

Determining Threshold Pace

A common endurance test for swimmers is the T-30. Swimmers are asked to swim as many laps as possible in 30 minutes. The coach records the total yards swum and divides it by 30 minutes to obtain the distance swum per minute.

This is then converted into an average 100 pace (i.e., time per 100 yards).

yards pace

| | | | |
|-----------|-----------|-----------|-----------|
| 3000 1:00 | 2368 1:16 | 1957 1:32 | 1667 1:48 |
| 2951 1:01 | 2338 1:17 | 1935 1:33 | 1651 1:49 |
| 2903 1:02 | 2308 1:18 | 1915 1:34 | 1636 1:50 |
| 2857 1:03 | 2278 1:19 | 1895 1:35 | 1622 1:51 |
| 2813 1:04 | 2250 1:20 | 1875 1:36 | 1607 1:52 |
| 2769 1:05 | 2222 1:21 | 1856 1:37 | 1593 1:53 |
| 2727 1:06 | 2195 1:22 | 1837 1:38 | 1579 1:54 |
| 2687 1:07 | 2169 1:23 | 1818 1:39 | 1565 1:55 |
| 2647 1:08 | 2143 1:24 | 1800 1:40 | 1552 1:56 |
| 2609 1:09 | 2118 1:25 | 1782 1:41 | 1538 1:57 |
| 2571 1:10 | 2093 1:26 | 1765 1:42 | 1525 1:58 |
| 2535 1:11 | 2069 1:27 | 1748 1:43 | 1513 1:59 |
| 2500 1:12 | 2045 1:28 | 1731 1:44 | 1500 2:00 |
| 2466 1:13 | 2022 1:29 | 1714 1:45 | |
| 2432 1:14 | 2000 1:30 | 1698 1:46 | |
| 2400 1:15 | 1978 1:31 | 1682 1:47 | |

Distance test sets are good for determining thresholds and then determining paces for other energy systems.

Why is knowing your anaerobic threshold so special? Well, many in the field of sport science believe that training at one's anaerobic threshold is the best way to improve aerobic endurance. Improving aerobic endurance means one can keep swimming faster for a longer period of time. It improves the buffering system, even in races as short as 100. So, it is really important to know your anaerobic threshold when doing interval-based training.

Interval Test Set:

Interval test sets 2000 – 3000 yards:

10 x 200 or 10 x 300 average; 20 – 30 sec rest

Five Training Adaptations

1. Aerobic Endurance – PINK/RED, threshold, ability to sustain a sub-maximal pace for an extended period
2. Aerobic Power -- BLUE, VO₂ max, maximum ability to consume oxygen
3. Lactate Tolerance – PURPLE, Lactate Tolerance, the ability to prevent large drops in pH when lactic acid accumulates, physiological (buffer capacity) and psychological (pain tolerance) factors
4. Anaerobic Power – GREEN/YELLOW - Sprints, ability to reach and maintain maximum velocity
5. Economy -- oxygen cost of exercising at any given of the above intensities

- These are the five adaptations that we should seek to develop in our training.
- We don't want to rely on accidental success. We should have targeted success with targeted workouts.

Set Design - Training Guidelines – (assuming given White/Pink Percentages)

| | AEROBIC Endurance | VO2Max | Lactate Tolerance | Sprint |
|--------------------|------------------------------------|-------------------------------------|-------------------------------------|---------------------------|
| | Threshold | | | |
| Energy System | RED - EN2 | BLUE - EN3 | PURPLE - SP1 | GREEN/YELLOW - SP3 |
| Distance / | >1,000 | 800-2000 | 400-1200 | 150-500 |
| Work Interval Time | >10 min | 8-20 min | 4-12 min | 1.5-5 min |
| Rep Distance / | 100-1650 | 100-400 | 50-200 | <50 |
| Rep Time | 1-15 min | 1-4 min | 30s-2 min | <30s |
| Rest Interval | 10s - 1 min | 50% of rep | 2-4x rep | 4-10x rep |
| Intensity | 70-80% of max HR 95-100% of T30 | 80-90% of max HR 104-107% of T30 | >90% of max HR >90% of best time | All out |
| Max Freq P/Wk | 10 | 3 | 2 | 4-5 |

Heart Rate Measures:

Heart rate measures vary from athlete to athlete depending on their conditioning. Sprinters and younger swimmers have a higher heart rate when approaching their anaerobic threshold, and distance swimmers have a lower heart rate. Heart rates of 165 to 175 are typical for distance swimmers, whereas sprinters often reach up to 190 and younger ft swimmers 200 or higher.

HR Profiles

- Protocol is 2 x200y -- first 200y is swum at 70% (even aerobic pace) -- rest five minutes and swim the second at close to all out pace.
- Track 10s HR immediately after and occasionally take the sum of 3x10s taken at 0s, 30s and 90s following repeat (note that is 30s worth of heart beats). When using the summation method, make no adjustment, just track the sum.

| Training Zone | | Intensity Level | Total Duration of Work | Duration of Repeat | Duration of Rest |
|----------------------|---|--|-------------------------------|---------------------------|-------------------------------|
| REC WHITE | Warm Up Warm Down | Undefined – Easy HR 60 - 100 | Undefined - Any | Undefined - Any | Undefined |
| EN1 PINK | Aerobic | Low to Moderate HR 120 - 140 | 15 to 60 Minutes | 5 to 60 Minutes | 10 to 30 Seconds |
| EN2 RED | Aerobic At Threshold Endurance Pace | Moderate to Very Hard HR 140 - 160 | 8 to 30 Minutes | 2 to 20 Minutes | 15 to 60 Seconds |
| EN3 BLUE | Aerobic At Max Oxygen Uptake Max VO2 | Hard – Painful Talking Stops HR 160 - max | 8 to 30 Minutes | 2 to 20 Minutes | 15 to 60 Seconds |
| SP1 PURPLE | Anaerobic Lactate Tolerance (20 seconds recovery no active recovery) | Maximum Effort Close (at least 90%) of race Velocity HR180 - max | 3 to 12 Minutes | 20 to 120 Seconds | 1:1 to 1:2 Work:Rest Ratio |
| SP2 GREEN | Anaerobic Lactate Recovery (120 seconds and active recovery) | Maximum Effort Close (at least 92%) of race Velocity HR max | 3 to 12 Minutes | 20 to 120 Seconds | 1:2 to 1:8 Work:Rest Ratio |
| SP3 YELLOW | Anaerobic Complete Lactate Recovery | Maximum Effort (Race Velocity or faster) HR Max | 1 to 2 Minutes | 5 to 20 Seconds | 1:8 or Higher Work:Rest Ratio |