Modern Breaststroke using the example of Olympic Champion and World Record Holder

Cameron vd Burgh

"Aerobic Stimulance Training"

Doha (QAT)November 30th

Dirk Lange (DLP Project 2016)/Miro Žeravica

Miro Žeravica

- Croatian Olympic Academy for Swimming coach
- Technical Head Coach Berlin National Centar(2014-...)
- Senior coach Croatian National team(2007-2014)
- Senior coach HAPK Mladost(2012-2014)
- Head coach Pk Sisak(2006-2012)
- Personal coach in varius sports(football,handball,tennis,etc....2002-2006)
- European champion 50back 1999.....
- CRO-National Team Member from 1992-2002

2nd FINA Gold Medal Clinic 2014

1. **Philosophy of Aerobic Stimulance Training (AST)**
2. **Cameron vd Burgh Characteristics**
   - **2.1 Antrometry**
     - **2.1.1 Antrometry, Age and Records – Cameron vd Burgh**
     - **2.1.2 Antrometry and Age – London 2012**
     - **2.1.3 Basic Derivations – Antrometry and Age**
     - **2.1.4 Performance Development**
3. **Principles of Sprint**
   - **3.1 Racing Issues**
   - **3.2 „100m Philosophy“**

2nd FINA Swimming Coaches Clinic Golden

4. Season Planning

- **4.1 Results 2012 vs 2013**
- **4.2 Week Schedule**
- **4.3 Season Analysis**
  - **4.3.1 Olympic Season**
    - **4.3.1.1 Macro Cycle**
      - **4.3.1.1.1 Marco Cycle 1**
      - **4.3.1.1.2 Marco Cycle 2**
      - **4.3.1.1.3 Macro Cycle 3**
    - **4.3.1.2 Weekly Mileage 2011/ 2012**
  - **4.3.2 WCH 2013 Season**
    - **4.3.2.1 Macro Cycle**
      - **4.3.2.1.1 Marco Cycle 1**
      - **4.3.2.1.2 Macro Cycle 2**
      - **4.3.2.1.3 Marco Cycle 3**
- **4.4 Total Season Results - 2011/12, 2012/13**

2nd FINA Swimming Coaches Clinic Golden

4.5 Swim Inputs
- **4.5.1 aerob**
- **4.5.2 lactat tolerance**
- **4.5.3 speed**

4.6 Racing Output
- **4.6.1 Olympic Games 2012**
  - **4.6.1.1 Results**
  - **4.6.1.2 Pacing Strategy - London 2012**
- **4.6.2 WCH Barcelona 2013**
  - **4.6.2.1 Results**
  - **4.6.2.2 Pacing Strategy – Barcelona 2013**
- **4.6.3 Basic Derivations - Pacing Strategy**
- **4.6.4 Lap times and Speed – Barcelona**
- **4.6.5 Basic Derivations – Lap times and Speed**
- **4.6.6 Underwater Portion – Barcelona**
- **4.6.7 Basic Derivations – Underwater Portion**

5. Review key: „take away“ of the Presentation

6. Resume

1. Philosophy
Theory of training for Seniors (fully physiologically develop swimmers)

Aerobic Stimulance Training(AST)

Why Aerobic Stimulance Training(AST)?

- same or similar milage by more efficiency
- much better energy store and restore (muscle cell)
- more time and energy for develope strenght in water
- drills become important part of practice
- more time and energy for develope strenght in gym
- individual approach for every swimmer
- no more „garbage milage“

Aerobic capacity

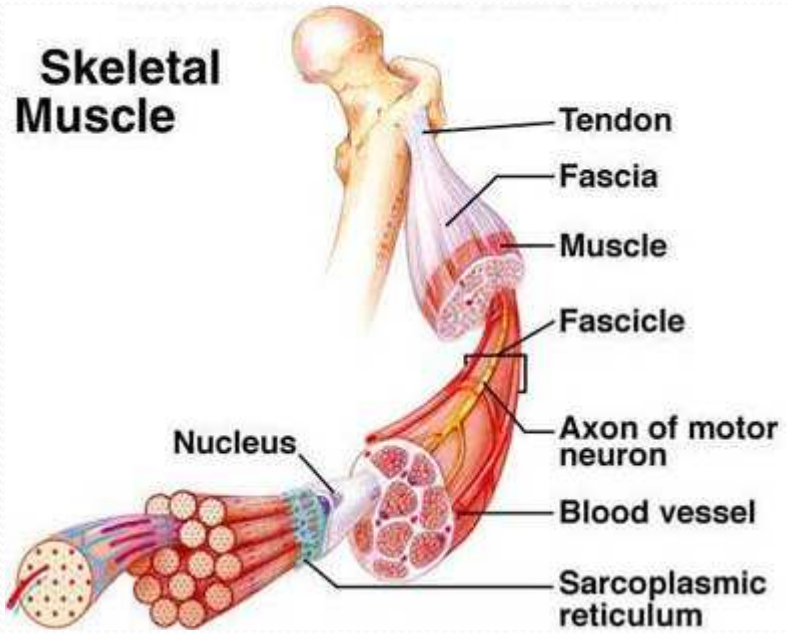
We can only influence **before** athletes are fully physiologically developed.

We **can't** influance the amount of blood in one heart rate(amount that get oxygen enrichment in one heart beat,80-130 cc) **after** the athletes are fully physiologically developed

Network of blood vessels what bring the "fresh" blood into the muscles **can't** be upgraded **after** the athletes are fully physiologically developed

Blood vessels network

- We need maximum development of the blood vessels network before swimmers reach fully physiologically growth
- With great network of blood vessels we have better foundations for progress with AST



Examples of AST in **Basic** bloc of training

800 warm up

4x(4x200)2'50"200 easy,(2'25")hr=23/24

600 free/fins hr=22

4x(100back/100free)kick 3'50"

100easy

4x100 fr/fins 1'50"hr=26

100easy

6800 m

- Why 4x(4x200) with 200 easy between,instead 4x800
- 4x200 is enough to make athletes fully aerobicly stimulated
- After we cross the aerobic zone what's the target,we just attack the energy store inside muscle cell what we don't want!

Exemples of AST in **Specific** bloc of training

400 warm up

4x(400free
hr=22,25max+75easy,200 drills,100free hr=26/27 on 1'45"+50max+150easy)

500free/fins easy on stroke

4900 m

- One main set including 1600 easy aerobics(hr22),800drills, 400aerobics on treshold(hr26/27),200lac /tolerance(hr 28) and 100 pure speed lounched from hr 22.

Examples of AST in **Race Pace** bloc of training

400 warm up

16x50 mix on 50" hr=22

400 drills

30 x (25 max/no breathing+75easy on 2')

400 social kick

5000 m

- Using a shorter distance(50 or 100m)
- Not more than 600-800m
- Enough to stimulate aerobic aparatus and not to disturb energy level in muscle cell
- Leave planty of energy for Race Pace set and gym

Exemples of AST in **Taper** bloc of training

600 warm up

8x50 free hr=22 50”

200 drills

6x50 free hr=24 1’

300 drills

4x50 free hr=26/27 1’30”

400 drills

25 max on 30”+50 hr=26 on 1’+25max

200easy 2700 m

- Shorter sets with shorter distance
- Higher HR less repeats
- Individual aproach for every athlete
- 36-42 days muscle cell recovery
- We want to stimulate aerobic aparatus and leave enough period in cyclus for muscle cell to reach full recovery

2. Cameron vd Burgh
2.1.1 Antropometry,Age and Records

Born	25 May 1988
Location:	Pretoria
High:	184 cm
Weight:	86 kg
WR Holder:	
50m Breast sc	25,25
50m Breast lc	26,67
100m Breast sc	55,61
100m Breast lc	58,46

2.1.2 Antropometry and Age – London 2012

OLYMPIC GAMES LONDON 2012 - SWIMMING
- Antropometry and age (semifinals participants) -

50m Freestyle men

rank	Competitor	age	body height (cm)	body weight (kg)	BMI
1	Manaudou Florent	21	199	99	25.00
2	Jones Cullen	28	196	95	24.73
3	Cielo Cesar	25			
4	Frolov Bruno	23			
5	Ervin Anthony	31	191	77	21.11
6	Schoeman Roland	32	190	84	23.27
7	Bovell George Richard	29	195	85	22.39
8	Sullivan Eamon	26	189	78	21.84
9	Louw Gideon	24	194	93	24.71
10	Gretchin Andrey	24	198	94	23.98
11	Magnussen James	21	195	90	23.67
12	Takacs Krisztian	26	185	77	22.50
13	Dotto Luca	22	190	80	22.16
14	Govorov Andrii	29	190	90	24.93
15	Hayden Brent	28	193	86	23.09
16	Trandafir Norbert	24	185	75	21.91
	average - medals	25.25	197.50	97.00	24.86
	average - from 4. to 8. place in the finals	28.20	191.50	81.25	22.15
	average - all the finalists	26.88	193.50	86.50	23.05
	average - semifinalists failed to qualify	23.63	191.25	85.63	23.37
	average - all the semifinalists	25.25	192.21	86.00	23.23

50m Freestyle women

rank	Competitor	age	body height (cm)	body weight (kg)	BMI
1	Kromowidjojo Ranomi	21	179	69	21.53
2	Herasimenia Aliaksandra	26	175	60	19.59
3	Veldhuis Marleen	33	182	67	20.23
4	Steffen Britta	28	180	60	18.52
5	Halsall Francesca	22	172	59	19.94
6	Alshammar Therese	34	180	65	20.06
7	Hardy Jessica	25	182	69	20.80
8	Vanderpool Wallace Arianna	22			
9	Smith Amy	25	172	59	19.94
10	Campbell Bronte	18	179	58	18.10
11	Santamans Anna	19	176	60	19.37
12	Ottesen Gray Jeanette	24	178	71	22.41
13	Campbell Cate	20	186	67	19.37
14	Sjostrom Sarah	18	186	70	20.23
15	Poon Victoria	27	184	73	21.56
16	Dralou Theodora	20	169	67	23.46
	average - medals	23.88	178.71	64.14	20.45
	average - from 4. to 8. place in the finals	26.20	178.75	63.25	19.78
	average - all the finalists	26.38	178.71	64.14	20.07
	average - semifinalists failed to qualify	21.38	178.75	65.63	20.56
	average - all the semifinalists	23.88	178.73	64.93	20.33

2.1.3 Basics Derivations – Antrometry and Age

- 100m Breaststroker are older (25 vs 23/24 years), larger(186,8 vs 185,7 cm) and heavier (84 vs 81 kg) as 200m Breaststroke athletes.
- Medal winner are in average younger (25,1 vs 25,3) than the average finalist.
- Body high and body weight across all disciplines a very similar between the medal winners and finalists.

2. Cameron vd Burgh
2.1.4 Performance Developement

year/ age	50m Br lc	100m Br lc
2004/ 16	30,22	1:05,32
2005/ 17	29,44	1‘04,36
2006/ 18	28,38	1‘03,00
2007/ 19	27,49	1‘01,12
2008/ 20	27,29	59,96
20012/ 24	27,07	58,46

3. Principles of Sprint
3.1 Racing Issues

What are the 100m racing issues?

- Speed, speed endurance, aerobic, racing strategy, training backround

The Key word for any Sprint and Middle distance in Swimming is:

SPEED - Availability

3. Principles of Sprint
3.2 “100m Training-Philosophy”

The “whole Game” is about the right balance of the relevant training tools:

- Aerobic capacity – “AST”
- Speed endurance
- Speed
- Technique capacity
- Gym/ Run

4.Season Planning

4.1 Results: 2012 vs 2013

2011/2012

- **Macro Cycle I**: 22.08.-28.12.2011 (18 weeks/3days = ***129 days***)

Mileage: 686,8 km, Gym: 89,5 hours

- **Macro Cycle II**: 01.01.-17.4.2012 (15 weeks/2days = ***107 days***)

Mileage: 553,9 km; Gym: 40,75 hours

- **Macro Cycle III**: 23.04.-04.08.2012 (15 weeks = ***105 days***)

Milage: 498,4 km; Gym: 34 hours

2012/2013

- **Macro Cycle I**: 05.11.-30.12.2012 (7 weeks/6days = ***55 days***)

Mileage: 215,2 km, Gym: 24 hours

- **Macro Cycle II**: 31.12.2012-21.04.2013 (16 weeks = ***112 days***)

Mileage: 560,8 km; Gym: 30,50 hours

- **Macro Cycle III**: 22.04.-04.08.2013 (15 weeks = ***105 days***)

Milage: 491,3 km; Gym: 33 hours

4.2 Week Schedule

Monday:	1. Session: swim (aerobic), gym (p)
	2. Session: swim (speed)
Tuesday:	1. Session: swim (pull, kick)
	2. Session: swim (thresh descend, speed)
Wednesday:	gym (end), swim (aerobic)
Thursday:	1. Session: swim (pull, kick)
	2. Session: swim (thresh descend, speed)
Friday:	1. Session: swim (Butterfly, Streamline)
	2. Session: gym (speed), swim (aerobic, dive)
Saturday:	**1. Session: swim (test)**
	2. Session: run-up hill, dpr, intervall
Sunday:	off

4.3 Season Analysis

4.3.1 Olympic Season

4.3.1.1 Macro Cycle

4.3.1.1.1 Macro Cycle 1

date	week	mileage/ km	gym/ h	other
22. – 28.08.11	1	19,3	4	General physic
29.08. – 04.09.11	2	38,5	3,5	
05. – 11.09.11	3	24,9	3	comp
12. – 18.09.11	4	51,8	4	
19. – 25.09.11	5	49,7	4	
26. 09. – 02.10.11	6	49,1	4	
03. – 09.10.11	7	16,3	2	regeneration
10. – 16.10.11	8	47,7	7,5	
17. – 23.10.11	9	45,4	7,5	
24. – 30.10.11	10	43,7	7,5	
31.10. – 06.11.11	11	19,2	1,5	regeneration
07. – 13.11.11	12	51,5	7,5	
14. – 20.11.11	13	44,6	7,5	

4.3.1 Olympic Season

4.3.1.1 Macro Cycle

4.3.1.1.2 Macro Cycle 2

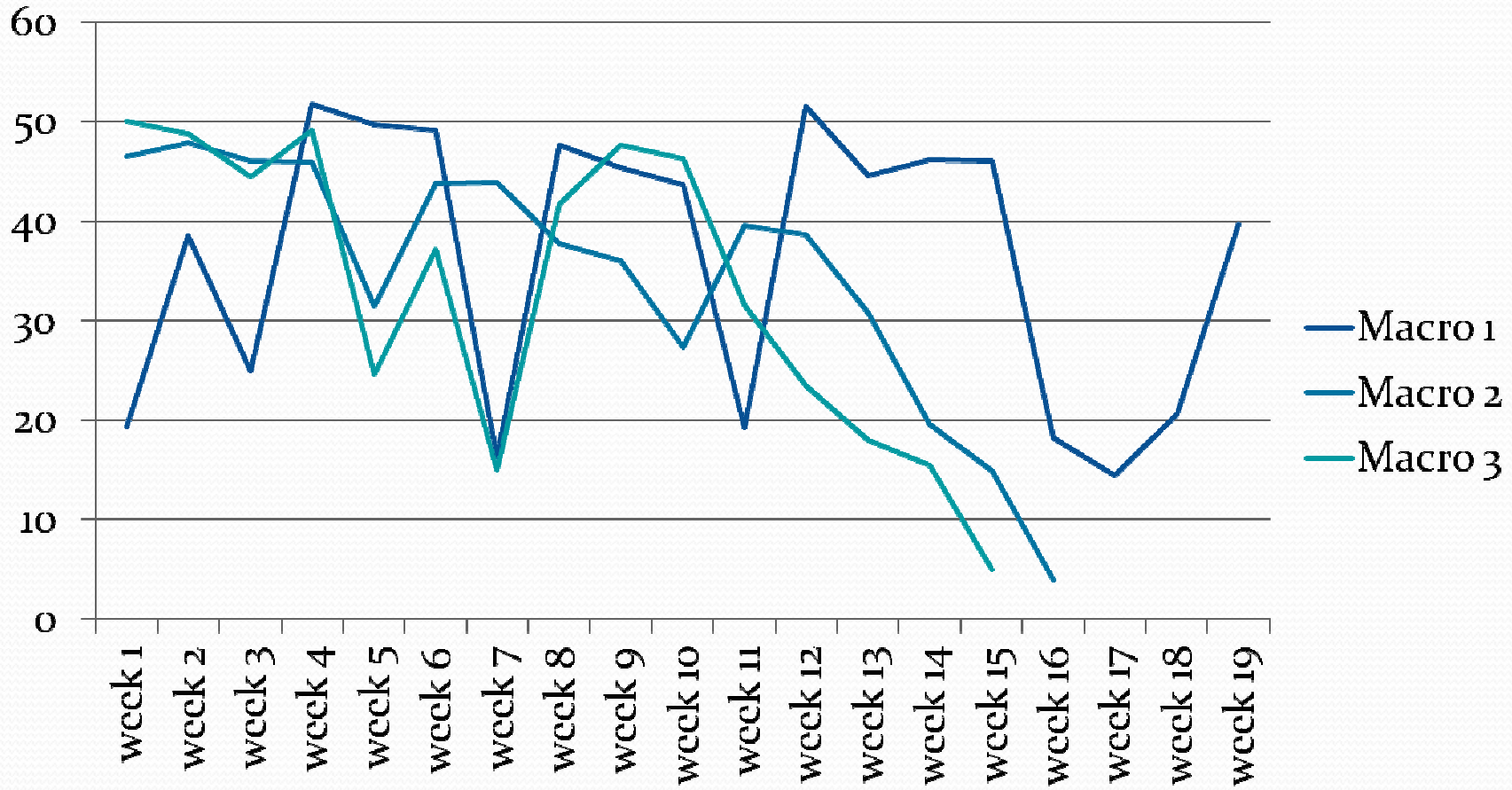
date	week	mileage/ km	gym/ h	other
02. – 08.01.12	1	46,5	4	
09. – 15.01.12	2	47,9	4	
16. – 22.01.12	3	46,1	4	
23. – 29.01.12	4	45,9	3	Comp
30.01. – 05.02.12	5	31,4	3	reg, up hill runs
06. – 12.02.12	6	43,8	3	up hill runs
13. – 19.02.12	7	43,9	3	up hill runs
20. – 26.02.12	8	37,7	3	up hill runs
27.02. – 04.03.12	9	36,0	3	up hill runs
05. – 11.03.12	10	27,3	1	regeneration
12. – 18.03.12	11	39,5	2,5	
19. – 25.03.12	12	38,6	2,5	
26.03. – 01.04.12	13	30,8	2,5	
02. – 08.04.12	14	19,6	1,5	

4.3.1 Olympic Season
4.3.1.1 Macro Cycle
4.3.1.1.3 Macro Cycle3

date	week	mileage/ km	gym/ h	other
23. – 29.04.12	1	50,0	3	
30.04. – 06.05.12	2	48,8	3	up hill runs
07. – 13.05.12	3	44,5	2,25	up hill runs
14. – 20.05.12	4	49,1	2,25	up hill runs
21. – 27.05.12	5	24,6	2,25	regeneration
28.05.- 03.06.12	6	37,2	1,5	comp
04. – 10.06.12	7	15,0	3	sick
11. – 17.06.12	8	41,7	2,5	comp
18. – 24.06.12	9	47,7	3	
25. 06. – 01.07.12	10	46,3	3	
02. – 08.07.12	11	31,6	1,5	reg., comp
09. – 15.07.12	12	23,4	1	taper
16. – 22.07.12	13	18,0	2,25	taper

4.3.1 Olympic Season

4.3.1.2 Weekly-Mileage: 2011/ 2012



4.3.2 WCH 2013 Season

4.3.2.1. Macro Cycle

4.3.2.1.1 Macro Cycle 1

date	week	mileage/ km	gym/ h	other
05. – 11.11.12	1	28,6	6	
12. – 18.11.12	2	25,7	3	
19. – 25.11.12	3	10,8	2	sick
26.11. – 02.12.12	4	40,0	3	
03. – 09.12.12	5	31,5	3	
10. – 16.12.12	6	36,5	3	
17. – 23.12.12	7	42,1	4	
24. – 30.12.12	8			vacation

4.3.2 WCH 2013 Season

4.3.2.1 Macro Cycle

4.3.2.1.2 Macro Cycle 2

date	week	mileage/ km	gym/ h	other
31.12.12 – 06.01.13	1	56,6	1	tc
07. – 13.01.13	2	61,2	2	tc
14. – 20.01.13	3	39,9	2	up hill runs
21. – 27.01.13	4	42,4	2	up hill runs
28.01. – 03.02.13	5	55,5	3	
04. – 10.02.13	6	10,9	2	regeneration
11. – 17.02.13	7	45,3	3	up hill runs
18. – 24.02.13	8	43,4	3	up hill runs
25.02. – 03.03.13	9	47,3	2,5	
04. – 10.03.13	10	48,0	2,5	
11. – 17.03.13	11	19,5	2	regeneration
18. – 24.03.13	12	28,5	1,5	regeneration/aerob
25. – 31.03.13	13	17,2	1,5	tapern
01. – 07.04.13	14	20,0	1,5	tapern

4.3.2 WCH 2013 Season

4.3.2.1 Macro Cycle

4.3.2.1.3. Macro Cycle 3

date	Week	mileage/ km	gym/ h	other
22. – 28.04.13	1	42,6	3	Tc
29.04. – 05.05.13	2	40,1	2	tc, up hill runs
06. – 12.05.13	3	43,4	3	tc,up hill runs
13. – 19.05.13	4	44,2	3	tc, up hill runs
20. – 26.05.13	5	46,0	3	up hill runs
27.05.- 02.06.13	6	47,9	3	up hill runs
03. – 09.06.13	7	21,3	2	comp
10. – 16.06.13	8	21,8	1,5	comp
17. – 23.06.13	9	40,9	2	tc, up hill
24. – 30.06.13	10	45,6	3	tc, up hill
01. – 07.07.13	11	15	1	tc, comp, inj
08. – 14.07.13	12	30,2	3	inj, taper
15. – 21.07.13	13	22,1	2	tc, taper

4.4 Total Season Results - 2011/12, 2012/13

2012	2013	diff.
Swim - 1.739,1 km	Swim - 1.267,3 km	-27,1%
Gym - 164,25 hours	Gym - 87,50 hours	-46,7%

4.5 Swim Inputs

4.5.1 aerob

- 5x(400IM,4x100Br)
- 10x(300Bu/Ba/F,100Br)
- 10x(100Bu,50Br,100Ba,50Br,100Br,50Br,100F,50Br)
- 6x125/25 on 2’45 T: (1’20),8x100 on 2‘ T: 1‘17, 6x75/25 on 2’10 T: 54
- 3x(4x(150,50)) Br
- 4x(200IM,2x50Br)
- 6x(200,150,100,50) Br
- 3x(3x(200,100)) Br
- 3x(4x(50,100,100)) Br

Wochentrainingsplan			12. - 18.09.11																	
Name:	Cameron																			
Mo			Di			Mi			Do			Fr			Sa					
200	warm up	1	200	warm up	1				200	warm up	1	200	warm up	1	comp	warm up	1;2			
800	IM 200 i.C.	2	5x200	pull on 2'55	2				3x(1000,10x100)		2;3	30x50	Bu on 1'	1	Test		SE			
4x100	Brkick on 2'	3	400	Br pull with Fl	2					pull a. 14'/1'40/35/			*3kick1pull/sw		4x(2x(30" hold breath/25)					
100	easy	1	100	easy	1					30/25			*2fast2easy/sw			Br T: 13,5				
800	IM 100 i.c.	3	5x200	pull on 2'50	2					negativ split			*easy		3x(4x200)	*F/Ba a. 3'	1			
8x50	Brkick with Sno on 1'		300	Br pull with Fl	3					Z: 13'/1'12		300	scull/sw/combi	co		*IM on 3'20				
100	easy	1	100	easy	1				200	easy	1	6x100	BuKick on Ba on 2'			*F with Pad/Fl/Sno				
800	IM 50 i.c.	2	5x200	pull on 2'45	2				10x50	Br 1pull2kick on	2	100	easy	co		on 2'50				
8x25/25	StL on 1'15	4	200	Br pull with Fl	4				100	easy	1	10x100	Bu on 2'	1						
100	easy	1	100	easy	1				3	div	7		*3x							
			5x200	pull on 2'40	2				100	easy	1		*3x with Fl							
			100	Br pull with Fl	5								*3x with FingerPadd/Fl							
			100	easy	1								*1x with Padd/Fl							
												100	easy	co						
4.000			5.600						7.200			3.800			4.500					
gym			power Str	"300"		gym			power Str	"300"		gym			run	Spr				
															4x50					
400	warm up	1	200	warm up	1	400	warm up	1	400	warm up	1	200	warm	1	3x20					
2x(6x(25sc ass,15))		2;7	10x(300Bu/Ba/F,100Br)		2;5	600	Ba/Br/F	2	25	Br Z: 12,5	7	2x(1000F/Ba with Pad,10x100 with Fl)								
	Br on 1'50 with			a. 4'45/2'15		1x50	kick	3	100	easy	1		F with 2' rest on 1'40							
	200easy		400	pull/sw/kick/sw	1	500	F	2	2x(5x(100Bu,50Br,100Ba,50B		2;4	100	lo	1						
	T: (40-60)		400	kick	2	2x50	kick on 1'	3	100F,50Br))	with 200easy SP		16x(25Ges/25StL)		3						
400	pull/sw/kick/sw	1	12x50	kick with Sno 1	3	400	F/Ba	2		on 1'45/1'			Br a. 1'15							
3x(4x100)	Brkick on 2'	2;3	100	easy	1	3x50	kick on 1'	3		T: 36		100	lo	1						
	with 100easy					300	kick/sw	2	600	kick/re/le/sw	1									
	*2x norm					4x50	kick on 1'	3	12x50	F with Pad/Fl/Sno										
	*1x with Sno					200	F/Ba	2		on 1'	2									
						5x50	kick on 1'	3	100	easy	1									
						150	easy	1	3	div	7									
						6x100	Br 2kick1pull/Ges a. 2'		100	easy	1									
						100	easy	1												
						3x300	Br with Pad/Fl	2												
							on 4'45													
						100	easy	1												
3.000			5.700			5.000			6.800			5.200								
7.000			**11.300**			**5.000**			**14.000**			**9.000**			**4.500**					

4.5 Swim Inputs
4.5.2 lactat tolerance

- 3x(4x(25/25,100,25/25)) on 1‘/1’50/1’40 T: 13,5/15,5
- 6x(25/25,50,100,50) on 1‘/1‘/2‘ T: 13,5/33/31,8
- 2x(6x(125/25,50) on 2’30/1’30 T: (1’20),33-31
- 2x(5x(2x15,50,100,50)) on 1‘/1‘15/1‘50 T: 7,5/37/1‘14-10/37
- 3x(4x(50,100,75/25)) on 55“/1‘50/2‘30 T: 33/1‘16/52-47
- 10x100 on 2‘30,10x50 on 1‘15,10x25/25 on 1‘30
- 3x(6x75/25) on 2‘30 T: 54-46,5
- 3x(4x(3x50,1x100)) on 55“/2‘45 T: 37, 1‘15-08
- 4x100 Br on 6‘ T: 1‘03,0
- 6x50 Br on 4‘ T: 28,2

Wochentrainingsplan 18. - 24.06.12

Name: Cam

Mo			Di			Mi			Do			Fr			Sa		
200	warm up	1	200	warm up	1				200	warm up	1	200	warm up	1	600	warm up	1
1500	F	1	4x(4x150)	pull on 2'15	1;2				3x(5x200)	pull on 2'50	1	3x(8x50)	Bu on 1' with	1;2	4x(3x25/25)	Br on 1'30/50easy	
1000	F/Ba	1		and 100easy						with 100easy			200easy			T: (70),(60),(50)	
500	F with Fl	1		T.: 1'50-1'40						T.:			*25kick/25sw		400	kick	co
200	easy	co	200	easy	co					*2'25			*25 3kick1pull/25sw		8x100	kick on 2'	1;2
3x(100,2x50,100,100,100,2x50)			6x100	Br with Pad/Fl	1					*2'30-20			*50 with Pad/Fl			T: 1/1	
	kick on 1'50/1'05/1'50/			on 1'50						*2'25		100	easy	co		neg/neg Split	
	2'10/1'05	1;2	100	easy	co				100	easy	co	2x(100kick,100sw,200kick,		1	200	easy	co
	T.: 1'45/42/40/1'45/		12x50	Br on 1'05	1				3x(4x50)	kick on 1'	1	4x50sw stroke count)			4x300	F mit Pad/Fl/	1
	1'30/1'45/42/40			*t-drills						*norm			Br on 2'/2'/4'/1'			on 4'15	
100	easy	co		*stroke count						*with sno			neg/neg Split		100	easy	co
			100	easy	co					*2kick1pull		100	easy	co			
									100	easy	co						
5.300			4.500						4.200			3.100			4.100		
gym			power	str		gym			power	str		gym			comp	warm up	1;2
															6x(50,25)	Br on 50"	RE
600	warm up	1	400	warm up	1	200	warm up	1	400	warm up	1	200	warm up	1		T: 29,0/13,0	
3x(4x(30" keep breath/20))		S,SE	25	Br T.: 12,2	S	5x200	IM on 3'30	1	25	Str T: 15,0	S	6x(4x50scull,100 stroke count)			200	easy	co
	Br on 1'45		100	easy	co	100	easy	co	100	easy	co		on 1'20/2'10	1	3x200	Br on 3'45	1
	*2x T: (60)/(70)		3x(4x(15/35,100,50))		1;2	10x100	IM on 1'50	1	3x(3x(200,50,50))		1;2	100	easy	co	100	easy	co
	*with Pad (45)			Br with 200easy		100	easy	co		Br on 3'30/50"/1'40		8x(100IM/50BU/Ba/Br/F)		1	10x100	F/Ba on 1'40	1
200	easy	co		on 1'/1'50/1'40		20x50	IM,MIM on 1'	1		with 100easy			on 2'30		100	easy	co
6x50	Br t-drill/stroke count			T.: (70)/1'18/35-30		200	easy	co		T.: 2'45/34/33-30		100	easy	co			
100	easy	co	600	pull/kick/sw	co	10x(25StL/252kick1pull/25StL		1	800	pull/kick	co						
25	Br with Pad/Fl	S	5x200	F with Pad/Fl/Sno		/25 kick on Ba)			8x150	Ba/Br/F on 2'20	1						
75	easy	co		on 3'	1		Br on 2'		100	easy	co						
5x200	IM on 3'15	1	100	easy	co	100	easy	co	3	dive	SE						
200	easy	co				6x25\25	Br with Pad/Fl	SE	100	easy	co						
							on 1'15										
						100	easy	co									
3.000			5.300			5.100			5.900			4.200			3.000		
8.300			**9.800**			**5.100**			**10.100**			**7.300**			**7.100**		

4.5 Swim Inputs
4.5.3 speed

- 3x(15,35) on 45“ T: (65)/(50); 2x25 with Padd/Fl
- 15/20/15/25/15/35/15/40 on 1’30
- 6x(3x15,100)
- 6x50 on 6‘ T: 28,2
- 6x(50,25/25) on 50“/5‘ T: 28,5/13,5
- 2x(6x(2x15 sc assist,35/15)) T: (15,0)-(13,5)
- 3x(4x25/25) on 1‘30
- 6x(30“ hold breath/25/75) on 3‘ T: 14,5-13,2
- 6x(2x15“ sc against with Pad, 20 sc assist,25/175)

Wochentrainingsplan			16. - 22.07.12														
Name:	Cam																
Mo			Di			Mi			Do			Fr			Sa		
400	warm up	1				400	warmup	1				400	warm up	1	comp	warm up	1
200,2x100,200,4x50,200,4x25/25						16x50	kick on 1'05	1;2				4x(200,4x50)	kick on 4'/1'10	1;2	Test		S
	kick on 4'/2'/4'/1'/4'/						T: 1-4,5-8,...dec						T: 3'40/46/44/42/40		50,25/25	Br on 50"	
	1'15	1;2					49-42,48-40,48-39,					200	easy	co		T:28,0/13,0	
	T: 3'40/1'40/1'30/						48-38								400	easy	co
	45-40/20-17					200	easy	co							4x20	sc ass	S
200	easy	co													200	easy	co
															2x15"	sc against	SE
															100	easy	co
															or		
															3x(25/25,100,25/25)		1;SE
																Br on 1'/1'50/1'40	
																14,0/1'20/13,5	
1.800						1.400						2.200			2.000		
gym			power	str		gym			power	str		gym					
200	warmup	1	600	warm up	1	200	warm up	1	600	warm up	1	200	warm up	1			
1000	F/Ba	1	Test		S	4x200	pull on 1'30	1	Test		S	800	F with Pad	1			
100	easy	co	75	Br		100	easy	co	50	Br		100	easy	co			
				T: 43,5 (28,0)		800	F with Pad/Fl/S	1		T: 27,5		4x50	Scull on 1'30	1			
			400	pull/sw/kick/sw	co	100	easy	co	600	pull/sw	co	200	Br	1			
			16x50	Br a. 1'10	1	16x50	Bu/MIM/Ba/MIM/Br/		4x(35StL/15sw,25StL/25sw)		1;2	4x50	Scull on 1'30	1			
				*StL/sw			MIM/Fr/MIM	1		T: (1/1)		100	Br	1			
				*t-drills/sw		100	easy	co		1'50/1'45-30		4x50	Scull on 1'30	1			
				*kick/sw		3	dives	SE	100	easy	co	50	Br "stroke coun	1			
				*stroke count		100	easy	co				150	easy	co			
			100	easy	co												
			3	pull down sc	SE												
			100	easy	co												
			or														
			4x(50,100)	Br on 1'/2'30	2;1												
				T: 33-29/1'18													
1.300			2.200			3.100			1.800			2.200					
3.100			**2.200**			**4.500**			**1.800**			**4.400**			**2.000**		

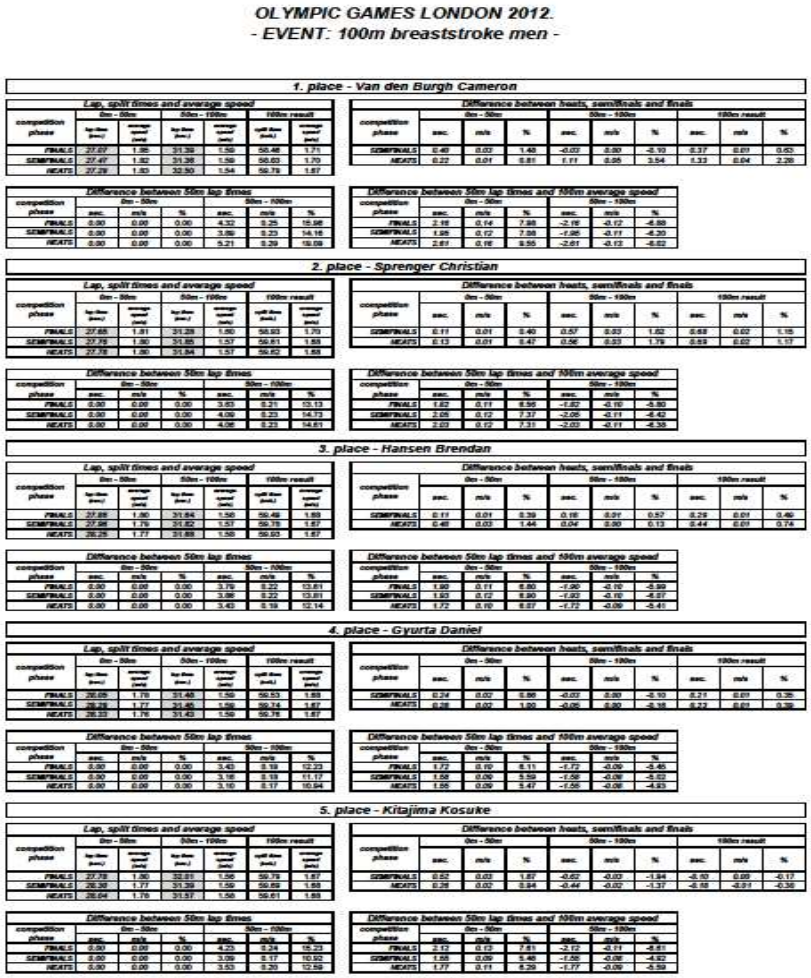
4.6 Racing Output
4.6.1 Olympic Games 2012
4.6.1.2 Results

	targets	results
Heats	59,70 (27,7/32,0)	59,79 (27,29/32,41)
Semi	59,00 (27,2/31,8)	58,83 (27,47/31,36)
Final	58,50 (26,9/31,6)	58,46 (27,07/31,39)

4.6 Racing Output

4.6.1 Olympic Games 2012

4.6.1.2 Pacing Strategy – London 2012



OLYMPIC GAMES LONDON 2012.
- EVENT: 100m breaststroke men -

1. place - Van den Burgh Cameron

Lap, split times and average speed

competition phase	0m - 50m		50m - 100m		100m result	
	lap time (sec)	average speed (m/s)	lap time (sec)	average speed (m/s)	split time (sec)	average speed (m/s)
FINALS	27.07	1.38	31.39	1.59	58.46	1.71
SEMIFINALS	27.47	1.82	31.36	1.59	58.83	1.70
HEATS	27.29	1.83	32.50	1.54	59.79	1.67

Difference between heats, semifinals and finals

competition phase	0m - 50m			50m - 100m			100m result		
	sec.	m/s	%	sec.	m/s	%	sec.	m/s	%
SEMIFINALS	0.40	0.02	1.48	-0.03	0.00	-0.10	0.37	0.01	0.63
HEATS	0.22	0.01	0.81	1.11	0.05	3.54	1.33	0.04	2.26

Difference between 50m lap times

competition phase	0m - 50m			50m - 100m		
	sec.	m/s	%	sec.	m/s	%
FINALS	0.00	0.00	0.00	4.32	0.25	15.98
SEMIFINALS	0.00	0.00	0.00	3.86	0.23	14.16
HEATS	0.00	0.00	0.00	5.21	0.29	18.09

Difference between 50m lap times and 100m average speed

competition phase	0m - 50m			50m - 100m		
	sec.	m/s	%	sec.	m/s	%
FINALS	2.18	0.14	7.88	-2.18	-0.12	-6.88
SEMIFINALS	1.88	0.12	7.88	-1.86	-0.11	-6.39
HEATS	2.61	0.16	9.55	-2.61	-0.13	-8.02

2. place - Sprenger Christian

Lap, split times and average speed

competition phase	0m - 50m		50m - 100m		100m result	
	lap time (sec)	average speed (m/s)	lap time (sec)	average speed (m/s)	split time (sec)	average speed (m/s)
FINALS	27.65	1.81	31.28	1.60	58.93	1.70
SEMIFINALS	27.79	1.80	31.85	1.57	59.61	1.68
HEATS	27.78	1.80	31.84	1.57	59.62	1.68

Difference between heats, semifinals and finals

competition phase	0m - 50m			50m - 100m			100m result		
	sec.	m/s	%	sec.	m/s	%	sec.	m/s	%
SEMIFINALS	0.11	0.01	0.40	0.57	0.03	1.82	0.68	0.02	1.16
HEATS	0.13	0.01	0.47	0.56	0.03	1.79	0.69	0.02	1.17

Difference between 50m lap times

competition phase	0m - 50m			50m - 100m		
	sec.	m/s	%	sec.	m/s	%
FINALS	0.00	0.00	0.00	3.63	0.21	13.13
SEMIFINALS	0.00	0.00	0.00	4.06	0.23	14.73
HEATS	0.00	0.00	0.00	4.06	0.23	14.61

Difference between 50m lap times and 100m average speed

competition phase	0m - 50m			50m - 100m		
	sec.	m/s	%	sec.	m/s	%
FINALS	1.62	0.11	6.96	-1.62	-0.10	-5.92
SEMIFINALS	2.06	0.12	7.37	-2.06	-0.11	-6.42
HEATS	2.03	0.12	7.31	-2.03	-0.11	-6.39

3. place - Hansen Brendan

Lap, split times and average speed

competition phase	0m - 50m		50m - 100m		100m result	
	lap time (sec)	average speed (m/s)	lap time (sec)	average speed (m/s)	split time (sec)	average speed (m/s)
FINALS	27.68	1.80	31.84	1.56	59.48	1.68
SEMIFINALS	27.96	1.79	31.82	1.57	59.78	1.67
HEATS	28.25	1.77	31.88	1.56	60.03	1.67

Difference between heats, semifinals and finals

competition phase	0m - 50m			50m - 100m			100m result		
	sec.	m/s	%	sec.	m/s	%	sec.	m/s	%
SEMIFINALS	0.11	0.01	0.39	0.18	0.01	0.57	0.29	0.01	0.49
HEATS	0.48	0.03	1.44	0.04	0.00	0.13	0.44	0.01	0.74

Difference between 50m lap times

competition phase	0m - 50m			50m - 100m		
	sec.	m/s	%	sec.	m/s	%
FINALS	0.00	0.00	0.00	3.79	0.22	13.61
SEMIFINALS	0.00	0.00	0.00	3.96	0.22	13.81
HEATS	0.00	0.00	0.00	3.43	0.19	12.14

Difference between 50m lap times and 100m average speed

competition phase	0m - 50m			50m - 100m		
	sec.	m/s	%	sec.	m/s	%
FINALS	1.90	0.11	6.80	-1.90	-0.10	-5.99
SEMIFINALS	1.93	0.12	6.90	-1.93	-0.10	-5.97
HEATS	1.72	0.10	6.07	-1.72	-0.09	-5.41

4. place - Gyurta Daniel

Lap, split times and average speed

competition phase	0m - 50m		50m - 100m		100m result	
	lap time (sec)	average speed (m/s)	lap time (sec)	average speed (m/s)	split time (sec)	average speed (m/s)
FINALS	28.09	1.78	31.48	1.58	59.53	1.68
SEMIFINALS	28.25	1.77	31.45	1.59	59.74	1.67
HEATS	28.23	1.76	31.43	1.59	59.76	1.67

Difference between heats, semifinals and finals

competition phase	0m - 50m			50m - 100m			100m result		
	sec.	m/s	%	sec.	m/s	%	sec.	m/s	%
SEMIFINALS	0.24	0.02	0.86	-0.03	0.00	-0.10	0.21	0.01	0.36
HEATS	0.28	0.02	1.00	-0.05	0.00	-0.18	0.22	0.01	0.38

Difference between 50m lap times

competition phase	0m - 50m			50m - 100m		
	sec.	m/s	%	sec.	m/s	%
FINALS	0.00	0.00	0.00	3.43	0.19	12.23
SEMIFINALS	0.00	0.00	0.00	3.16	0.19	11.17
HEATS	0.00	0.00	0.00	3.16	0.17	10.94

Difference between 50m lap times and 100m average speed

competition phase	0m - 50m			50m - 100m		
	sec.	m/s	%	sec.	m/s	%
FINALS	1.72	0.10	6.11	-1.72	-0.09	-5.45
SEMIFINALS	1.58	0.09	5.59	-1.58	-0.08	-5.02
HEATS	1.55	0.09	5.47	-1.55	-0.08	-4.93

5. place - Kitajima Kosuke

Lap, split times and average speed

competition phase	0m - 50m		50m - 100m		100m result	
	lap time (sec)	average speed (m/s)	lap time (sec)	average speed (m/s)	split time (sec)	average speed (m/s)
FINALS	27.79	1.80	32.01	1.56	59.79	1.67
SEMIFINALS	28.30	1.77	31.39	1.59	59.69	1.68
HEATS	28.04	1.78	31.57	1.58	59.61	1.68

Difference between heats, semifinals and finals

competition phase	0m - 50m			50m - 100m			100m result		
	sec.	m/s	%	sec.	m/s	%	sec.	m/s	%
SEMIFINALS	0.52	0.03	1.87	-0.62	-0.03	-1.94	-0.10	0.00	-0.17
HEATS	0.26	0.02	0.94	-0.44	-0.02	-1.37	-0.18	-0.01	-0.30

Difference between 50m lap times

competition phase	0m - 50m			50m - 100m		
	sec.	m/s	%	sec.	m/s	%
FINALS	0.00	0.00	0.00	4.25	0.24	15.23
SEMIFINALS	0.00	0.00	0.00	3.09	0.17	10.92
HEATS	0.00	0.00	0.00	3.53	0.20	12.59

Difference between 50m lap times and 100m average speed

competition phase	0m - 50m			50m - 100m		
	sec.	m/s	%	sec.	m/s	%
FINALS	2.12	0.13	7.81	-2.12	-0.11	-6.81
SEMIFINALS	1.55	0.09	5.46	-1.55	-0.08	-4.92
HEATS	1.77	0.11	6.29	-1.77	-0.09	-5.59

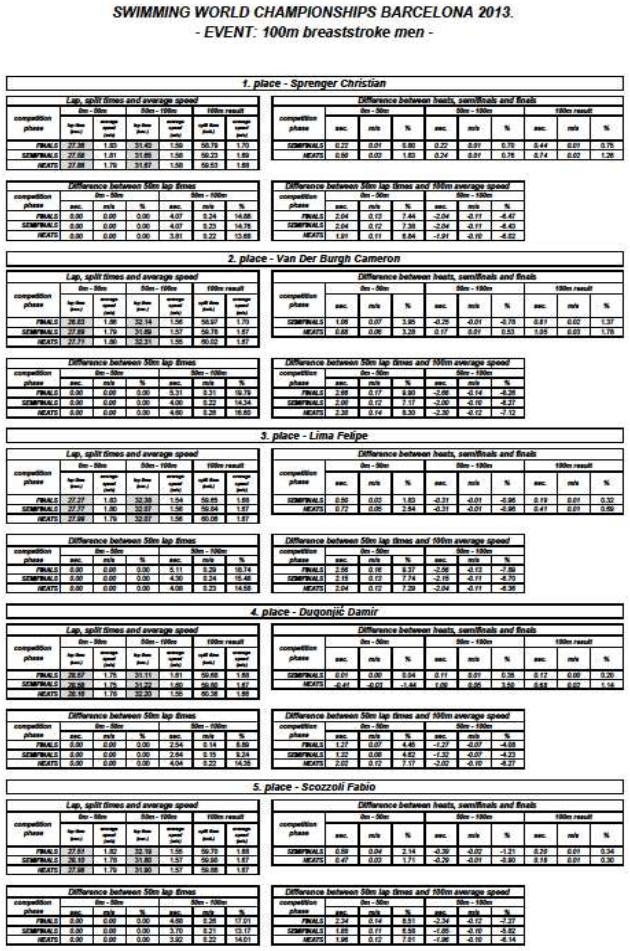
4.6 Racing Output
4.6.2. WCH Barcelona 2013
4.6.2.1 Results

	targets	results
Heats	59,90 (28,0/31,9)	60,02 (27,71/32,31)
Semi	59,50 (27,7/31,8)	59,78 (27,89/31,89)
Final	58,60 (26,9/31,7)	58,97 (26,83/32,14)

4.6 Racing Output

4.6.2 WCH Barcelona 2013

4.6.2.2 Pacing Strategy – Barcelona 2013



SWIMMING WORLD CHAMPIONSHIPS BARCELONA 2013.
- EVENT: 100m breaststroke men -

1. place - Sprenger Christian

Lap, split times and average speed

competition phase	0m - 50m		50m - 100m		100m result	
	lap time (sec)	average speed (m/s)	lap time (sec)	average speed (m/s)	split time (sec)	average speed (m/s)
FINALS	27.38	1.83	31.43	1.59	58.79	1.70
SEMIFINALS	27.58	1.81	31.65	1.58	59.23	1.69
HEATS	27.88	1.79	31.67	1.58	59.53	1.68

Difference between heats, semifinals and finals

competition phase	0m - 50m			50m - 100m			100m result		
	sec.	m/s	%	sec.	m/s	%	sec.	m/s	%
SEMIFINALS	0.22	0.01	0.80	0.22	0.01	0.70	0.44	0.01	0.75
HEATS	0.50	0.03	1.83	0.24	0.01	0.76	0.74	0.02	1.26

Difference between 50m lap times

competition phase	0m - 50m			50m - 100m		
	sec.	m/s	%	sec.	m/s	%
FINALS	0.00	0.00	0.00	4.07	0.24	14.68
SEMIFINALS	0.00	0.00	0.00	4.07	0.23	14.76
HEATS	0.00	0.00	0.00	3.81	0.22	13.68

Difference between 50m lap times and 100m average speed

competition phase	0m - 50m			50m - 100m		
	sec.	m/s	%	sec.	m/s	%
FINALS	2.04	0.12	7.44	-2.04	-0.11	-6.47
SEMIFINALS	2.04	0.12	7.38	-2.04	-0.11	-6.43
HEATS	1.91	0.11	6.84	-1.91	-0.10	-6.02

2. place - Van Der Burgh Cameron

Lap, split times and average speed

competition phase	0m - 50m		50m - 100m		100m result	
	lap time (sec)	average speed (m/s)	lap time (sec)	average speed (m/s)	split time (sec)	average speed (m/s)
FINALS	26.83	1.86	32.14	1.56	58.97	1.70
SEMIFINALS	27.69	1.79	31.89	1.57	59.78	1.67
HEATS	27.73	1.80	32.31	1.55	60.02	1.67

Difference between heats, semifinals and finals

competition phase	0m - 50m			50m - 100m			100m result		
	sec.	m/s	%	sec.	m/s	%	sec.	m/s	%
SEMIFINALS	1.06	0.07	3.85	-0.25	-0.01	-0.78	0.81	0.02	1.37
HEATS	0.83	0.06	3.28	0.17	0.01	0.53	1.05	0.03	1.78

Difference between 50m lap times

competition phase	0m - 50m			50m - 100m		
	sec.	m/s	%	sec.	m/s	%
FINALS	0.00	0.00	0.00	5.31	0.31	19.79
SEMIFINALS	0.00	0.00	0.00	4.00	0.22	14.24
HEATS	0.00	0.00	0.00	4.60	0.28	16.60

Difference between 50m lap times and 100m average speed

competition phase	0m - 50m			50m - 100m		
	sec.	m/s	%	sec.	m/s	%
FINALS	2.68	0.17	9.99	-2.68	-0.14	-8.26
SEMIFINALS	2.00	0.12	7.17	-2.00	-0.10	-6.27
HEATS	2.38	0.14	8.30	-2.30	-0.12	-7.12

3. place - Lima Felipe

Lap, split times and average speed

competition phase	0m - 50m		50m - 100m		100m result	
	lap time (sec)	average speed (m/s)	lap time (sec)	average speed (m/s)	split time (sec)	average speed (m/s)
FINALS	27.27	1.83	32.38	1.54	59.65	1.68
SEMIFINALS	27.77	1.80	32.27	1.56	59.94	1.67
HEATS	27.99	1.79	32.07	1.56	60.06	1.67

Difference between heats, semifinals and finals

competition phase	0m - 50m			50m - 100m			100m result		
	sec.	m/s	%	sec.	m/s	%	sec.	m/s	%
SEMIFINALS	0.50	0.03	1.83	-0.31	-0.01	-0.96	0.19	0.01	0.32
HEATS	0.72	0.05	2.64	-0.31	-0.01	-0.96	0.41	0.01	0.69

Difference between 50m lap times

competition phase	0m - 50m			50m - 100m		
	sec.	m/s	%	sec.	m/s	%
FINALS	0.00	0.00	0.00	5.11	0.29	18.74
SEMIFINALS	0.00	0.00	0.00	4.30	0.24	15.48
HEATS	0.00	0.00	0.00	4.08	0.23	14.58

Difference between 50m lap times and 100m average speed

competition phase	0m - 50m			50m - 100m		
	sec.	m/s	%	sec.	m/s	%
FINALS	2.56	0.16	9.37	-2.56	-0.13	-7.59
SEMIFINALS	2.19	0.12	7.74	-2.19	-0.11	-6.70
HEATS	2.04	0.12	7.29	-2.04	-0.11	-6.36

4. place - Dugonjič Damir

Lap, split times and average speed

competition phase	0m - 50m		50m - 100m		100m result	
	lap time (sec)	average speed (m/s)	lap time (sec)	average speed (m/s)	split time (sec)	average speed (m/s)
FINALS	26.57	1.75	31.11	1.61	59.68	1.68
SEMIFINALS	26.58	1.75	31.72	1.60	60.30	1.67
HEATS	26.19	1.76	32.20	1.56	60.39	1.66

Difference between heats, semifinals and finals

competition phase	0m - 50m			50m - 100m			100m result		
	sec.	m/s	%	sec.	m/s	%	sec.	m/s	%
SEMIFINALS	0.01	0.00	0.04	0.11	0.01	0.35	0.12	0.00	0.20
HEATS	-0.41	-0.03	-1.44	0.68	0.05	1.98	0.63	0.02	1.14

Difference between 50m lap times

competition phase	0m - 50m			50m - 100m		
	sec.	m/s	%	sec.	m/s	%
FINALS	0.00	0.00	0.00	2.54	0.14	8.89
SEMIFINALS	0.00	0.00	0.00	2.64	0.15	9.24
HEATS	0.00	0.00	0.00	4.04	0.23	14.38

Difference between 50m lap times and 100m average speed

competition phase	0m - 50m			50m - 100m		
	sec.	m/s	%	sec.	m/s	%
FINALS	1.27	0.07	4.45	-1.27	-0.07	-4.65
SEMIFINALS	1.22	0.08	4.63	-1.32	-0.07	-4.23
HEATS	2.02	0.12	7.17	-2.02	-0.10	-6.37

5. place - Scozzoli Fabio

Lap, split times and average speed

competition phase	0m - 50m		50m - 100m		100m result	
	lap time (sec)	average speed (m/s)	lap time (sec)	average speed (m/s)	split time (sec)	average speed (m/s)
FINALS	27.51	1.82	32.19	1.55	59.70	1.68
SEMIFINALS	26.19	1.79	31.80	1.57	59.99	1.67
HEATS	27.98	1.79	31.90	1.57	59.88	1.67

Difference between heats, semifinals and finals

competition phase	0m - 50m			50m - 100m			100m result		
	sec.	m/s	%	sec.	m/s	%	sec.	m/s	%
SEMIFINALS	0.59	0.04	2.14	-0.39	-0.02	-1.21	0.20	0.01	0.34
HEATS	0.47	0.03	1.71	-0.29	-0.01	-0.90	0.18	0.01	0.30

Difference between 50m lap times

competition phase	0m - 50m			50m - 100m		
	sec.	m/s	%	sec.	m/s	%
FINALS	0.00	0.00	0.00	4.60	0.26	17.01
SEMIFINALS	0.00	0.00	0.00	3.70	0.21	13.17
HEATS	0.00	0.00	0.00	3.92	0.22	14.01

Difference between 50m lap times and 100m average speed

competition phase	0m - 50m			50m - 100m		
	sec.	m/s	%	sec.	m/s	%
FINALS	2.34	0.14	8.51	-2.34	-0.12	-7.27
SEMIFINALS	1.85	0.11	6.58	-1.85	-0.10	-5.82
HEATS	1.96	0.12	7.01	-1.96	-0.10	-6.14

4.6.3 Basics Derivations – Pacing Strategy

- from the heats to semis and finals improved tends to the first 50m split, while the second 50m are rather getting slower.
- the tactical target on 100m Breast:
  it can be seen on the first part of race significantly higher growth rates, as shown in the second part. What mean finalist realize faster 100m results by getting fast out for 1. 50m, holding 3. 25m and ensure that last 25m not to die.

4.6.4 Lap times and Speed - Barcelona

Swimming World Championships (Barcelona 2013.)
- event: 100m breaststroke men -

1. 50m LAP TIMES & 100m TIME

COMPETITION PHASE	HEATS			SEMIFINALS			FINALS		
Category	0m - 50m (sec.)	50m - 100m (sec.)	Time (sec.)	0m - 50m (sec.)	50m - 100m (sec.)	Time (sec.)	0m - 50m (sec.)	50m - 100m (sec.)	Time (sec.)
Gold medal	27.96	31.67	59.53	27.58	31.65	59.23	27.36	31.43	58.79
Medals	27.85	32.02	59.87	27.75	31.87	59.62	27.15	31.98	59.14
From 4. to 8. place in the finals	28.18	31.89	60.06	28.19	31.66	59.85	28.17	31.72	59.90
Finalists	28.06	31.94	59.99	28.02	31.74	59.76	27.79	31.82	59.61
Semifinalists	28.20	31.94	60.14	28.19	32.13	60.31	/	/	/

2. TIME DIFFERENCE BETWEEN HEATS, SEMIFINALS AND FINALS (SECONDS)

	SEMIFINALS - HEATS			FINALS - HEATS			FINALS - SEMIFINALS		
Category	0m - 50m (sec.)	50m - 100m (sec.)	Time (sec.)	0m - 50m (sec.)	50m - 100m (sec.)	Time (sec.)	0m - 50m (sec.)	50m - 100m (sec.)	Time (sec.)
Gold medal	0.28	0.02	0.30	0.50	0.24	0.74	0.22	0.22	0.44
Medals	0.11	0.15	0.25	0.70	0.03	0.73	0.59	-0.11	0.48
From 4. to 8. place in the finals	-0.01	0.23	0.21	0.09	0.16	0.17	0.02	-0.06	-0.05
Finalists	0.03	0.20	0.23	0.26	0.12	0.38	0.23	-0.08	0.15
Semifinalists	0.02	-0.19	-0.17	/	/	/	/	/	/

3. LAP AND SPLIT AVERAGE SPEED

COMPETITION PHASE	HEATS			SEMIFINALS			FINALS		
Category	0m - 50m (m/s)	50m - 100m (m/s)	0m - 100m (m/s)	0m - 50m (m/s)	50m - 100m (m/s)	0m - 100m (m/s)	0m - 50m (m/s)	50m - 100m (m/s)	0m - 100m (m/s)
Gold medal	1.79	1.58	1.69	1.81	1.58	1.70	1.83	1.59	1.71
Medals	1.80	1.56	1.68	1.80	1.57	1.69	1.84	1.56	1.70
From 4. to 8. place in the finals	1.77	1.57	1.67	1.77	1.58	1.68	1.78	1.58	1.68
Finalists	1.78	1.57	1.67	1.78	1.58	1.68	1.80	1.57	1.69
Semifinalists	1.77	1.57	1.67	1.77	1.56	1.67	/	/	/

4. TIME DIFFERENCE BETWEEN HEATS, SEMIFINALS AND FINALS (PERCENT)

	SEMIFINALS - HEATS			FINALS - HEATS			FINALS - SEMIFINALS		
Category	0m - 50m (%)	50m - 100m (%)	100m (%)	0m - 50m (%)	50m - 100m (%)	100m (%)	0m - 50m (%)	50m - 100m (%)	100m (%)
Gold medal	0.02	0.00	0.02	0.03	0.01	0.04	0.01	0.01	0.03
Medals	0.01	0.01	0.01	0.05	0.00	0.05	0.04	-0.01	0.03
From 4. to 8. place in the finals	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.00
Finalists	0.00	0.01	0.01	0.02	0.01	0.02	0.02	0.00	0.01
Semifinalists	0.00	-0.01	-0.01	/	/	/	/	/	/

4.6.5 Basics Derivations - Lap times and Speed

The high-end clean-race-speed is everything subordinate

in a race:

1. The first 3. 25m's medal winners faster than average finalists. From 75m to 100m finalist are better.
2. The underwater distance by medal winner is higher, what is showing the importance of starts and turns.
3. The reaction times by medal winners are quicker than by average finalists.
4. The last 5m per lap finalists are better than medal winners.
5. Medal winner have a higher average frequency, even the stroke lenght per cycle is longer by average finalists than medal winners.
6. Targets for a perfect race position seemed to be: **12,4/ 27,5/43,04**

4.6.6 Underwater Portion - Barcelona

SWC BARCELONA 2013. - EVENT: 100m breaststroke men

Group no. 1: Parameters concerning underwater portion of the race

Rank	Competitor	Competition phase	1. Underwater distance after start (m)	2. Underwater distance after start (hip-flag) (sec.)	3. Average speed during the underwater portion of the race after start (m/sec.)	4. Underwater distance after turn (m)	5. Underwater distance after turn (hip-flag) (sec.)	6. Average speed during the underwater portion of the race after turn (m/sec.)	7. Total underwater distance (m)	8. Total underwater distance (hip-flag) (sec.)	9. Average speed during underwater portion of the race (m/sec.)	10. Total underwater distance & race distance ratio (%)	11. Total underwater distance (up) then & race then ratio (%)
1	Sprenger Christian	SEMIFINALS	13.72	5.68	2.42	10.40	5.94	1.75	24.12	11.62	2.08	24.12	19.62
		FINALS	13.50	5.44	2.48	8.91	5.52	1.80	22.41	10.96	2.14	23.47	18.64
2	Van Der Burgh Cameron	SEMIFINALS	13.43	5.46	2.46	10.68	5.91	1.81	24.10	11.37	2.12	24.10	18.16
		FINALS	13.86	5.32	2.61	8.91	5.57	1.78	22.77	10.89	2.09	23.77	16.47
3	Lins Felipe	SEMIFINALS	13.76	5.12	2.49	8.33	5.27	1.77	22.09	10.39	2.13	22.09	17.38
		FINALS	13.93	5.28	2.57	8.85	5.50	1.77	23.08	10.95	2.14	23.08	18.19
4	Dugonjić Damir	SEMIFINALS	12.89	5.24	2.46	8.33	4.98	1.79	21.82	10.22	2.13	21.82	17.09
		FINALS	13.80	5.64	2.36	10.21	5.96	1.72	24.01	11.79	2.04	24.01	18.78
5	Scozzoli Fabio	SEMIFINALS	13.37	5.60	2.48	10.96	6.54	1.73	24.33	11.94	2.03	24.33	19.33
		FINALS	14.03	5.56	2.52	8.85	5.53	1.78	23.88	11.09	2.15	23.88	18.56
6	Kitajima Kosuke	SEMIFINALS	13.32	5.44	2.45	10.22	5.71	1.79	23.54	11.15	2.12	23.54	18.61
		FINALS	12.54	4.96	2.53	8.89	4.84	1.84	21.43	9.80	2.19	21.43	16.34
7	Cordes Kevin Willem	SEMIFINALS	14.24	5.78	2.47	8.73	5.41	1.80	22.97	11.17	2.14	23.97	18.69
		FINALS	13.72	5.44	2.52	8.70	5.46	1.79	23.42	10.90	2.15	23.42	18.19
8	Fink Nicolas	SEMIFINALS	12.94	5.12	2.53	8.59	5.33	1.80	22.52	10.45	2.16	22.52	17.48
		FINALS	13.34	5.44	2.45	8.44	5.27	1.79	22.78	10.71	2.13	22.78	17.82
9	Strelnikov Kirill	SEMIFINALS	13.41	5.44	2.47	8.93	5.07	1.76	22.34	10.51	2.11	22.34	17.52
10	Fekhevár Hendrik	SEMIFINALS	13.39	5.56	2.41	9.25	5.37	1.72	22.63	10.93	2.06	22.63	18.03
11	Murdoch Ross	SEMIFINALS	13.18	5.48	2.41	8.94	5.53	1.80	23.12	11.01	2.10	23.12	18.33
12	Tikovs Giedrius	SEMIFINALS	13.26	5.48	2.42	8.48	5.24	1.81	22.74	10.72	2.11	22.74	17.93
13	Snyders Glenn	SEMIFINALS	12.83	5.28	2.43	9.62	5.49	1.75	22.45	10.77	2.09	22.45	17.98
14	Gomes Jr Joao	SEMIFINALS	14.07	5.79	2.44	10.10	5.66	1.78	24.17	11.45	2.11	24.17	19.01
15	Jamieson Michael	SEMIFINALS	13.59	5.56	2.36	10.01	5.91	1.80	23.60	11.47	2.07	23.60	18.93
16	Peaco Mattia	SEMIFINALS	13.71	5.64	2.43	9.95	5.84	1.70	23.66	11.48	2.07	23.66	18.90

DATA FROM SEMIFINALS

CATEGORY	1. Underwater distance after start (m)	2. Underwater distance after start (hip-flag) (sec.)	3. Average speed during the underwater portion of the race after start (m/sec.)	4. Underwater distance after turn (m)	5. Underwater distance after turn (hip-flag) (sec.)	6. Average speed during the underwater portion of the race after turn (m/sec.)	7. Total underwater distance (m)	8. Total underwater distance (hip-flag) (sec.)	9. Average speed during underwater portion of the race (m/sec.)	10. Total underwater distance & race distance ratio (%)	11. Total underwater distance (up) then & race then ratio (%)
Gold medal	13.72	5.68	2.42	10.40	5.94	1.75	24.12	11.62	2.08	24.12	19.62
Medals	13.43	5.46	2.46	10.14	5.71	1.78	23.57	11.16	2.12	23.57	18.72
From 4. to 8. place in the finals	13.46	5.40	2.49	8.88	5.38	1.79	23.34	10.99	2.13	23.34	18.36
Finalists	13.46	5.44	2.47	8.88	5.81	1.78	23.42	11.05	2.13	23.42	18.49
*Semifinalists failed to qualify	13.37	5.53	2.42	8.74	5.80	1.77	23.10	11.03	2.09	23.10	18.29

DATA FROM FINALS

CATEGORY	1. Underwater distance after start (m)	2. Underwater distance after start (hip-flag) (sec.)	3. Average speed during the underwater portion of the race after start (m/sec.)	4. Underwater distance after turn (m)	5. Underwater distance after turn (hip-flag) (sec.)	6. Average speed during the underwater portion of the race after turn (m/sec.)	7. Total underwater distance (m)	8. Total underwater distance (hip-flag) (sec.)	9. Average speed during underwater portion of the race (m/sec.)	10. Total underwater distance & race distance ratio (%)	11. Total underwater distance (up) then & race then ratio (%)
Gold medal	13.50	5.44	2.48	8.91	5.52	1.80	22.41	10.96	2.14	23.47	18.64
Medals	13.63	5.36	2.53	8.89	5.56	1.78	23.42	10.90	2.15	23.42	18.43
From 4. to 8. place in the finals	13.51	5.45	2.48	8.82	5.41	1.79	23.12	10.86	2.13	23.12	18.13
Finalists	13.50	5.41	2.50	8.72	5.46	1.78	23.24	10.87	2.14	23.24	18.24
*Semifinalists failed to qualify	13.37	5.53	2.42	8.74	5.80	1.77	23.10	11.03	2.09	23.10	18.29

4.6.7 Basics Derivations – Underwater Portion

The goodness of starts and turns are an essential basis for good times:

1. the regular medal winner have a very high initial speed by dives and turns.
2. this can be derived in the 15m splits on the first and second lap, where medal winner much faster than the rest.
3. Medal winner are able to reduce the loss of speed during the transition.

5. Review Key: „take aways“ of the Presentation

- Race tactic
- Race technique
- Racing is the main guidance of season. Not enough time for long aerobic blocs during a season. AST: same or similar milage by more efficiency, no more „garbage-milage“
- Maintenance of aerobic capacity is build on short periods of aerobic „reloads“ and shorter sets with relevant pace. Often used medium altitude 1.400m to 1.900m.
- Individual approach for every swimmer.
- AST create more time and energy to develope strenght in water.
- Drills become important part of any practice.
- Dryland work is more based on wightlifting exercises for general fitness than on specific exercises just for swim.
- Relevant training tools are: **race speed, race technique and race frequency**.

6. Resume

- Everybody is talking about inensity. But the real key is recovery.
- Trainings- and Sportscience are no fast track to success.
- Trainings programs are individual and promote the individual strengths.
- Success is a result of combination from Sport Sience + „Art of Coaching“+ dedicated Athlete + Luck.
- „Art of Coaching“ is the keyword for any coach. A good coach must recognize athlete needs to understand the relevance of athlete skills.
- It is very easy to distroy trainings success if you are not listening to athletes signals even as kind of visual communications. A good coach is „reading“ his athlete.
- Coach must be taff enough to ignore sometimes science rules of training when athletes are sending different messages.

Practising in racing frequencies are the future performance key.

Thanks for your Attention:
www.dirklange.org