SPECIAL INSIGHTS INTO PHYSIOLOGY OF TENNIS

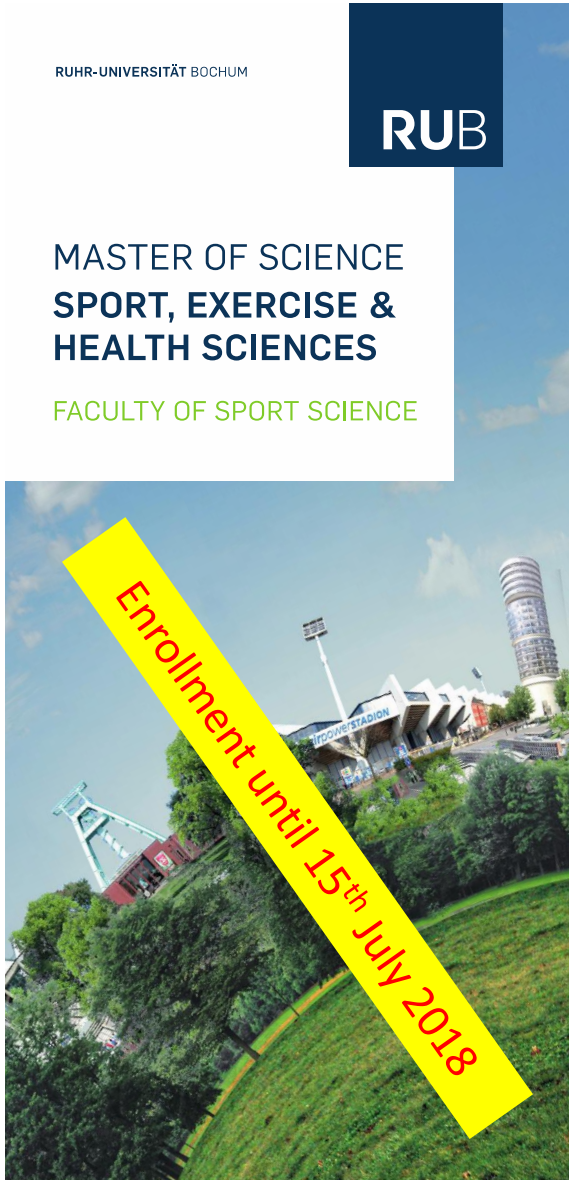
Alexander Ferrauti


Berlin
Metropolis Ruhr


22nd annual Congress of the
EUROPEAN COLLEGE OF SPORT SCIENCE
SPORT SCIENCE IN A METROPOLITAN AREA
5th - 8th July 2017
Ruhr University Bochum, TU Dortmund University and University of Duisburg-Essen
ECSS
EUROPEAN COLLEGE of SPORT SCIENCE
ECSS2017
Book of Abstracts
Edited by:
Ferrauti, A., Platen, P., Grimminger-Seidensticker, E., Jaitner, T.,
Bartmus, U., Becher, L., De Marées, M., Mühlbauer, T.,
Schauerte, A., Wiewelhove, T., Tsolakidis, E.


Westendorf
Evonik. Kraft für Neues.

International Master Degree: *Sport Exercise & Health Sciences* (M. Sc.)


RUHR-UNIVERSITÄT BOCHUM
RUB
MASTER OF SCIENCE
SPORT, EXERCISE & HEALTH SCIENCES
FACULTY OF SPORT SCIENCE
Enrollment until 15th July 2018

SPECIAL INSIGHTS INTO PHYSIOLOGY OF TENNIS

Alexander Ferrauti

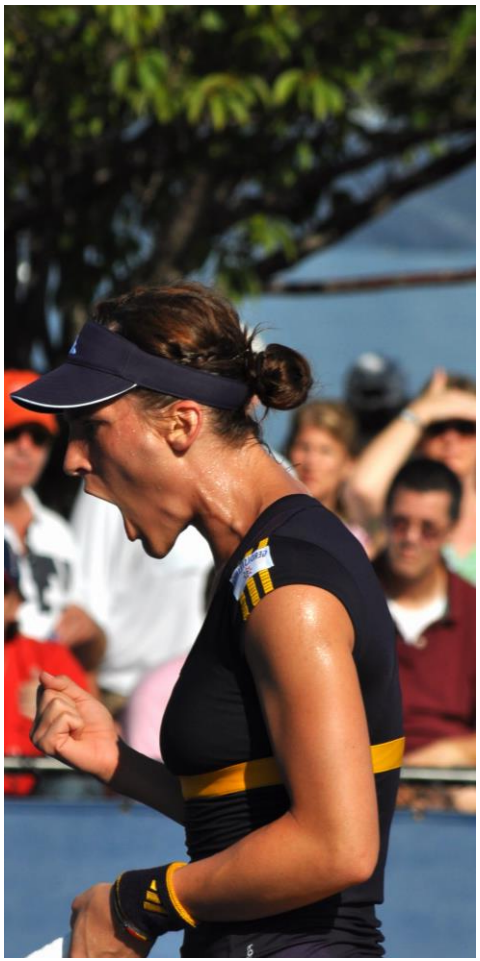
1 PHYSIOLOGY OF TENNIS MATCH PLAY

2 PHYSIOLOGY OF TENNIS ON-COURT DRILLS

3 PHYSICAL FITNESS TESTING & TRAINING

4 CHO, CAFFEINE & CREATINE SUPPLEMENTATION

5 TRANSFER TO BADMINTON & TABLE TENNIS

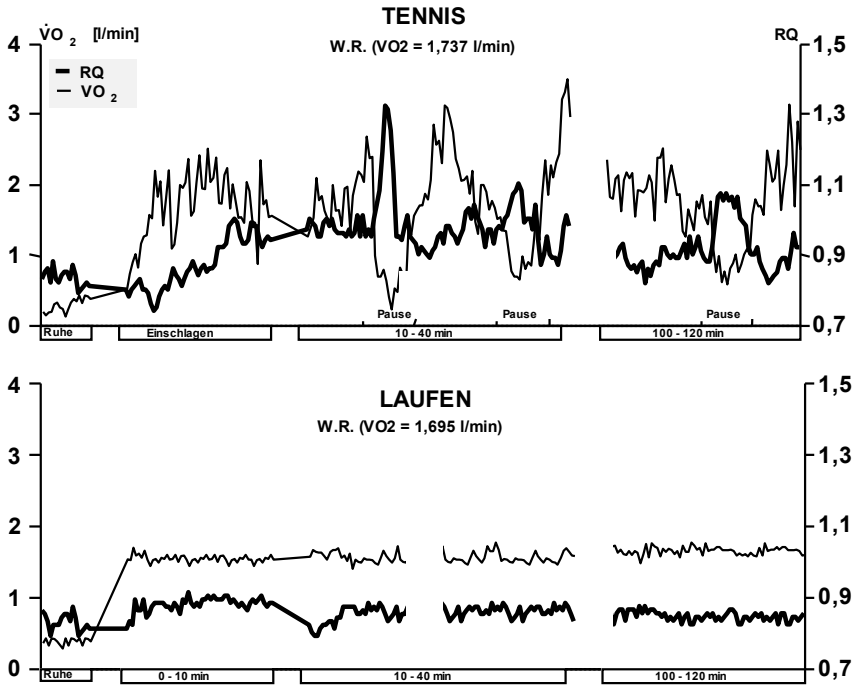


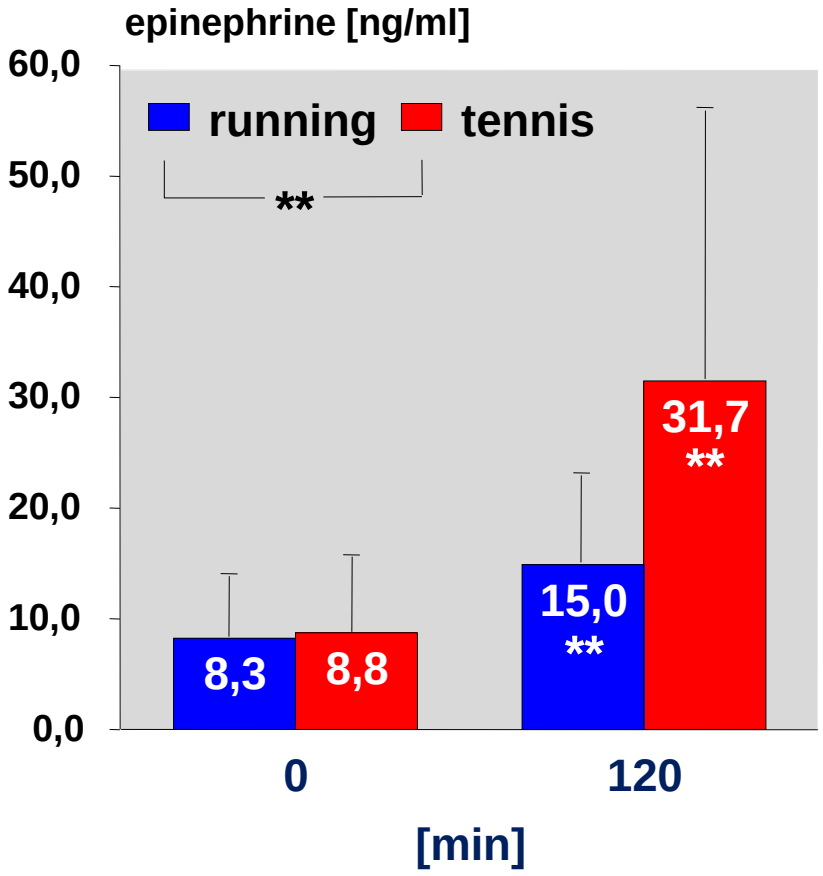
Eur J Appl Physiol (2001) 85: 27–33
DOI 10.1007/s004210100425

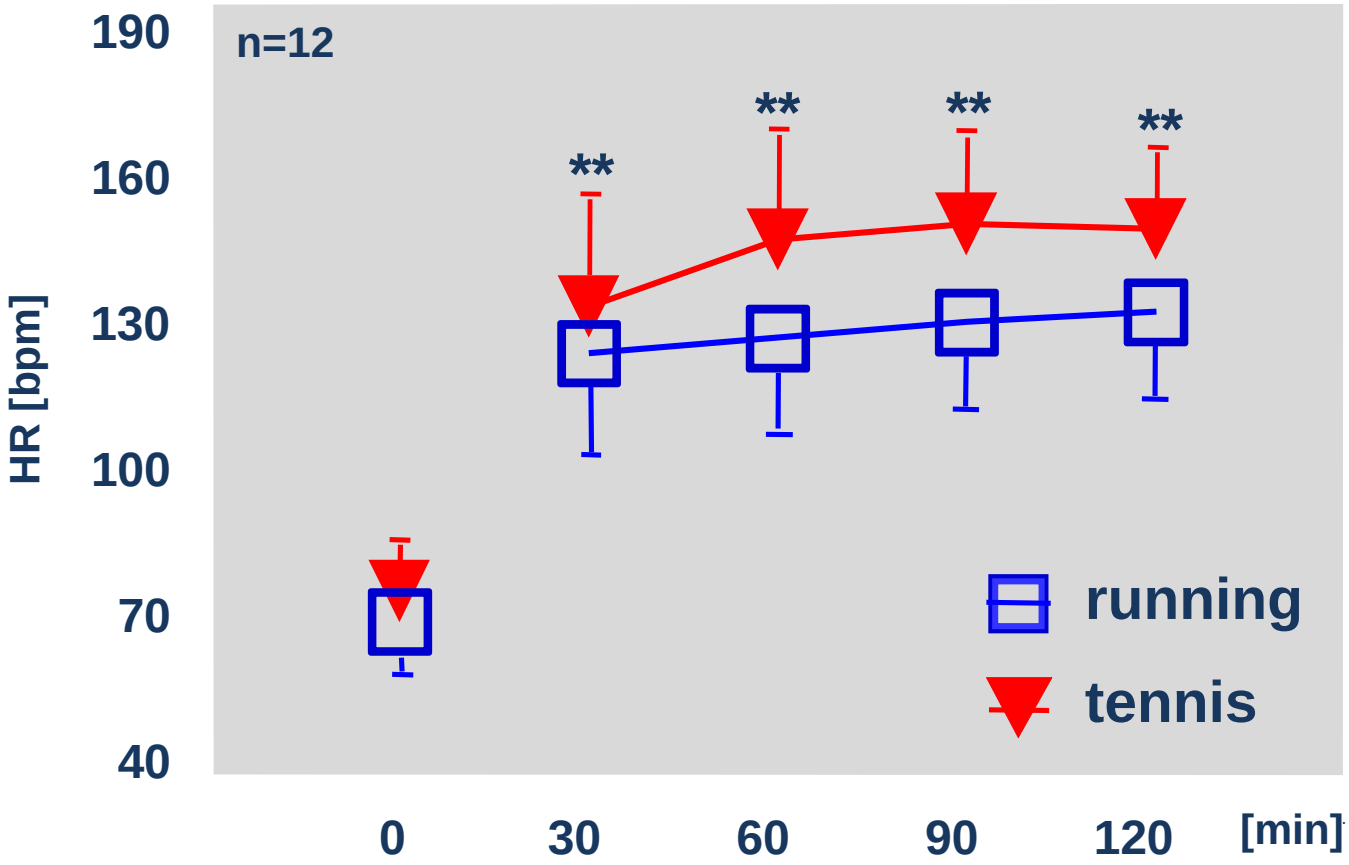
ORIGINAL ARTICLE

Alexander Ferrauti · Michael F. Bergeron
Babette M. Pluim · Karl Weber

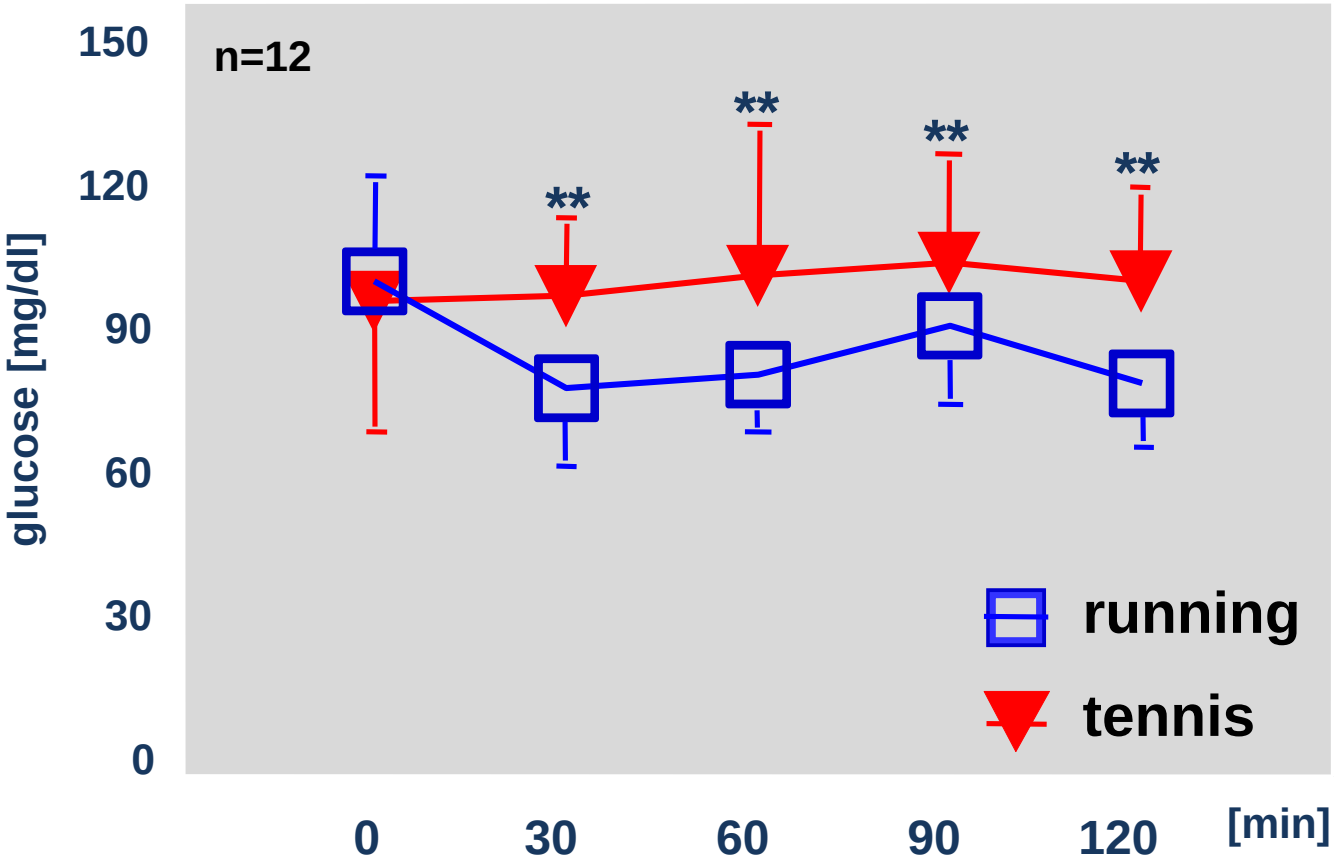
Physiological responses in tennis and running with similar oxygen uptake


TENNIS
W.R. (VO2 = 1,737 l/min)
V̇O 2 [l/min]
RQ
RQ
VO 2
4
3
2
1
0
1,5
1,3
1,1
0,9
0,7
Pause
Pause
Pause
Ruhe
Einschlagen
10 - 40 min
100 - 120 min
LAUFEN
W.R. (VO2 = 1,695 l/min)
4
3
2
1
0
1,5
1,3
1,1
0,9
0,7
Ruhe
0 - 10 min
10 - 40 min
100 - 120 min

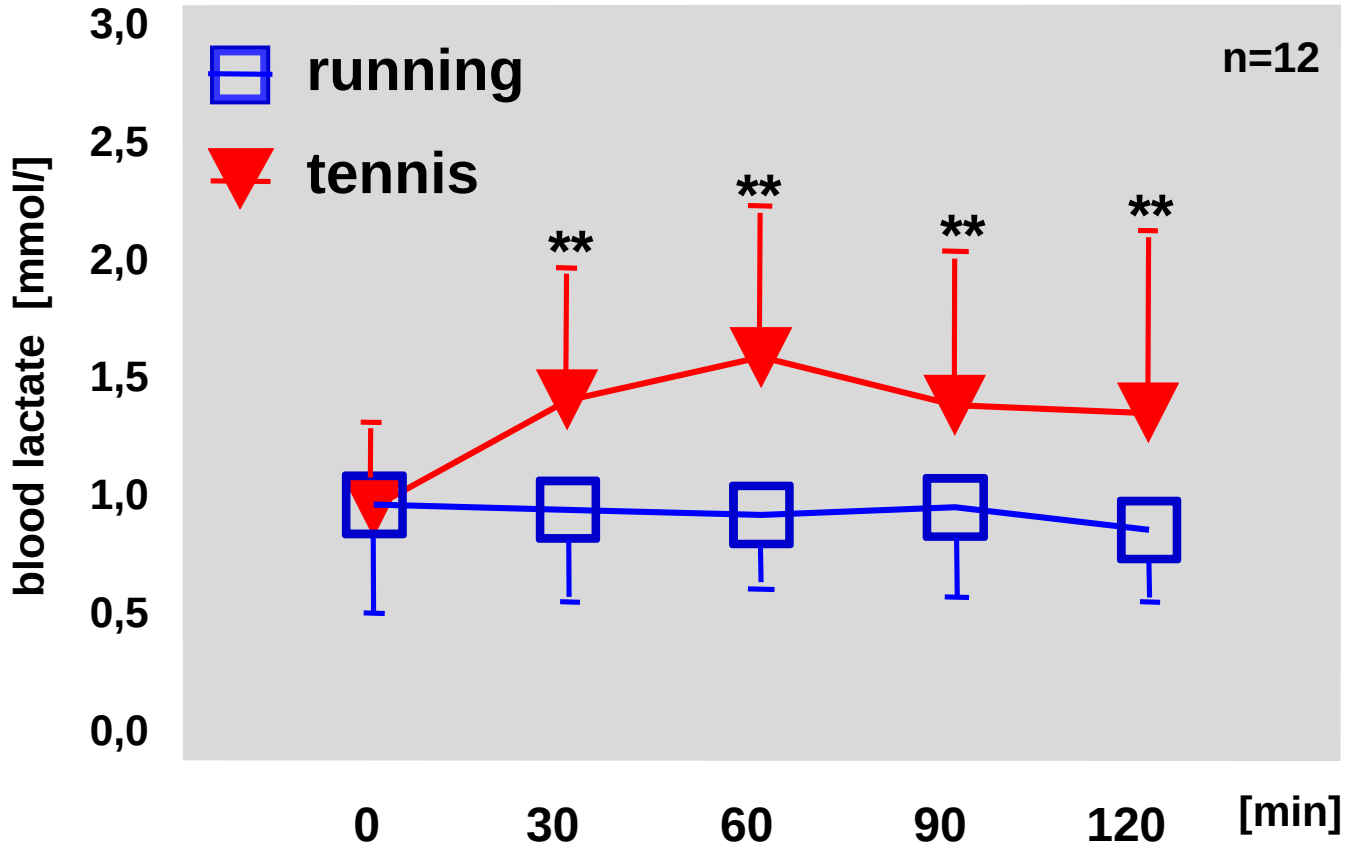

epinephrine [ng/ml]
60,0
50,0
40,0
30,0
20,0
10,0
0,0
running
tennis
**
8,3
8,8
15,0
**
31,7
**
0
120
[min]



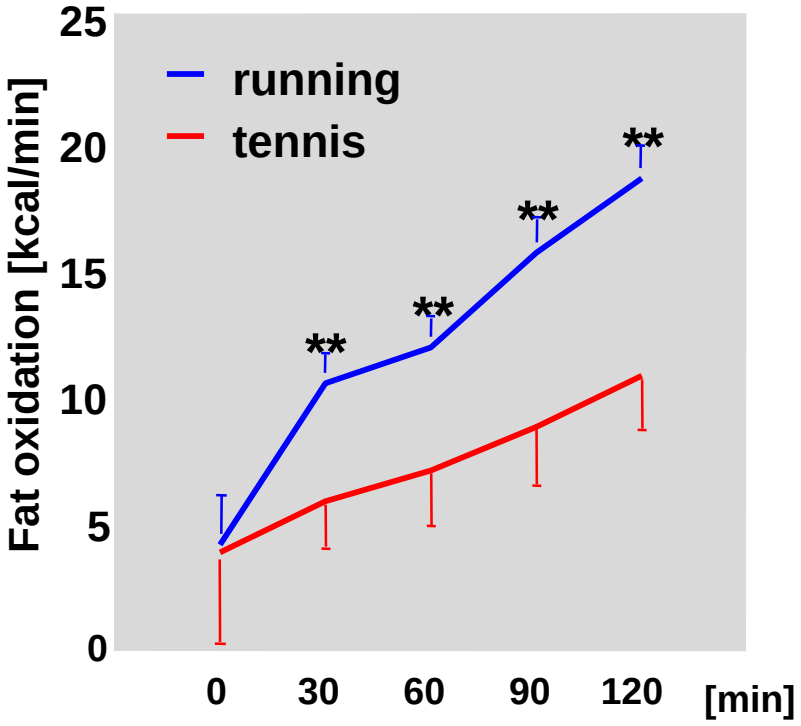
(Ferrauti et al. 2002)

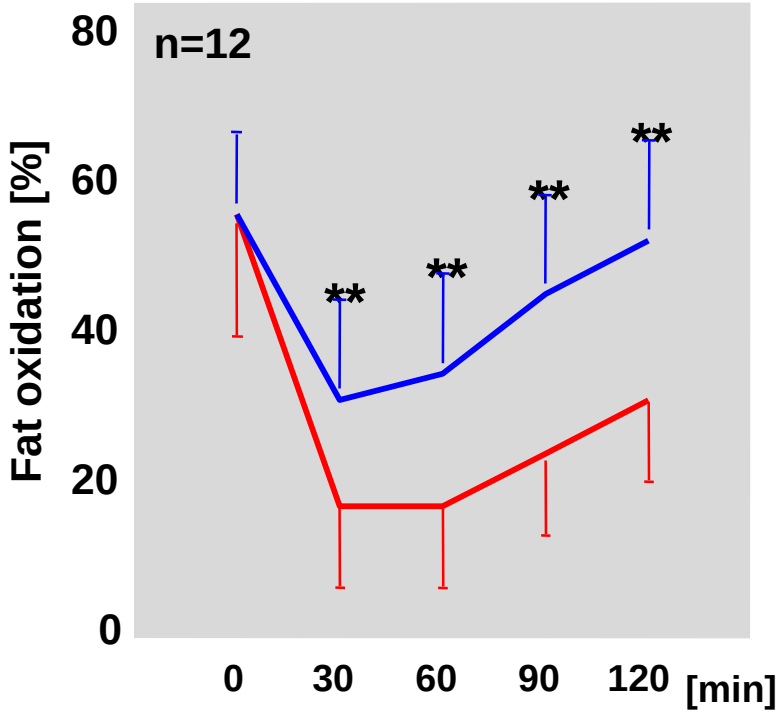


(Ferrauti et al. 2002)



(Ferrauti et al. 2002)





(Ferrauti et al. 2002)


23340

THE PHYSIOLOGICAL DEMANDS OF HITTING AND RUNNING IN TENNIS ON DIFFERENT SURFACES

JAIME FERNANDEZ-FERNANDEZ, VANESSA KINNER, AND ALEXANDER FERRAUTI

Department of Coaching Science, Faculty of Sports Science, Ruhr-University, Bochum, Germany

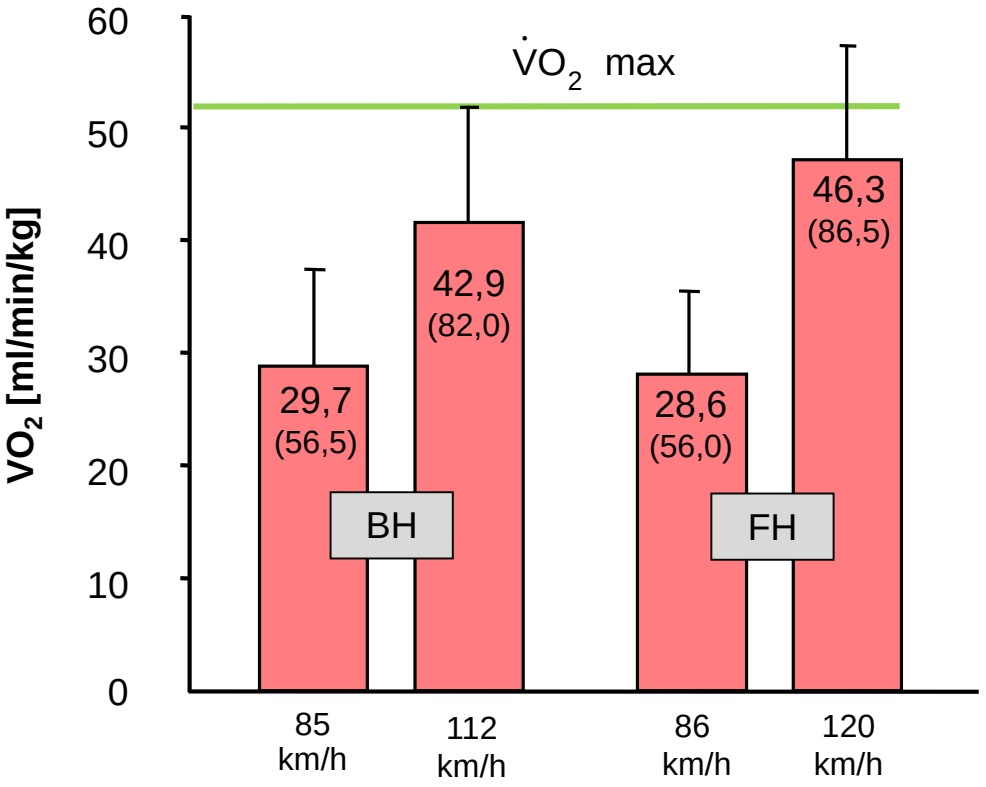
VOLUME 24 | NUMBER 12 | DECEMBER 2010 | 3255

BH max (112 km/h)

FH max (121 km/h)

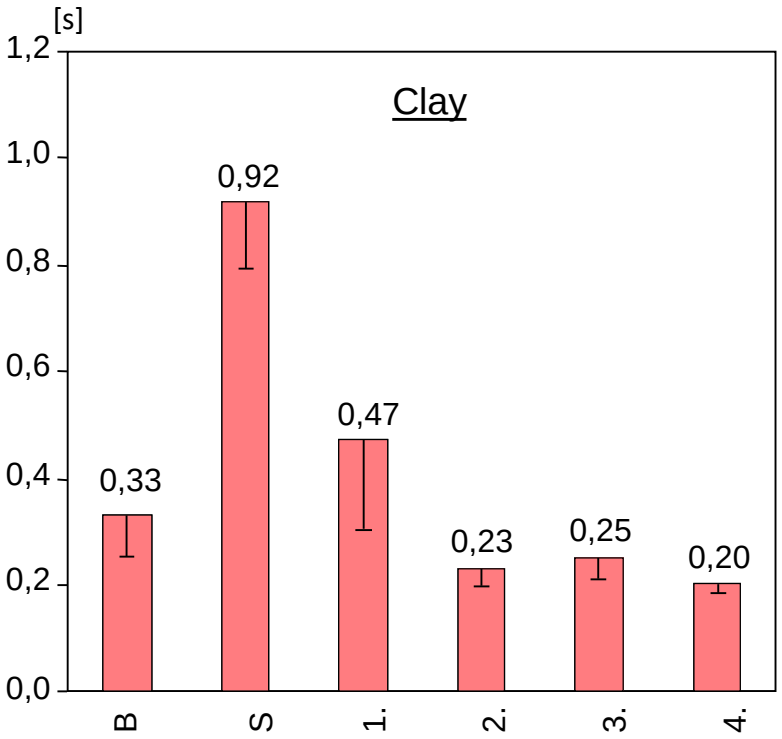
energy demands of hitting

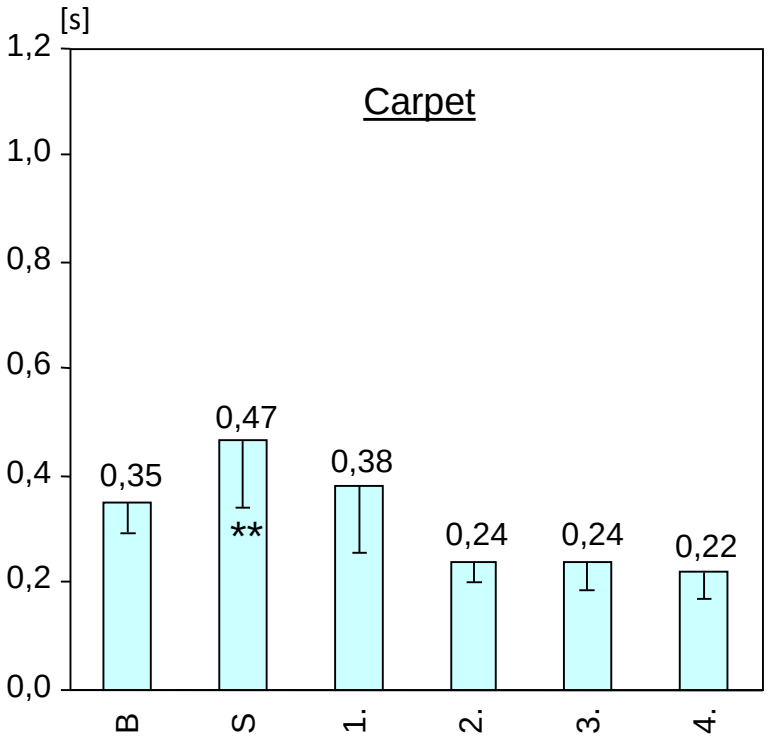
n=12 male players (23,9 ± 2,5 yrs; 186 ± 5 cm; 79,9 ± 5,9 kg)

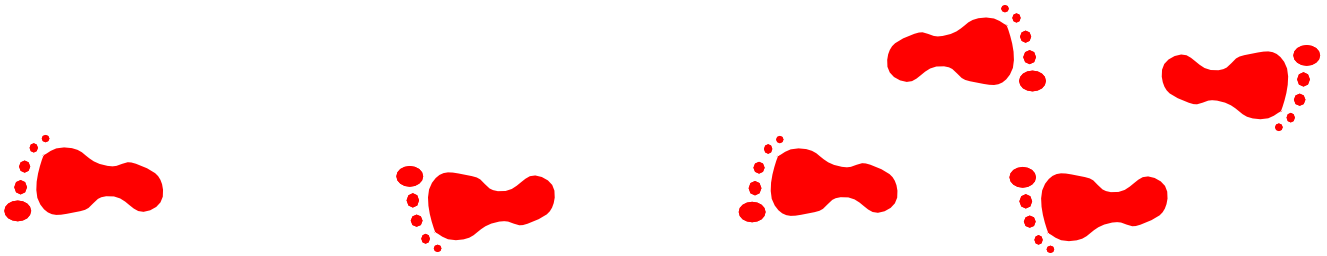


(Fernandez-Fernandez et al. 2010)

Ground contact times [s]







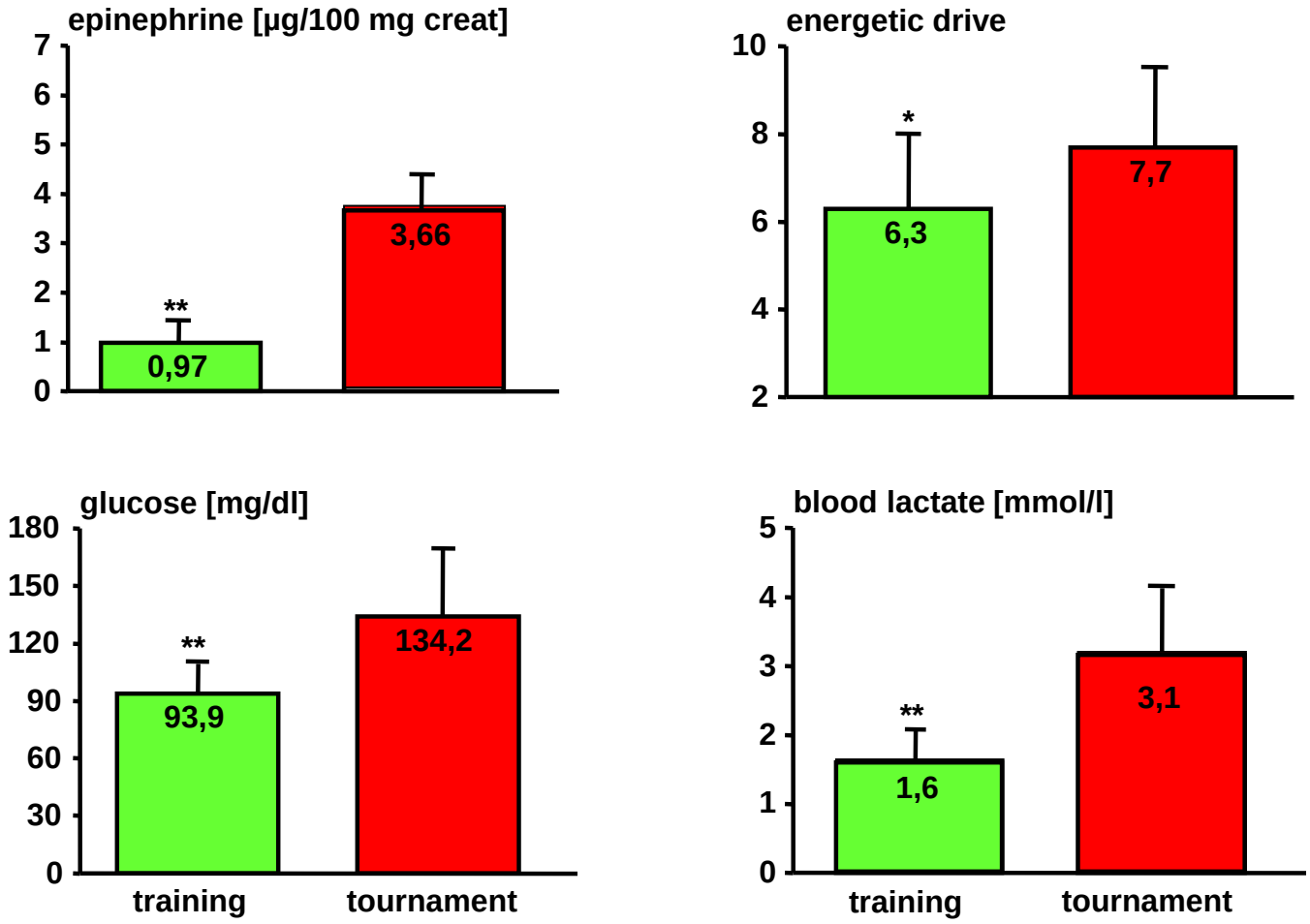
R. Federer (SUI) – R. Nadal (ESP)

5:7/6:4/6:7

J SPORTS MED PHYS FITNESS 2001;41:269-74

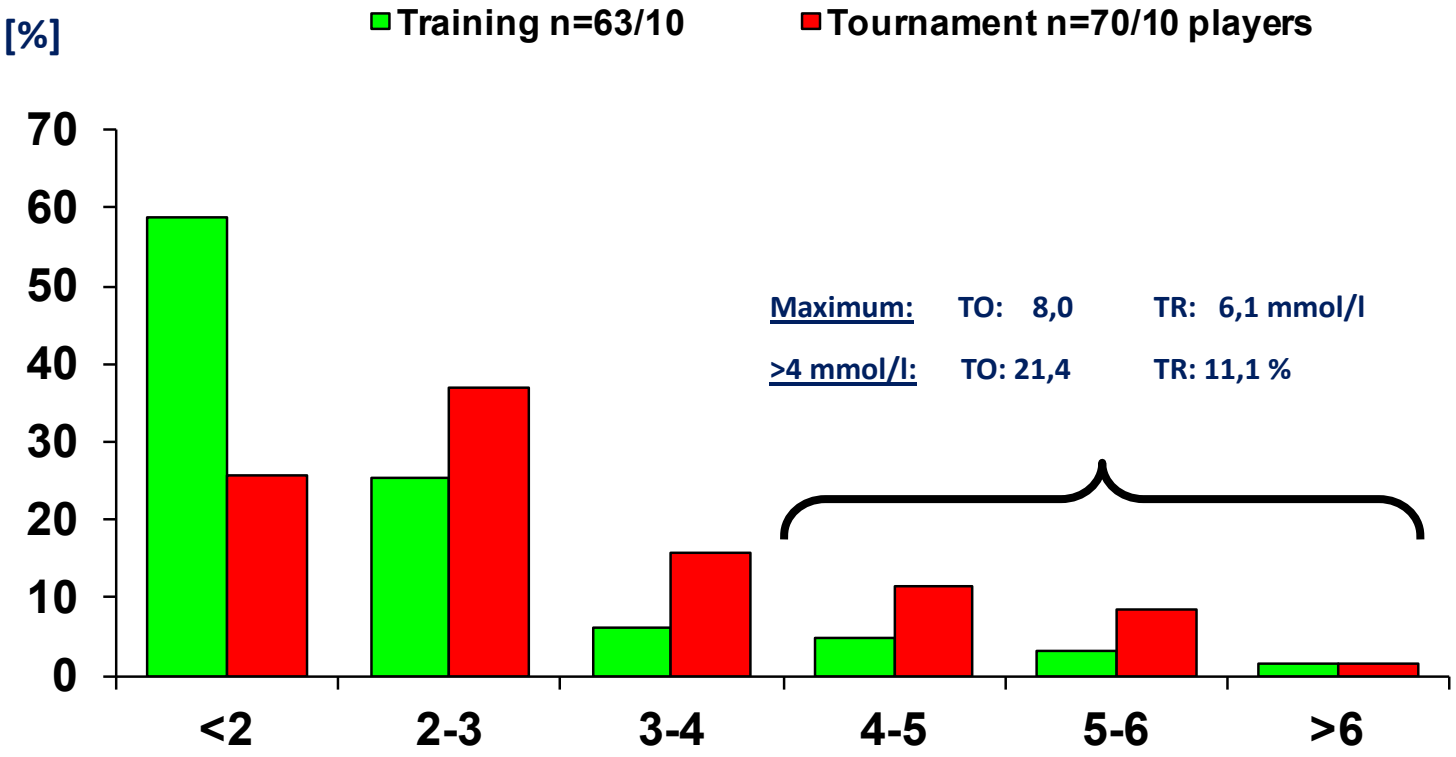
Urine catecholamine concentrations and psychophysical stress in elite tennis under practice and tournament conditions

A. FERRAUTI, G. NEUMANN, K. WEBER, J. KEUL*



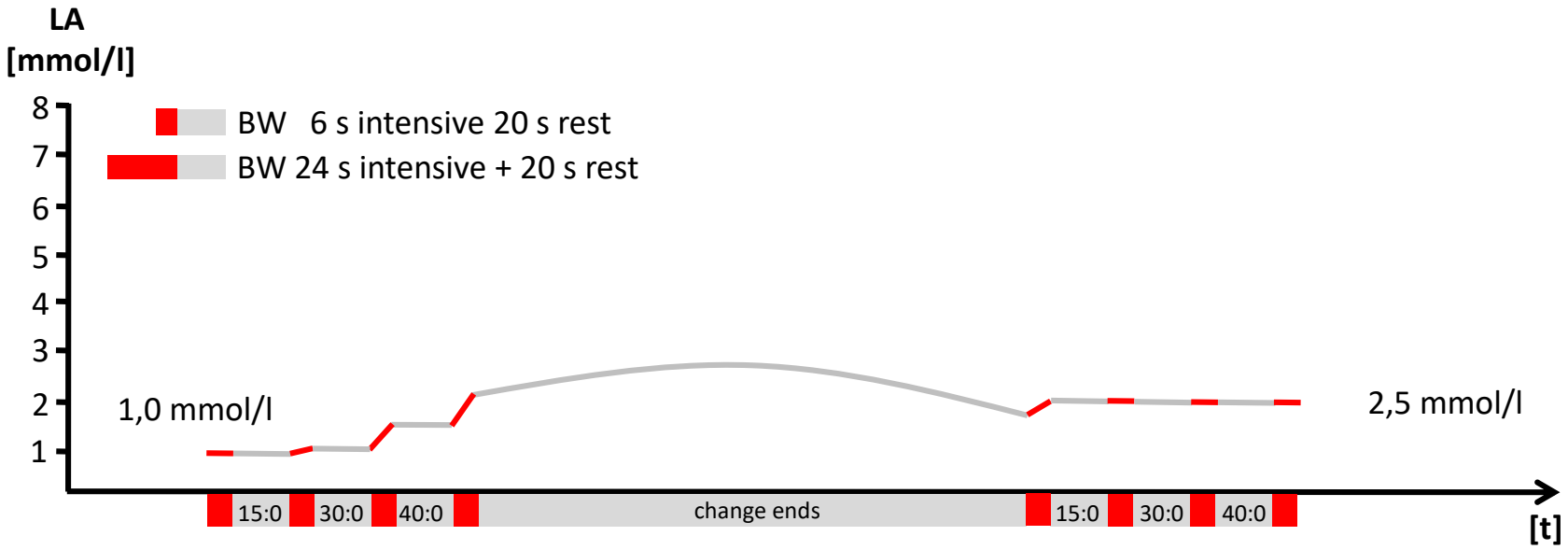
(Ferrauti et al. 2001)

Blood Lactate Values during Match Play



rally patterns influence LA concentration

n=6 male players (22,3±2,1 yrs; 182±6 cm; 74,9±5,1 kg)



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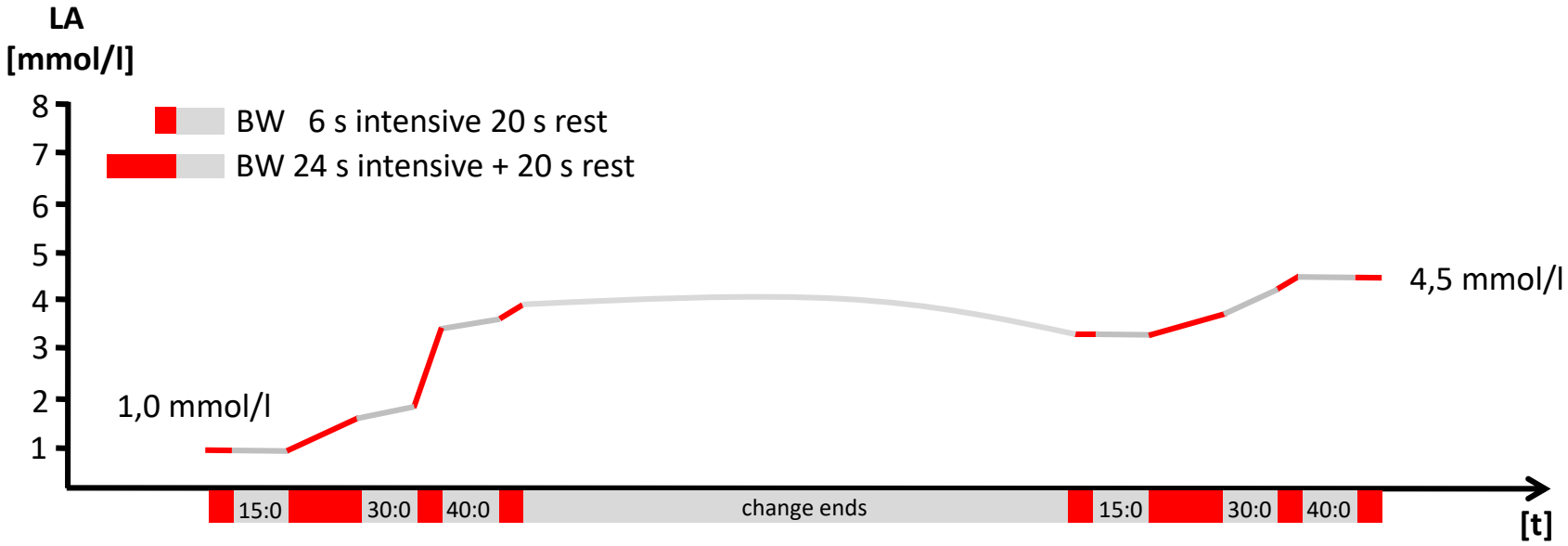

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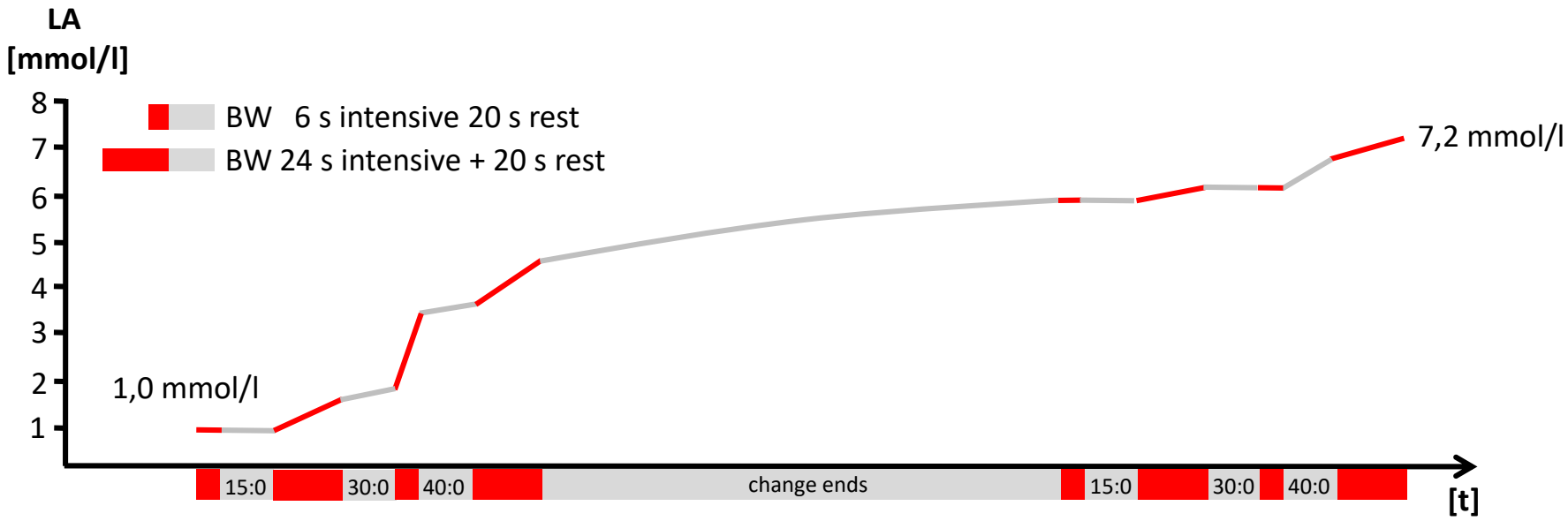
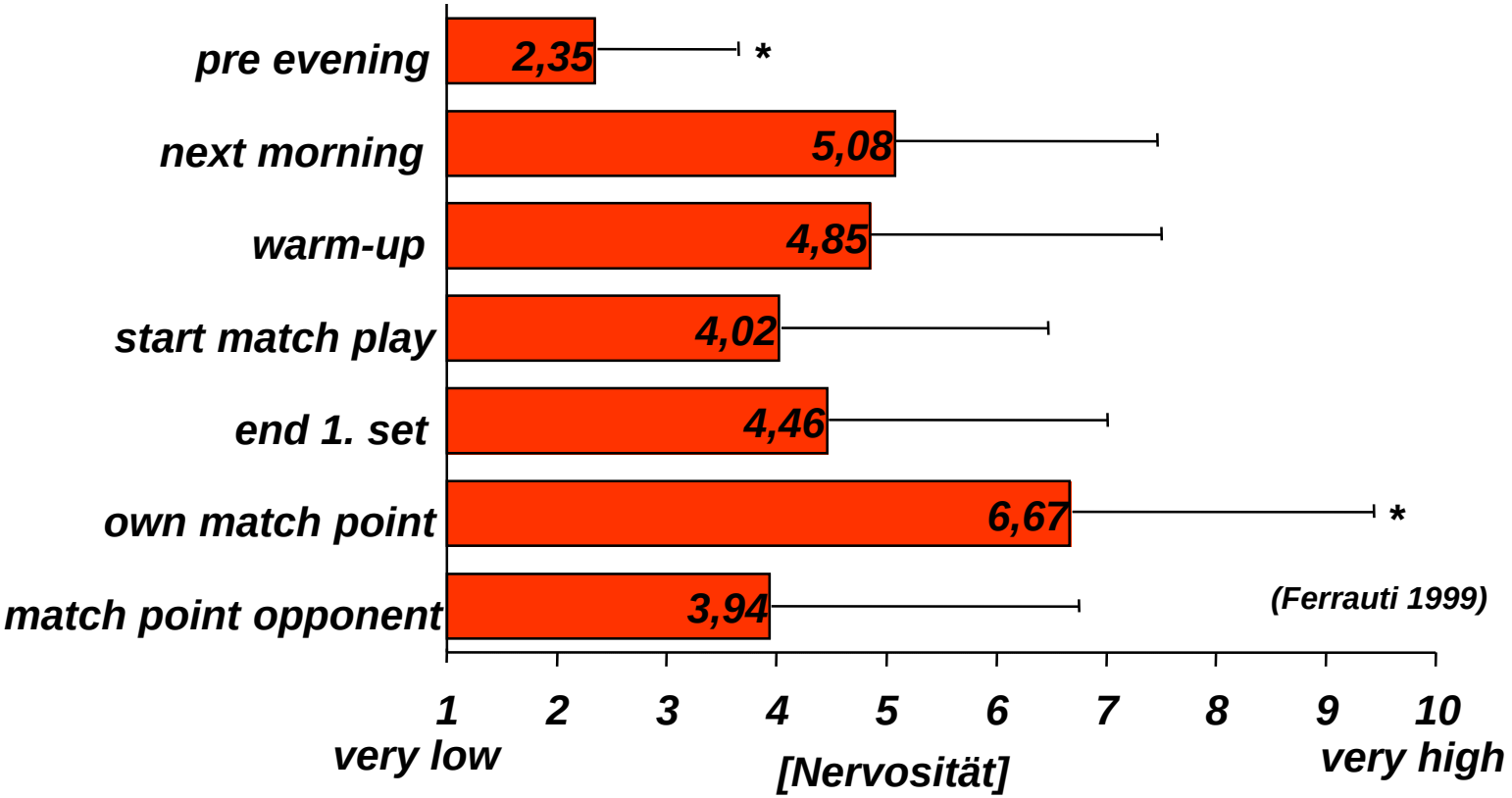


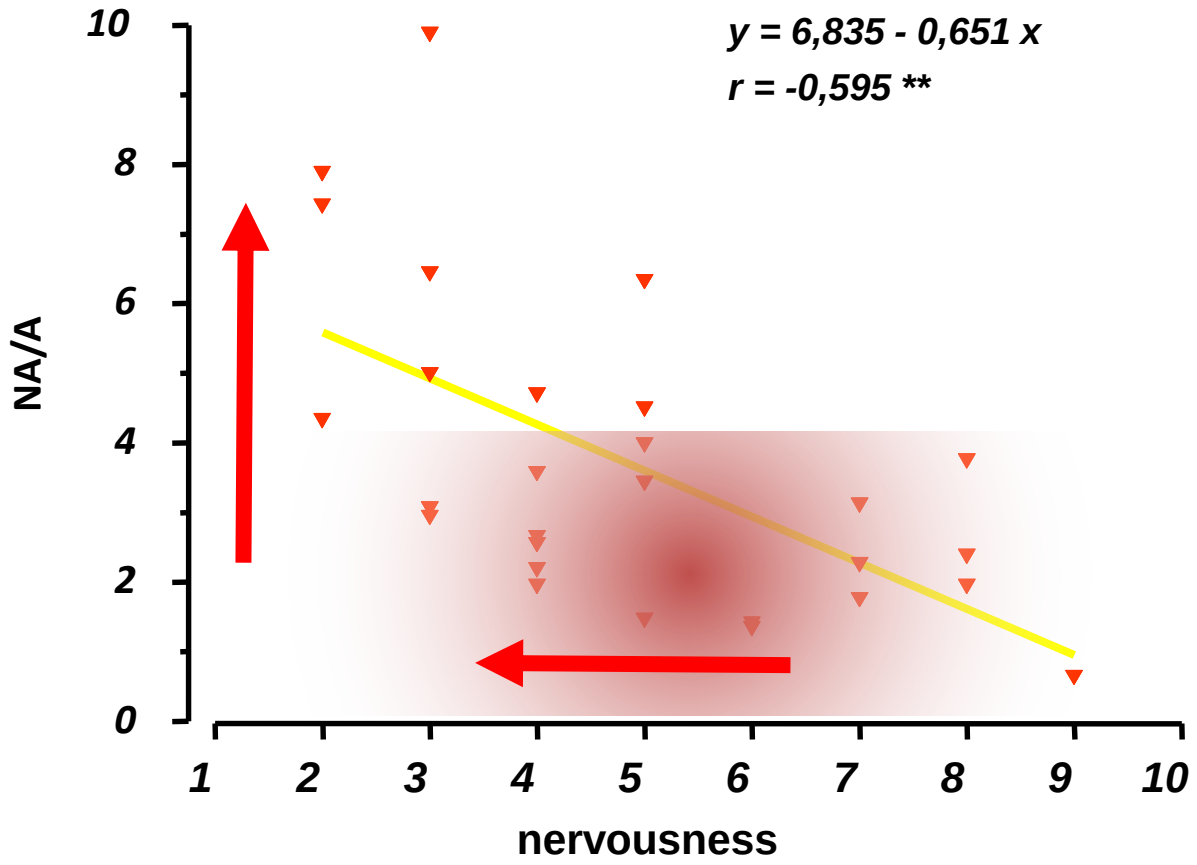
pre start nervousness

(n=26 tournament players)



post exercise urine catecholamines

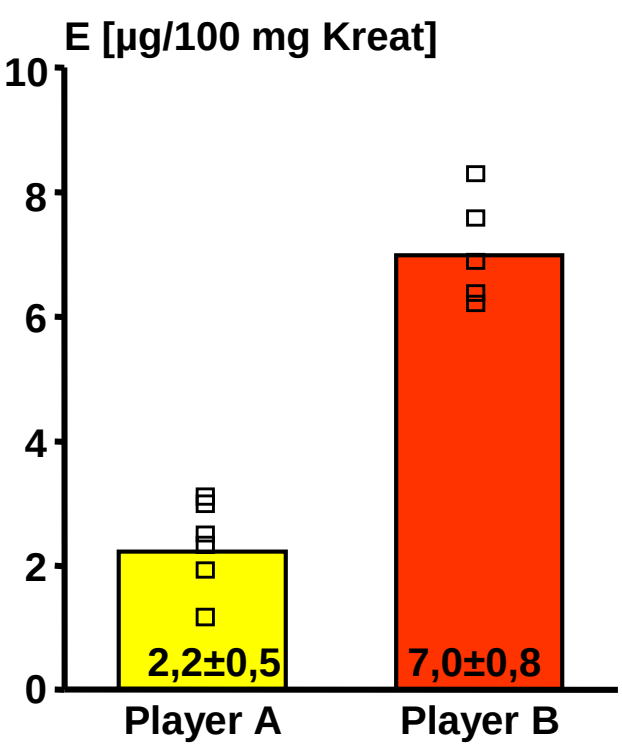
(n=26 tournament players)

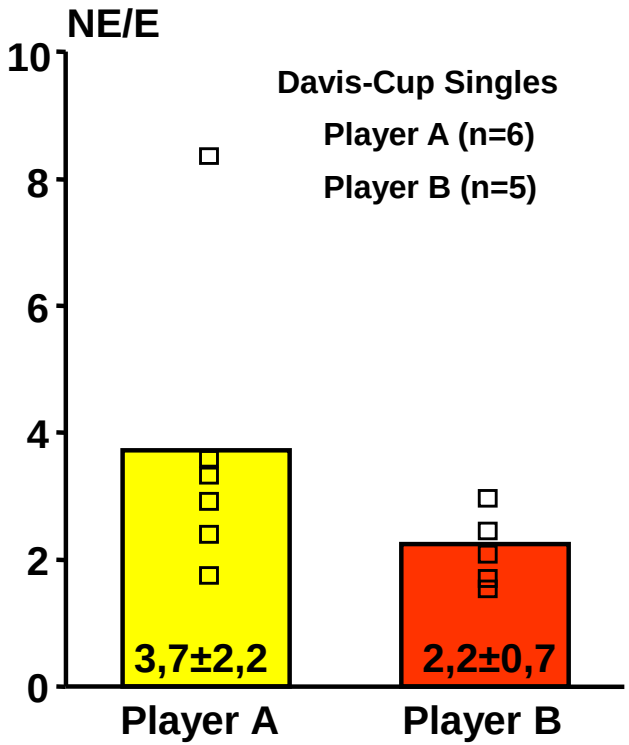


(Ferrauti et al. 2001)

post exercise urine catecholamines

(n=26 tournament players)





(Ferrauti et al. 2002)

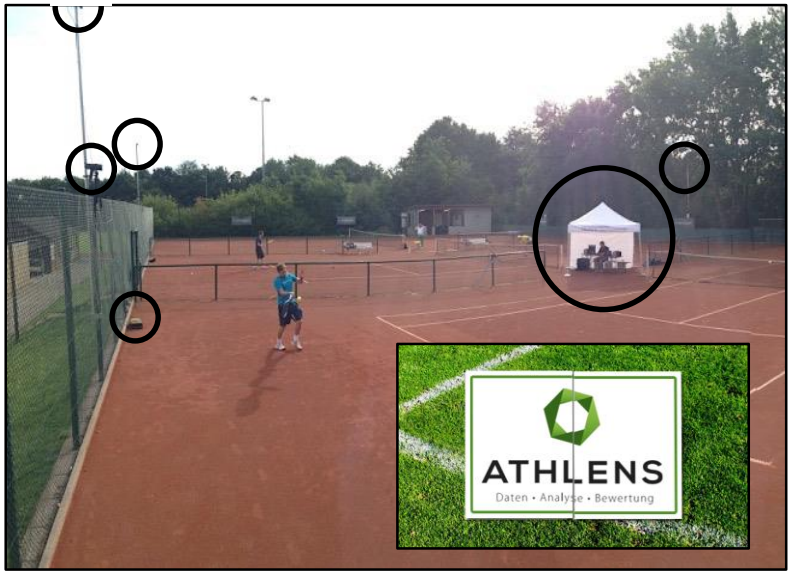
REVIEW / SPECIAL ISSUE

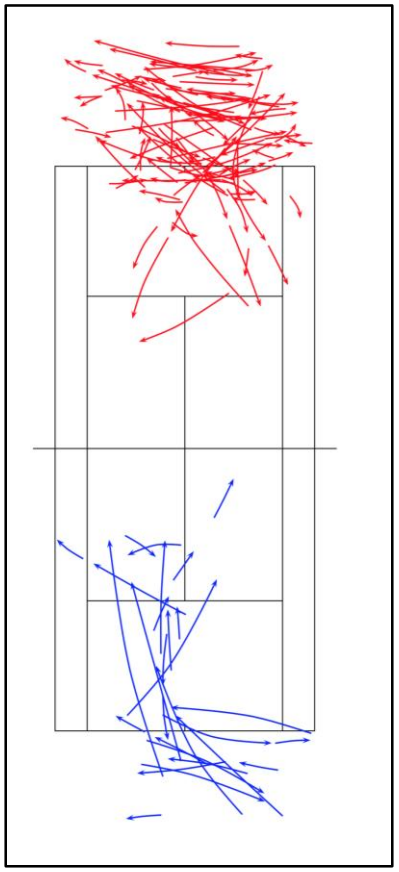
Sports Orthop. Traumatol. 34, 3–14 (2018)
© Elsevier GmbH
www.SOTjournal.com
https://doi.org/10.1016/j.orthtr.2018.01.001

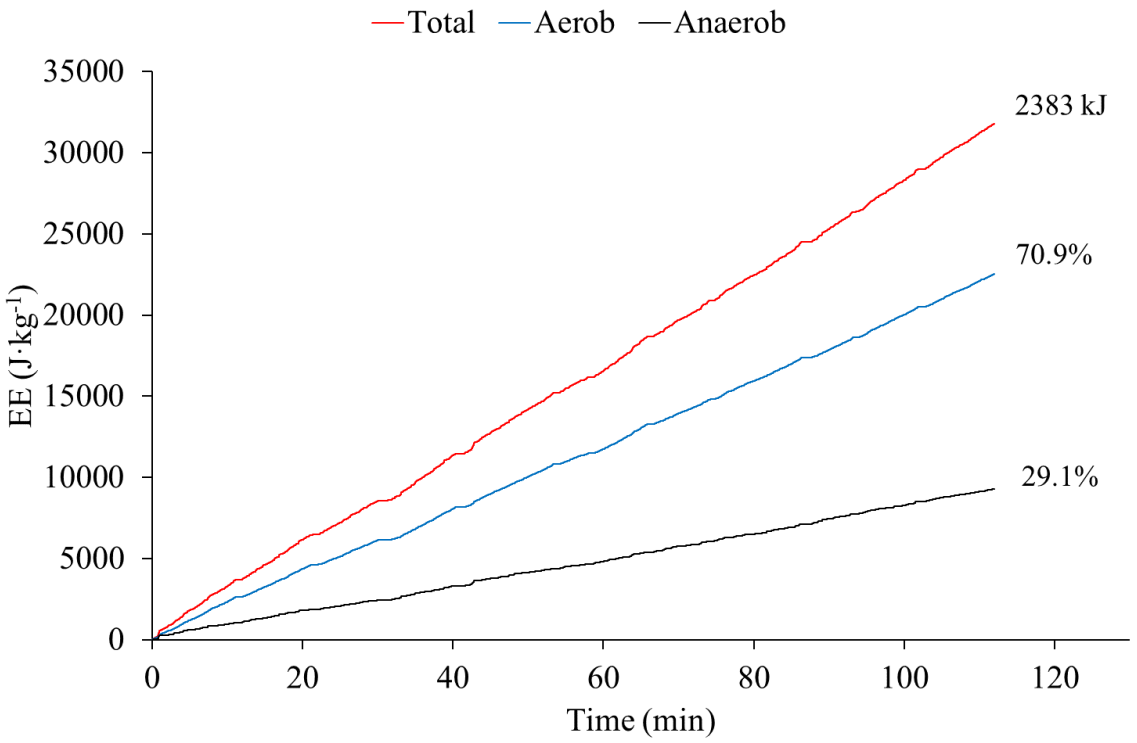
REVIEW / SPECIAL ISSUE

Estimating external loads and internal demands by positioning systems and innovative data processing approaches during intermittent running activities in team and racquet sports

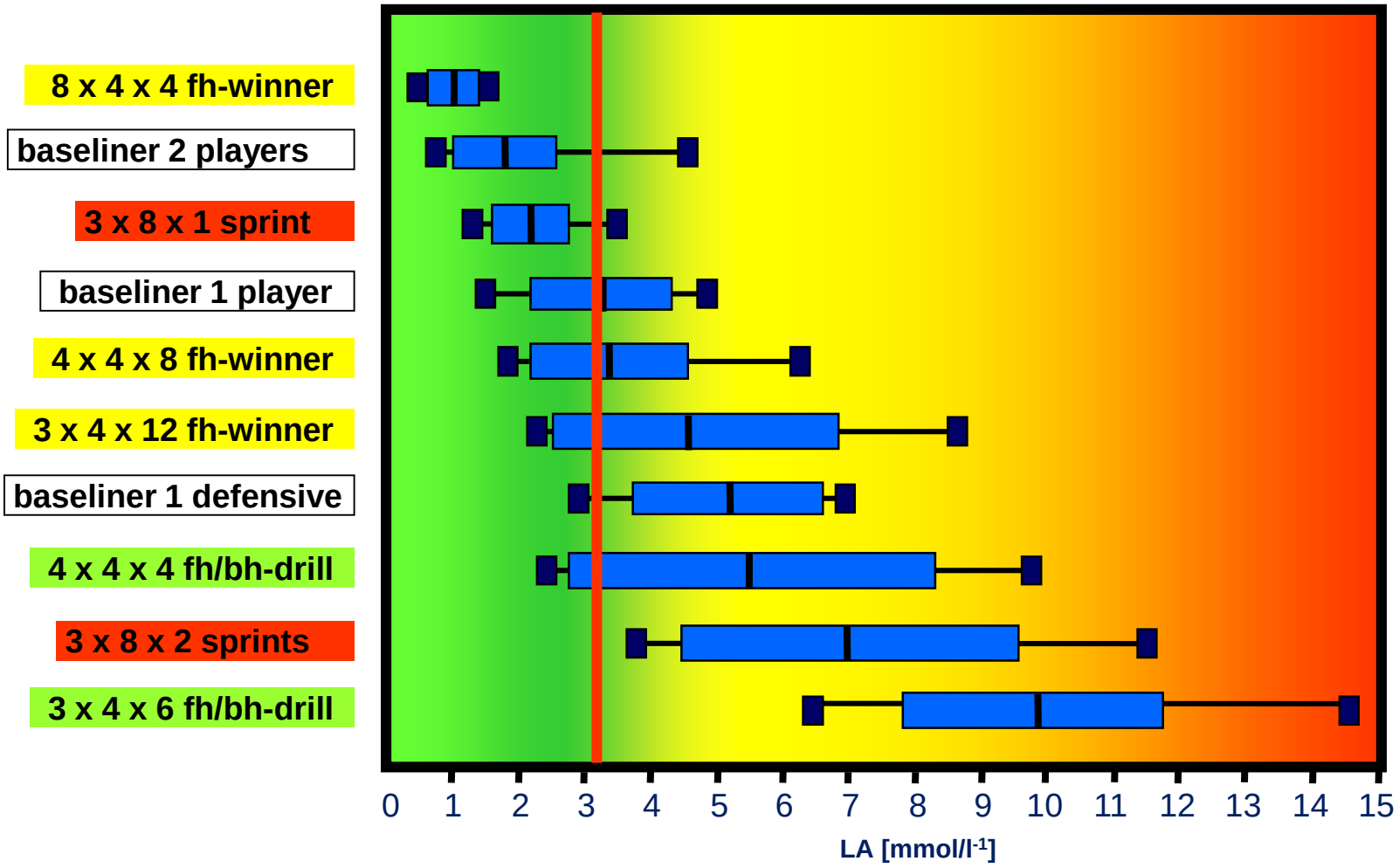
Matthias W. Hoppe, Christian Baumgart, Jürgen Freiwald
University of Wuppertal, Department of Movement and Training Science, Wuppertal, Germany






Total
Aerob
Anaerob
35000
30000
25000
20000
15000
10000
5000
0
EE (J·kg-1)
0
20
40
60
80
100
120
Time (min)
2383 kJ
70.9%
29.1%

blood lactate in tennis drills

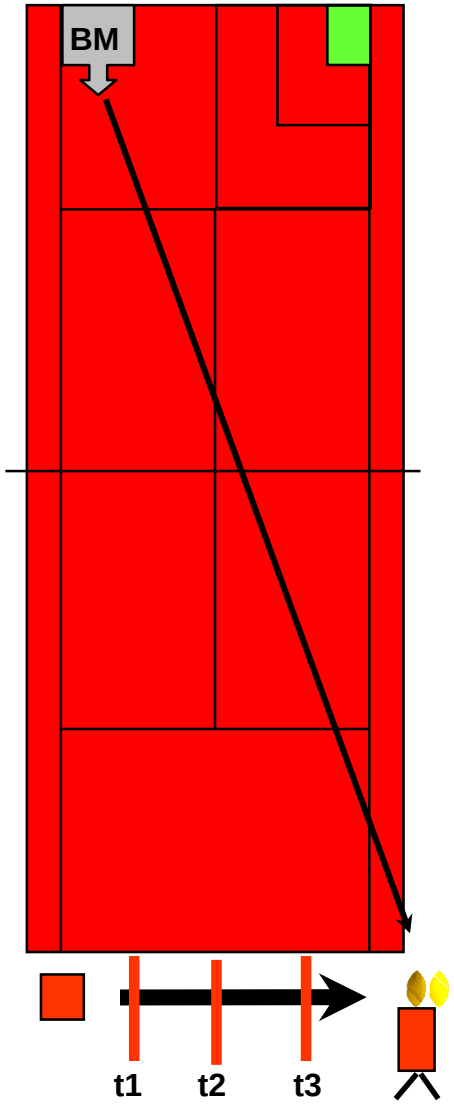


Journal of Sports Sciences, 2001, **19**, 235–242

The effect of recovery duration on running speed and stroke quality during intermittent training drills in elite tennis players

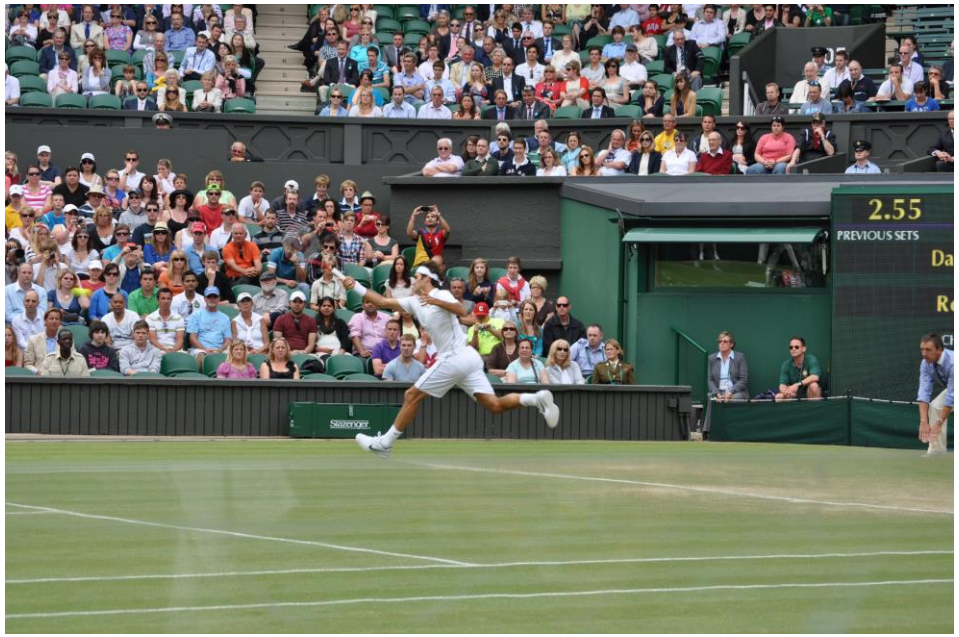
ALEXANDER FERRAUTI,[1]* BABETTE M. PLUIM[2] and KARL WEBER[1]

[1]*Institute of Sports Games, German Sport University Cologne, Carl-Diem-Weg 6, D-50933 Cologne, Germany and*
[2]*Royal Netherlands Lawn Tennis Association, Displayweg 4, 3821 BT Amersfoort, The Netherlands*



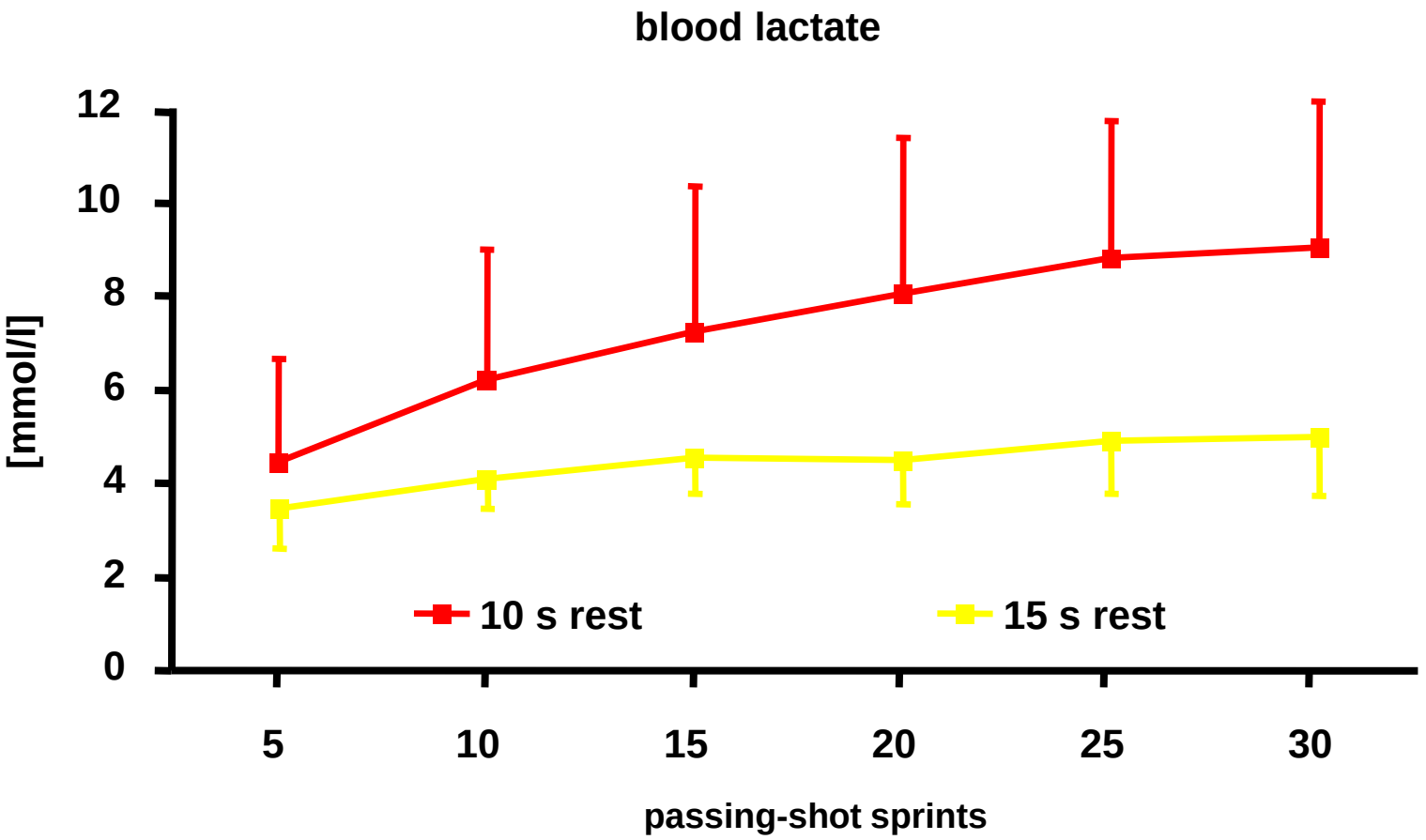
exercise:

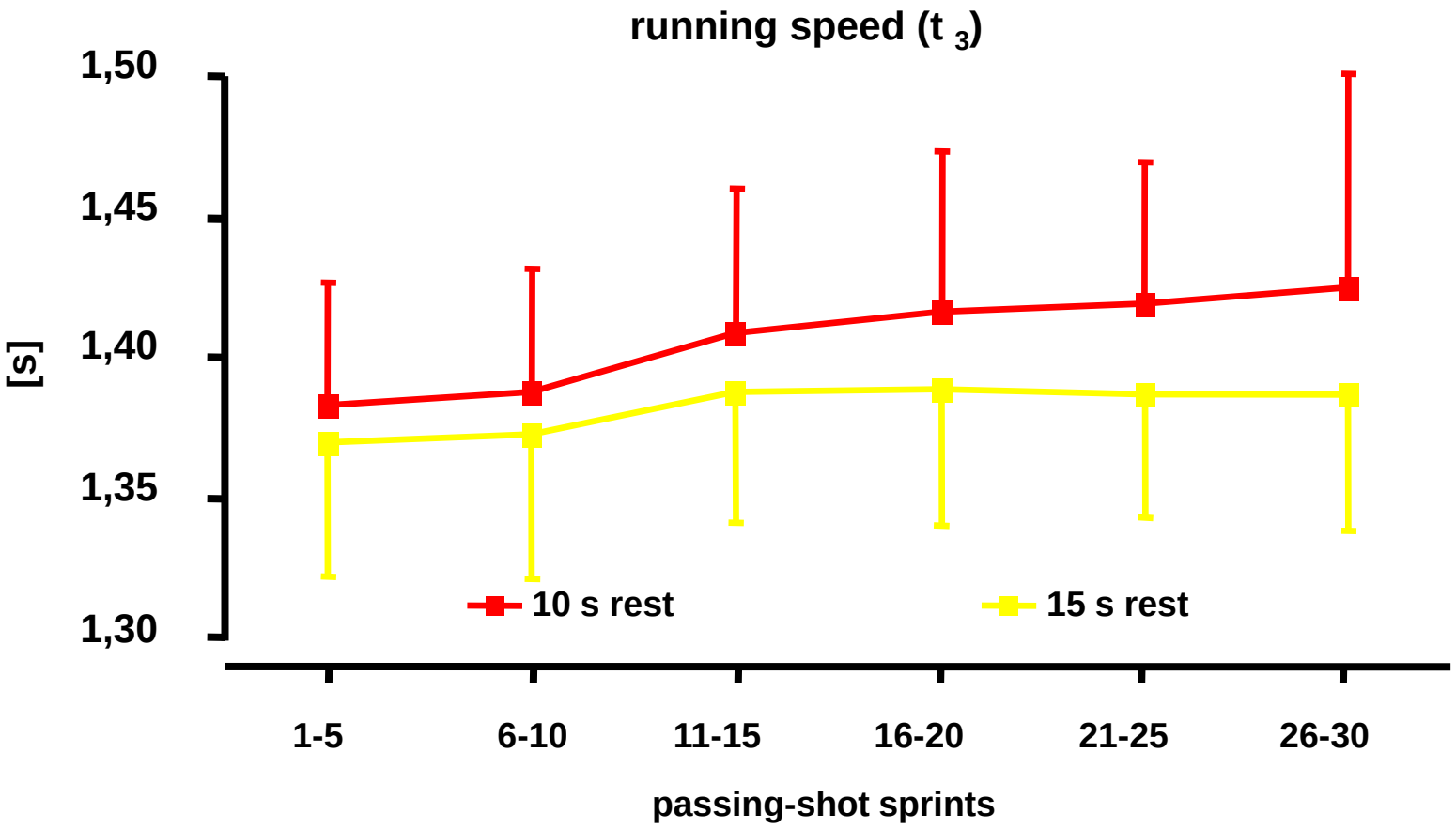
passing-shot sprints ($t_{1, 2, 3}$)

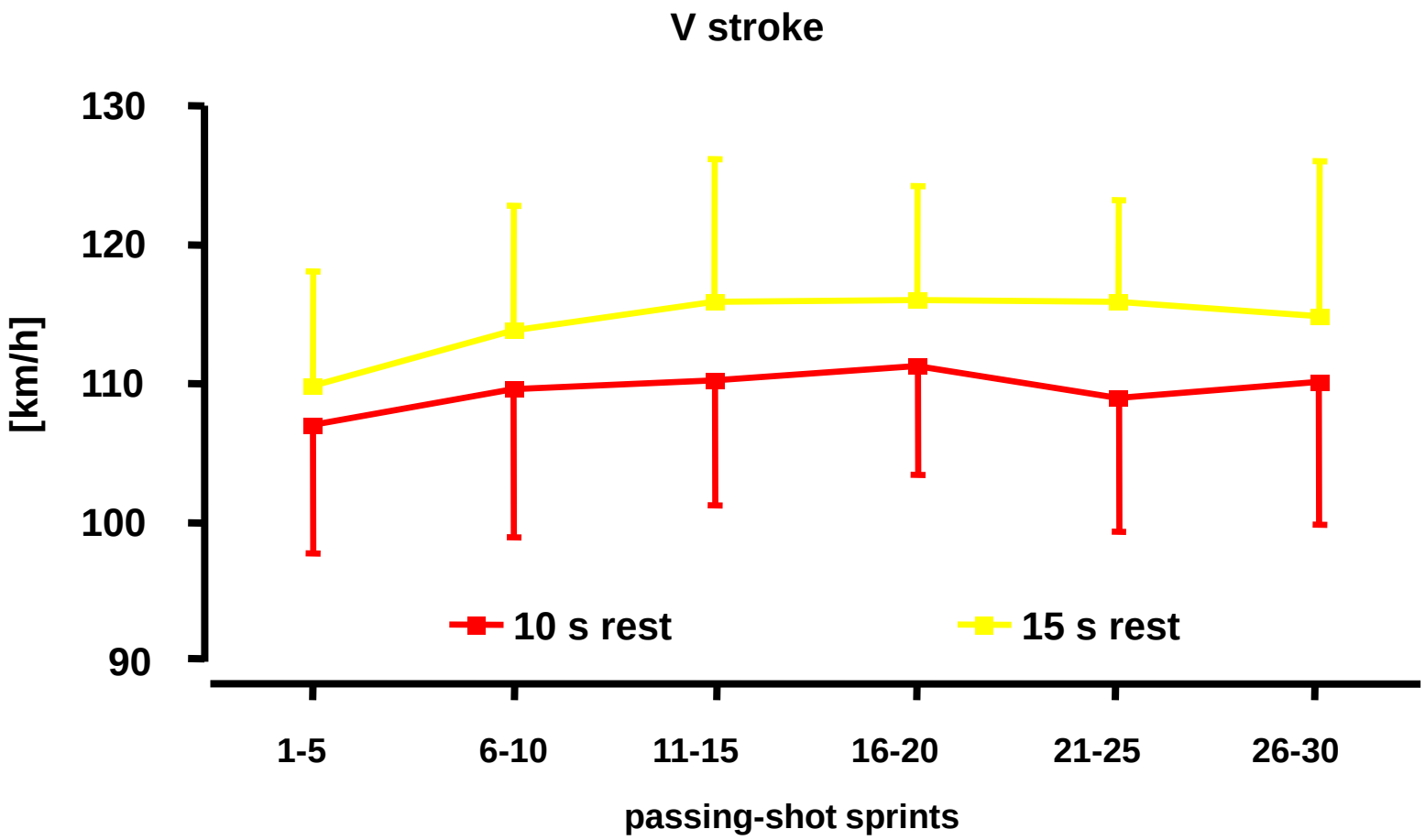


ANOVA

rest	p = 0,001 **
sprints	p = 0,019 *
rest x sprints	p = 0,039 *




running speed (t 3)
1,50
1,45
1,40
1,35
1,30
[s]
10 s rest
15 s rest
1-5
6-10
11-15
16-20
21-25
26-30
passing-shot sprints


V stroke
130
120
110
100
90
[km/h]
10 s rest
15 s rest
1-5
6-10
11-15
16-20
21-25
26-30
passing-shot sprints

Tips for Coaches

- there is no „good“ or „bad“ drill, but a „wrong“

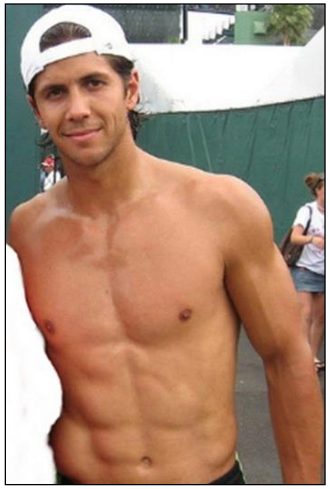
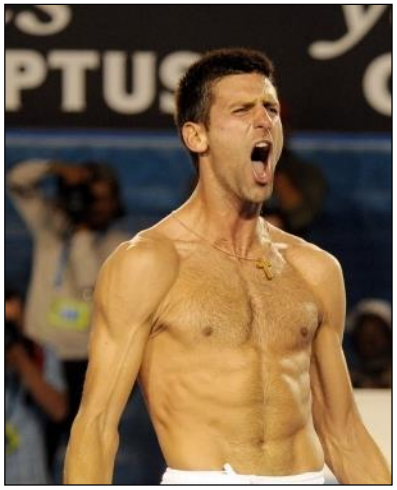
- define training goal before constructing drills

- adjust intensity, duration and recovery

  according to the goals

- establish feedback agreements with players

- Attention !
  Coaches usually underestimate intensity

SCHWERPUNKT / ORIGINALARBEIT

Sport Orthop. Traumatol. **29**, 180–192 (2013)
Elsevier – Urban&Fischer
www.elsevier.de/SportOrthoTrauma
http://dx.doi.org/10.1016/j.orthtr.2013.07.005

ORIGINALARBEIT/ORIGINAL PAPER

Conception for Fitness Testing and individualized training programs in the German Tennis Federation

Alexander Ulbricht, Jaime Fernandez-Fernandez, Alexander Ferrauti
Department of Training and Exercise Science, Faculty of Sports Science,
Ruhr-University Bochum, Germany

Journal of Sports Sciences, 2011; 1–10, i*First* article

Routledge
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The Hit & Turn Tennis Test: An acoustically controlled endurance test for tennis players

ALEXANDER FERRAUTI, VANESSA KINNER, & JAIME FERNANDEZ-FERNANDEZ

Department of Coaching Science, Faculty of Sports Science, Ruhr Universität Bochum, Bochum, Germany


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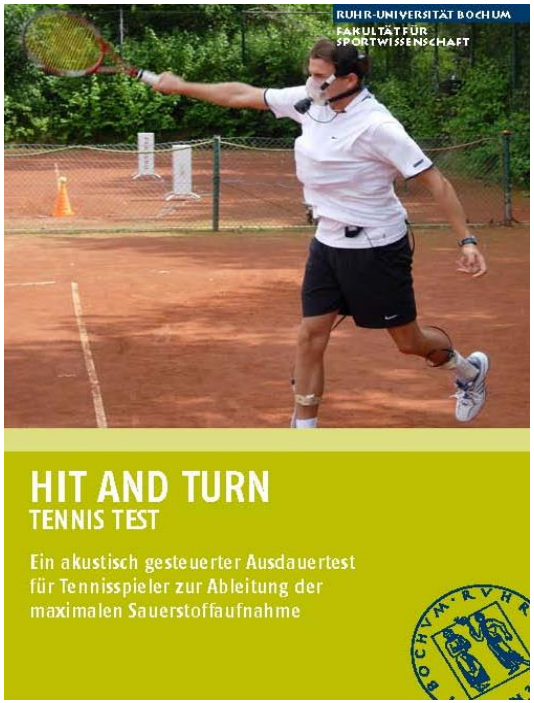
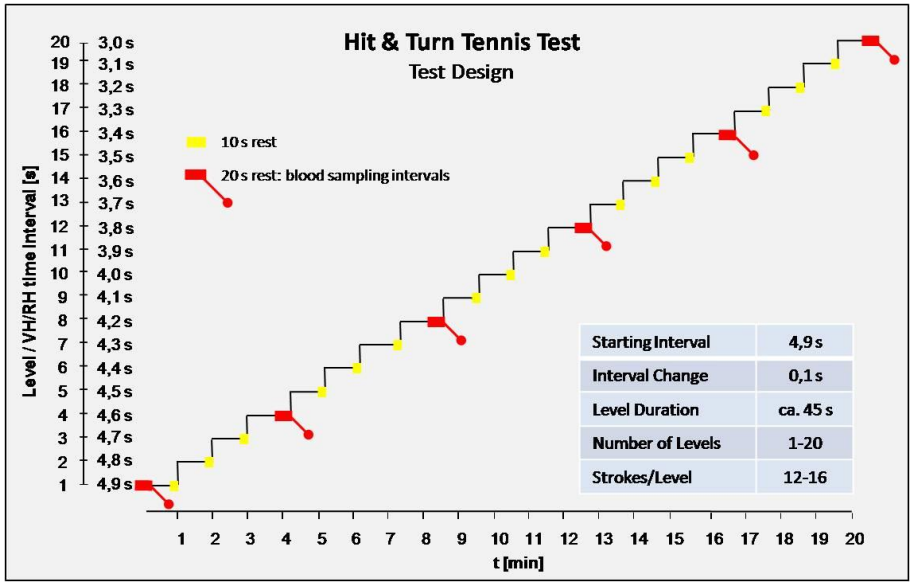

RUHR-UNIVERSITÄT BOCHUM
FAKULTÄT FÜR
SPORTWISSENSCHAFT
HIT AND TURN
TENNIS TEST
Ein akustisch gesteuerter Ausdauertest
für Tennisspieler zur Ableitung der
maximalen Sauerstoffaufnahme

Hit & Turn Tennis Test (HTT)

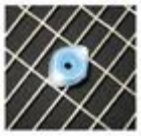
- Translation of the multistage 20 m shuttle run test (Léger et al.1988) on tennis demands.
- The Hit and Turn Tennis test is an acoustically controlled and progressive Fitness Test.
- The test can be easily carried out with a racket on a tennis court by one or more players at the same time.
- The object of the test is to follow as long as possible the audible signals and to hold up the required footwork.
- The player has to run along the base line and to hit a forehand or backhand shot in the respective corners just in time with the signals.
- The maximum achieved test level is assessed and can be used to estimate the maximum oxygen uptake.



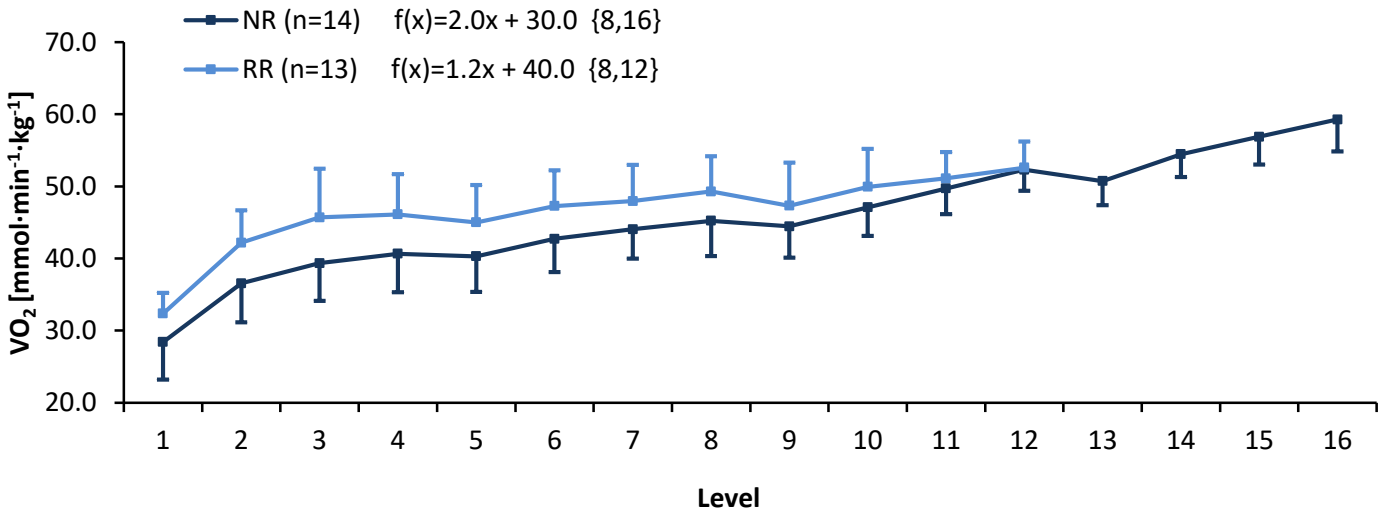
developed by Ruhr-University Bochum (2008)
under support of ITF and DTB

contact: alexander.ferrauti@rub.de

HTT test materials



	n=12 regional players	$VO_{2\ peak}$	$L_{4\ mmol}$
Reliability	Carpet/Carpet	0,942**	0,848**
	Carpet/Clay	0,713**	0,880**
Validity	HTT/Ballmachine Test	0,961**	0,756**
	HTT/Treadmill Test	0,619 *	0,617 *



Norm Values for Male Tournament Players																	
$VO_{2\,est}$ [ml/min/kg]		Strokes															Category
Level	Intervall [s]	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
1	4.9																	untrained
2	4.8																	
3	4.7																	
4	4.6																	
5	4.5																	
6	4.4																	
7	4.3																	
8	4.2																	
9	4.1	46.0	46.0	46.1	46.2	46.3	46.4	46.6	46.8	47.0	47.2	47.4	47.6	47.8	**48.0**			
10	4.0	48.0	48.0	48.1	48.2	48.3	48.4	48.6	48.8	49.0	49.2	49.4	49.6	49.8	**50.0**			
11	3.9	50.0	50.0	50.1	50.2	50.3	50.4	50.6	50.8	51.0	51.2	51.4	51.6	51.8	**52.0**			bad
12	3.8	52.0	52.0	52.1	52.2	52.3	52.4	52.6	52.8	53.0	53.2	53.4	53.6	53.8	**54.0**			
13	3.7	54.0	54.0	54.1	54.2	54.3	54.4	54.5	54.6	54.8	55.0	55.2	55.4	55.6	55.8	**56.0**		reasonable
14	3.6	56.0	56.0	56.1	56.2	56.3	56.4	56.5	56.6	56.8	57.0	57.2	57.4	57.6	57.8	**58.0**		
15	3.5	58.0	58.0	58.1	58.2	58.3	58.4	58.5	58.6	58.8	59.0	59.2	59.4	59.6	59.8	**60.0**		good
16	3.4	60.0	60.0	60.1	60.2	60.3	60.4	60.5	60.6	60.8	61.0	61.2	61.4	61.6	61.8	**62.0**		
17	3.3	62.0	62.0	62.1	62.2	62.3	62.4	62.5	62.6	62.7	62.8	63.0	63.2	63.4	63.6	63.8	**64.0**	excellent
18	3.2	64.0	64.0	64.1	64.2	64.3	64.4	64.5	64.6	64.7	64.8	65.0	65.2	65.4	65.6	65.8	**66.0**	
19	3.1	66.0	66.0	66.1	66.2	66.3	66.4	66.5	66.6	66.7	66.8	67.0	67.2	67.4	67.6	67.8	**68.0**	international
20	3.0	68.0	68.0	68.1	68.2	68.3	68.4	68.5	68.6	68.7	68.8	69.0	69.2	69.4	69.6	69.8	**70.0**	champion

HIGH-INTENSITY INTERVAL TRAINING VS. REPEATED-SPRINT TRAINING IN TENNIS

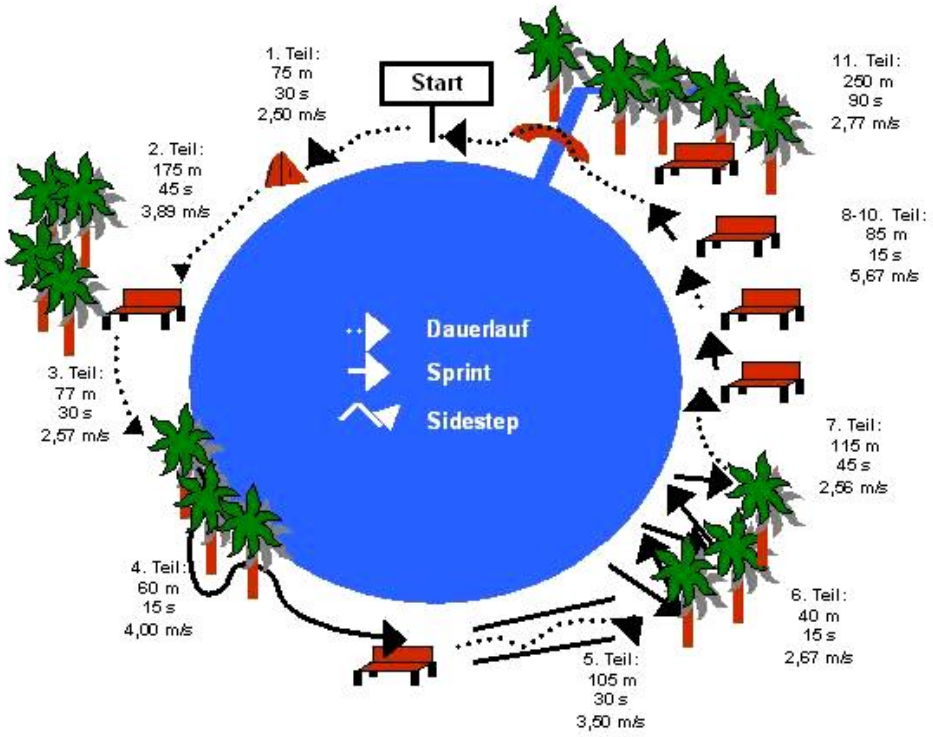
JAIME FERNANDEZ-FERNANDEZ, RICO ZIMEK, THIMO WIEWELHOVE, AND ALEXANDER FERRAUTI

Department of Training and Exercise Science; Faculty of Sports Science, Ruhr-University Bochum, Bochum, Germany

Journal of Strength and Conditioning Research

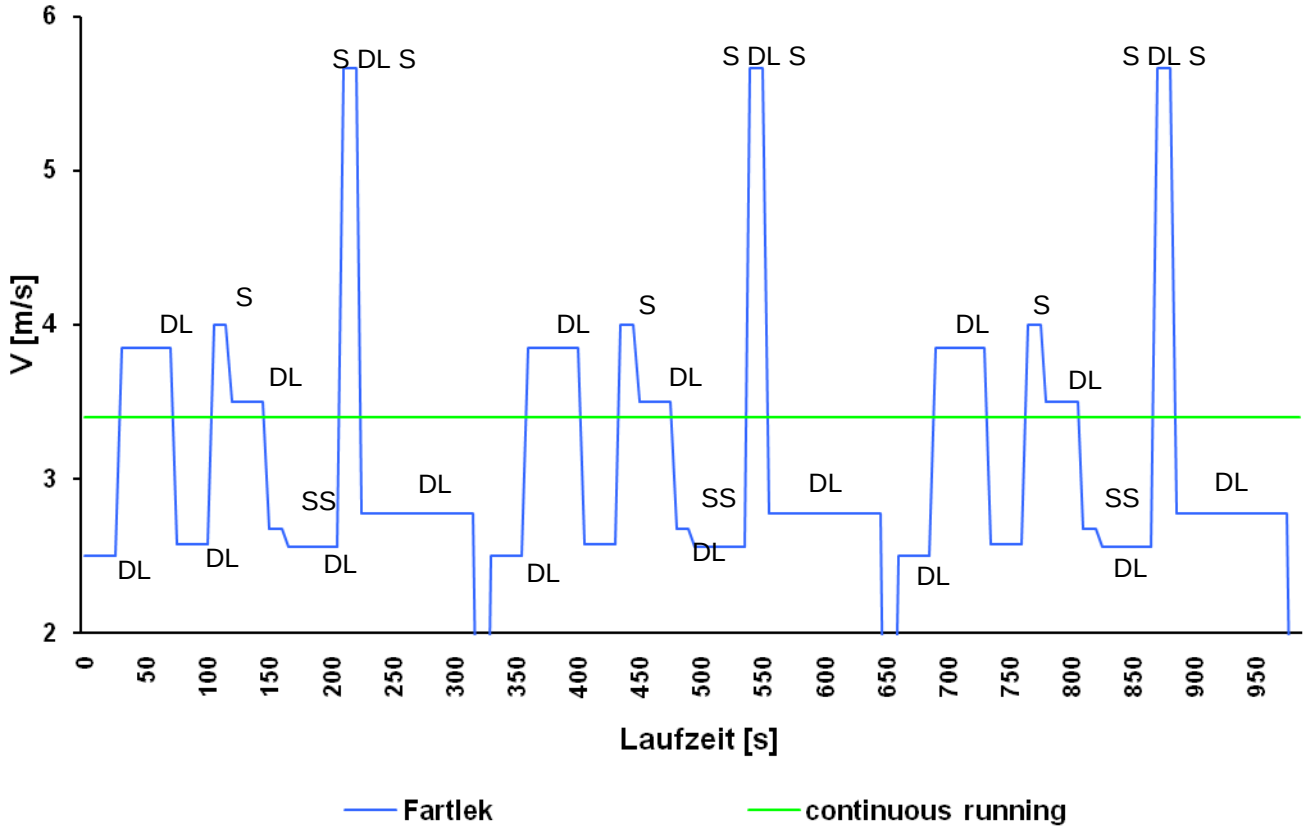
VOLUME 26 | NUMBER 1 | JANUARY 2012 |

Fartlek

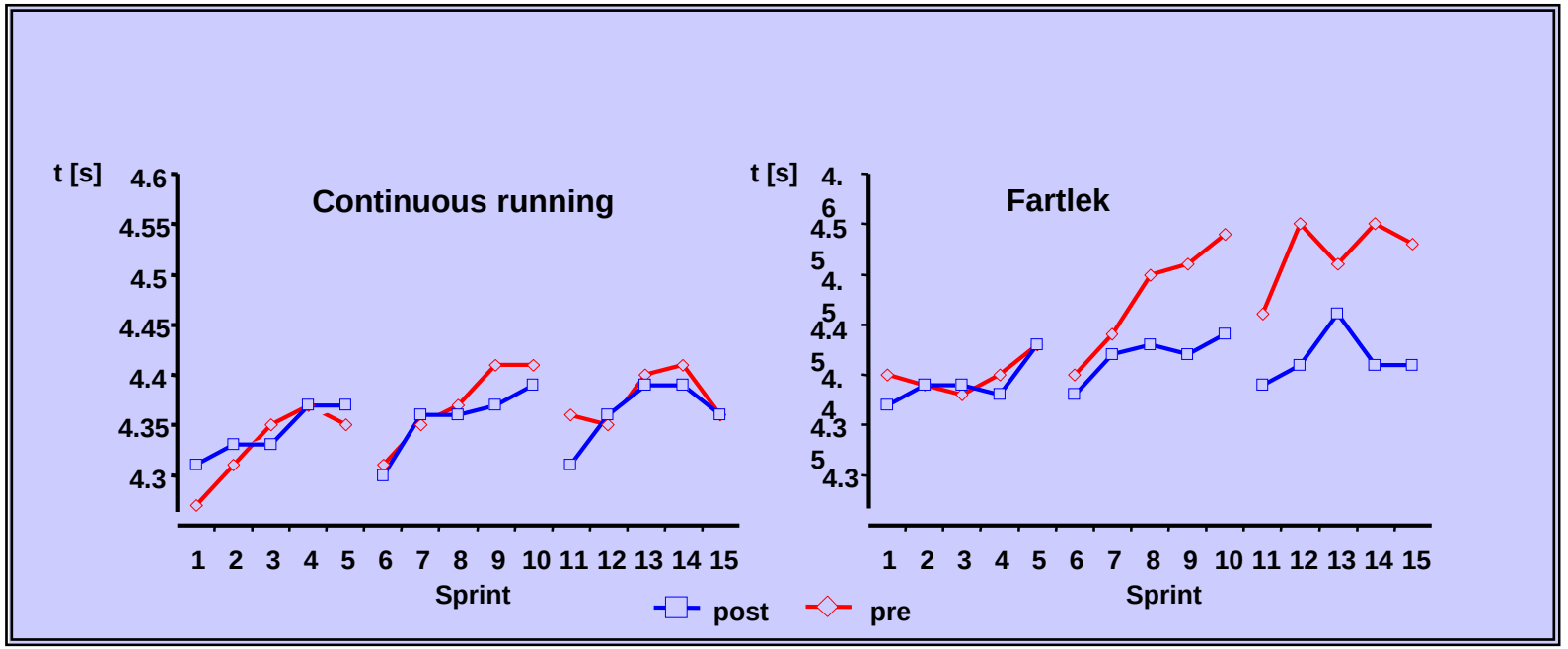

Start
1. Teil:
75 m
30 s
2,50 m/s
2. Teil:
175 m
45 s
3,89 m/s
3. Teil:
77 m
30 s
2,57 m/s
4. Teil:
60 m
15 s
4,00 m/s
5. Teil:
105 m
30 s
3,50 m/s
6. Teil:
40 m
15 s
2,67 m/s
7. Teil:
115 m
45 s
2,56 m/s
8-10. Teil:
85 m
15 s
5,67 m/s
11. Teil:
250 m
90 s
2,77 m/s
Dauerlauf
Sprint
Sidestep

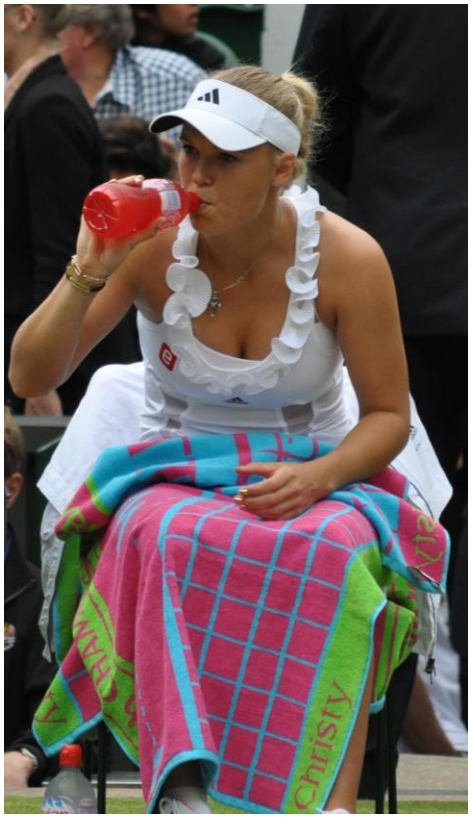
5 week endurance training

(3x60 min/week)



15 x 30 m intermittent sprint performance




Christy

Blood glucose responses and incidence of hypoglycaemia in elite tennis under practice and tournament conditions

A Ferrauti[1], B M Pluim[2], T Busch[3] & K Weber[3]

[1]Ruhr-University Bochum, Falculty for Sports Sciences, Bochum, Germany. [2]Royal Netherlands Lawn Tennis Association, Amersfoort, Netherlands.[3]German Sport University Cologne, Institute of Sports Games, Cologne, Germany

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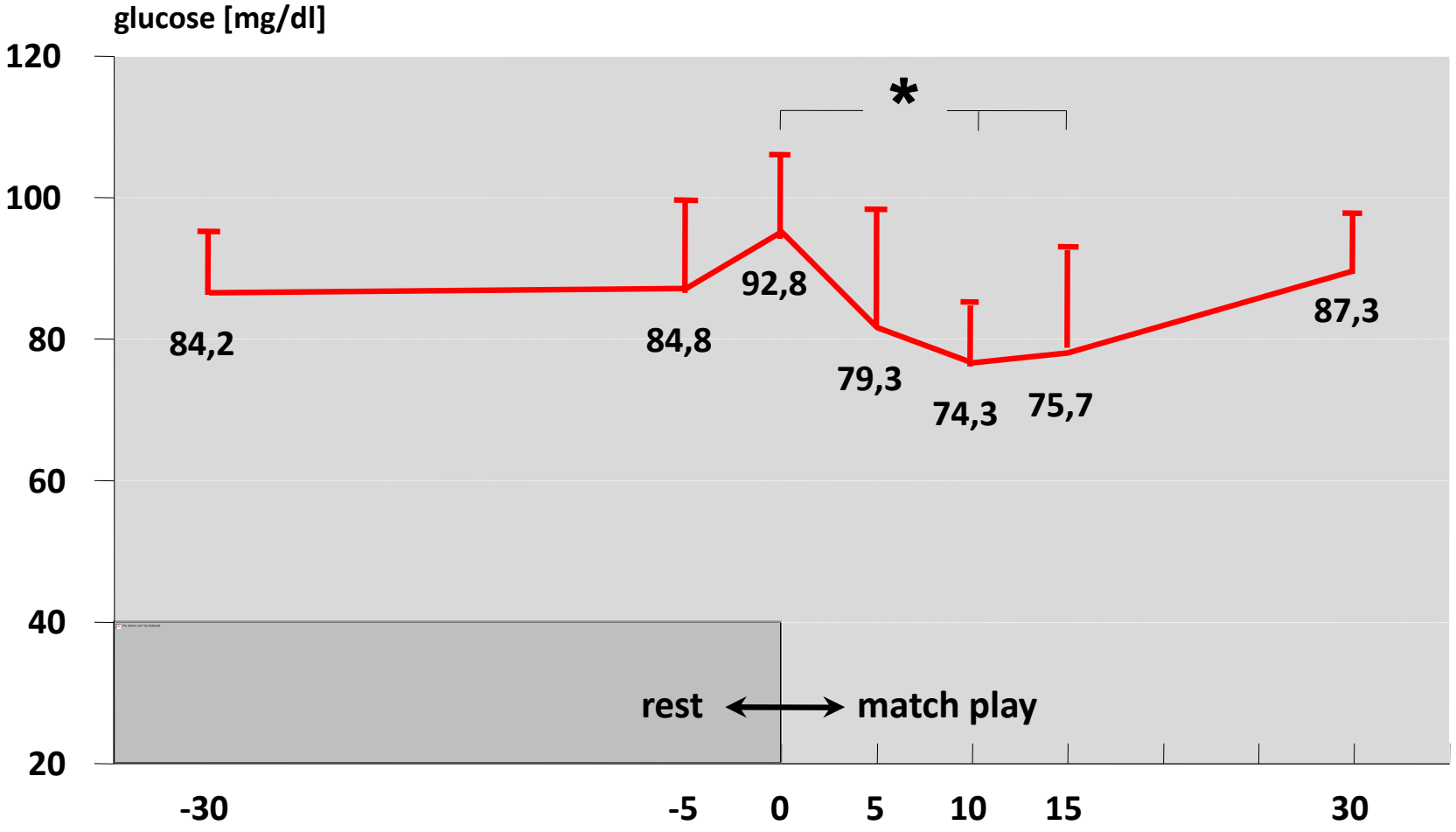
Ferrauti, A, Pluim, B, M, Busch, T, & Weber, K (2003). Blood glucose responses and incidence of hypoglycaemia in elite tennis under practice and tournament conditions. *Journal of Science and Medicine in Sport 6 (1): 28-39.*

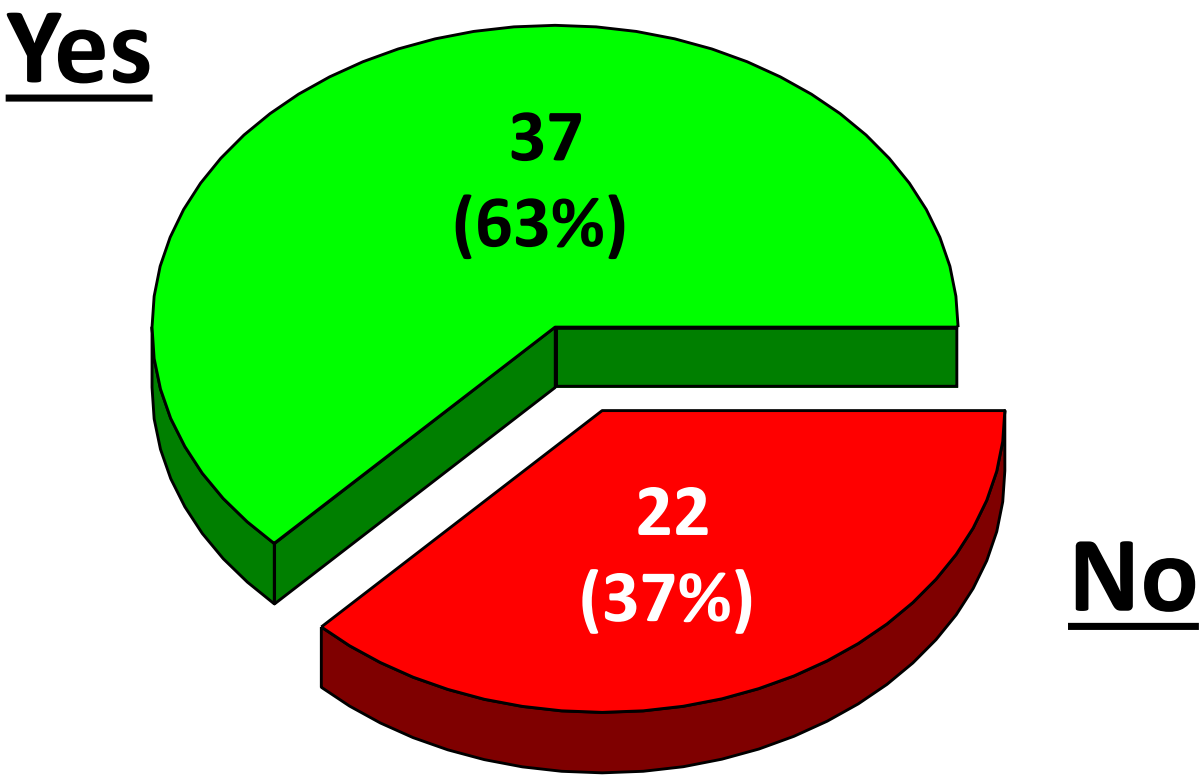
Transition rest-play

NL/RL (n=16)



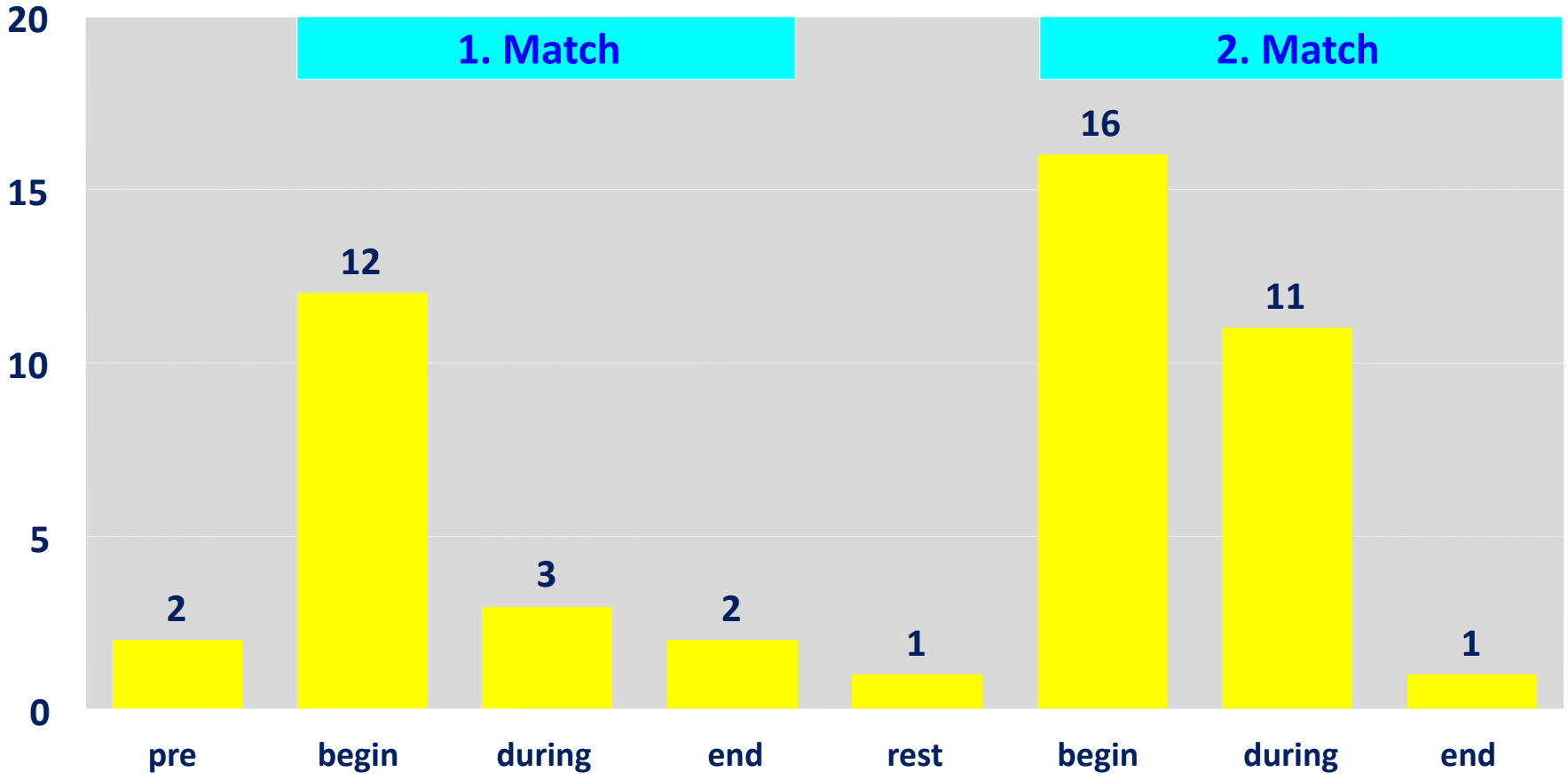
Do you frequently complain about hypoglycemia in tennis?

men NL/RL (n=59)



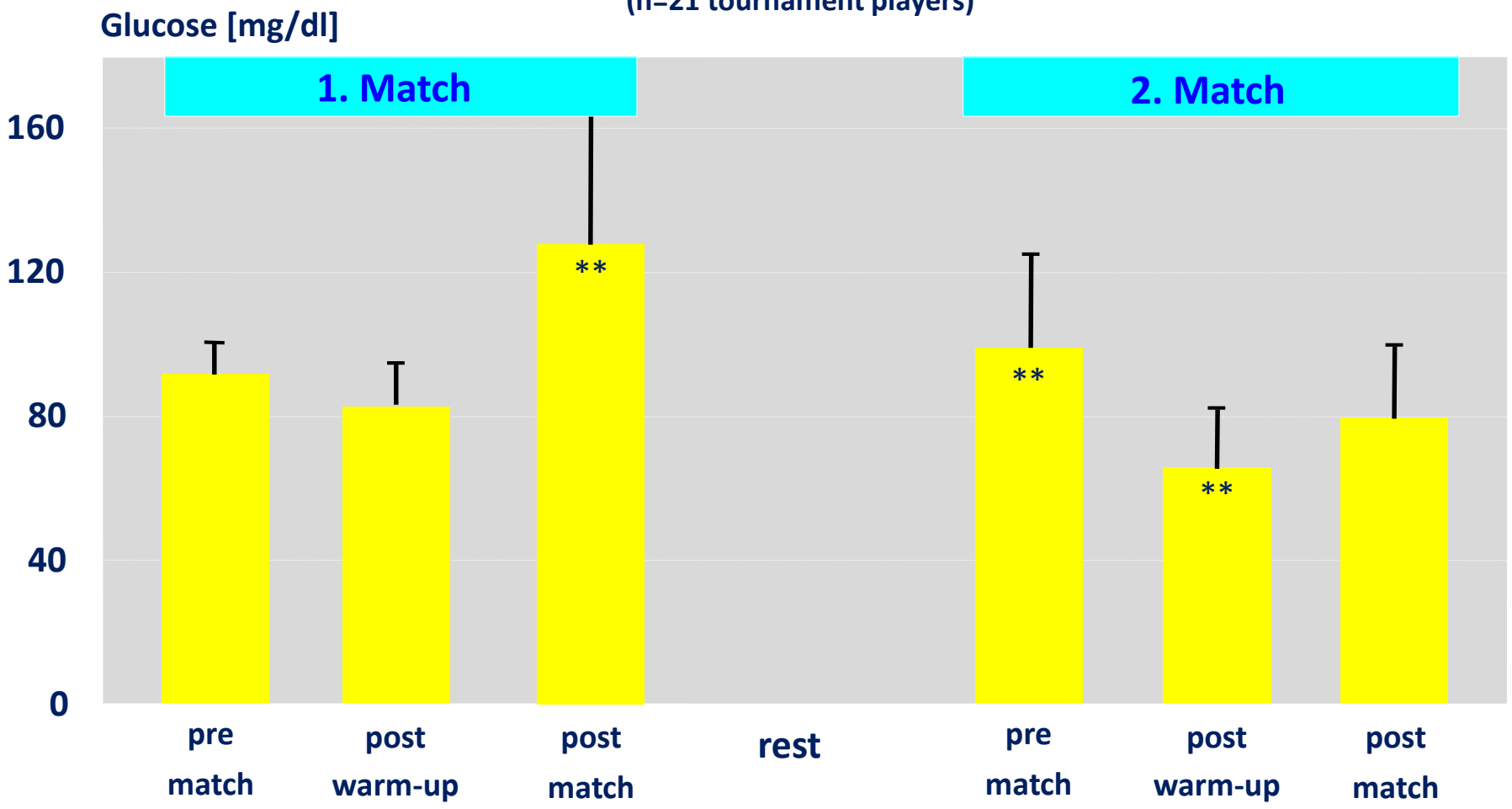
incidence of hypoglycemia

(n=59 tournament players)



Team competition

(n=21 tournament players)



J SPORTS MED PHYS FITNESS 1997;37:258-66

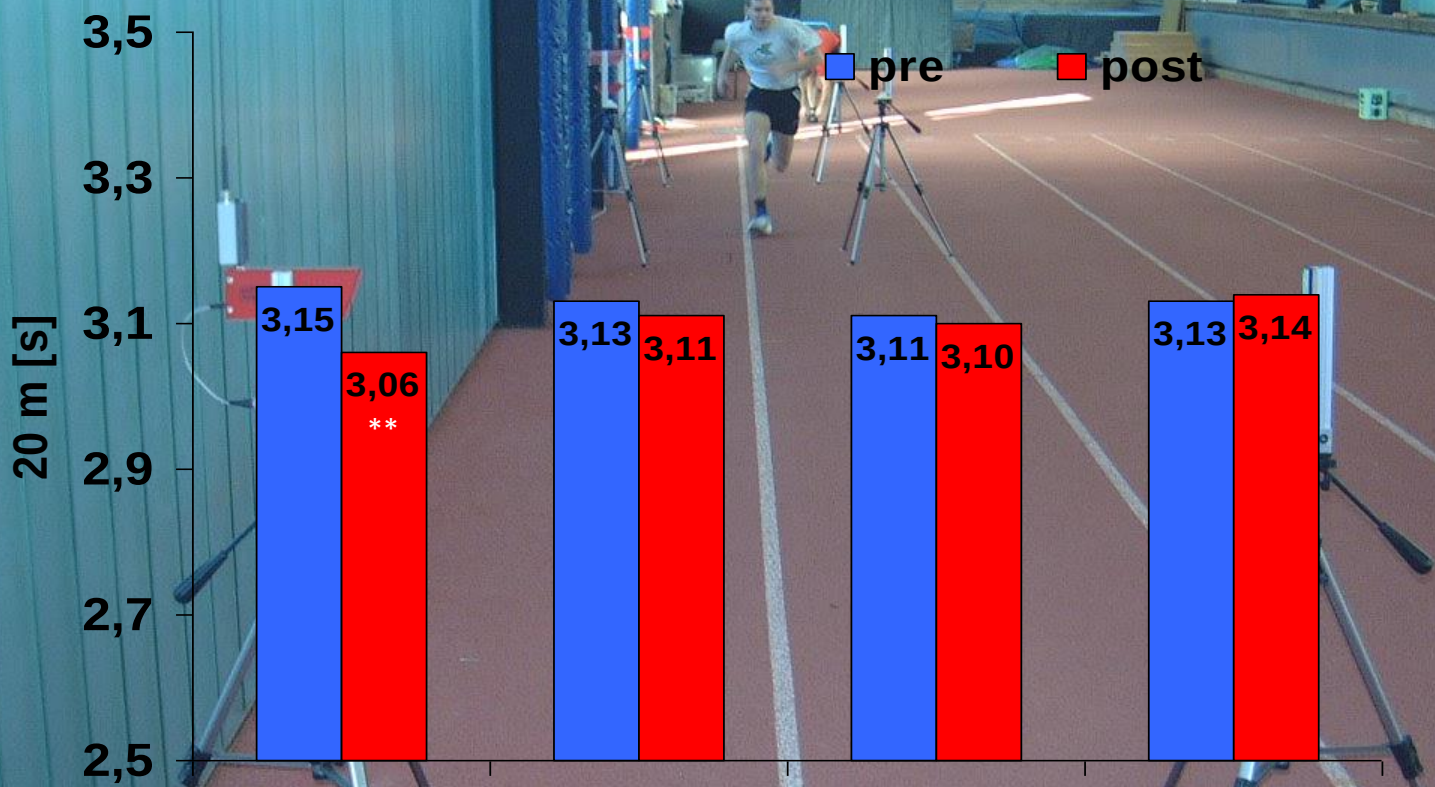
Metabolic and ergogenic effects of carbohydrate and caffeine beverages in tennis

A. FERRAUTI, K. WEBER, H. K. STRÜDER

1. Increase of intramuscular phosphocreatine concentration (6-12 %).
2. Improvement of phosphocreatine resynthesis in case of intermittent work.
3. Increase of body weight (0,5-1,6 kg after 5-7 days)
    - Water retention
    - Activation of muscle contractil protein synthesis

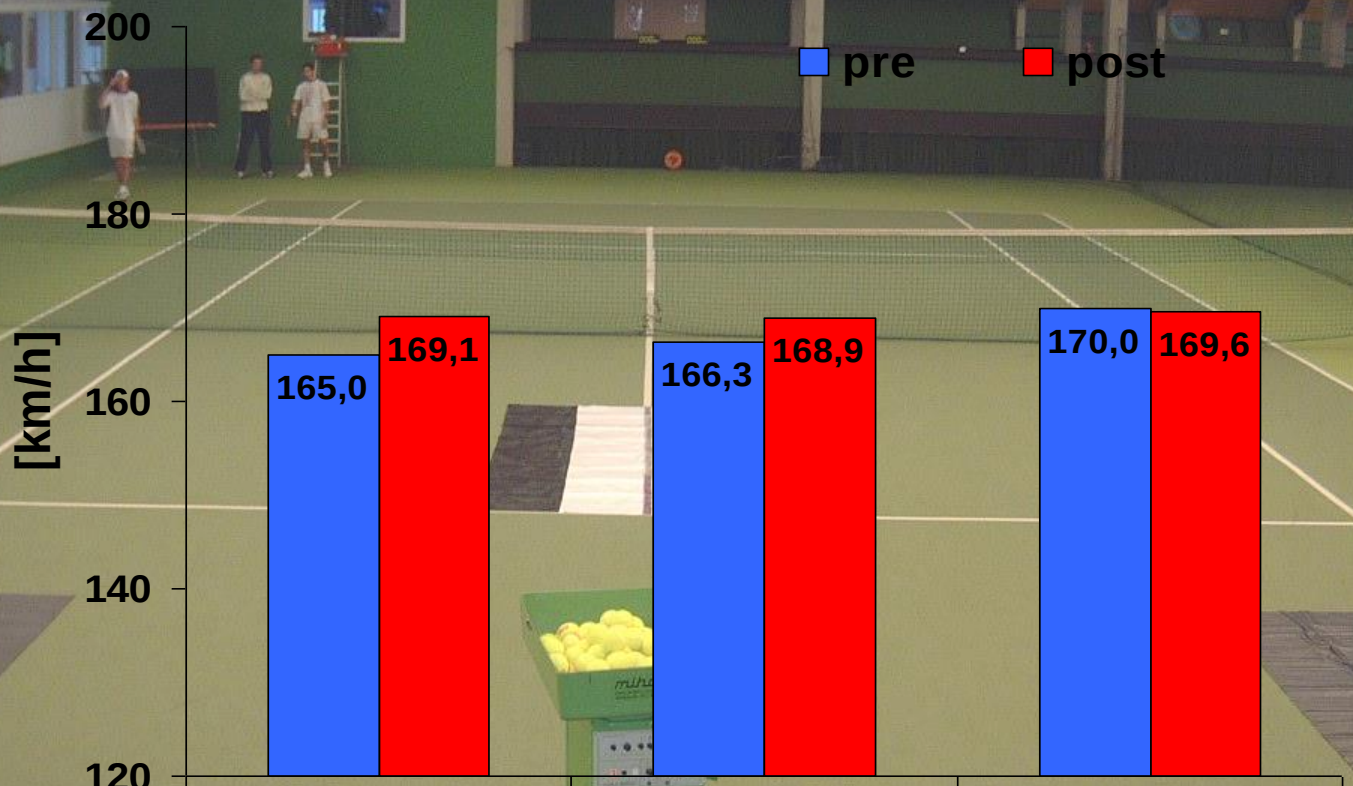
Creatine + training (1 week loading, 4 weeks/0,05 g/kg/day)

Intermittent Sprint Performance



Creatine + training (1 week loading, 4 weeks/0,05 g/kg/day)

Serve Velocity



ORIGINAL ARTICLE

The effects of creatine supplementation on selected factors of tennis specific training

B M Pluim, A Ferrauti, F Broekhof, M Deutekom, A Gotzmann, H Kuipers, K Weber

Br J Sports Med 2006;**40**:507–512. doi: 10.1136/bjsm.2005.022558

TOP 10 Males:
28,7 yrs
193,1 cm
87,3 kg
23,4 BMI

TOP 10 Females:
26,0 yrs
177,9 cm
65,8 kg
20,8 BMI

TOP 10 Males:
27,4 yrs
180,7 cm
72,7 kg
22,1 BMI

TOP 10 Females:
23,0 yrs
167,4 cm
58,0 kg
20,9 BMI

TOP 10 Males:
26,6 yrs
176,4 cm
71,2 kg
22,8 BMI

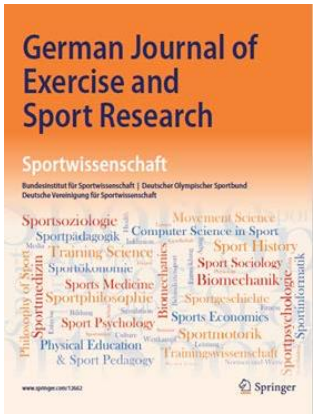
TOP 10 Females:
23,3 yrs
159,6 cm
51,8 kg
20,3 BMI

Intermittent Work load	**+**	**+**
Adrenergic stimulation	**+**	**+**
Catecholamine Release	**+**	**+**
Hitting Power demands	**+/-**	**-**
Surface differences	**-**	**-**
Endurance Specificity	**+**	**+**
Training Drill Demands	**+**	**+**
Hypoglycemic risk	**+**	**+/-**
CHO Needs	**+**	**+/-**
Caffeine Effects	**+**	**+**
Creatine Benefits	**+/-**	**-**

FUN

+++ +++ +++


HEAD



Call for papers
German Journal of Exercise and Sport Research
Racket and Batting Sports. A multidisciplinary perspective on globally popular lifetime sports.

This thematic issue will contain – but is explicitly not limited to – outstanding contributions to the 6th World Congress of Racket Sport Science, held in Bangkok in 2018. The issue will include original papers and reviews on performance and health related aspects in Badminton, Baseball, Cricket, Golf, Softball, Squash, Table Tennis and Tennis, as well as new racket and batting sport games. Its goal is to combine research perspectives from science and medicine (e.g. physiology and sports medicine, training and exercise science, biomechanics) with those from the humanities (e.g. sport philosophy, sport history, physical education) and from various social and behavioural academic disciplines (e.g. sport sociology, sport psychology, sport management). Six senior action editors

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SPECIAL INSIGHTS INTO PHYSIOLOGY OF TENNIS

Alexander Ferrauti

Thank you