Decisive parameters in swimming

150 swimmers

138 of them members of the Hungarian National Swimming Team, of whom 49 were Olympians. Collectively, the athletes had won 20 Olympic medals, 35 World Championship medals, 311 European Championship medals, 866 World Cup medals, 70 Junior World Championship medals, 226 Junior European Championship medals and 20 Youth Olympic medals, including both pool and open water disciplines.

Ivan Petrov

Parameters per distance

		Short Distance	Middle Distance	Long Distance
Weight (kg)	M	80.78 ± 8.57	74.93 ± 10.28	75.10 ± 8.94
	F	64.24 ± 5.94	59.62 ± 6.88	59.32 ± 5.79
Height (cm)	M	186.05 ± 6.95	183.18 ± 8.04	182.45 ± 6.17
	F	171.94 ± 7.63	168.56 ± 7.44	168.64 ± 4.44
Body fat percent (%)	M	9.27 ± 2.08	9.79 ± 2.86	11.84 ± 2.49
	F	17.64 ± 5.27	16.94 ± 3.16	18.62 ± 2.93
Muscle mass (kg)	M	73.20 ± 7.08	67.97 ± 8.06	65.96 ± 6.97
	F	51.24 ± 8.59	48.77 ± 6.66	48.32 ± 4.21
Fat-free mass index	M	21.13 ± 1.43	20.13 ± 1.34	19.89 ± 1.41
	F	17.90 ± 1.05	17.33 ± 0.97	16.95 ± 0.94

Parameters per distance

Table 1

	Short Distance	Middle Distance	Long Distance
Ejection fraction (%)	61.59 ± 3.08	59.40 ± 4.37	59.97 ± 4.69
Septal wall thickness (mm)	9.72 ± 1.46	9.93 ± 1.45	10.03 ± 1.50
Posterior wall thickness (mm)	9.25 ± 1.22	9.68 ± 1.43	9.90 ± 1.40
LV end-diastolic diameter	48.47 ± 4.44	48.67 ± 5.18	48.55 ± 4.28
RV diameter (mm)	34.59 ± 4.50	34.64 ± 4.44	35.48 ± 3.85
TAPSE	24.16 ± 4.51	23.63 ± 4.46	23.31 ± 4.56
Treadmill time (min)	12.99 ± 2.19	13.52 ± 1.97	13.43 ± 1.96
Max load (Watt)	351.53 ± 90.48	332.51 ± 78.13	339.51 ± 80.87
Resting HR (bpm)	68.18 ± 12.61	68.48 ± 14.35	68.59 ± 15.41
Peak HR (bpm)	194.34 ± 9.24	196.00 ± 11.41	194.66 ± 10.28
HRR	24.51 ± 9.23	30.01 ± 10.41	29.52 ± 11.11
RER	1.17 ± 0.07	1.14 ± 0.09	1.13 ± 0.05

Parameters per distance

Table 1

	Short Distance	Middle Distance	Long Distance
Ejection fraction (%)	61.59 ± 3.08	59.40 ± 4.37	59.97 ± 4.69
Septal wall thickness (mm)	9.72 ± 1.46	9.93 ± 1.45	10.03 ± 1.50
Posterior wall thickness (mm)	9.25 ± 1.22	9.68 ± 1.43	9.90 ± 1.40
LV end-diastolic diameter	48.47 ± 4.44	48.67 ± 5.18	48.55 ± 4.28
RV diameter (mm)	34.59 ± 4.50	34.64 ± 4.44	35.48 ± 3.85
TAPSE	24.16 ± 4.51	23.63 ± 4.46	23.31 ± 4.56
Treadmill time (min)	12.99 ± 2.19	13.52 ± 1.97	13.43 ± 1.96
Max load (Watt)	351.53 ± 90.48	332.51 ± 78.13	339.51 ± 80.87
Resting HR (bpm)	68.18 ± 12.61	68.48 ± 14.35	68.59 ± 15.41
Peak HR (bpm)	194.34 ± 9.24	196.00 ± 11.41	194.66 ± 10.28
HRR	24.51 ± 9.23	30.01 ± 10.41	29.52 ± 11.11
RER	1.17 ± 0.07	1.14 ± 0.09	1.13 ± 0.05

Parameters per distance

		Short Distance	Middle Distance	Long Distance
FEV1	M	5.40 ± 0.68	5.21 ± 1.00	5.10 ± 1.07
	F	3.99 ± 0.53	3.93 ± 0.64	3.48 ± 0.53
FVC	M	6.55 ± 0.90	6.26 ± 1.19	6.44 ± 1.03
	F	4.57 ± 0.82	4.44 ± 0.69	4.13 ± 0.35
VO_2max (L/min)	M	4.63 ± 0.58	4.41 ± 0.68	4.52 ± 0.57
	F	3.10 ± 0.40	3.14 ± 0.45	3.09 ± 0.38
VO_2max (mL/min/kg)	M	56.80 ± 5.28	59.17 ± 5.01	59.98 ± 5.01
	F	48.23 ± 4.15	52.54 ± 4.68	52.30 ± 6.14
O_2 pulse	M	25.74 ± 9.18	23.35 ± 4.26	23.47 ± 3.71
	F	16.25 ± 2.19	16.40 ± 2.86	16.20 ± 2.15
VE (l/min)	M	173.45 ± 25.66	156.76 ± 29.46	160.53 ± 33.61
	F	117.50 ± 11.09	115.31 ± 17.98	111.50 ± 16.92
VE/VCO_2	M	31.75 ± 4.57	31.17 ± 3.73	32.09 ± 4.63
	F	33.01 ± 3.62	31.57 ± 3.49	30.55 ± 3.11
VE/VCO_2 nadir	M	24.62 ± 2.61	25.19 ± 2.23	26.29 ± 1.95
	F	26.96 ± 2.83	26.61 ± 2.78	25.64 ± 2.61
Peak lactate (mmol/L)	M	11.10 ± 2.45	8.87 ± 2.69	9.55 ± 3.20
	F	9.36 ± 2.51	9.40 ± 2.79	9.07 ± 2.26

Parameters per distance

		Short Distance	Middle Distance	Long Distance
FEV1	M	5.40 ± 0.68	5.21 ± 1.00	5.10 ± 1.07
	F	3.99 ± 0.53	3.93 ± 0.64	3.48 ± 0.53
FVC	M	6.55 ± 0.90	6.26 ± 1.19	6.44 ± 1.03
	F	4.57 ± 0.82	4.44 ± 0.69	4.13 ± 0.35
VO_2max (L/min)	M	4.63 ± 0.58	4.41 ± 0.68	4.52 ± 0.57
	F	3.10 ± 0.40	3.14 ± 0.45	3.09 ± 0.38
VO_2max (mL/min/kg)	M	56.80 ± 5.28	59.17 ± 5.01	59.98 ± 5.01
	F	48.23 ± 4.15	52.54 ± 4.68	52.30 ± 6.14
O_2 pulse	M	25.74 ± 9.18	23.35 ± 4.26	23.47 ± 3.71
	F	16.25 ± 2.19	16.40 ± 2.86	16.20 ± 2.15
VE (l/min)	M	173.45 ± 25.66	156.76 ± 29.46	160.53 ± 33.61
	F	117.50 ± 11.09	115.31 ± 17.98	111.50 ± 16.92
VE/VCO_2	M	31.75 ± 4.57	31.17 ± 3.73	32.09 ± 4.63
	F	33.01 ± 3.62	31.57 ± 3.49	30.55 ± 3.11
VE/VCO_2 nadir	M	24.62 ± 2.61	25.19 ± 2.23	26.29 ± 1.95
	F	26.96 ± 2.83	26.61 ± 2.78	25.64 ± 2.61
Peak lactate (mmol/L)	M	11.10 ± 2.45	8.87 ± 2.69	9.55 ± 3.20
	F	9.36 ± 2.51	9.40 ± 2.79	9.07 ± 2.26

Parameters per stroke

		Strokes				
		Free	**Breast**	**Back**	**Butterfly**	**Medley**
Weight (kg)	M	77.39 ± 10.56	71.34 ± 11.82	77.16 ± 5.49	74.19 ± 10.54	79.53 ± 5.54
	F	61.43 ± 6.38	59.80 ± 6.53	59.46 ± 6.21	59.70 ± 6.60	59.44 ± 9.80
Height (cm)	M	183.61 ± 7.08	180.13 ± 9.03	187.61 ± 4.88	182.98 ± 10.00	184.59 ± 5.93
	F	169.82 ± 6.84	168.86 ± 4.08	167.98 ± 5.36	170.85 ± 10.13	167.91 ± 10.46
Body fat percent (%)	M	9.96 ± 2.99	9.04 ± 2.83	9.92 ± 1.65	9.54 ± 1.67	12.26 ± 2.68
	F	17.84 ± 3.15	15.42 ± 3.41	19.04 ± 4.70	14.50 ± 4.25	16.67 ± 3.38
Muscle mass (kg)	M	69.58 ± 9.07	68.93 ± 2.52	69.27 ± 5.01	66.14 ± 9.77	69.81 ± 4.90
	F	49.92 ± 6.94	50.54 ± 5.35	45.57 ± 6.14	50.68 ± 8.28	48.47 ± 7.05
Fat-free mass index	M	20.59 ± 1.63	20.55 ± 0.54	19.69 ± 1.36	19.86 ± 1.19	20.59 ± 1.00
	F	17.48 ± 0.94	17.69 ± 1.21	16.99 ± 1.09	17.44 ± 0.87	17.22 ± 1.39

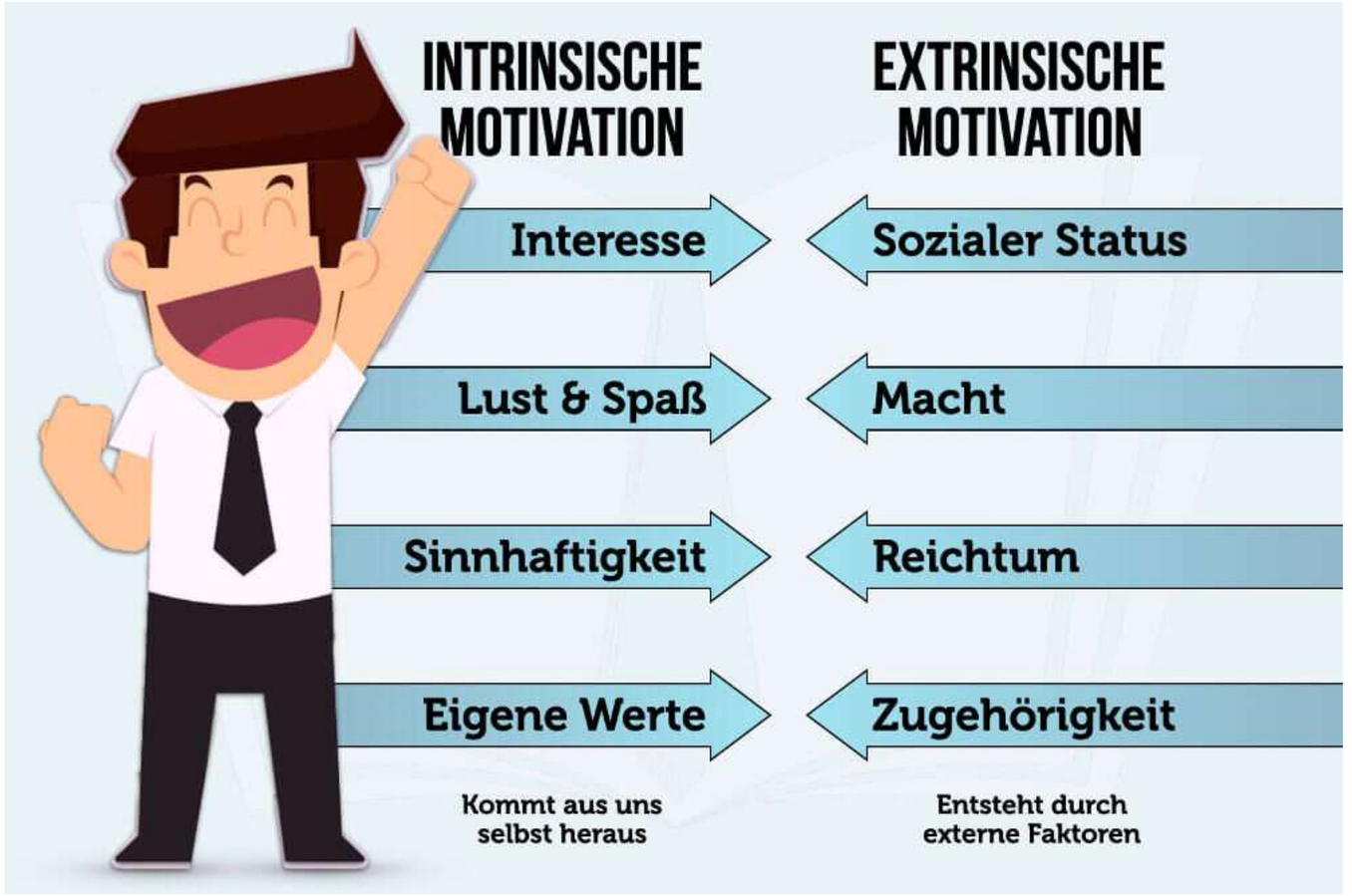
Parameters per stroke

	Free	Breast	Back	Butterfly	Medley
Ejection fraction (%)	60.32 ± 4.21	61.54 ± 4.45	59.29 ± 4.77	59.80 ± 4.09	58.62 ± 3.70
Septal wall thickness (mm)	9.96 ± 1.29	9.15 ± 1.63	10.00 ± 1.19	9.73 ± 1.91	10.31 ± 1.78
Posterior wall thickness (mm)	9.49 ± 1.36	9.54 ± 1.33	9.83 ± 1.20	9.80 ± 1.37	9.94 ± 1.81
LV end-diastolic diameter	48.88 ± 4.88	47.31 ± 4.53	48.44 ± 3.63	48.73 ± 6.26	48.38 ± 4.66
RV diameter (mm)	34.97 ± 4.37	34.69 ± 4.70	34.33 ± 3.20	35.27 ± 4.13	34.25 ± 5.36
TAPSE	23.50 ± 4.58	24.08 ± 2.50	23.65 ± 5.26	24.07 ± 4.03	23.88 ± 5.10
Treadmill time (min)	13.31 ± 1.88	12.55 ± 2.17	13.31 ± 2.49	14.64 ± 1.55	13.12 ± 2.01
Max load (Watt)	341.33 ± 81.78	302.84 ± 83.55	331.40 ± 78.36	365.93 ± 76.10	337.09 ± 87.85
Resting HR (bpm)	68.44 ± 14.25	69.43 ± 10.32	67.24 ± 10.64	65.82 ± 13.14	71.75 ± 20.36
Peak HR (bpm)	194.94 ± 9.86	192.21 ± 10.39	198.14 ± 9.76	194.88 ± 13.02	196.75 ± 13.26
HRR	29.03 ± 10.57	26.00 ± 10.07	27.33 ± 11.25	29.82 ± 11.32	28.20 ± 8.75
RER	1.14 ± 0.07	1.18 ± 0.15	1.13 ± 0.07	1.18 ± 0.07	1.13 ± 0.09

Parameters per stroke

		Strokes				
		Free	**Breast**	**Back**	**Butterfly**	**Medley**
FEV1	M	5.21 ± 0.93	5.42 ± 1.44	5.39 ± 0.86	5.04 ± 0.81	5.32 ± 0.82
	F	3.84 ± 0.72	4.02 ± 0.55	3.86 ± 0.33	3.84 ± 0.63	3.89 ± 0.48
FVC	M	6.43 ± 1.10	6.23 ± 1.32	6.48 ± 1.23	6.08 ± 1.03	6.53 ± 0.64
	F	4.41 ± 0.70	4.53 ± 0.73	4.37 ± 0.42	4.44 ± 0.99	4.40 ± 0.75
VO_2max (L/min)	M	4.54 ± 0.56	4.16 ± 0.87	4.57 ± 0.79	4.37 ± 0.61	4.62 ± 0.57
	F	3.20 ± 0.39	3.00 ± 0.35	3.00 ± 0.35	3.01 ± 0.45	3.07 ± 0.66
VO_2max (mL/min/kg)	M	58.85 ± 5.46	58.17 ± 4.64	58.51 ± 5.33	59.08 ± 5.05	57.96 ± 5.04
	F	52.07 ± 5.06	50.11 ± 5.60	50.70 ± 5.22	50.30 ± 4.38	51.95 ± 5.98
O_2 pulse	M	24.90 ± 7.29	22.43 ± 4.77	23.21 ± 3.75	22.57 ± 4.16	23.91 ± 2.43
	F	16.78 ± 2.37	15.89 ± 2.47	15.11 ± 1.57	16.30 ± 2.62	16.12 ± 4.26
VE (l/min)	M	164.77 ± 28.92	148.57 ± 47.09	159.09 ± 25.51	160.82 ± 23.17	166.00 ± 34.92
	F	115.72 ± 15.43	118.14 ± 16.18	112.90 ± 11.66	115.17 ± 16.80	112.62 ± 26.92
VE/VCO_2	M	31.55 ± 3.87	32.47 ± 5.44	32.19 ± 5.03	31.04 ± 3.79	30.33 ± 4.16
	F	31.29 ± 3.77	33.31 ± 1.96	32.43 ± 2.30	31.83 ± 3.99	31.55 ± 4.25
VE/VCO_2 nadir	M	25.50 ± 2.31	24.71 ± 2.03	25.18 ± 2.57	24.60 ± 1.94	25.52 ± 3.10
	F	26.32 ± 2.73	27.46 ± 2.40	26.72 ± 2.75	26.97 ± 3.85	26.14 ± 2.76
Peak lactate (mmol/L)	M	9.27 ± 2.77	9.60 ± 2.32	10.83 ± 2.72	10.74 ± 3.13	8.41 ± 3.27
	F	8.91 ± 2.61	9.14 ± 1.83	10.41 ± 2.64	9.23 ± 3.40	10.31 ± 2.56

Motivation


INTRINSISCHE MOTIVATION
EXTRINSISCHE MOTIVATION
Interesse
Sozialer Status
Lust & Spaß
Macht
Sinnhaftigkeit
Reichtum
Eigene Werte
Zugehörigkeit
Kommt aus uns selbst heraus
Entsteht durch externe Faktoren

Parents?

- Olympian child: Lottery draw
- While in pool, no phone
- Exercise is good!
- Does it help if you are involved in high performance?

Speed work

- Reducing frontal resistance
- Increasing propulsive resistance
- Glide
- Float
- Scull
- Kick (upward kick!!!)
- Pattern!

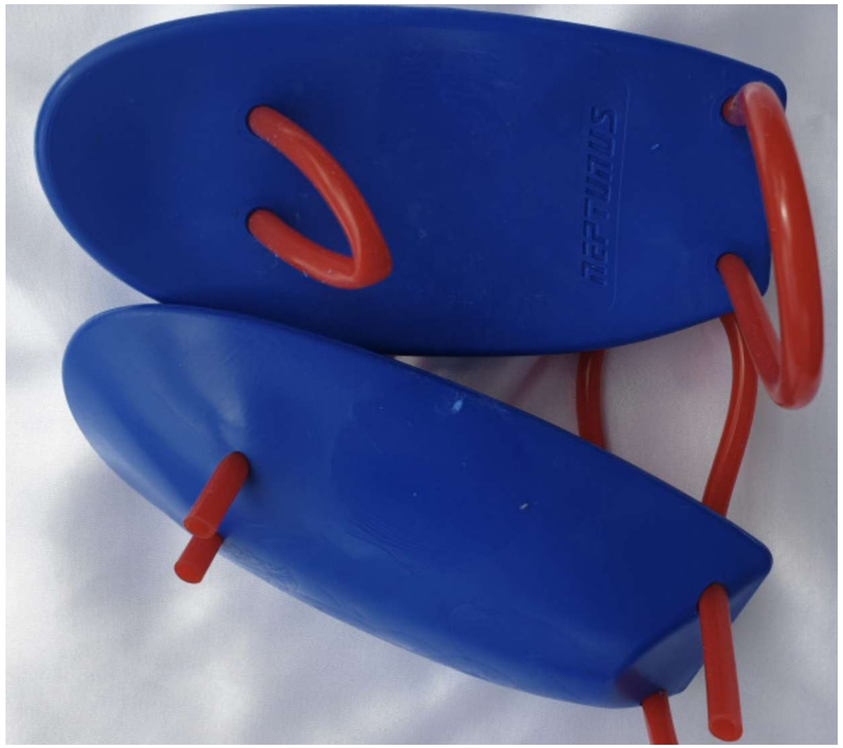
Speed work

- SPEED = DPS x FREQUENCY
- DPS comes from drills
- FREQUENCY comes from power
- MUSCLE ACTIVATION
- STROKE DYNAMICS

Speed work

DPS

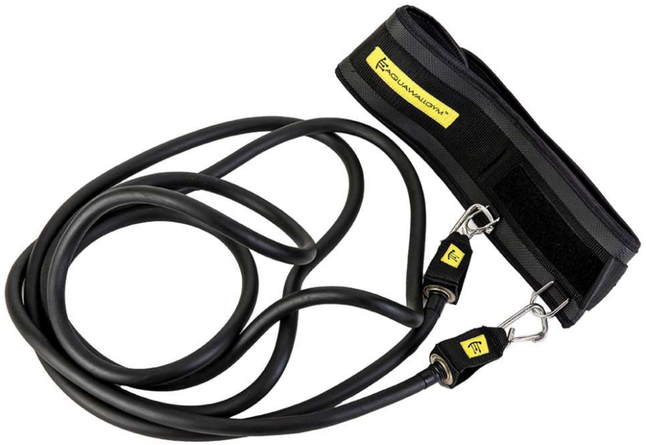
- Teknőc
- Drills

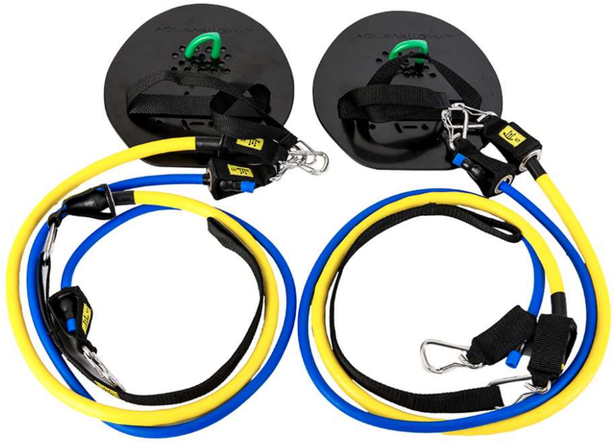


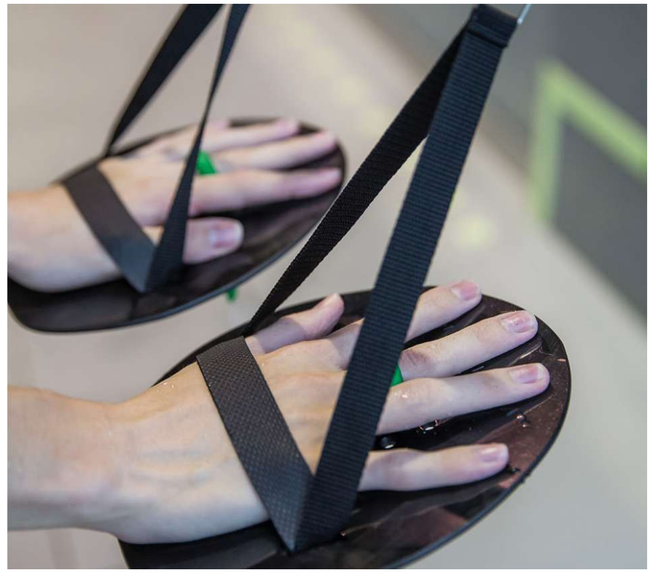
Speed work

FRQ

- Stretch cord
- Dryland cord
- Maximum strength exercises







Drill ideas

Széles Sándor

- https://www.youtube.com/watch?v=qATwJ0torRM
- https://www.youtube.com/watch?v=MY8wgVszvLQ
- https://www.youtube.com/watch?v=jbf3q6uWPLo
- https://www.youtube.com/watch?v=-gL2yT-Y9Rc
- https://www.youtube.com/watch?v=ObOjxp70yyk

Sample trainings

SAMPLE WEEKLY TRAININGS

	INTRODUCING	MAX NO OF SESSIONS	MAX KM
4-6 YEARS	LEARN TO SWIM	5	12
7-8 YEARS	DRILLS, GAMES GYMNASTICS	6	20
9-10 YEARS	SPEED, DRILLS, COMPETITIONS, CARDIO	7	30
11-12 YEARS	CROSSFIT	8	40
13-14 YEARS	BASIC STRENGTH	9	60
15-16	FULL TRAINING	12	100
17-18	FULL TRAINING	12	100
ADULTS	FULL TRAINING	12	100

Sample trainings

WEEKLY SAMPLE TRAINING FOCUS

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
MORNING	CARDIO	CROSSFIT	CARDIO	CROSSFIT	CARDIO	CROSSFIT	
	BUTTERFLY KICK-PULL	BACKSTROKE KICK-PULL	MEDLEY SETS	BREASTSTROKE KICK-PULL	BUTTERFLY KICK-PULL	MEDLEY SETS	
	START - TURN - FINISH	DISTANCE FREE	COMP. WARM UP	DISTANCE FREE	START - TURN - FINISH	COMP. WARM UP	
	UW KICK	BROKEN SET	RACE TEST	BROKEN SET	UW KICK	RACE TEST	
AFTERNOON	BASIC STRENGTH	CARDIO	BASIC STRENGTH	CARDIO	BASIC STRENGTH	BASIC STRENGTH	
	BUTTERFLY DRILL	BACKSTROKE DRILL	MEDLEY DRILL	BREASTSTROKE DRILL	BUTTERFLY DRILL	MEDLEY DRILL	
		UW KICK	STRETCH	UW KICK		STRETCH	
			SAUNA			SAUNA	

SAMPLE TRAININGS

NAME		EXAMPLE
CARDIO	15-60’ BICYCLE	30’ BICYCLE
	15-60' RUN	30' RUN
	5-20’ ROPE SKIPPING	15X1’ ROPE + 15” REST
	5-20' JUMPING JACK	15X1' JUMPING JACK + 15” REST
CROSSFIT	10-30’ PLANK	10X(30” PLANK + 15” REST)
	5-15’ WALL BALL	15X(30” WALL BALL + 30” REST)
	BURPEE	8X(30” PLANK + 8 BURPEE + 30” REST)
WEIGHT	BENCH PRESS	4X(10 BENCH PRESS + 1’ REST) R: 2’
	SQUAT	4X(10 SQUAT + 1’ REST) R: 2’
	PULLUP	4X(8 PULLUP + 8 BURPEE + 1’ REST)
DRILLS	AS VIDEO!	16X(100 DRILL)@2’ 4FLY,4BK,4BR,4FR 25KICK-50DRILL-25PROGRESS
START-TURN-FINISH	AS VIDEO!	8X(1START, 1 TURN, 1 FINISH)
DISTANCE FREE	2-10.000 METER	4X1500 FREE@25’ 1-4! PROGRESS, 1.ANTI PADDLES, 2. NORMAL, 3. PADDLES, 4. FINS+PADDLES, NEGATIVE SPLIT!
UW KICK	500-1000 M	20X25@45” UW KICK 10NORMAL,10FINS
MEDLEY SETS	800-6400M	4X(4X100@2’ + 400@7’) 100:FLY 400 PACE, 400: IM PB+30 1-4! LAST 15M 0 AIR FINISH!
COMPETITION WARM UP	2000-6000 M	10X100 IM START@2’ EASY, 10X50 STK KICK@1’15”, 5X100 STK PULL@2’, 2X(1START, 1 TURN, 1 FINISH), 6X50 FREE AIR 5@1’, 4X25@45” STK 100 PACE, 200BK EASY

Broken set examples

SAMPLE TRAININGS

NAME		EXAMPLE
CARDIO	15-60’ BICYCLE	30’ BICYCLE
	15-60' RUN	30' RUN
	5-20’ ROPE SKIPPING	15X1’ ROPE + 15” REST
	5-20' JUMPING JACK	15X1' JUMPING JACK + 15” REST
CROSSFIT	10-30’ PLANK	10X(30” PLANK + 15” REST)
	5-15’ WALL BALL	15X(30” WALL BALL + 30” REST)
	BURPEE	8X(30” PLANK + 8 BURPEE + 30” REST)
WEIGHT	BENCH PRESS	4X(10 BENCH PRESS + 1’ REST) R: 2’
	SQUAT	4X(10 SQUAT + 1’ REST) R: 2’
	PULLUP	4X(8 PULLUP + 8 BURPEE + 1’ REST)

Broken set examples

SAMPLE TRAININGS

DRILLS		16X(100 DRILL)@2’ 4FLY,4BK,4BR,4FR 25KICK-50DRILL-25PROGRESS
START-TURN-FINISH		8X(1START, 1 TURN, 1 FINISH)
DISTANCE FREE	2-10.000 METER	4X1500 FREE@25’ 1-4! PROGRESS, 1.ANTI PADDLES, 2. NORMAL, 3. PADDLES, 4. FINS+PADDLES, NEGATIVE SPLIT!
UW KICK	500-1000 M	20X25@45” UW KICK 10NORMAL,10FINS
MEDLEY SETS	800-6400M	4X(4X100@2’ + 400@7’) 100:FLY-BK-BR-FR 400 PACE, 400: IM PB+30 1-4! LAST 15M 0 AIR FINISH!
COMPETITION WARM UP	2000-6000 M	10X100 IM START@2’ EASY, 10X50 STK KICK@1’15”, 5X100 STK PULL@2’, 2X(1START, 1 TURN, 1 FINISH), 6X50 FREE AIR 5@1’, 4X25@45” STK 100 PACE, 200BK EASY

Broken set examples

50 FREE	50-400 M	3X(10 + 15 + 25 FREE 50 PACE R: 45” + 100 EASY)
100 FREE	200-600 M	16X25@45” 100 PACE
200 FREE	200 - 1200 M	8X50@2” 200 PACE
400 FREE	400 - 2000 M	5X(4X100@1’30”) STK 400 PACE
800 FREE	800 - 6400 M	8X800@10’ FREE 1-4! 5-8! 1-4. ANTI PADDLES, 5-8. NORMAL
1500 FREE	1500 - 9000 M	1500 FREE NEG.SPLIT R: 1’ ANTI PADDLES, STK COUNT + 5X300@5’ 1-5! NEG. SPLIT NORMAL + 15X100 FREE@2’ 1500 PACE!
400 MEDLEY	400 - 2000 M	4X(4X100@2’ + 400@7’) 100:FLY-BK-BR-FR 400 PACE, 400: IM PB+30 1-4! LAST 15M 0 AIR FINISH!