



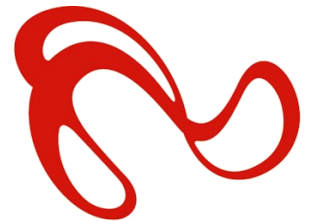
BRITISH FENCING  
NATIONAL ACADEMY

# DETERMINANTS OF REPEAT SPRINT ABILITY

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# Presentation Outline

- This presentation will use the most current, peer-reviewed research to discuss the following:
- What is it RSA and its significance to performance
- Determinants:
  - Aerobic capacity
  - Lactate buffering
  - Speed, strength and power
- *Here, sprint refers to efforts of  $\leq 10$ s, whereby peak power could be maintained throughout*

# First, Establish the Physiological Demands

- What are the work to rest ratios (W/R) for Fencing:
  - Epee
  - Foil
  - Sabre
- Roi & Bianchedi. (2008). *The Science of Fencing. Sports Med.*
  - 1:1 in Epee
  - 1:3 in foil

# Energy Systems

- Sprints rely on the muscle's stores of
  - Adenosine triphosphate (ATP)
  - Phosphocreatine (PCr)
- Both are replenished via the aerobic system
- Many coaches assume ↑ aerobic capacity ( $\text{VO}_2\text{max}$ ) = ↑ recovery and ↑ RSA

# VO<sub>2</sub>max

- Conflicting findings due to the RSA test used
- For example:
  - moderate correlation ( $r = -0.35$ ) using 8 X 40m sprints with 30s of recovery between sprints (Aziz et al., 2000)
  - But not 6 X 20m sprints with 20s of recovery between sprints (Aziz et al., 2007)
- Length of the sprint alters contribution of the aerobic system (Balsom et al., 1992)


# VO<sub>2</sub>max Summary

- VO<sub>2</sub>max unrelated to RSA with sprints ≤40m (or 6s) (Da Silva et al., 2010)
- Also, recovery between sprints affects RSA (Bogdanis et al., 1996)
- If recovery is long enough, ATP and PCr can be resynthesized during recovery phases via the aerobic system (Glaister, 2005)
- If recovery is too short, thus inhibiting PCr repletion, the contribution of anaerobic glycolysis is increased as reflected by higher lactate levels (Glaister et al., 2005)


# But...

- $VO_2$ max may be important only after certain number of sprints (Thebault et al., 2011)
- Researchers skeptical to conclude  $VO_2$ max is not important until protocols of match duration performed (Castagna et al., 2007)
- But they are referring to team sports like football and rugby

# Lactate Threshold

- Da Silva et al., (2010): RSA test of 7 X 35m sprints (involving a change of direction) and 25s recovery, produced high lactate ( $15.4 \pm 2.2\text{mmol/L}$ )
- Inability to maintain RSA subsequent due to lactate, hydrogen ( $\text{H}^+$ ) and depletion of PCr (Spencer et al., 2005)
- Velocity at onset of blood lactate accumulation (vOBLA) better correlated with RSA ( $r = -0.49$ )
- vOBLA reflects peripheral adaptations =  capillary density and capacity to transport lactate and  $\text{H}^+$  ions (Bilat et al., 2003; Thomas et al., 2004)

# Speed, Strength and Power

- Da Silva et al., (2010) (protocol aforementioned) and Pyne et al., (2008) (using 6 X 30m sprints with 20s rest):
- Strongest predictor of RSA was anaerobic power i.e., fastest individual sprint time
- Explained 78% of variance and relationship ( $r$ ) of 0.66 respectively
- Training should also  sprint speed, strength and power

# Conclusion Part I

- ↑ anaerobic qualities such as strength, power and speed
- ↑ vOBLA
- These are regardless sport's W/R

# Conclusion Part II

- Sports that require:
- repeated high intensity efforts over a prolonged period of time (e.g., >15min),
- in which athletes are required to cover >40m per interval
- and regularly produce efforts  $\geq 10s$ ,
- would benefit  $\uparrow$   $VO_2max$

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