10x100 SWIM TEST PROTOCOL

A simple & effective test for swimmers of all ages

By Wayne Goldsmith

Coaches and swimmers are always looking for ways to test and measure how they are going in training. Swim test sets are one method of analysing the progress of swimming training and to gather vital information to ensure your training program is helping you achieve your goals.

Why test?

Swimming successfully is a bit like taking a journey from one place to the other. First, you make sure you know exactly where you are. From knowing where you are starting, you can decide where to go next. Once you decide where to go, you plan a course of action how to get there. Every so often you stop and check the map to make sure you on the right track and have not got lost along the way.

Swimming test sets are a bit like those little "map checks". Every so often in your training program it is important to stop and check your progress. Information gained by regular testing provides you with direction for your next step and future course of direction.

As with all tests there are ten fundamental steps in the process.

1. Decide what you want to measure (and why?)
2. Determine what test/s will give you the information you require
3. Prepare effectively … e.g. equipment, pool space, athlete skills
4. Complete the test accurately
5. Record all results accurately
6. Present the information in the appropriate manner
7. Analyse and interpret the data
8. Discuss the results and provide feedback to the appropriate person
9. Determine how the results can be used in the improvement of performance and incorporated into the training program
10. Implement the test results into the training program

This is a simple but effective and useful swimming test set that coaches and competitive swimmers of all ages can use to measure where they are in their preparation. It is a **MULTI DISCIPLINARY** test protocol which means it looks at physiological areas as well as biomechanical and technical aspects of swimming performance.

TEST OVERVIEW

- 3x(3x100 metres) with a 200-metre swim down after each set of 3
- 5 minutes rest then a single 100 metres maximum speed swim

CYCLE TIMES

- Freestyle/Butterfly/Backstroke: First 3 on 1:40, Next 3 on 1:50, Next 3 on 2:00
- Breaststroke: First 3 on 2:00, Next 3 on 2:10, Next 3 on 2:20
  (i.e. the swimmer gets **more** rest as the speed increases)

INTENSITY LEVELS

- 1st set of 3x100 is at AEROBIC LEVEL (e.g. approx. 1500 plus pace)
- 2nd set of 3x100 is at THRESHOLD PACE (e.g. approx. 400 pace)
- 3rd set of 3x100 is at VO_2 PACE (e.g. approx. 200 pace)
- Final 100 is an all out, Maximum Speed effort.
- All swims are push starts.

TEST EXAMPLE – FREESTYLE

Race Day Warm up (always a good idea to fine tune race day/competition warm up by using it to warm up for test sets)

Test Procedure:

- 3x100 Aerobic Pace on 1:40
- 200 Easy Swim
- 3x100 Threshold Pace on 1:50
- 200 Easy Swim
- 3x100 VO_2 Speed on 2:00
- 200 Easy Swim
- 5 minutes rest
- 100 Maximum Speed all out effort
- Race day swim down.

TEST LOGISTICS (what you will need)

- Pace clock

- Stop Watch
- Recording sheets (see attached)
- Pens/Clip boards
- Long course/short course pool
- Heart rate monitors if available
- Lactate Testing equipment if available (including sharps and contaminated items disposal unit)
- Data collectors: one per swimmer would be ideal – enlist parents, assistant coaches, resting swimmers, anyone who can write!!!!

SWIMMER PREREQUISITES

This test can be used with age groupers as well as senior swimmers. However, it is imperative that any swimmer undergoing this test protocol has a well-developed PACING ability. (Note: This applies for most swimming tests … e.g. 7x200 Step Test, 7x50 Stroke Efficiency Test where increasing speed is involved. It may be that younger age group swimmers or less experienced swimmers will need to spend several months learning accurate pacing skills before they are capable of completing this test effectively).

VARIABLES TO BE MEASURED

Take Time, Heart Rate, Stroke Count and Stroke Rate for each 100m. Take lactate (if available) after each set of 3x100.

After 100 max speed swim, take Heart Rate, Lactate (if available) at 3-5 mins post swim, and Heart Rate at 0 seconds (i.e. as soon as possible after the swimmer touches the wall), 30 seconds post swim, 60 seconds post swim and 90 seconds post swim to check swimmer's recovery from the maximum speed swim.

Have the swimmer perform his/her usual swim down … e.g. 600-800 metres, and repeat Lactate measurement to determine the effectiveness of their swim down routine (post swim – post swim down lactate reduction measurement test).

In the absence of a lactate measurement however, heart rate and time will provide most of the basic information needed for training prescription.

WHAT WE ARE LOOKING AT

Main focus: Physiological and biomechanical efficiency at a range of swimming speeds directly related to training and racing.

SPECIFIC AREAS OF MEASUREMENT

1. Heart rate/lactate response to increasing swimming speed
2. Stroke count and stroke rate changes (swimming efficiency) with increasing speed
3. Recovery ability
4. Swim down effectiveness

TARGET GROUP

Competitive Age group and senior swimmers with good pacing skills.

WHEN TO TEST

As with all tests, try to standardise as much as possible. Aim to at the same time of day, same day of the week during the swimming season. Ideally test on days when swimmers are recovered … i.e. Monday morning after a Sunday rest day. If swimming the first test in a 50-metre pool, try to complete the second and subsequent tests also in a 50-metre pool.

RECORDING TEST INFORMATION

Test information can be collected on a standardised data collection sheet. These sheets can be laminated to protect them from the weather and water of the training environment. Swimmers can be educated to record some test data on the sheets themselves using a waterproof pencil (Chinagraph pencil – available from stationary stores and some newsagencies). The advantages of swimmers recording their own test data include:

- It frees the coach to make technical observations during the test
- It makes the swimmers more aware of the test protocols and test parameters
- It helps educate swimmers in the area of self monitoring of performance
- It provides the coach the freedom to provide coaching / motivational / technical / tactical input during the test (i.e. instead of simply taking times and counting strokes.

After testing, laminated sheets can be photocopied (ideally if A4 size) and kept for future reference and the sheets wiped down with mineral turpentine to be reused at the next test.

TEST PROTOCOL: 10x100 METRES as 3 x (3x100), 100 metres max speed swim							
Swimmer's Name:							
Test Date:							
Stroke:							
Best time for stroke: 50 metres		100 metres		200 metres		400 metres	
Club:							
Coach:							
	Time	Split	Heart Rate	Stroke Count	Stroke Rate	Lactate	Cycle
AEROBIC							
100							
100							
100							
Average							
Fastest-Slowest							
THRESHOLD							
100							
100							
100							
Average							
Fastest-Slowest							
VO_2							
100							
100							
100							
Average							
Fastest-Slowest							
100 Max Speed							
Single Effort							
Recovery Heart Rates							
Immediate post swim							
30 seconds post							
60 seconds post							
90 seconds post							
Lactate 3-5 mins post							
Post Swim Down							
Comments							

10x100 Test Sheet – (Recording Sheet)

DATA PRESENTATION (What to do with Test Results)

- On a table show the times, heart rates, stroke counts, stroke rates, etc.
- Graph heart rate and speed/heart rate and time.
- Graph speed (or time) and stroke count/distance per stroke in metres.
- Graph speed (or time) and stroke rate in strokes per minute.

	Time	Split	Heart Rate	Stroke Count (both 50's)	Stroke Rate (2nd 50 only)	Lactate	Cycle
AEROBIC							
100	1:25	42/43	145	38/41	33.8		1:40
100	1:26	42/44	147	38/42	34.1		1:40
100	1:25	42/43	149	39/43	32.6	2.9	1:40
Average	1:25.3						
Fastest-Slowest	1.0						
THRESHOLD							
100	1:16	37/39	161	42/44	32.9		1:50
100	1:15	37/38	163	42/46	33.7		1:50
100	1:15	37/38	168	42/45	34.7	3.4	1:50
Average	1:15.3						
Fastest-Slowest	1.0						
VO2							
100	1:11	35/36	180	44/49	39.7		2:00
100	1:10	34/36	179	45/49	40.0		2:00
100	1:11	34/37	184	46/51	39.1	4.5	2:00
Average	1:10.6						
Fastest-Slowest	1.0						
100 Max Speed	1:06.5	32/34	191	47/55	47.5	6.2	
Single Effort							
Heart rate at 0 seconds			191				
Heart rate at 30 seconds post			179				
Heart rate at 60 seconds post			167				
Heart rate at 90 seconds post			145				
Post Swim Down lactate						3.1	
Post swim down heart rate			108				

Example of a completed test of an age group swimmer

(Personal best time 100 Freestyle 1:05).
Stroke counts refer to the number of strokes for each 50, e.g. 44/49 means 44 strokes for the first 50 and 49 strokes for the second 50.
Stroke rate is a measure of the number of strokes per minute.

WHAT TO LOOK FOR AT THE FIRST TEST

1. As speed increases **HEART RATE** will increase. Rationale – As the swimmer works harder and has a greater need for oxygen rich blood, the heart needs to work harder to keep up with the demand of working muscles.
2. As speed increases, **STROKE COUNT** – the number of strokes per lap will **INCREASE**, ie the distance covered by the swimmer with each stroke will decrease. Rationale: As the swimmer attempts to increase speed, technique limitations and inefficient stroke techniques lead to shorter and more frequent strokes.
3. As the speed increases, **STROKE RATE** – the number of strokes per minute will **INCREASE**. This is a normal aspect of increasing speed – to **up** the rating. However, if the distance covered by the swimmer with each stroke decreases significantly with the increase in rating, the swimmer is becoming inefficient. Rationale: As with stroke count, as the swimmer's technique breaks down, it takes more strokes (and more energy) to maintain the same speed.
4. As the speed increases, **LACTATE** levels will increase. Rationale: As the swimmer attempts to swim faster, the balance between lactate production and lactate removal rate changes. Nearing PB time, when muscles are working hard, lactate removal is exceeded by lactate production resulting in an elevated lactate level.
5. After the final 100, the swimmer's heart rate should steadily decrease when resting and after swim down. Rationale: After the test, as the swimmer relaxes and swims down, the body will try to achieve a state of balance. As carbon dioxide is exhaled and as lactate steadily decreases, heart rate falls towards resting levels.

WHAT TO LOOK FOR NEXT TIME (i.e. SECOND & SUBSEQUENT TESTS) IF THE TRAINING PROGRAM IS WORKING

1. The swimmer's heart rate will be lower at the same speed. Rationale: Swimmer is **fitter** – more physiologically efficient and has a lower oxygen demand at the same speed.
2. The swimmer's stroke count will be lower at the same speed. Rationale: The swimmer is more efficient in the water and has a higher distance per stroke.
3. The swimmer's stroke rate will be lower at the same speed. Rationale: The swimmer is more efficient in the water and has a higher distance per stroke.
4. The swimmer's lactate will be lower at the same speed. Rationale: The swimmer's ability to tolerate and remove lactate has improved with training.
5. The swimmer's heart rate will return to near resting levels in a shorter time after the final 100 effort. Rationale: The swimmer has an improved recovery ability due to a training program activity, eg greater emphasis on endurance work, improved recovery skills.

HOW TO USE THE TEST RESULTS IN THE TRAINING PROGRAM PLANNING FOR THE SWIMMER

An important part of testing is correctly analysing the information gathered and using it to make effective changes to the training program.

In general, as a swimmer trains they become more efficient. They use less energy, less oxygen and take fewer strokes at the same speed. The challenge for the coach is to teach the swimmer to be efficient at higher and higher speeds.

If the testing process shows a clear trend of improvement, you have no problems. What do you do however, if test results show a decline in performance?

1. If the test shows the swimmer is taking more strokes to maintain the same speed, try some technique training and work on stroke technique and skills training to develop a more efficient stroke.
2. If the swimmer's heart rate is higher at the same speed or they are taking longer to recover after the test set, try some long, steady, relaxed, rhythm type training to develop some essential aerobic characteristics.
3. If the swimmer shows a marked increase in stroke rate to maintain the same speed with a corresponding decrease in distance per stroke and an elevated heart rate it is possible the swimmer is tired and the test will need to be redone when the swimmer is rested and unfatigued.

Test results are however only a guide. Often they are the objective support for the subjective feelings of a coach or athlete. A coach might test a swimmer to gather some hard evidence to support what he or she believes is happening based on experience and judgement.

In many cases the best testing protocol is for the coach and athlete to sit and talk about the program. The coach can "see" and observe, but can't feel what the swimmer is experiencing. The swimmer **FEELS** but cannot see technique and skills. By working together, the seeing of the coach and the feeling of the swimmer can often provide the best solution.

The 10x100 test is a valuable coaching assessment tool. It can provide the coach and athlete with feedback into the progress and development of the training program and provide guidance for planning of future program initiatives.

Author's note: Any coach or athlete trying this test can send me the results and I am happy to look over the results and give some input.

Contact me at MOREGOLD@BIGPOND.COM.

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