K.I.S.S. (KEEP IT SIMPLE SWIMMING) – EFFICIENT AND EFFECTIVE TRAINING

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STUFF HAPPENS…

Fourteen weeks ago I was approached by a fifteen -year old male triathlete who was not satisfied that his current swimming program was preparing him for a 500 m "Kids of Steel" swimming race at the July Ontario provincial triathlon championships. Having thirty-one years experience in the sport of competitive swimming, my concerns included: Could he be helped efficiently and effectively in this short period of time? Was there sufficient pool time and space available to meet his needs? Since I have never coached a triathlete, would this program conflict with his cycling and running training programs? How committed was he to achieving the best that he could be?

In my time as a swimming coach, I have come to trust two authorities in exercise principles: (1) Tudor Bompa's basic training methodologies and (2) Ernest Maglischo's swimming principles. As suggested in Joe Friel's The Triathlete's Training Bible (1998), a fusion of these two schools of thought makes program design easy. In consultation with the triathlete's cycling and running coaches and after balancing swimming needs and time against that of the other two disciplines, it was determined that the triathlete would swim three times a week during a one-hour, late evening adult fitness swim session. At three-hours of swimming a week, the athlete appeared committed to a focused, no-nonsense approach to improving his swimming. With this limited swimming time, a program was designed that was both efficient, and ultimately, effective.

HOW TO…

Bompa's famous "mesocycles", as found in Theory and Methodology of Training (1983), include training incrementally harder over a few weeks, then easing off to recover for a week, thereby preventing over-training. Figure 1 shows how this principle was adapted to create the plan that was then implemented. Essentially, three cycles of "three weeks forward, one week backward" were designed and followed: CYCLES 1 and 2 focused on increasing aerobic endurance by training below or at anaerobic threshold (AT) levels while gradually increasing repeat distances to 500 m and beyond; CYCLE 3 increased intensity and repeat recovery times as we focused on developing aerobic power; CYCLE 4 emphasized race-simulation work and the taper into the provincial championships.

Maglischo's Swimming Faster (1982) and Swimming Even Faster (1993) contain a detailed overview of stroke mechanics and training principles. Guidelines for workloads, rests, and swimming intensities are provided in each source. Table 1 shows the essentials for workout design that are suitable for an athlete preparing for a 500 m distance. These guidelines were used when creating workouts.

As there were only three one-hour workouts per week, practices focused on one main set, usually 20-40 minutes in duration – the remaining practice time focused on technical, low intensity work. By focusing on one energy zone per workout as the main set, the stimulus for physiological adaptation would be sufficient for the desired training effect. The 48 hours between practices would be sufficient for recovery and adaptation. Hence, the subsequent practice could be equally intense and no recovery practices were required.

As triathlons are subject to a variety of conditions and variables, gauging improvement based upon triathlon performance was not sufficient. Friel (1998) suggests creating a "test set" that monitors improvement in a controlled environment, like a swimming pool. As in Table 2, a test protocol of four graded 200 m swims, each at a higher level of effort, was used. A controlled warm-up was designed along with recovery swims between each 200 m effort. Final times, 100 m splits, and stroke counts were monitored and graphed. This test was implemented three times over the fourteen weeks to check for swimming improvement. The extent of improvement was evident when the line on the graph moved to the right from one test day to the next.

FIGURE 1: Fourteen-week Training Plan for a 500 m Triathlon Swim. Incremental increases in time spent training specific physiological “zones” were cycled with recovery weeks. Three test sets were conducted. Two Kids of Steel (KOS) triathlons were attended, the second of which was the “peek” competition. Incremental “mesocycles” followed Bompa (1983) principles.

TABLE 1: Training Zones for a 500 m Triathlon Swim. Suitable repetition distances, number of repeats, and rest are identified. Target heart rates and percent effort based on lifetime best (LTB) times are approximate and need to be adjusted to best meet individual needs. Adapted from the work of Maglischo (1982).

TRAINING
ZONE REPETITION DISTANCE (m) NUMBER OF REPETITIONS REST EFFORT
50 / 75 / 100 20-40 5-10s 70-90% LTB
1. Aerobic Threshold 150 / 200 150-180♥10-25 10s
(AT) 300 / 400 / 500 / 600 6-10 10-30s 75-95% LTB
700 / 150-180♥800 3-5 30-60s
50 40-60 reps. (sets of 10) 10s b/w 50 s & 2-3min b/w sets 80-85% LTB
2. Maximal O2 Uptake 75 / 100 20-30 (sets of 5-10) 10-20s b/w reps & 180-185♥2-3min b/w sets
(VO2) 150 / 200 10-20 (sets of 3-5) 30s b/w reps & 3-5 min b/w sets 85-90% LTB
300 / 400 / 500 4-8 2-3min 180-185♥
50 16-20 (sets of 4-10) 10-15s b/w reps & 30-60s b/w sets 85-90% LTB
3. Lactic Tolerance 75 / 100 4-12 (sets of 3-5) 10-15s b/w reps & near max♥3-5min b/w sets
(LT) 150 / 200 3-6 3-5min 90-97%
300 / 400 3-5 near max♥3-5 min
50 / 75 / 100 15-60 (sets of 10-15) 10-30s b/w reps & 2-5 min b/w sets
4. Race Pace 150 / 200 5-10 2-3 min near/below LTB
(RP) near max♥300 / 400 / 500 3-4 3-5 min
Broken 500 3-5 10s @ 50/100 & 3-5 min b/w reps
10 / 12.5 40-60 (sets of 10) 20-30s
5. Speed Work 25 20-40 (sets of 10) 20-30s near/below LTB
(SW) 37.5 / 50 6-20 (sets of 5) 2-3min
Broken 50 6-10 10s @ 25m & 1-2min b/w 50s LTB or better

TABLE 2: Test Set Protocol. After a warm-up, four 200 m swims at graded efforts were swum.
Warm-Up: 5 X (4 X 50) continuous sets with 4 @ 55 / 50 / 45 / 40 / 60
Test Set: 4 X (200 m freestyle -- graded efforts @ 4:00 + 6 X 50 easy @ 50) on 12:00 pace time
Efforts: heart rate #1 @ 155 bpm, #2 @ 170 bpm, #3 @ 185 bpm, #4 @ max. effort

SO WHAT HAPPENED?

As the triathlete had already done months of work in his former swimming program, little preparatory work was necessary except for some technical work on the swimming stroke. The first mesocycle focused on training aerobic endurance. Based on practice performances and heart rates measured with a heart rate monitor, it was estimated that the triathlete’s anaerobic threshold (i.e., the point at which lactic acid begins to accumulate) was between 180 and 185 bpm. At this point the swimmer is training hard for a sustained period and speed. The aerobic systems are working maximally. The anaerobic systems are at work, too, but the lactic acid does not yet debilitate the performance.

In the fifth week, the first test set was conducted and “baseline” data was collected against which subsequent tests could be compared. The resulting line (refer to Figure 2) reflects: (a) sub-threshold (or aerobic fitness) at heart rates of 150-180 bpm, (b) the threshold area itself at 180-185 bpm, and (c) the above-threshold levels (or anaerobic fitness) at maximal velocity.

FIGURE 3: Test-Set Data for 4 X 200m Protocol. A heart rate monitor measured heart rates. Velocities were calculated based on the final time of each 200 m swim. Anaerobic threshold (AT) was estimated to be 185 bpm and target heart rates for each test swim were: 155, 170, 185, and max. beats per minute (bpm). Anaerobic threshold levels improved by 6.2% over two months. Maximal velocity improved by 2.0% over two months.

At the end of the second mesocycle, in the ninth week, the second test was conducted. The triathlete's first 200 m effort was done incorrectly and was subsequently ignored. The bottom portion of the line had shifted to the right on the graph, indicating an improved velocity at the same heart rate (e.g., at 170 bpm, the baseline test velocity was 1.27 m/s while the subsequent test velocity, one month later, was 1.29 m/s, or roughly a 3 second improvement). This was predicted as practices had focused on improving aerobic endurance. The anaerobic threshold (AT) at 185 bpm also improved but no improvement in the final swim was seen as no training had been done to improve this highly anaerobic effort.

In the fourteenth week, the third test was conducted and the line on the graph shifted to the right once again reflecting further improvement. While this was expected, the degree of improvement was much larger than in the previous test. Through this period of time we had worked on developing aerobic power by focusing on VO2 sets and this appears to explain why the bottom ¾ of the line moved to the right. We also focused on developing anaerobic capacities by emphasizing race-simulation work and this resulted in a good improvement in the final 200 m swim as the top quarter of the line also shifted to the right. Once baseline values were found, the improvement of the anaerobic threshold level (i.e., 185 bpm) was 1.5% over the first month and 4.7% over the next month. While no improvement occurred after the first month, the improvement in the maximum effort anaerobic swim was 2.0% in the second month. Friel (1998) states that improvements in testing are sometimes only as large as 1% or less. If this is so, the performance measures taken here were notable.

The ultimate test of this program came at the provincial championships where the triathlete exited the water in a close second place to a swimmer who trains many more swimming hours in a week with a competitive swimming club. He ultimately finished the race with a close second place to the same athlete. This suggests that this narrowly focused program was both efficient and effective.

WHAT'S NEXT?

Three one-hour practices may be a bit too marginal to address all needs adequately (e.g., kicking practice and leg conditioning for swimming may be lacking). It might be better to have three 90-minute practices in a week but more does not appear to be necessary at present. With practices every 48 hours, fatigue and over-training were not evident and the desired improvement occurred. Main sets of a 40-minute duration every practice may be possible and incremental increases in workload up to this point may not be necessary. A 90-minute practice may also allow for a "minor set" to be done (e.g., the kick set that this triathlete still requires). As this triathlete will soon graduate from the Kids of Steel category of racing, the focus of his program will change to the 800 m swimming distance and it will remain to be seen if the current program would still suffice.

Based upon these positive results, a plan that follows similar principles is recommended for anyone searching for a simple, but effective, swimming program.