l'Allenamento ad Alta Intensità: Nuove Acquisizioni

Carlo Castagna

Corso di Laurea in Scienze Motorie

Università di Roma Tor Vergata, Rome, Italy

castagnac@libero.it

www.carlocastagna.com

Team-Sports Research Area

Sommario

- Gli Sport ad Alta Intensità
- Fisiologia dell'Alta Intensità
- Training ad Alta Intensità
- "Consensus Statement"
- Discussione e Conclusioni

Gli Sport ad "Alta Intensità"

- Sport Durata < 8 min
- Giochi Sportivi
  - Sequenze ad alta Intensità
  - Repeated Sprint Ability

L'Allenamento ad Alta Intensità

- **Sprint Training**
- **Interval Training**
- **Intermittent Training**

Iaia & Bangsbo 2010

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Esempio

- **Ciclista $vVO_2max \rightarrow$ 400 W**
- **Picco Potenza $\rightarrow$1200 W (test 10")**

$vVO_2max \rightarrow$ 33% PP

Iaia & Bangsbo 2010

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- **Dominio Training Alta Intensità**

$vVO_2max \leftrightarrow PP$

Supra-maximal Training

Anaerobic Training

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Anaerobic Training

Speed Endurance Training

Speed Training

Reilly & Bangsbo 1998

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Anaerobic Training

Speed Training

Max Intensità ↔ 2-10"

Recupero 50 —100"

Reilly & Bangsbo 1998

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Anaerobic Training

Speed Endurance Training

PRODUCTION

MAINTENANCE

Reilly & Bangsbo 1998

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Speed Endurance

PRODUCTION *Training*

Durata <40" Max Intensità

Recupero >5 volte durata

Costanza Performance

Reilly & Bangsbo 1998

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Speed Endurance

MAINTENANCE *Training*

Durata 5-90"Alta Intensità

Recupero ≤3 Volte Durata

Accumulo Fatica

Reilly & Bangsbo 1998

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Speed Endurance Training

Intensità > 70% Massimo

Iaia & Bangsbo 2010

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Speed Endurance Training

Adattamenti Fisiologici:

Training Study

Mohr e coll. 2007

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Speed Endurance Training

Protocollo:
8x30" 130% VO_2max
158-170m
Recupero 90"
MAINTENANCE *training*

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Speed Endurance Training

Risposte Fisiologiche:
Picco 97% FCmax
Media 84% FCmax
Lattato Ematico 16.5mM
Lattato Muscolare 45mM

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Speed Endurance Training

Risposte Fisiologiche:

↑ Metabolismo Anae/Aero

Da ↑ Anae ↓ Aero

A ↓Anae ↑ Aero

MAINTENANCE *training*

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Speed Endurance Training

Adattamenti Fisiologici:

Descriptive Study

Nevill et al. 1994

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Contribution of phosphocreatine and aerobic metabolism to energy supply during repeated sprint exercise

GREGORY C. BOGDANIS, MARY E. NEVILL,
LESLIE H. BOOBIS, AND HENRYK K. A. LAKOMY
Department of Physical Education, Sports Science, and Recreation Management, Loughborough University, Loughborough, LE11 3TU; and Sunderland District General Hospital, Sunderland, SR4 7TP, United Kingdom

Bogdanis, Gregory C., Mary E. Nevill, Leslie H. Boobis, and Henryk K. A. Lakomy. Contribution of phosphocreatine and aerobic metabolism to energy supply during repeated sprint exercise. *J. Appl. Physiol.* 80(3): 876–884, 1996.—This study examined the contribution of phosphocreatine (PCr) and aerobic metabolism during repeated bouts of

However, such studies examining a single sprint can only make a limited contribution to understanding the causes of fatigue and limitations of performance, as all metabolic changes occur concurrently. More recently, the model of intermittent exercise has become more

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- $vVO_2max \rightarrow$ 303 W
- Picco Potenza $\rightarrow$1391 W

$vVO_2max \rightarrow$ 22% PP

Bogdanis et al 1996

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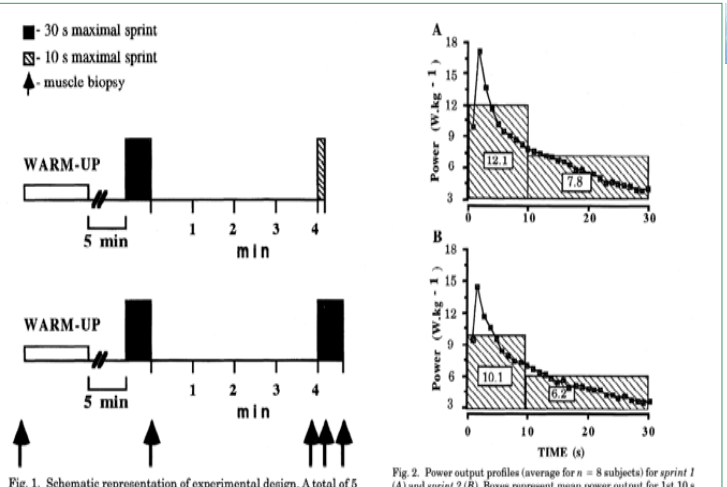

Fig. 1. Schematic representation of experimental design. A total of 5 muscle biopsies were obtained from each subject during the 2 conditions.

Fig. 2. Power output profiles (average for $n = 8$ subjects) for *sprint 1* (*A*) and *sprint 2* (*B*). Boxes represent mean power output for 1st 10 s and last 20 s of each sprint.

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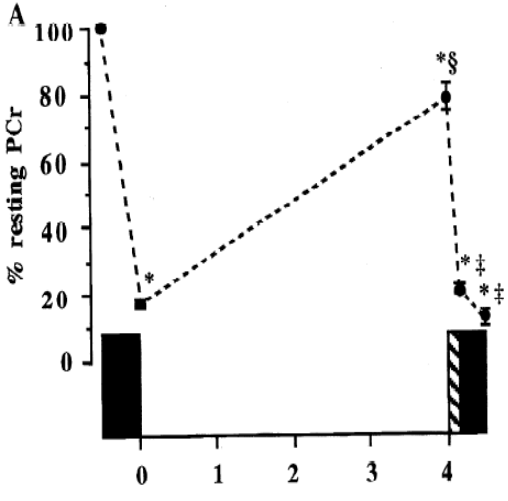

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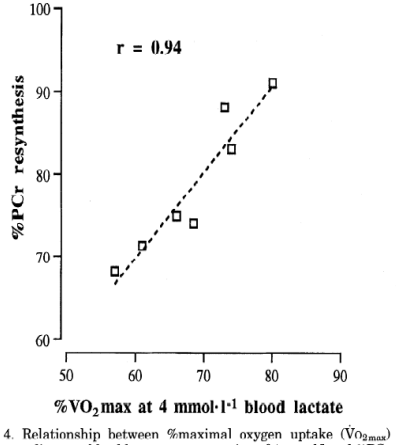

Fig. 4. Relationship between %maximal oxygen uptake ($\dot{V}O_{2max}$) corresponding to a blood lactate concentration of 4 mmol/l and %PCr resynthesis after 4 min of passive recovery following a maximal 30-s sprint ($n = 7$ subjects, $P < 0.01$).

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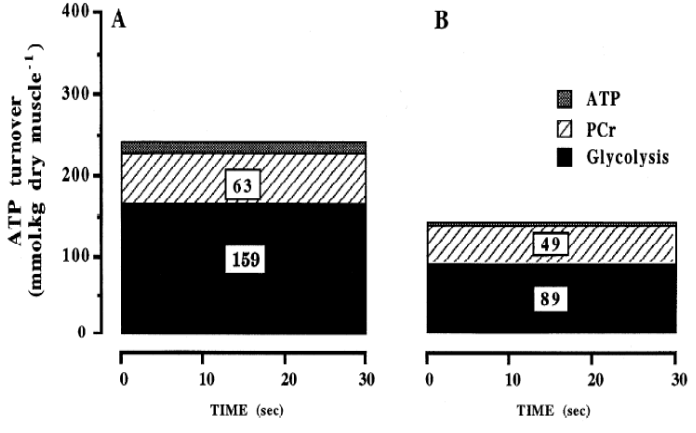

"ATP Turnover"


30" 4' 30"

PCr	21%	20%
Glyc	50%	36%
Aero	29%	44%

Nevill et al. 1994

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Four weeks of speed endurance training reduces energy expenditure during exercise and maintains muscle oxidative capacity despite a reduction in training volume

F. Marcello Iaia,[1,2] Ylva Hellsten,[1] Jens Jung Nielsen,[1] Maria Fernström,[3,4] Kent Sahlin,[3,4] and Jens Bangsbo[1]

[1]*Copenhagen Muscle Research Centre, Department of Exercise and Sport Sciences, Section of Human Physiology, University of Copenhagen, Copenhagen, Denmark;* [2]*Faculty of Exercise Sciences, State University of Milan, Milan, Italy;* [3]*Department of Physiology and Pharmacology, Karolinska Institutet, Stockholm, Sweden; and* [4]*Department of Sports and Health Science, Stockholm University College of Physical Education and Sports, Stockholm, Sweden*

Submitted 21 May 2008; accepted in final form 1 October 2008

Iaia FM, Hellsten Y, Nielsen JJ, Fernström M, Sahlin K, Bangsbo J. Four weeks of speed endurance training reduces energy expenditure during exercise and maintains muscle oxidative capacity despite a reduction in training volume. *J Appl Physiol* 106: 73–80, 2009. First published October 9, 2008; doi:10.1152/japplphysiol.90676.2008.—We studied the effect of an alteration from regular endurance to speed endurance training on muscle oxidative capacity, capillarization, as well as energy expenditure during submaximal exercise and its relationship to mitochondrial uncoupling protein 3 (UCP3) in humans. Seventeen endurance-trained runners were assigned to either a speed endurance training (SET; $n = 9$) or a control (Con; $n = 8$) group. For a 4-wk intervention (IT) period, SET replaced the ordinary training (~45 km/wk) with frequent high-intensity sessions each consisting of 8–12 30-s sprint runs separated by 3 min of rest (5.7 ± 0.1 km/wk) with additional 9.9 ± 0.3 km/wk at low running speed, whereas Con

ventilatory demands (19), greater muscular power generation (41), as well as improved musculotendinous stiffness (59) and shorter ground contact times (40). Although the energy cost of running has been widely investigated the effect of high-intensity intermittent training, i.e., speed endurance training, on energy expenditure during exercise is still unclear and some of the underlying mechanisms remain poorly understood.

One of the potential candidates of training-induced improvements in running economy is an increased mitochondrial efficiency (i.e., increased ATP/O_2) due to reduced uncoupled respiration. The mitochondrial uncoupling protein 3 (UCP3) has, among other things, been suggested to be involved in thermogenesis by mediating mitochondrial proton leak, and thus energy is dissipated as heat instead of being converted to

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Speed Endurance Training

8-12x 30" Sprint /Rec. 3'

PRODUCTION *training n=9*

Endurance Training

52.3±2.4 min

AEROBIC *training n=8*

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Speed Endurance Training

8-12x 30" Sprint /Rec. 3'

3.4±0.1 $d \cdot w^{-1}$ *n=9*

Endurance Training

52.3±2.4 min

3-4 $d \cdot w^{-1}$ *n=8*

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Speed Endurance Training

5.7±0.1 km·wk^{-1}

93±0.5% → 30" All-out

Endurance Training

45.7±0.1 km·wk^{-1}

3-5 Sessions

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Speed Endurance Training

5.7±0.1 km·wk^{-1}

PRODUCTION *training n=9*

Endurance Training

45.7±0.1 km·wk^{-1}

3-5 Sessions

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	[La]	VO_{2MAX}	10_{Km}	MC	ME
SET	NC	NC	NC	NC	NC
END	NC	NC	NC	NC	NC

Heart Rate Response:

SET **35-40' 73-92% HR_{max}**

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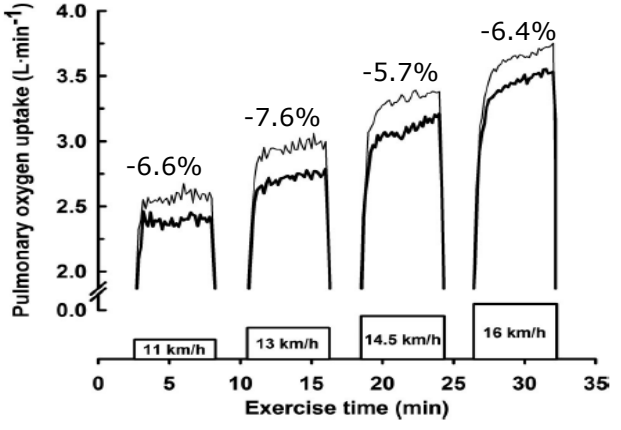

Fig. 2. Pulmonary oxygen uptake during 4 treadmill stages of 6-min each before (thin line) and after (thick line) 4 wk of speed endurance training (SET group).

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Speed Endurance Training:

- **Utile per Mantenimento Aerobico.**
- **Miglioramento Economia Corsa.**
- **Riduzione Drastica Volume**

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Am J Physiol Regul Integr Comp Physiol 294: R966–R974, 2008.
First published December 19, 2007; doi:10.1152/ajpregu.00666.2007.

Reduced volume but increased training intensity elevates muscle Na^+-K^+ pump α_1-subunit and NHE1 expression as well as short-term work capacity in humans

F. Marcello Iaia,[1,2] Martin Thomassen,[1] Helle Kolding,[1] Thomas Gunnarsson,[1] Jesper Wendell,[1] Thomas Rostgaard,[1] Nikolai Nordsborg,[1] Peter Krustrup,[1] Lars Nybo,[1] Ylva Hellsten,[1] and Jens Bangsbo[1]
[1]*Department of Exercise and Sport Sciences, Section of Human Physiology, Copenhagen Muscle Research Center, University of Copenhagen, Copenhagen, Denmark; and* [2]*Faculty of Exercise Sciences, State University of Milan, Milan, Italy*

Submitted 14 September 2007; accepted in final form 11 December 2007

Iaia FM, Thomassen M, Kolding H, Gunnarsson T, Wendell J, Rostgaard T, Nordsborg N, Krustrup P, Nybo L, Hellsten Y, Bangsbo J. Reduced volume but increased training intensity elevates muscle Na^+-K^+ pump α_1-subunit and NHE1 expression as well as short-term work capacity in humans. *Am J Physiol Regul Integr Comp Physiol* 294: R966–R974, 2008. First published December 19, 2007; doi:10.1152/ajpregu.00666.2007.—The present study examined muscle adaptations and alterations in work capacity in endurance-trained runners after a change from endurance to sprint training. Fifteen runners were assigned to either a sprint training (ST, $n = 8$) or a control (CON, $n = 7$) group. ST replaced their normal training by 30-s sprint runs three to four times a week, whereas CON continued the endurance training (~45 km/wk). After the 4-wk sprint period, the expression of the muscle Na^+-K^+ pump α_1-subunit and Na^+/H^+-

changing the type of training of already trained subjects, new information may be provided.

The muscle ion transport proteins are important when discussing fatigue development. The Na^+-K^+ pump is pivotal in maintaining the muscle membrane potential during exercise (7), and the Na^+-K^+-$2Cl^-$ 1 (NKCC1) protein cotransporters, primarily located in the sarcolemma, may also be important for maintenance of muscle function during intense exercise, possibly by adding to the K^+ reuptake (39). In untrained subjects, the Na^+-K^+ pump has been shown to be upregulated by different types of exercise training (7, 8, 28, 29, 31). In addition, Nielsen et al. (31) observed that the elevated level of

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Speed Endurance Training

- 8-12x 30" Sprint /Rec. 3'
- 90-95% vel 30" all-out *n=8*

Endurance Training

- 45-60'x Day; 3-5 t. x w.
- 9-12 km *n=7*

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Training Design:

- 4 settimane
- Gruppi Paralleli (2 Gruppi)
- Longitudinale (Pre-Post)

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Speed Endurance Training

8-12x 30" Sprint /Rec. 3'

Mean 73% →Peak 92% HR_{max}

Endurance Training

9-12km; 3-5 t. x w.

Mean 80% →Peak 87% HR_{max}

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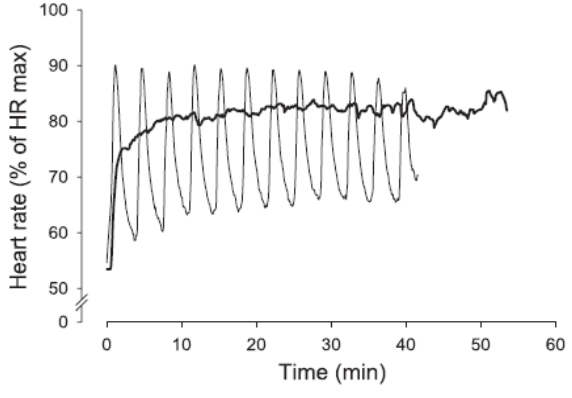

Fig. 1. Heart rate, expressed as %maximum heart rate (HR_{max}), during a training session for a representative subject in the control (CON; thick line) group and during a sprint training session for a representative subject in the sprint training group (ST, thin line).

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Valutazioni Fisiologiche:

Yo-Yo IR2

EX1→Exh «Rec. 2'» EX2 →Exh

****EX= 130% *v*VO_{2max}**

10 km

Test VO_{2max}

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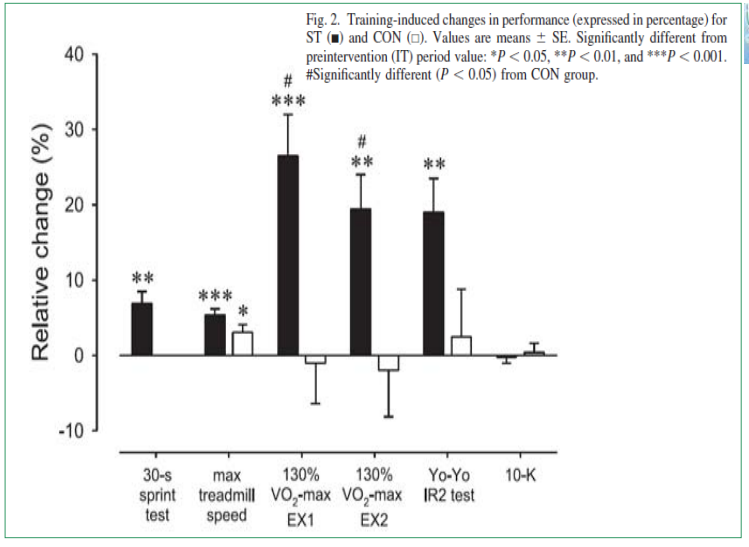

Fig. 2. Training-induced changes in performance (expressed in percentage) for ST (■) and CON (□). Values are means ± SE. Significantly different from preintervention (IT) period value: *$P < 0.05$, **$P < 0.01$, and ***$P < 0.001$. #Significantly different ($P < 0.05$) from CON group.

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Table 2. *Various performance variables before (pre) and after (post) the 4-wk IT period for ST and CON groups*

Performance	ST (n = 8)		CON (n = 7)	
	Pre	Post	Pre	Post
Sprint test (30 s), distance covered, m	201±5	215±5†		
Incremental treadmill test maximum speed, km/h	18.6±0.5	19.6±0.5‡	19.1±0.8	19.7±0.8*
Exhaustive supramaximal treadmill running*				
First bout, s	101±13	126±6‡§	74±8	73±8
Second bout, s	58±5	69±6†§	50±3	49±4
Yo-Yo IR2 test running distance, m	440±58	520±88†	405±67	415±57
10-km time, min:s	40:52±1:09	40:39±1:30	40:53±2:41	40:36±2:27

Values are means ± SE; n, no. of subjects. Yo-Yo IR2, intermittent Yo-Yo 2. *Running speed corresponding to approximately 130% $\dot{V}O_{2max}$ before the intervention recovery test level (IT) period. *$P < 0.05$, †$P < 0.01$, and ‡$P < 0.001$, significantly different from pre-IT period. §Significantly different ($P < 0.05$) from CON.

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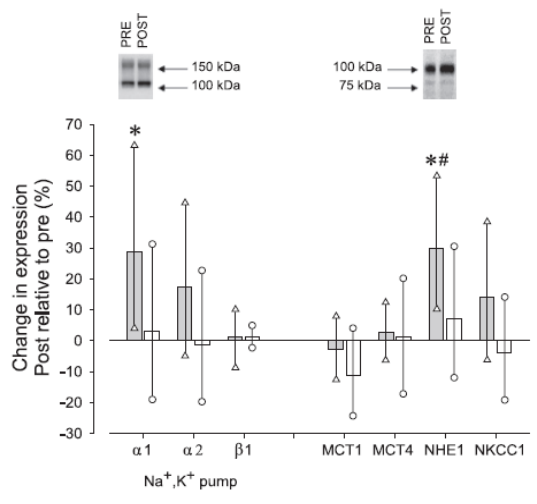

L'Allenamento ad Alta Intensità

Am J Physiol Regul Integr Comp Physiol 292: R1594–R1602, 2007.
First published December 28, 2006; doi:10.1152/ajpregu.00251.2006.

Effect of two different intense training regimens on skeletal muscle ion transport proteins and fatigue development

Magni Mohr,[1] Peter Krustrup,[1] Jens Jung Nielsen,[1] Lars Nybo,[1] Martin Kroyer Rasmussen,[2] Carsten Juel,[2] and Jens Bangsbo[1]

Copenhagen Muscle Research Centre, [1]Institute of Exercise and Sport Sciences, Department of Human Physiology and [2]Department of Molecular Biology, University of Copenhagen, Copenhagen, Denmark

Submitted 11 April 2006; accepted in final form 22 December 2006

Mohr M, Krustrup P, Nielsen JJ, Nybo L, Rasmussen MK, Juel C, Bangsbo J. Effect of two different intense training regimens on skeletal muscle ion transport proteins and fatigue development. *Am J Physiol Regul Integr Comp Physiol* 292: R1594–R1602, 2007. First published December 28, 2006; doi:10.1152/ajpregu.00251.2006.—This study examined the effect of two different intense exercise training regimens on skeletal muscle ion transport systems, performance, and metabolic response to exercise. Thirteen subjects performed either sprint training [ST; 6-s sprints ($n = 6$)], or speed endurance training [SET; 30-s runs ~130% $Vo_{2\,max}$, $n = 7$]. Training in the SET group provoked higher ($P < 0.05$) plasma K^+ levels and muscle lactate/H^+ accumulation. Only in the SET group was the amount of the Na^+/H^+ exchanger isoform 1 (31%) and Na^+-K^+-ATPase isoform α_2 (68%) elevated ($P < 0.05$) after training. Both groups had higher ($P < 0.05$) levels of Na^+-K^+-ATPase β_1-isoform and monocarboxylate transporter 1 (MCT1), but no change in MCT4 and Na^+-K^+-ATPase α_1-isoform. Both groups had greater ($P < 0.05$) accumulation of lactate during exhaustive exercise and higher ($P < 0.05$) rates of muscle lactate decrease after exercise. The ST group improved ($P < 0.05$) sprint performance, whereas the SET group elevated ($P < 0.05$) performance during exhaustive continuous treadmill running. Improvement in the Yo-Yo intermittent recovery test was larger ($P < 0.05$) in the SET than ST group (29% vs. 10%). Only of fast-twitch-a fibers and muscle buffer capacity are elevated after a period of high-intensity training (11, 21, 22, 40). Some studies have also demonstrated that intense training leads to a higher lactate-H^+ transport capacity and amount of both monocarboxylate transporters (MCT) and Na^+/H^+ exchanger isoform 1 (NHE1) (2, 23, 25, 36, 37), as well as a larger Na^+/K^+ pump activity and amount of Na^+/K^+ pumps (18, 19, 29, 31, 34). These changes are among other adaptations associated with a lowering of muscle interstitial potassium concentration and delayed development of fatigue during intense exercise (34). However, little is known about what causes these muscle adaptations and how they are related to the improvement in different kinds of muscle performance.

It is a common belief that the flux through a metabolic pathway or a transport system is a crucial factor in the adaptation of the contracting muscle, but no clear evidence has been provided. One way to study factors that may be of importance for the adaptation to training may be to carry out various training protocols that result in different metabolic responses in the contracting muscle and then examine the changes in the muscle variables. One study has compared the effect of a

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Speed Endurance Training

8x 30" Sprint /Rec. 90"

~130% VO_2max *n=7*

Sprint Training

15x 6" Sprint /Rec. 1'

95% of Max Speed *n=6*

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Speed Endurance Training

8x 30" Sprint /Rec. 90"

158→170m

Sprint Training

15x 6" Sprint /Rec. 1'

40→42m

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ST & SE Training (8 weeks):

3 times x week 1th 2 weeks

4 times x week 3 weeks

5 times x week 2 weeks

6 times x week Last week

More than 30 Sessions

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Valutazioni Fisiologiche:

- Yo-Yo IR2
- 5x30m Sprint /25" Active Rec.
- 2x50m Sprint/5' Rec.
- Test VO_{2max}

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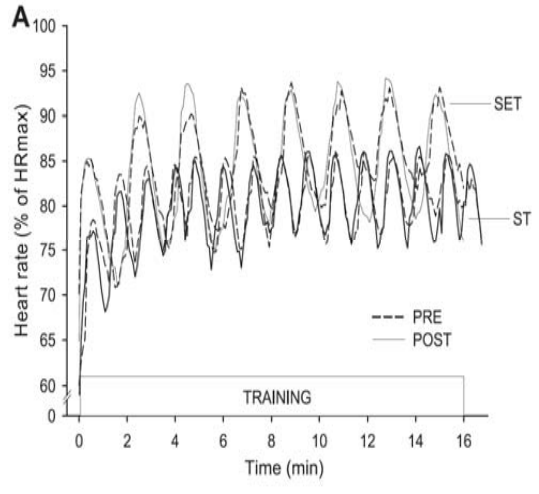

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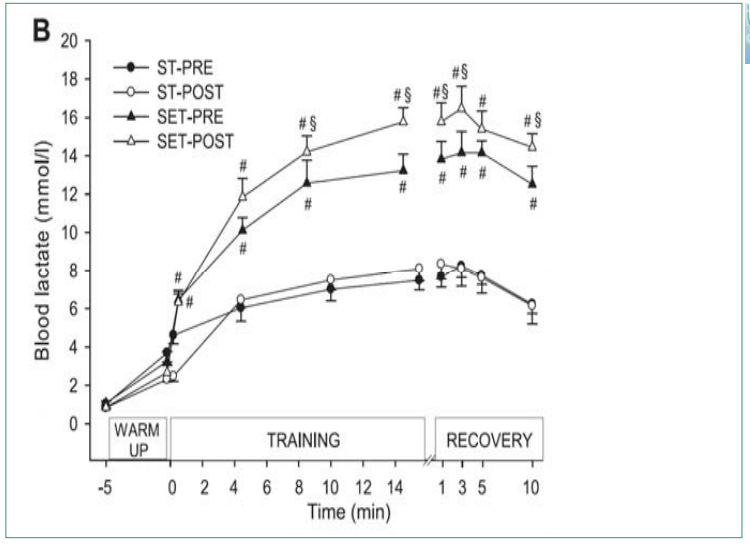

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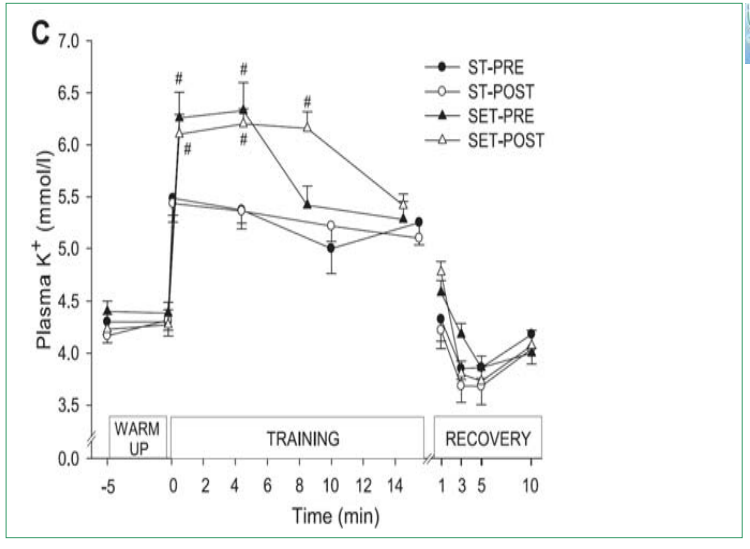

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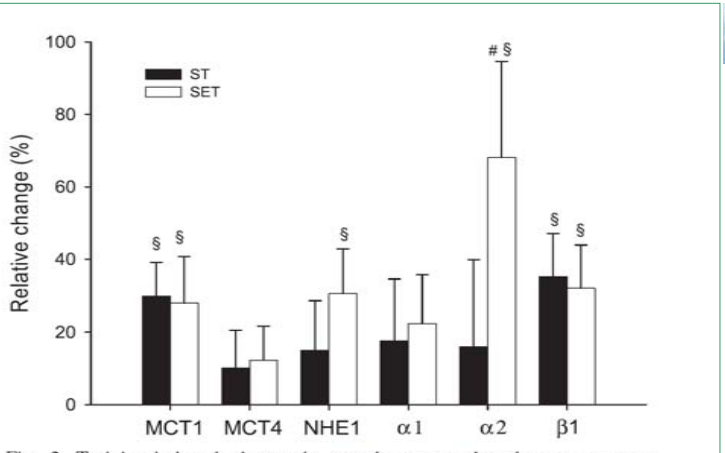

Fig. 2. Training-induced change in muscle monocarboxylate transporters (MCT1, MCT4), Na^+/H^+ exchanger isoform 1 (NHE1) and Na^+-K^+-ATPase α_1-, α_2-, β_1-isoforms. #Significant difference between ST and SET ($P < 0.05$); §significant ($P < 0.05$) difference between before and after the training period.

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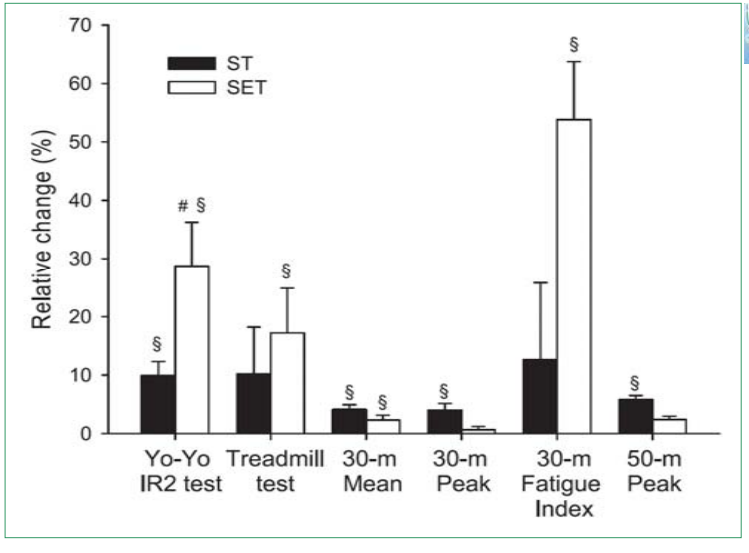

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Eur J Appl Physiol (1998) 78: 163–169

ORIGINAL ARTICLE

Brian Dawson · Martin Fitzsimons · Simon Green
Carmél Goodman · Michael Carey · Keith Cole

Changes in performance, muscle metabolites, enzymes and fibre types after short sprint training

Accepted: 5 January 1998

Allenamento ad alta Intensità

Table 1 The sprint training program, showing the number of repetitions and distances covered for each session. Five subjects completed 16 sessions while the other 4 subjects each completed 14, 15, 17 and 18 sessions, respectively. Each subject completed at least three sessions of 40–42 repetitions. Where a set of intervals are *underlined* those efforts were run at maximum speed. (*W*:*R*) work:recovery ratio)

Week	Session							% Maximum effort	W:R	Number of reps.
1	1	6 × 80	6 × 60	6 × 40	4 × 40			90	1:6	22
	2	6 × 80	6 × 60	6 × 40	4 × 40			90	1:6	22
	3	6 × 80	6 × 60	6 × 40	6 × 40			90	1:6	24
2	4	6 × 80	6 × 60	6 × 40	8 × 30			90	1:5	26
	5	6 × 80	6 × 60	6 × 40	8 × 30			90	1:5–6	26
	6	4 × 80	6 × 50	8 × 40	6 × 40	6 × 30		90/100	1:5–6	30
3	7	4 × 80	6 × 50	8 × 40	6 × 40	6 × 30		90/100	1:6	30
	8	8 × 30	6 × 50	8 × 30	6 × 40	6 × 30		90/100	1:5–6	34
	9	8 × 30	6 × 50	8 × 30	6 × 40	6 × 30		90/100	1:5–6	34
4	10	6 × 60	8 × 50	6 × 40	8 × 50	6 × 60		90/100	1:5	34
	11	6 × 60	8 × 50	6 × 40	8 × 50	6 × 60		90/100	1:6	34
	12[a]	6 × 60	8 × 50	6 × 40	6 × 40			90/100	1:5	24
5	13	8 × 50	8 × 40	8 × 40	8 × 40	8 × 50		90/100	1:5–6	40
	14	8 × 50	8 × 40	8 × 30	8 × 40	8 × 50		90/100	1:5–6	40
	15	8 × 50	8 × 40	8 × 30	8 × 40	8 × 50		90/100	1:4–6	40
6	16	8 × 50	8 × 40	8 × 30	6 × 50	6 × 40	6 × 30	90/100	1:4–6	42
	17	8 × 30	8 × 40	8 × 50	6 × 50	6 × 40	6 × 30	90/100	1:4–6	42
	18	8 × 30	8 × 40	6 × 50	6 × 50	6 × 40	6 × 30	90/100	1:4–6	40

Allenamento ad alta Intensità

Eur J Appl Physiol (1998) 78: 163-169

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Accepted: 5 January 1998

Recupero:

- Cammino, Jogging
- 2-4’ tra le serie

Allenamento ad alta Intensità

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ORIGINAL ARTICLE
Brian Dawson · Martin Fitzsimons · Simon Green
Carmel Goodman · Michael Carey · Keith Cole
Changes in performance, muscle metabolites, enzymes and fibre types after short sprint training
Accepted: 5 January 1998

RSA test=6x40m/30”

Table 2 Performance test scores [mean (SE)] measured before and after training (n = 9 except for repeated sprint test where n = 6). (*RST* repeated sprint test, $\dot{V}O_{2max}$ maximal oxygen consumption)

	Pre-training	Post-training
10 m Time (s)	1.87 (0.02)	1.81 (0.03)
40 m Time (s)	5.50 (0.05)	5.37 (0.08)***
Supramaximal run (s)	49.9 (3.5)	55.5 (4.0)*
RST total time (s)	35.66 (0.65)	34.88 (0.49)*
RST % decrement	7.1 (2.6)	5.9 (1.2)
$\dot{V}O_{2max}$ ($l \cdot min^{-1}$)	4.40 (0.18)	4.67 (0.16)***
$\dot{V}O_{2max}$ ($ml \cdot kg^{-1} \cdot min^{-1}$)	57.0 (2.4)	60.5 (1.9)***

*$P < 0.05$
***$P < 0.01$, significantly different from pre-training scores

Allenamento ad alta Intensità

Protocollo N=16

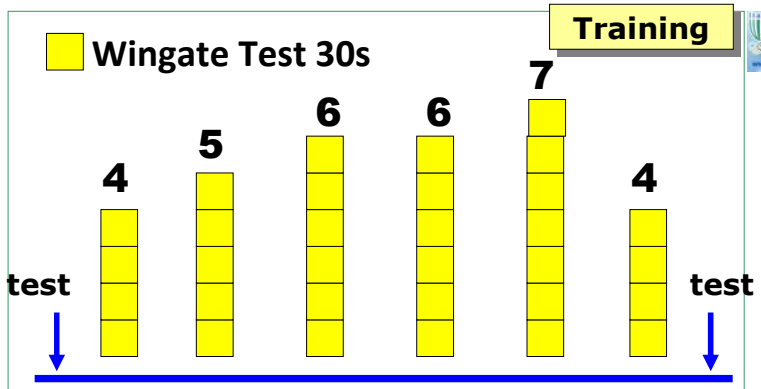
Burgomaster e coll. JAP 2005

Sprint 30s Max

Wingate Test

4 min Recupero

Allenamento ad alta Intensità



Burgomaster e coll. JAP 2005

Allenamento ad alta Intensità

Risultati

Variabili	Post-Training
Citrato Sintasi	**+38%**
VO_{2max}	**------**
Glicogeno Muscolare	**+26%**
Prova 80% VO_{2max}	**+100% [26→51min.]**
Wingate Test 30s	**↑ Picco Potenza**

Burgomaster e coll. JAP 2005

N=16

L'Allenamento Anaerobico

Table 1. Types of anaerobic training

Type of anaerobic training	Exercise intensity (% of maximum speed)	Duration of exercise (s)	Duration of recovery	No. of repetitions
Speed	100	2–10	50–100 s	5–20
Speed endurance production	70–100	10–40	>5 times exercise duration	3–12
Speed endurance maintenance	50–100	5–90	1–3 times exercise duration	2–25

Iaia & Bangsbo 2010

L'Allenamento ad Alta Intensità

Speed Endurance Training

Protocolli:

30" ~Max Int. Rec. ~3'

Lavoro: Pausa >1:4

PRODUCTION *training*

L'Allenamento ad Alta Intensità

Speed Endurance Training

Effetti:

Miglioramento

Con Ridotto Volume

di Allenamento

PRODUCTION *training*

L'Allenamento ad Alta Intensità

PRODUCTION Training

Interesse:

- 400-800-1500m Atletica
- 1000m Ciclismo
- 100-200m nuoto
- Sport di Squadra

L'Allenamento ad Alta Intensità

PRODUCTION Training

- ~1:6 → +++ Sforzi Ripetuti
- Es. Abilità Ripetere Sprint

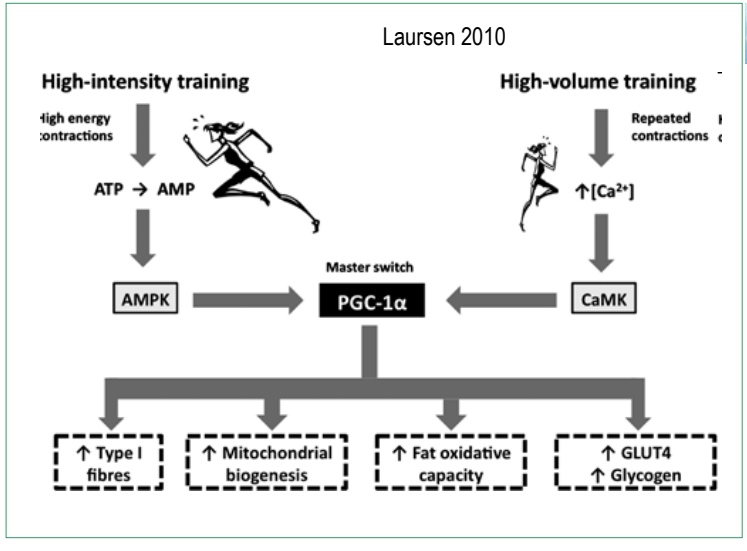
L'Allenamento ad Alta Intensità

MAINTENANCE Training

1:1-3 → +++ Sforzi Al Cont.

Es. Gare 4-6'

Consensus Statements



Consensus Statements

- Gli Atleti Dovrebbero Effettuare Interval-Training a Alta Intensità

Bangsbo 2010

Consensus Statements

- Interval-Training a Alta Intensità

  Intensità > VO_2max

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Consensus Statements

- Tapering

  Enfasi su AI

  Diminuzione Volume

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Consensus Statements

- Tapering

  Enfasi su AI

  Miglioramento e/o Mantenimento effetti Allenamento

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Consensus Statements

- L'allenamento della Forza con sovraccarichi elevati

Migliora la Performance negli Sport ad AI

Bangsbo 2010

Consensus Statements

- L'allenamento della Forza con sovraccarichi elevati

Senza Ipertrofia migliora L'ENDURANCE per SAI di breve durata

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Consensus Statements

- L'allenamento della Forza in:

  Calcio-Volley-Basket-Sprint-Salti-Ciclismo Pista-Kayak-Canottaggio-Karate

Bangsbo 2010

Consensus Statements

- L'allenamento della Forza:

  4-12 reps (70-95% 1RM)

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Consensus Statements

- L'allenamento della Forza:

  Miglioramento ENDURANCE in Sport di Resistenza media lunga durata

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Consensus Statements

- Concurrent Training:

  Miglioramento ENDURANCE in assenza Ipertrofia

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Consensus Statements

- Alimentazione:

  Carboidrati

  Proteine

Bangsbo 2010

Consensus Statements

- Proteine:

  Importante Timing (20-25g)

Bangsbo 2010

Consensus Statements

- Importanza Idratazione:

  Prima gara training

  Post gara training

  “Fare Peso” ?

Bangsbo 2010

Consensus Statements

- Training

  Lunga durata Bassa Intensità+o-AI

  Ottimale per Atleti di Elite

Bangsbo 2010


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