

6x50 built up (@60'')


The test aims to evaluate the decrease in technical efficiency associated with the increase in stroke rate needed to increase speed. It consists of swimming 6 repetitions of 50 meters, starting each one every minute and reducing the time by approximately 2 seconds between each repetition, so that the last repetition is maximal effort. During each repetition, the following parameters will be measured:

- Time taken
- Number of strokes
- Stroke rate (Sf) in the first and second 25 meters
- Time taken for the head to pass between two markers 20 meters apart in the middle of the pool

The following values will then be calculated:

- **Real swimming speed (Vr)** in m/s (20 divided by the time taken for the marked section)
 - **Distance per stroke cycle (Ds)** in m/cycle (Vr divided by stroke rate in cycles/s)
 - **Stroke Index Score (SIS)**, calculated as Vr squared multiplied by Ds, which expresses the external mechanical work per cycle per unit of drag coefficient (the higher the SIS index, the greater the efficiency)
 - **Simple SWOLF Index**, given by (number of strokes + time taken) and **Corrected SWOLF Index**, calculated as $(1/Sf + 1)$ multiplied by the number of strokes (the lower the SWOLF indices, the greater the efficiency)
 - **Ideal theoretical values** of stroke rate and number of strokes for the two fastest repetitions
- Swimmers will be filmed during the execution of the test.

Example of an Individual Result Sheet:

NOME COGNOME (Società)					Luogo, data - vasca 50 m 					
	tempo (s)	frequenza (cicli/min)			T20 (s)	distanza (m/ciclo)	numero di bracciate	indice SIS (Nm/k/ciclo)	SWOLF semplice	SWOLF corretto
		1° 25	2° 25	media						
1° 50	38,0	28,0	27,4	27,7	15,5	2,79	35	4,65	73,0	72,9
2° 50	36,3	30,2	31,0	30,6	14,8	2,65	37	4,84	73,3	73,3
3° 50	34,1	35,6	36,0	35,8	14,2	2,36	40	4,68	74,1	73,5
4° 50	31,9	42,3	43,2	42,8	13,5	2,08	43	4,56	74,9	73,2
5° 50	30,2	47,6	48,3	48,0	13,1	1,91	45	4,45	75,2	73,2
6° 50	28,5	52,2	53,5	52,9	12,7	1,79	48	4,43	76,5	75,2
migliori valori di efficienza (confrontare con i valori delle andature più veloci)								4,84	73,0	72,9

Il foglio calcola per ogni ripetizione i valori relativi a: frequenza media del ciclo di bracciate (Sf) nei 50 metri; distanza per ciclo di bracciate (Ds), calcolata sulla velocità media nel 20 metri centrali (velocità reale di nuoto); indice di efficienza SIS (velocità al quadrato * Ds) che esprime il lavoro meccanico esterno per ciclo per unità di coefficiente di drag (maggiore è l'indice SIS maggiore l'efficienza); indice SWOLF semplice, dato da (n. bracciate + tempo in secondi); indice SWOLF corretto calcolato da $(1/Sf + 1) * \text{numero di bracciate}$ (minori sono gli indici SWOLF maggiore è l'efficienza). I valori dei vari indici sono paragonabili fra loro a patto che le lunghezze dello scivolamento nella fase subacquea dopo la spinta dal bordo e nell'arrivo siano analoghe.

tempo 50 (s)	30,2	28,5	
frequenza ideale	44,1	48,4	La frequenza e il numero di bracciate ideali rappresentano l'obiettivo al quale tendere per avere una efficienza alle andature più veloci pari alla migliore calcolata nella serie (si deve considerare che una diminuzione di efficienza con l'aumento della velocità di nuoto è inevitabile)
n. bracciate ideale	43	45	

6x50 Pace of Back End Speed of a 100m event (@1'30")

The purpose of this test is to evaluate the decrease in technical efficiency due to the onset of fatigue when trying to maintain a constant speed.

The test involves swimming 6 repetitions of 50 meters, starting every 1'30", while maintaining the pace of the second 50 meters of your personal best in the 100 meters for as many repetitions as possible.

For each repetition, the same parameters previously described will be measured and calculated, including:


- Time taken
- Number of strokes
- Stroke rate (Sf) in the first and second 25 meters
- Time taken for the head to pass between two markers 20 meters apart in the middle of the pool

In addition, the theoretical ideal values for the number of strokes required to perform a stroke similar to that in the race will be indicated, particularly for the repetitions where speed is lower than the race speed.

Swimmers will be filmed during the execution of the test.

2 or 3 sets like the following can be a great Lactate Tolerance set as well

Example of an Individual Result Sheet:

NOME COGNOME (Società)					Luogo, data - vasca 					
	tempo (s)	frequenza (cicli/min)			T20 (s)	distanza (m/ciclo)	numero di bracciate	indice SIS (Nm/k/ciclo)	SWOLF semplice	SWOLF corretto
		1° 25	2° 25	media						
1° 50	31,5	46,5	45,5	46,0	14,2	1,84	43	3,64	74,5	71,0
2° 50	31,3	43,6	45,9	44,8	14,5	1,85	45	3,52	76,3	75,2
3° 50	31,0	47,0	46,1	46,6	13,3	1,94	45	4,38	76,0	74,0
4° 50	30,4	47,1	46,6	46,9	13,1	1,96	44	4,56	74,4	72,2
5° 50	30,6	47,6	46,9	47,3	13,3	1,91	44	4,32	74,6	71,9
6° 50	30,5	49,2	46,0	47,6	13,2	1,91	43	4,38	73,5	70,1
media	30,9	46,8	46,2	46,5	13,6	1,90	44	4,13	74,9	72,4

Il foglio calcola i valori medi relativi a: frequenza del ciclo di bracciata (Sf) nei 50 metri; distanza per ciclo di bracciata (Ds), calcolata sulla velocità media nel 20 metri centrali (velocità reale di nuoto); indice di efficienza SIS (velocità al quadrato * Ds) che esprime il lavoro meccanico esterno per ciclo per unità di coefficiente di drag (maggiore è l'indice SIS maggiore l'efficienza); indice SWOLF semplice, dato da (n. bracciate + t in secondi); indice SWOLF corretto, calcolato da $(1/Sf + 1) * \text{numero di bracciate}$ (minori sono gli indici SWOLF maggiore è l'efficienza). I valori dei vari indici sono paragonabili fra loro a patto che le lunghezze dello scivolamento nella fase subacquea dopo la spinta dal bordo e nell'arrivo siano analoghe.

tempo 50 (s)	32	34	36	38	
numero ideale di bracciate ogni 50	41	39	37	35	Il numero di bracciate ideale rappresenta l'obiettivo al quale tendere per compiere un lavoro per ciclo di bracciata più vicino possibile a quello di gara (da applicare durante le serie aerobiche)

Theoretical Calculation of Training Paces and Race Performances Across Various Distances Based on a Pair of Competition Times (100-200 or 200-400)

To non-invasively determine theoretical paces for training sets under different energy metabolism conditions, you can use two race performances, preferably obtained during the same competition. The spreadsheet also calculates theoretical performances for other race distances.

The Swim Evaluation app is available for the same calculations. (**This app is available for free in Italian only**)

Example of an Individual Result Sheet:

NOME COGNOME (Società)	
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Dati di ingresso		
Distanza	100	200
Tempo	0 52,45	1 53,60

Quadro previsionale		C1		B2		B1		A2		A1	
Distanza (m)	Tempo (min) (s)	Vr m/s	Tu (min) (s)	Vu m/s	Ta (min) (s)	Va m/s	Tom (min) (s)	Vom m/s	Tol (min) (s)	Vol m/s	
50	0 24,80	2,017	0 27,96	1,788	0 29,95	1,670	0 33,42	1,496	0 37,81	1,323	
75	0 37,87	1,981	0 43,26	1,734	0 45,41	1,652	0 50,44	1,487	0 56,71	1,323	
100	0 52,45	1,907	0 59,26	1,688	1 01,94	1,615	1 08,10	1,469	1 15,61	1,323	
150	1 22,59	1,816	1 31,15	1,646	1 35,58	1,569	1 43,74	1,446	1 53,42	1,323	
200	1 53,60	1,761	2 03,68	1,617	2 09,74	1,542	2 19,66	1,432	2 31,23	1,323	
250	2 25,20	1,722	2 37,57	1,587	2 44,24	1,522	2 55,77	1,422	3 09,03	1,323	
300	2 57,23	1,693	3 11,72	1,565	3 18,99	1,508	3 32,00	1,415	3 46,84	1,323	
400	4 02,27	1,651	4 19,16	1,543	4 29,04	1,487	4 44,77	1,405	5 02,45	1,323	
500	5 08,26	1,622	5 28,82	1,521	5 39,61	1,472	5 57,81	1,397	6 18,07	1,323	
600	6 14,96	1,600	6 37,55	1,509	6 50,58	1,461	7 11,06	1,392	7 33,68	1,323	
800	8 29,91	1,569	8 54,61	1,496	9 13,36	1,446	9 37,98	1,384	10 04,91	1,323	
900	9 37,97	1,557	10 05,94	1,485	10 25,07	1,440	10 51,62	1,381	11 20,52	1,323	
1000	10 46,36	1,547	11 18,62	1,474	11 36,95	1,435	12 05,34	1,379	12 36,13	1,323	
1200	13 03,93	1,531	13 38,01	1,467	14 01,14	1,427	14 32,99	1,375	15 07,36	1,323	
1500	16 31,84	1,512	17 11,49	1,454	17 38,25	1,417	18 14,91	1,370	18 54,20	1,323	

3x(5x100 on 1'30") in FREE or BACK with 1' Recovery between sets (mainly for Sprinters)

This incremental test consists of 3 sets of 5 repetitions each, with a start @1'30" and 1 minute of recovery between sets. Within each set, the repetitions should be performed at a consistent speed. The speed should increase from the first to the third set. Generally speaking, the first set should be done at a pace corresponding to the intensity defined as Aerobic endurance, the second at Anaerobic Threshold intensity, and the third at VO2 intensity.


For each repetition, the following parameters will be measured:

- Total time for each repetition
- Average number of strokes over 50 meters
- Average stroke rate (Sf)
- Blood lactate concentration from a capillary sample (within 1 minute of the end of each set)

For each set, the following average values will be calculated:

- Time taken, stroke rate, and number of strokes
- Real swimming speed (V_r) in m/s (20 divided by the time taken for the marked section) or average speed for each repetition
- Distance per stroke cycle (D_s) in m/cycle (V_r divided by stroke rate in cycles/s). If the T20 is not measured, the D_s value is calculated based on the average speed of the repetition, which, due to the push-off from the wall at the start and turn, is higher than the real swimming speed. This results in a slight overestimation of the D_s and SIS values.
- SIS and corrected SWOLF efficiency indices

The sheet includes indicative training paces for A2, B1, and B2 intensities at predefined blood lactate levels, usually 2, 4, and 8 mmol/l, respectively. The lactate values can be modified, and the paces will be calculated according to the entered value.

NOME COGNOME (Società) 												
3 x (5x100 a 1.30) con 1' recupero					Luogo, data, ora - vasca da							
	I serie - A2				II serie - B1				III serie - B2			
	tempo	Sf cicl/min	bracciate per vasca	T20	tempo	Sf cicl/min	bracciate per vasca	T20	tempo	Sf cicl/min	bracciate per vasca	T20
1	72,2	30	28		66,4	34,2	30		65,7	36,2	35	
2	74,2	29,8	26		69,7	33,8	32		65,9	36,4	33	
3	72,7	28,2	27		69,9	32	31		65,7	37,1	33	
4	72,4	29,3	27		69,4	32,7	31		66,3	39,4	34	
5	73,6	29,2	27		68,4	33,3	30		66,1	39,1	38	
media	73,0		27		68,8		31		65,9		35	
		29,3				33,2				37,6		

lattato (mmol/l)	2,1	4,6	9,0
vel (m/s)	1,37	1,45	1,52
Fc (b/min)	140	160	190
Ds (m/ciclo)	2,64	2,47	2,27
SIS	4,94	5,23	5,23
SWOLF corretto	54,6	58,6	62,2

Lattato mmol/l	Vel m/s	Fc b/min	Sf cicl/min	Ds m/ciclo		
2	A2	1,366	139	29,1	2,64	Indicativa della resistenza aerobica
4	B1	1,434	155	32,3	2,51	Indicativa della soglia anaerobica
8	B2	1,502	183	36,6	2,31	Indicativa della max potenza aerobica

Serie da:	A2	B1	B2
50 m	35,4	33,9	32,0
100 m	1 13,6	1 10,2	1 06,7
150 m	1 51,7	1 46,5	1 41,3
200 m	2 29,8	2 22,8	2 16,0
continuo	38,1	36,3	34,7

7x200 in Your Style with 1' Recovery (for 200m Swimmers)

5x300 Freestyle with 1' Recovery (for 400m and distance Swimmers)

These incremental tests consist of 7 repetitions of 200 meters and 5 repetitions of 300 meters, respectively, with 1 minute of recovery between each repetition. The repetitions should be performed at a constant speed, with the speed increasing from the first to the last repetition.


- **For the 200-meter test:** The progression should decrease the time by 3-5 seconds from one repetition to the next, with the last repetition at maximum intensity.
- **For the 300-meter test:** The progression should decrease the time by 5-7 seconds from one repetition to the next, with the last repetition matching the time differential between the 400m and 100m in a race.

For each repetition, the following parameters will be measured:

- Total time for each repetition
- Average number of strokes over 50 meters
- Average stroke rate (Sf)
- Blood lactate concentration from a capillary sample (within 1 minute of the end of each repetition)

The following average values will then be calculated:

- Time taken, stroke rate, and number of strokes
- Real swimming speed (Vr) in m/s (20 divided by the time taken for the marked section) or average speed for each repetition
- Distance per stroke cycle (Ds) in m/cycle (Vr divided by stroke rate in cycles/s). If the T20 is not measured, the Ds value is calculated based on the average speed of the repetition, which, due to the push-off from the wall at the start and turn, is higher than the real swimming speed. This results in a slight overestimation of the Ds and SIS values.
- SIS and corrected SWOLF efficiency indices

NOME COGNOME (Società) 											
7 x 200 SL con 1' recupero			Luogo, data, ora - vasca da								
Tempo			Lattato	Fc	T20	Vel	Sf	Ds	bracciale	SWOLF	SIS
minuti	secondi	decimi	mmol/l	b/min		m/s	cicli/min	m/ciclo	per vasca	corretto	
1	2	20	7	1,2	120	1,42	28,5	2,87	34	69,8	5,80
2	2	15	0	1,3	144	1,48	32,0	2,67	36	69,8	5,85
3	2	12	0	1,8	150	1,52	34,5	2,53	37	69,2	5,81
4	2	6	5	3,0	162	1,58	39,0	2,34	39	69,0	5,84
5	2	1	0	5,4	168	1,65	41,0	2,32	42	72,7	6,34
6	1	56	2	10,2	172	1,72	45,0	2,20	44	73,3	6,53
7	1	54	7	13,6	175	1,74	50,0	2,01	46	73,6	6,11


Indice di efficienza anaerobica 0,143 indica il guadagno di velocità (in m/s) da 5 a 10 mmol/l di lattato

Previsione alle diverse andature

Lattato (mmol/l)	Vel (m/s)	Fc (b/min)	Sf (cicli/min)	Ds (m/ciclo)	
1,5	A2	1,50	147	33,4	2,59
3	B1	1,58	162	39,0	2,34
6	B2	1,66	169	41,5	2,31

Indicativa della resistenza aerobica
Indicativa della soglia anaerobica
Indicativa della max potenza aerobica

Serie da:	A2	B1	B2
50 m	31,3	29,7	28,1
100 m	1 05,3	1 02,0	0 58,8
150 m	1 39,4	1 34,3	1 29,5
200 m	2 13,4	2 06,6	2 00,2
300 m	3 21,5	3 11,1	3 01,6
400 m	4 29,6	4 15,6	4 03,0
continuo	34,0	32,3	30,7

NOME COGNOME (Società) 											
5 x 300 SL con 1' recupero			Luogo, data, ora - vasca da								
Tempo			Lattato	Fc	T20	Vel	Sf	Ds	bracciale	SWOLF	SIS
minuti	secondi	decimi	mmol/l	b/min		m/s	cicli/min	m/ciclo	per vasca	corretto	
1	3	20	7	1,2	120	1,49	28,5	3,02	38	78,0	6,75
2	3	15	0	1,3	144	1,54	32,0	2,77	40	77,5	6,55
3	3	12	0	1,8	150	1,56	34,5	2,61	41	76,7	6,37
4	3	6	5	3,0	162	1,61	39,0	2,38	43	76,1	6,15
5	2	59	6	6,4	170	1,67	41,0	2,35	44	76,2	6,55

Previsione alle diverse andature

Lattato (mmol/l)	Vel (m/s)	Fc (b/min)	Sf (cicli/min)	Ds (m/ciclo)	
1,5	A2	1,55	147	33,4	2,68
3	B1	1,61	162	39,0	2,38
6	B2	1,66	169	40,8	2,35

Indicativa della resistenza aerobica
Indicativa della soglia anaerobica
Indicativa della max potenza aerobica

Serie da:	A2	B1	B2
50 m	30,3	29,3	28,0
100 m	1 03,2	1 01,0	0 58,7
150 m	1 36,1	1 32,7	1 29,4
200 m	2 09,0	2 04,4	2 00,1
300 m	3 14,8	3 07,9	3 01,4
400 m	4 20,6	4 11,3	4 02,8
continuo	32,9	31,7	30,7

The result sheet includes indicative training paces for Aerobic endurance, anaerobic threshold, and VO2 intensities at predefined blood lactate levels, usually 2, 4, and 8 mmol/l, respectively. For distance swimmers, the recommended lactate levels are 1.5, 3, and 6 mmol/l. These lactate values can be modified, and the paces will be calculated according to the entered value

SO Called “Kitajima Test”

Can be swam as a Lactacid set if done up to 3 times in a session with 30’ active recovery between repetition

Test 50-100-50									
Atleta					Luogo, data, vasca				
3 x (1x50 @1' + 1x100 @2' + 1x50) - Final Time + 5''-6'' is the current estimated performance time									
	tempo	Sf (cicli/min)			DS stimata (m/ ciclo)	numero di bracciate	numero di bracciate II 50	SIS	SWOLF
		1° tratto	2°tratto	media					
1° 50	29,3	47,0	43,0	45,0	2,28	33		6,63	62,3
2° 100	61,8	44,0	41,0	42,5	2,28	32	35	5,98	64,4
3° 50	28,7	49,0	42,0	45,5	2,30	34		6,97	62,7
totale	119,8			44,3	2,29			6,53	63,1
1° 50	29,1	44,0	44,0	44,0	2,34	34		6,92	63,1
2° 100	62,2	44,0	40,5	42,3	2,28	34	35	5,90	65,6
3° 50	29,1	45,5	45,5	45,5	2,27	35		6,69	64,1
totale	120,4			43,9	2,30			6,50	64,3
1° 50	29,3	44,0	44,0	44,0	2,33	34		6,78	63,3
2° 100	62,4	44,0	41,0	42,5	2,26	32	36	5,81	65,2
3° 50	29,1	45,5	45,5	45,5	2,27	34		6,69	63,1
totale	120,8			44,0	2,29			6,43	63,9
The data related to the time taken, average stroke rate in the 1st and 2nd sections of 25 (or 50) meters, number of strokes, and number of breaths for each 50 or 100 meters must be entered into the spreadsheet									
The sheet calculates average values for stroke frequency over 50 metres, mean distance per stroke cycle (which is overestimated because it is calculated on average speed in 50 metres and not actual swimming speed) and SIS efficiency index (product of the speed squared for the (product of the squared speed for distance per cycle) which expresses the external mechanical work per cycle per unit drag coefficient. The values are comparable as long as the slides in the underwater phase are the same in the various tests.									
The recovery between one repetition and another can be varied depending on the direction you want to give the exercise or in relation to the characteristics of the athlete. The exercise is also very useful for a proper management of the tender indicating to manage the three parts in relation to the characteristics of the athlete. The exercise is also very useful for a proper tender management indicating to manage the three parts in relation to a potential 1-4-3-2 (first 50 the fastest, second fast is the last 50, then third 50 and the second 50 is the slowest.)									