INDICE

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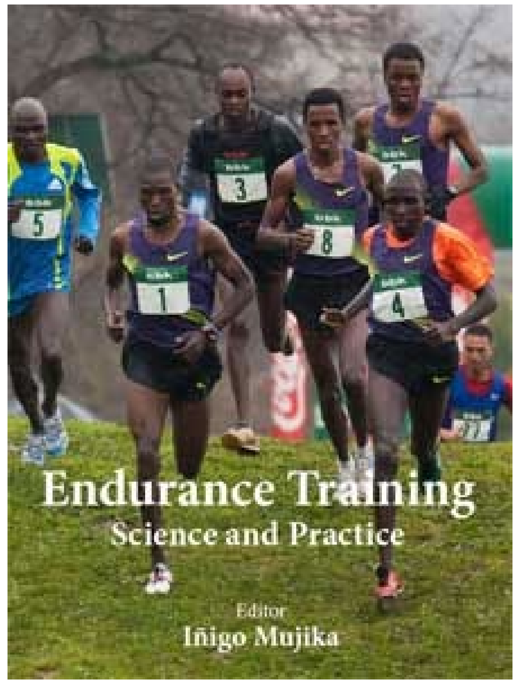

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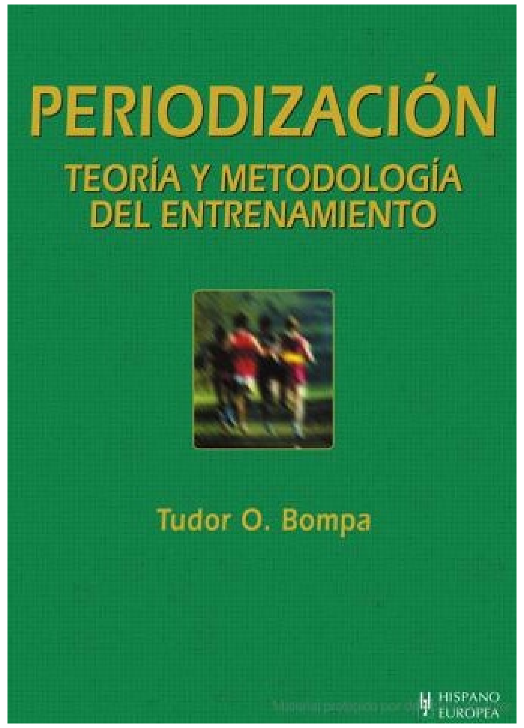

REVIEW ARTICLE

Sports Med 2010; 40 (3): 189-206
0112-1642/10/0003-0189/$49.95/0

New Horizons for the Methodology and Physiology of Training Periodization

Vladimir B. Issurin

Elite Sport Department, Wingate Institute, Netanya, Israel

REFERENCIAS

BRIEF REVIEW

International Journal of Sports Physiology and Performance, 2010, 5, 276-291

What is Best Practice for Training Intensity and Duration Distribution in Endurance Athletes?

Stephen Seiler

Aerobic endurance training improves soccer performance

JAN HELGERUD, LARS CHRISTIAN ENGEN, ULRIK WISLØFF, and JAN HOFF
Norwegian University of Science and Technology, Department of Sport Sciences, N-7491 Trondheim, NORWAY

ABSTRACT

HELGERUD, J., L. C. ENGEN, U. WISLØFF, and J. HOFF. Aerobic endurance training improves soccer performance. *Med. Sci. Sports Exerc.*, Vol. 33, No. 11, 2001, pp. 1925–1931. **Purpose:** The aim of the present study was to study the effects of aerobic training on performance during soccer match and soccer specific tests. **Methods:** Nineteen male elite junior soccer players, age 18.1 ± 0.8 yr, randomly assigned to the training group ($N = 9$) and the control group ($N = 10$) participated in the study. The specific aerobic training consisted of interval training, four times 4 min at 90–95% of maximal heart rate, with a 3-min jog in between, twice per week for 8 wk. Players were monitored by video during two matches, one before and one after training. **Results:** In the training group: a) maximal

Josep Lluís Castarlenas,
Dr. Joan Solé,
*Departamento de Rendimiento Deportivo.
INEFC-Lleida.*

EL ENTRENAMIENTO DE LA RESISTENCIA EN LOS DEPORTES DE LUCHA CON AGARRE: UNA PROPUESTA INTEGRADORA

ORIGINAL ARTICLE

Soccer specific aerobic endurance training

J Hoff, U Wisløff, L C Engen, O J Kemi, J Helgerud

Br J Sports Med 2002;**36**:218–221

See end of article for authors' affiliations

Correspondence to:
Dr Hoff, Department of Physiology and Biomedical

Background: In professional soccer, a significant amount of training time is used to improve players' aerobic capacity. However, it is not known whether soccer specific training fulfils the criterion of effective endurance training to improve maximal oxygen uptake, namely an exercise intensity of 90–95% of maximal heart rate in periods of three to eight minutes.
Objective: To determine whether ball dribbling and small group play are appropriate activities for interval training, and whether heart rate in soccer specific training is a valid measure of actual work intensity.
Methods: Six well trained first division soccer players took part in the study. To test whether soccer specific training was effective interval training, players ran in a specially designed dribbling track, as well as participating in small group play (five a side). Laboratory tests were carried out to establish the relation between heart rate and oxygen uptake while running on a treadmill. Corresponding measure-

REVIEW ARTICLE

Sports Med 2004; 34 (3): 165-180
0112-1642/04/0003-0165/$31.00/0

Endurance and Strength Training for Soccer Players
Physiological Considerations

Jan Hoff and *Jan Helgerud*
Faculty of Medicine, Norwegian University of Science and Technology, Trondheim, Norway

Sprint vs. Interval Training in Football

Authors D. Ferrari Bravo[1], F. M. Impellizzeri[1,2], E. Rampinini[1], C. Castagna[3], D. Bishop[4], U. Wisloff[5]
Affiliations The affiliations are listed at the end of the article

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REVIEW ARTICLE
Sports Med 2002; 32 (1): 53-73
0112-1642/02/0001-0053/$22.00/0

The Scientific Basis for High-Intensity Interval Training

Optimising Training Programmes and Maximising Performance in Highly Trained Endurance Athletes

Paul B. Laursen and *David G. Jenkins*
School of Human Movement Studies, University of Queensland, Brisbane, Australia

Scand J Med Sci Sports 2010: 20 (Suppl. 2): 1–10
doi: 10.1111/j.1600-0838.2010.01184.x

SCANDINAVIAN JOURNAL OF MEDICINE & SCIENCE IN SPORTS

Review

Training for intense exercise performance: high-intensity or high-volume training?

P. B. Laursen[1,2,3]
[1]New Zealand Academy of Sport, Auckland, New Zealand, [2]Sport Performance Research Institute New Zealand (SPRINZ), School of Sport and Recreation, Auckland University of Technology, Auckland, New Zealand, [3]School of Exercise, Biomedical and Health Sciences, Edith Cowan University, Joondalup, Western Australia, Australia
Corresponding author: Paul B. Laursen, New Zealand Academy of Sport North Island, PO Box 18444, Glen Innes, Auckland 1743, New Zealand. Tel: +64 9 477 5427, Fax: +64 9 479 1486, E-mail: paull@nzasni.org.nz

REVIEW ARTICLE
Sports Med 2003; 33 (15): 1103-1126
0112-1642/03/0015-1103/$30.00/0

A Framework for Understanding the Training Process Leading to Elite Performance

David J. Smith
Human Performance Laboratory, Faculty of Kinesiology, University of Calgary, Calgary, Alberta, Canada

REVIEW ARTICLE
Sports Med 2006; 36 (2): 117-132
0112-1642/06/0002-0117/$39.95/0

Is there an Optimal Training Intensity for Enhancing the Maximal Oxygen Uptake of Distance Runners?

Empirical Research Findings, Current Opinions, Physiological Rationale and Practical Recommendations

Adrian W. Midgley, *Lars R. McNaughton* and *Michael Wilkinson*
Department of Sport, Health and Exercise Science, University of Hull, Hull, England

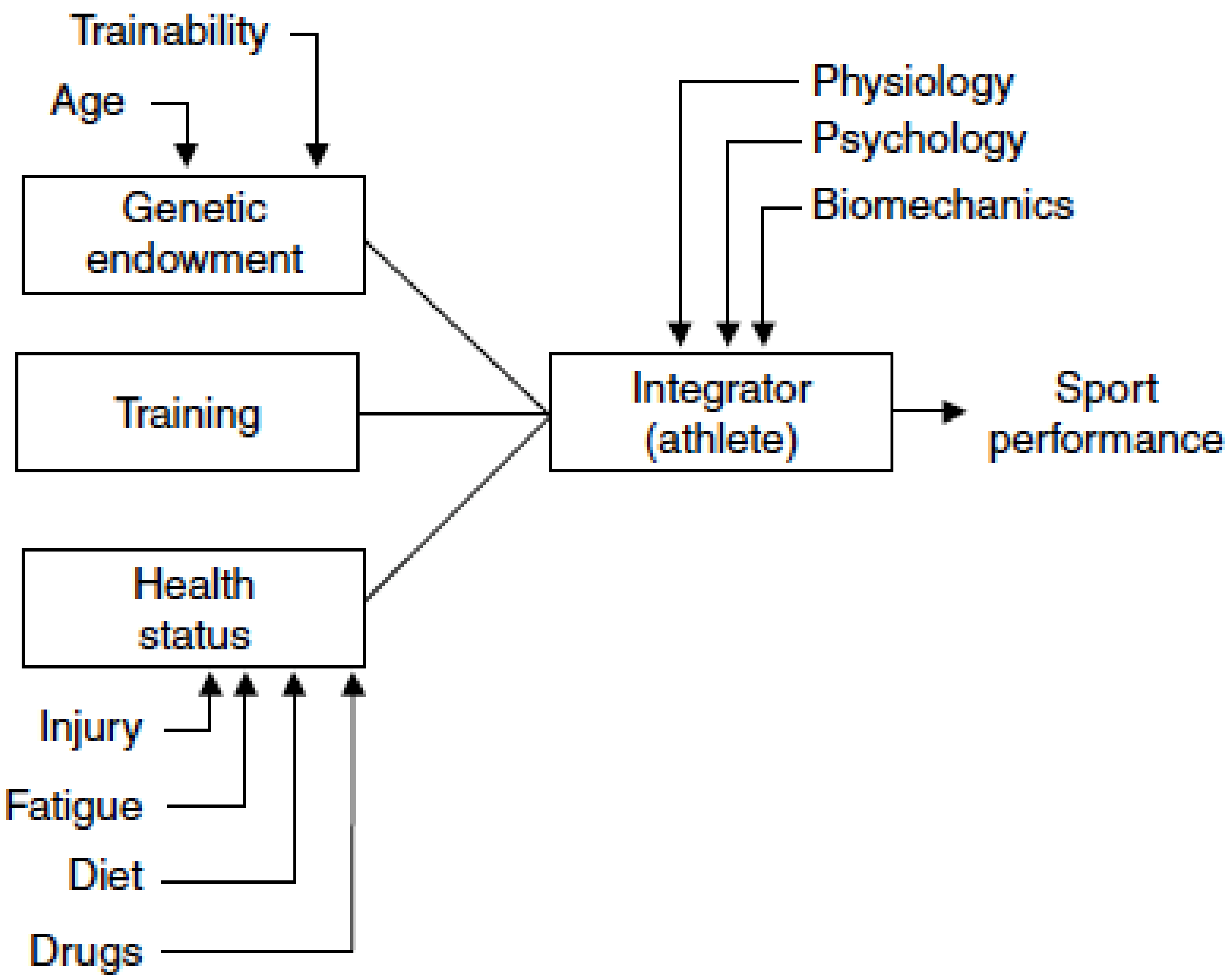
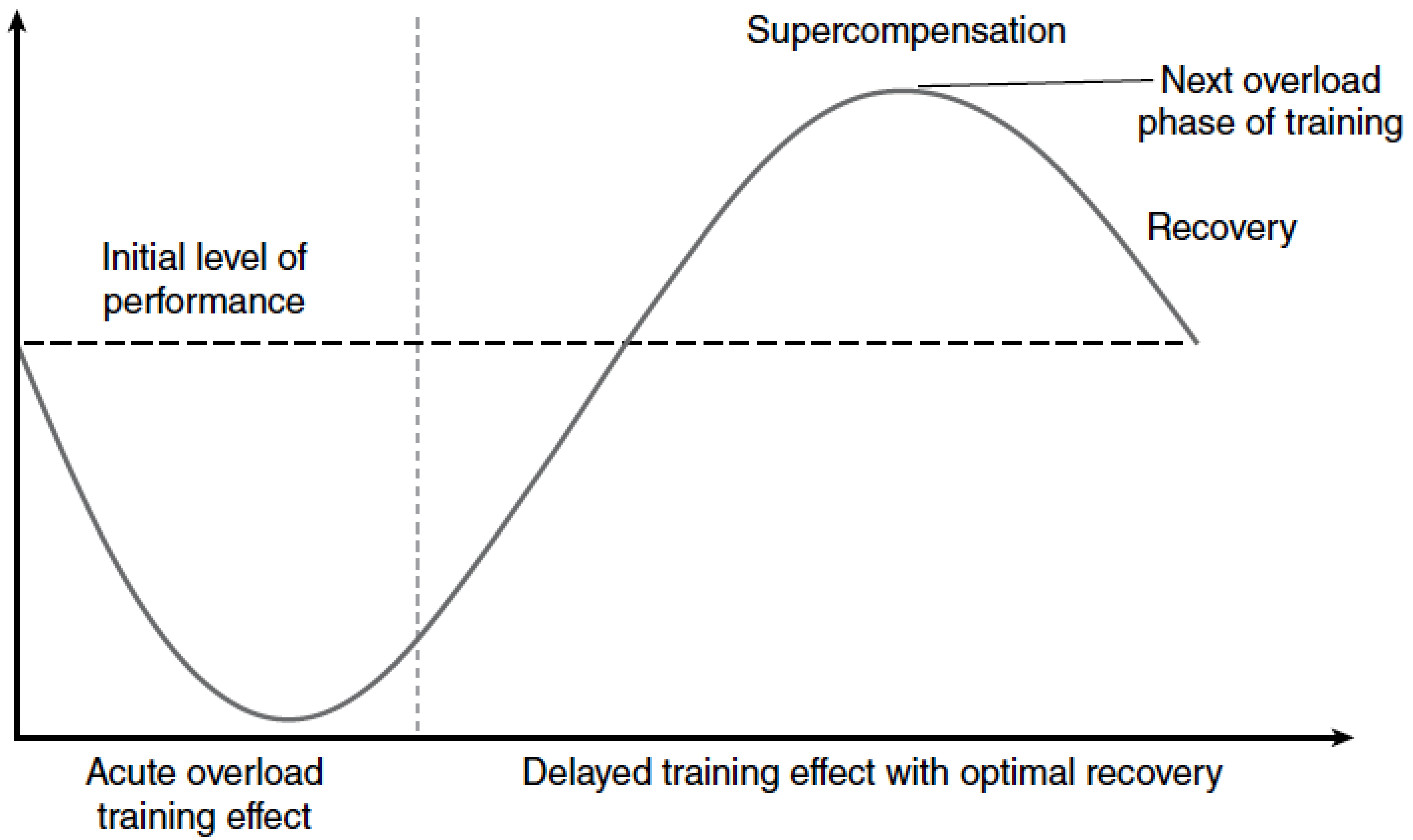
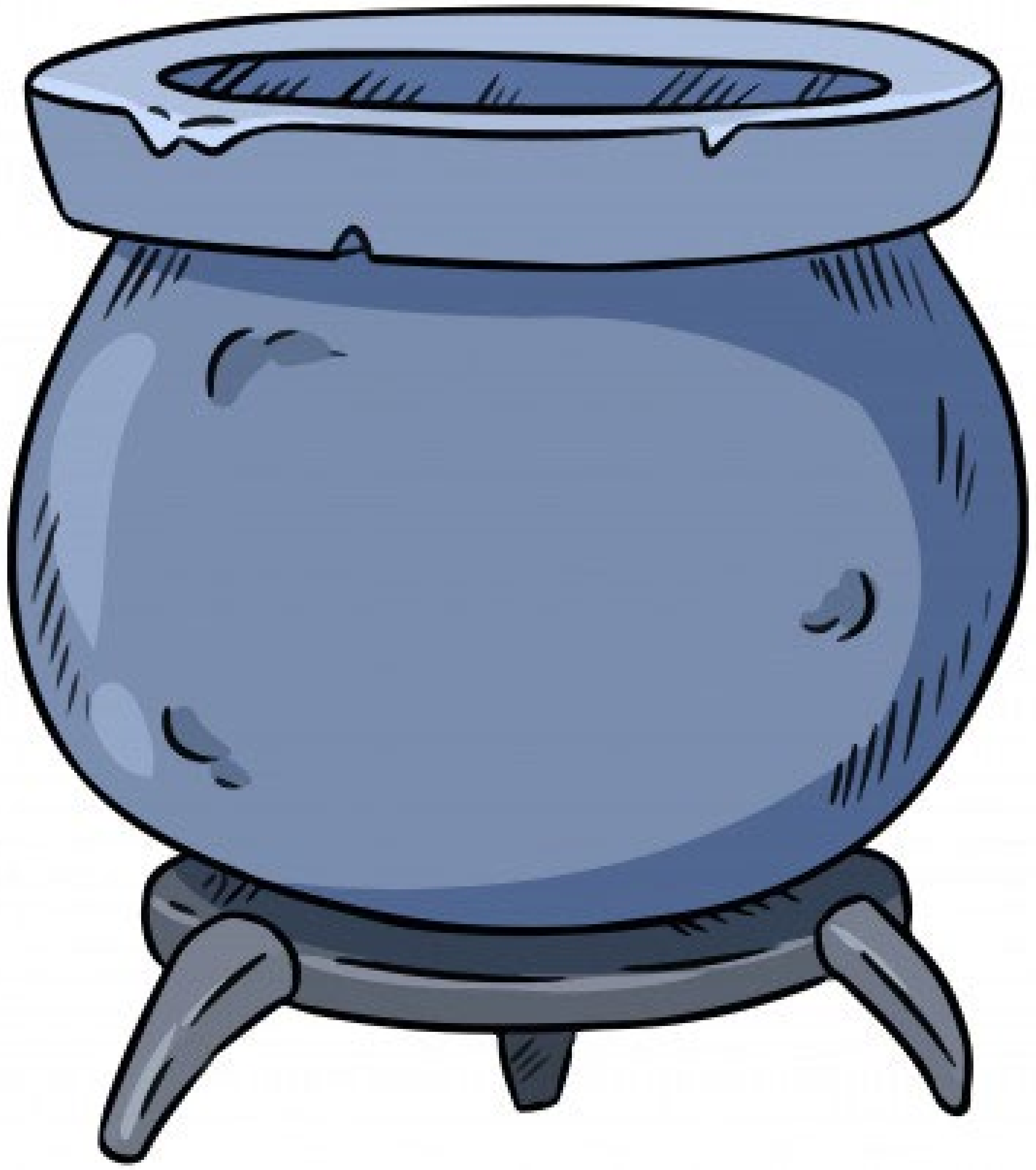


Fig. 1. Factors associated with sport performance (reproduced from MacDougall and Wenger,[17] with permission).



▶ **Figure 27.1** Fundamental concept of biological adaptation, in which an overload exercise stimulus causes a delay in performance ability because of acute fatigue but produces a supercompensation recovery response that increases fitness and performance ability.



5.1. FUNDAMENTACIÓN Y ADAPTACIONES FISIOLÓGICAS

… Adaptaciones fisiológicas

A CORTO PLAZO

A LARGO PLAZO

- ¿A que se refiere?
- ¿De qué dependerá?
- ¿Qué habrá que tener en cuenta?

J Physiol 586.1 (2008) pp 35–44

TOPICAL REVIEW

Endurance exercise performance: the physiology of champions

Michael J. Joyner[1] and Edward F. Coyle[2]

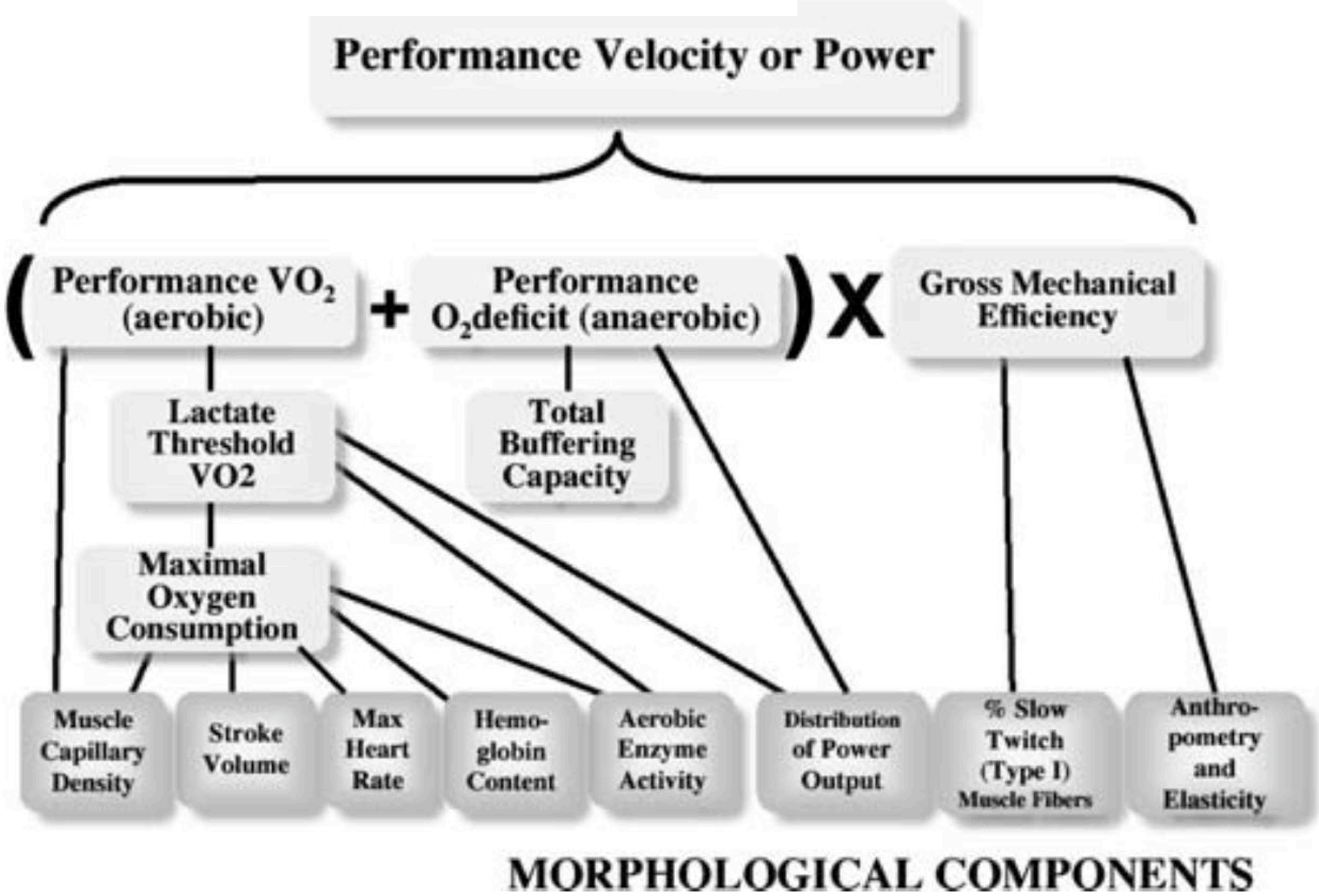


Figure 2. Overall schematic of the multiple physiological factors that interact as determinants of performance velocity or power output
This figure serves as the conceptual framework for the ideas discussed in this review.

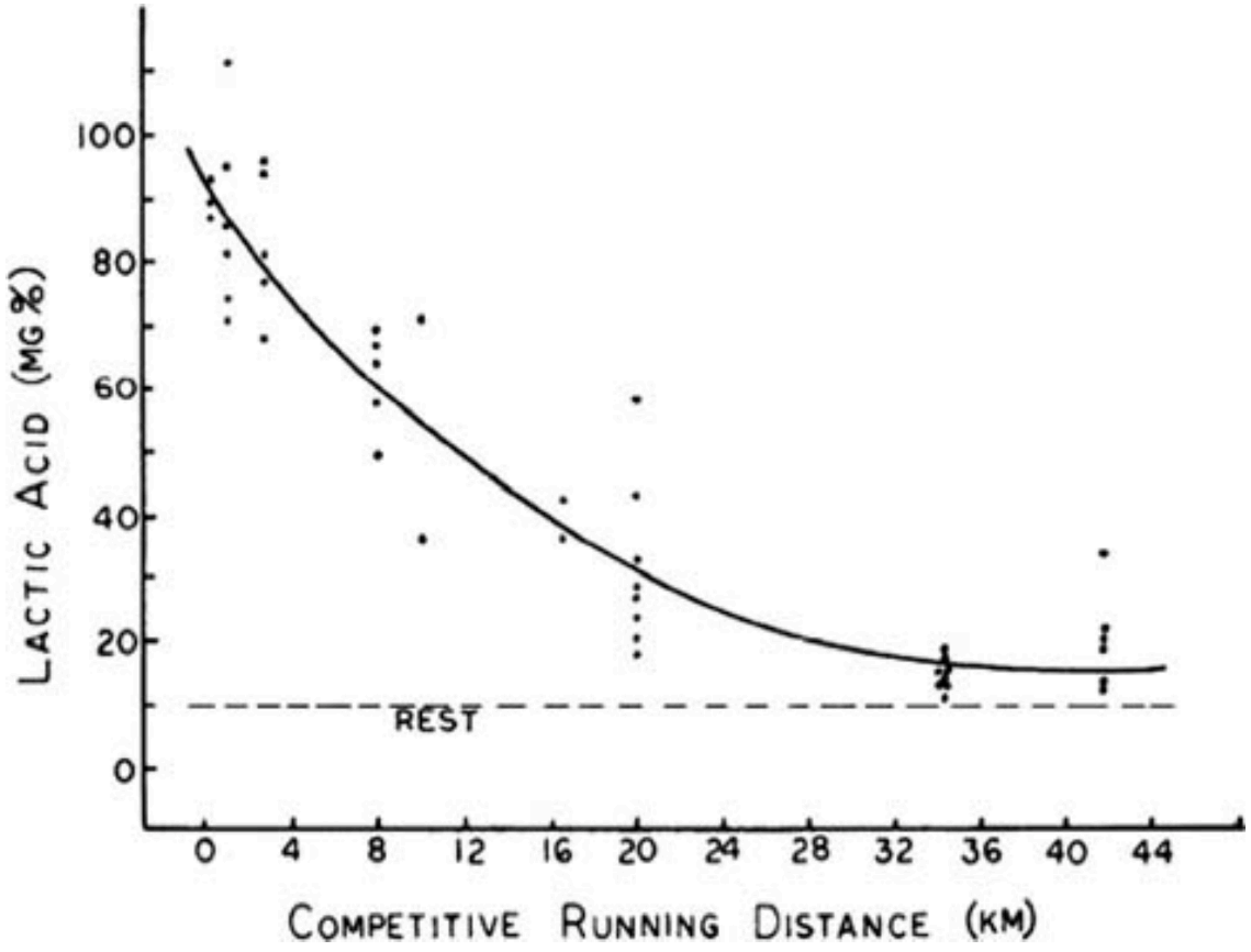


Figure 3. Plot or blood lactic acid concentration *versus* race distance (Costill, 1970)
This figure is an example of the diminishing contribution of so-called ‘anaerobic’ energy sources as race distance increases. This paper also set the stage for a number of later investigations related to the fraction of $\dot{V}_{O_2,max}$ (e.g. performance $\dot{V}_{O_2}$) that could be sustained in competition.

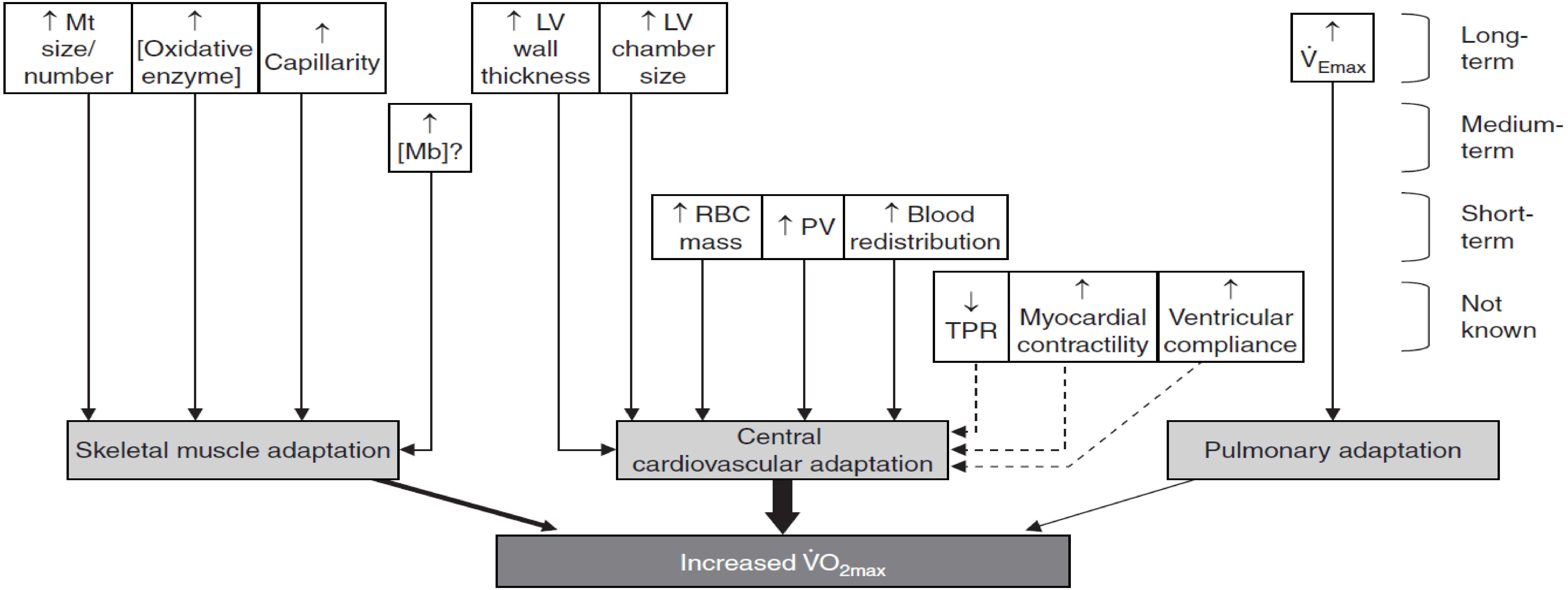
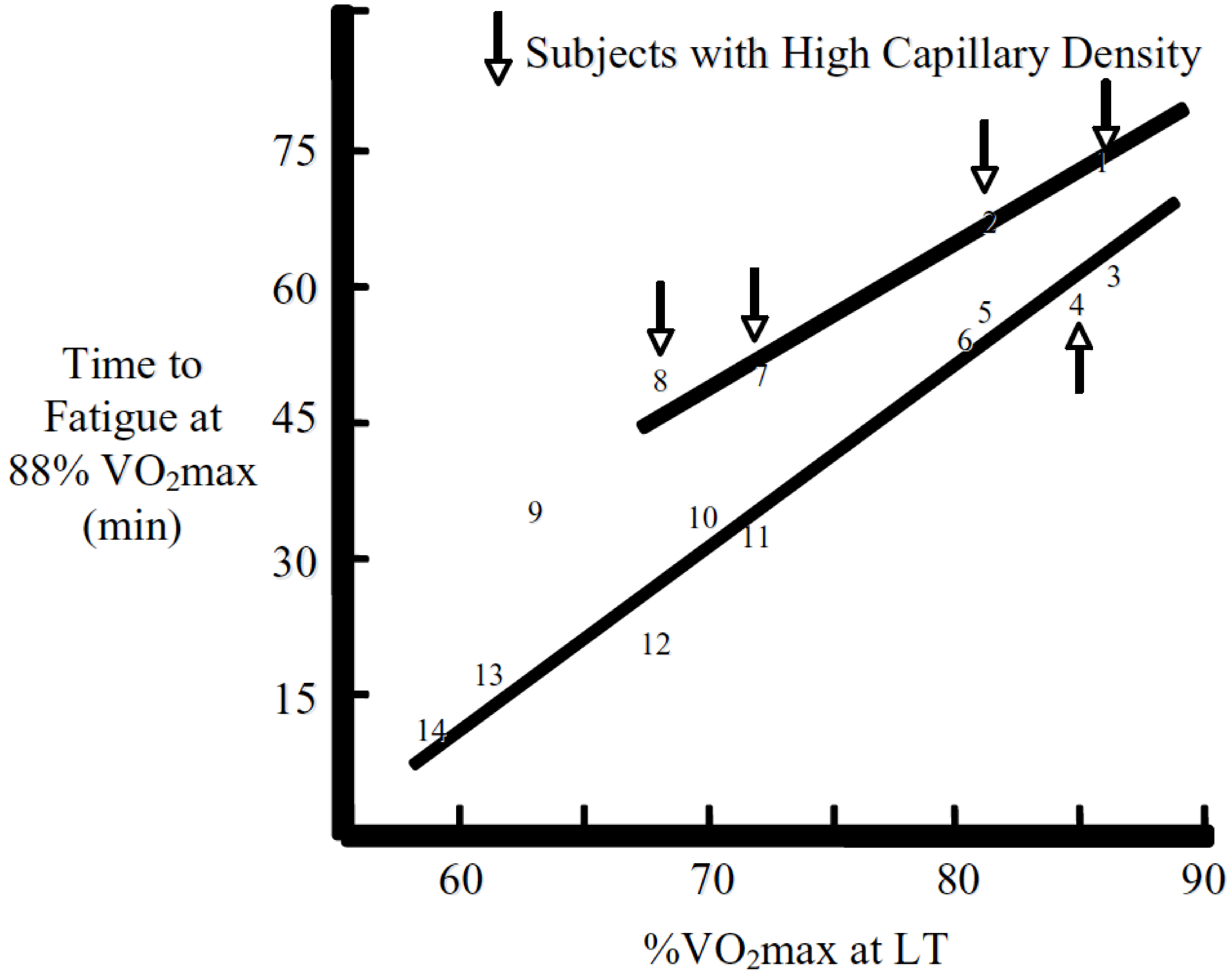


Fig. 1. Training-induced physiological adaptations associated with the enhancement of maximal oxygen uptake ($\dot{V}O_{2max}$). Short-, medium- and long-term adaptations typically have a maximum period of adaptability of days, months and years, respectively. The arrows with broken lines indicate the time course of those adaptations has presently not been elucidated. The width of the three shaded arrows at the bottom of the figure broadly represent the total contribution of those adaptations in the long-term enhancement of $\dot{V}O_{2max}$. Maximum period of adaptability for myoglobin concentration based on rat studies. **LV** = left ventricular; [**Mb**] = myoglobin concentration; **Mt** = mitochondrial; [**Oxidative enzyme**] = oxidative enzyme concentration; **PV** = plasma volume; **RBC** = red blood cell; **TPR** = total peripheral resistance; $\dot{V}_{Emax}$ = maximal minute ventilation; ↑ indicates increase; ↓ indicates decrease; **?** indicates presently unknown if training-induced increases occur in humans under normoxic conditions.

VARIABLES FISIOLÓGICAS	IMPORTANCIA FISIOLÓGICA DE LA MEJORA	INFLUENCIA POTENCIAL DE LA INTENSIDAD DE ENTRENAMIENTO
Tamaño/volumen de la mitocondria + enzimas aeróbicas	El aumento de la capacidad oxidativa de las fibras de contracción rápida puede ampliar la diferencia a-vO_2 máxima	Las fibras rápidas sólo son reclutadas a intensidades ≥ al 90-100% del VO_{2max}, siendo por tanto éste, el límite inferior para mejorar su capacidad oxidativa.
Capilarización del músculo esquelético	Incremento del consumo y la difusión de oxígeno para una pO_2 y un flujo sanguíneo dado. Incremento maximal de la diferencia a-vO_2	La capilaración se ve estimulada por incremento del estrés de cizalla y la presión de la sangre capilar por el aumento de las velocidades de flujo producidas paralelamente al incremento de la intensidad del ejercicio
Mioglobina	Facilitación de la difusión del oxígeno desde el sarcolema a la mitocondria. Incremento del consumo de oxígeno para una pO_2 y un flujo sanguíneo dado. Incremento maximal de la diferencia a-vO_2	Bajo condiciones de normoxia, probablemente sólo hay mejoras como respuesta a ejercicios de altas intensidades relativas en humanos
Espesor de la pared del ventrículo izquierdo	Aumento de la fuerza de contracción del ventrículo izquierdo, incremento de la fracción de eyección sistólica, se mantiene el estrés normal en la pared durante la hipertrofia.	La presión arterial media y la sistólica se incrementan cuando la intensidad del esfuerzo superan el VO2max, produciendo una sobrecarga de presión miocárdica dependiente de la intensidad y que produce el estímulo necesario para la adaptación del miocardio.
Aumento de la cavidad interna del ventrículo izquierdo	Aumenta el volumen diastólico final y la fracción de eyección maximal.	El volumen de eyección sistólica aumenta cuando la intensidad del esfuerzo superan el VO2max, produciendo una sobrecarga de presión miocárdica dependiente de la intensidad y que produce el estímulo necesario para la adaptación del miocardio.
Masa eritrocitaria	Aumenta el volumen sanguíneo, el retorno venoso y el volumen diastólico final. Incremento del contenido de oxígeno arterial y de la máxima diferencia a-vO_2	Reducción del flujo sanguíneo al riñón relacionado positivamente con la intensidad del ejercicio, con descenso de la concentración de oxígeno que estimula la producción de eritropoyetina y eritropoyesis.
Volumen plasmático	Aumenta el volumen sanguíneo, el retorno venoso y el volumen diastólico final	La producción hormonal responsable del aumento del plasma sanguíneo es dependiente de la intensidad del ejercicio



Joyner & Coyle, 2008

5.1. FUNDAMENTACIÓN Y ADAPTACIONES FISIOLÓGICAS

A CORTO PLAZO

TIPO DE ORIENTACIÓN	RECUPERACIÓN COMPLETA
ANAEROBICO - ALACTICO	5 – 8 HORAS
ANAERÓBICO LACTICO	24 – 48 HORAS
AEROBICO - ANAEROBICO	48 – 72 HORAS
AEROBICO	24 – 48 – 72 HORAS

A LARGO PLAZO

	Reposo	Ejercicio Submáximo	Ejercicio Máximo
CONSUMO MÁXIMO DE OXÍGENO	Sin cambios	Sin cambios	Aumenta
GASTO CARDIACO	Dism. o sin cambios	Dism. o sin cambios	Aumenta
VOLUMEN SISTÓLICO	Aumenta	Aumenta	Aumenta
FRECUENCIA CARDIACA	Disminuye	Disminuye	Dism. o sin cambios

Adaptaciones al entrenamiento de resistencia sobre los diferentes parámetros fisiológicos (Bahamonde y Cansino, 1997; Mtez. Caro, 1989; Fox, 1987; etc…)

UNIVERSITAS
Miguel Hernández