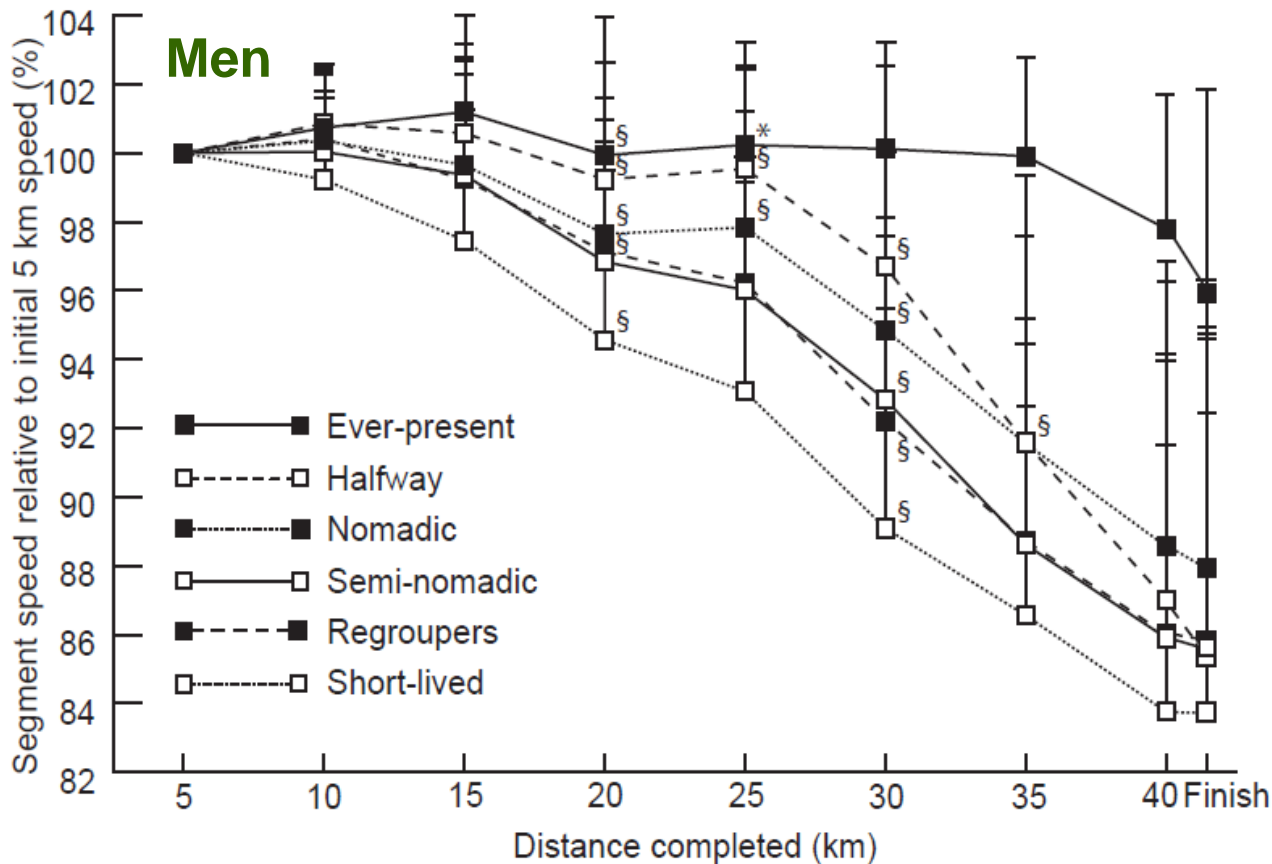


# Attrition in the 50 km – Rio 2016



# Sex-based differences

- Women have been shown to be better at pacing the marathon, with fewer dropouts, less deceleration, and more negative splits.



# Physiological / nutritional factors

- One reason given for women's more even pacing is a greater proportion of Type I (endurance) muscle fibres. Another physiological reason is men's greater likelihood of glycogen depletion.
- Performance benefits of a slower starting speed are reduced rates of carbohydrate depletion, lower excessive oxygen consumption, lower blood lactate concentrations and ultimately a better finishing time.
- Whereas 50 km walkers need to have a well-planned feeding strategy to delay the transfer to using lipids as fuel, most 20 km walkers do not need much refuelling (depending on ability).

# Biomechanical changes

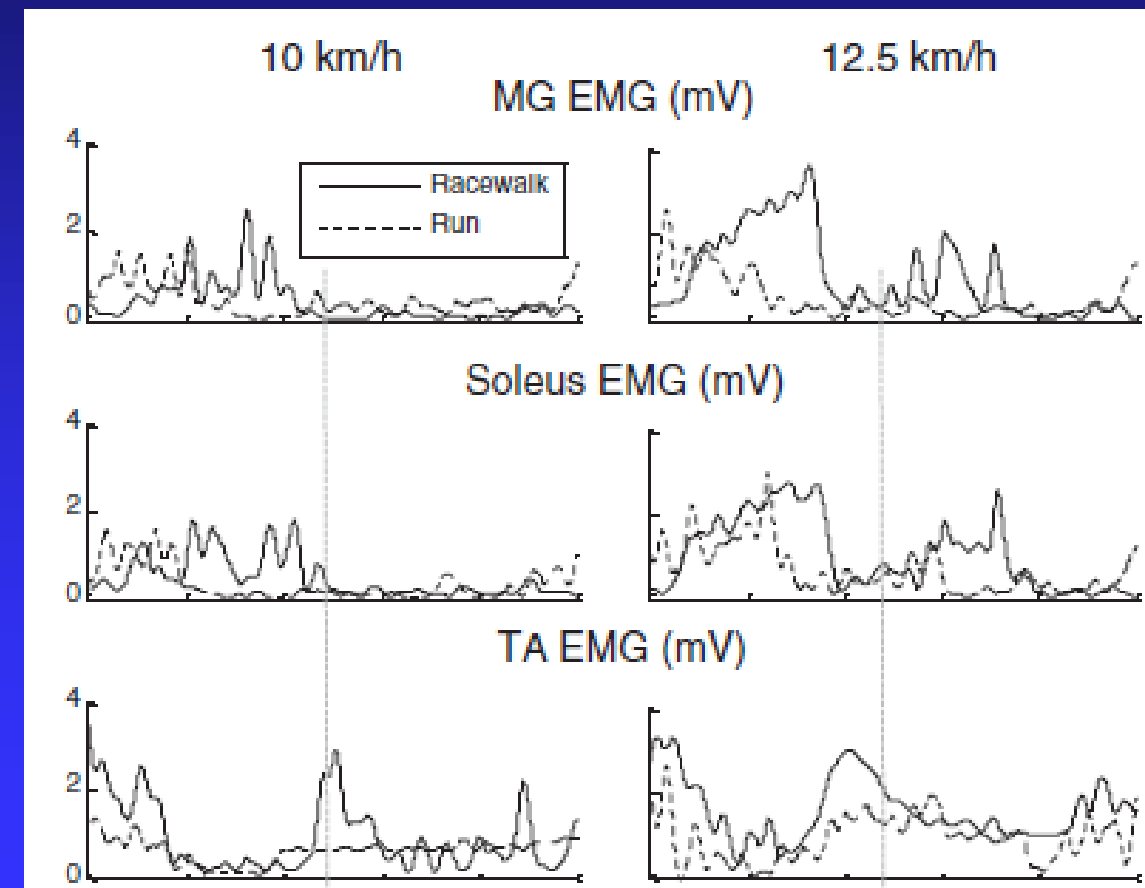
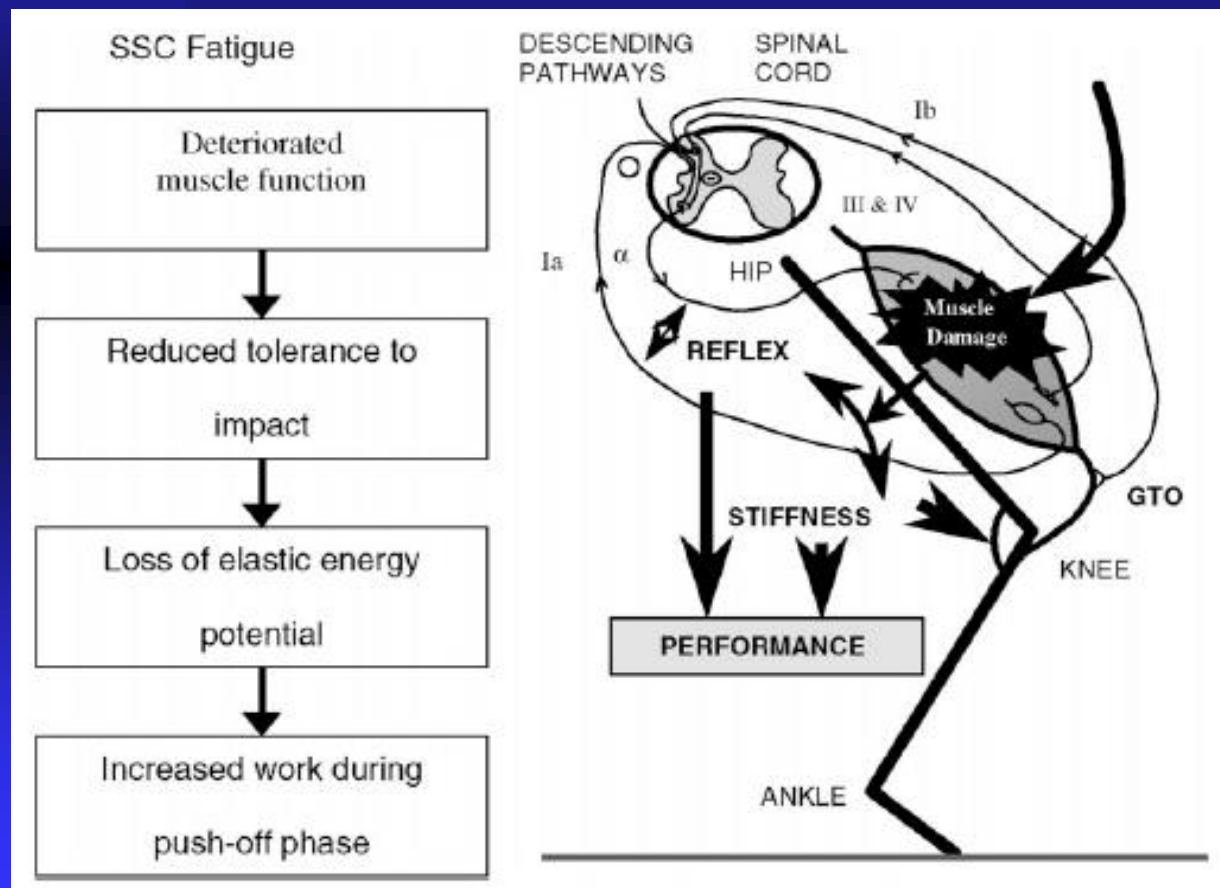
- How fast a race walker moves is determined by two main factors, step length and cadence. Previous research has shown that it is the decrease in step length that results in lower speeds in the latter stages of the 50 km. The shorter steps are caused primarily by shorter flight times, although pelvic rotation also decreases.
- Cadence seems to be maintained (or ‘protected’) during fatigue.

	Speed (km·h <sup>-1</sup> )	Step length (m)	Cadence (Hz)	Pelvic rotation (°)	Shoulder rotation (°)
18.5 km	14.11 (±0.61)	1.25 (±0.05)	3.14 (±0.08)	21 (±3)	18 (±3)
28.5 km	14.15 (±0.60)	1.24 (±0.04)	3.16 (±0.09)	19 (±2)	19 (±3)
38.5 km	13.98 (±0.76)	1.23 (±0.05)	3.16 (±0.11)	18 (±3)	18 (±3)
48.5 km	13.43 (±0.71)	1.20 (±0.05)	3.12 (±0.13)	17 (±3)	18 (±3)
Difference (%)	+0.3, -1.2, -3.2	-0.8, -0.8, -2.4	+0.6, 0.0, -1.3	-10, -2, -5	+1, -4, -2
ANOVA	$F_{1,71,18.76} = 9.35$ $P = 0.002$ $\eta_p^2 = 0.46$	$F_{3,33} = 10.88$ $P < 0.001$ $\eta_p^2 = 0.50$	$F_{3,33} = 1.91$ $P = 0.147$ $\eta_p^2 = 0.15$	$F_{3,33} = 5.75$ $P = 0.003$ $\eta_p^2 = 0.34$	$F_{3,33} = 1.86$ $P = 0.156$ $\eta_p^2 = 0.15$



# Biomechanical changes

- Muscle elasticity is a key part of race walking. Its decrease with fatigue means an increased reliance on energy generation.



# How to pace more evenly

- Psychological training?
- Use a treadmill in training?

**TABLE 2.** Temporal data (mean  $\pm$  SD) at each distance.

Distance (m)	Step time (s)	Contact time (s)	Flight time (s)	Flight time (%)
2,500	0.324 $\pm$ 0.013	0.285 $\pm$ 0.018	0.039 $\pm$ 0.016	12.1 $\pm$ 4.8
4,500	0.325 $\pm$ 0.013	0.283 $\pm$ 0.018	0.042 $\pm$ 0.015*	12.8 $\pm$ 4.7
6,500	0.326 $\pm$ 0.014	0.282 $\pm$ 0.017	0.044 $\pm$ 0.014*	13.4 $\pm$ 4.3*
8,500	0.326 $\pm$ 0.013	0.282 $\pm$ 0.017	0.044 $\pm$ 0.013	13.6 $\pm$ 4.1

\*A significant difference from the previous measurement is denoted as  $p \leq 0.05$  based on repeated-measure contrasts.

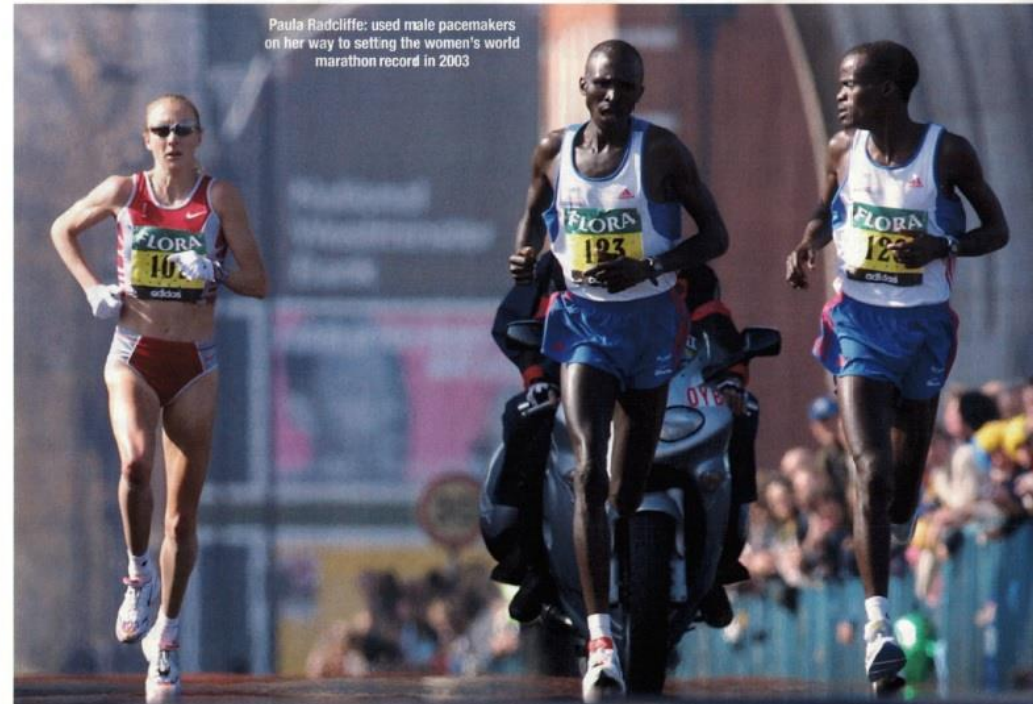
Hanley, 2015b

- Use a pacemaker?

# How to pace more evenly

AW/ PERFORMANCE

COACHING



Paula Radcliffe: used male pacemakers on her way to setting the women's world marathon record in 2003

MARK OLSZEWSKI

## KEEP TO THE PACE

**THE PACING AND PACKING TACTICS OF WORLD-CLASS MARATHON RUNNERS HAVE BEEN EXPLORED IN NEW RESEARCH BY DR BRIAN HANLEY**

after about 20 miles when the body's carbohydrate stores have been depleted so much that fat becomes an increasingly important fuel source, notwithstanding that the athlete is tiring anyway. Strategies to combat this seemingly inevitable outcome have included meticulous carbo-loading before the race and ensuring a ready

relatively quick start followed by decreases in pace, especially amongst those athletes finishing in the minor positions.

As expected, the 30km distance was when most runners started slowing significantly, but it was also at about this point in the race when most dropouts occurred. While my results were not

# Conclusion

- Most race walkers record positive splits in competition, and might be better off starting slower (relative to PB / SB pace). Learning to ignore how easy the early pace can feel is a key skill to develop.
- This can be difficult because athletes like to use rivals and friends as external references for pacing (herd behaviour), and this is generally the least psychologically taxing strategy.
- Athletes occasionally slow before the final stages on purpose to save metabolic reserves for a fast finish, but speeding up near the end is also because of the psychological boost of knowing the end is near (very few DNFs in the last 10% of the race).
- A relatively slow start is best from a physiological point of view, and can help athletes maintain the required biomechanical output.

Thank you for your attention!



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