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MEDIA REVIEW

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Complete Conditioning for Swimming

By Dave Salo, PhD and Scott A. Riewald, PhD. Published in 2008 by Human Kinetics. 240 pages; \$24.95.

Reviewed by Stephen J. Langendorfer, Ph.D, Bowling Green State University.

One of the newest additions to the Human Kinetics ever-expanding library of aquatic and swimming publications is *Complete Conditioning for Swimming*. The authors, Drs. Dave Salo and Scott Riewald, possess outstanding scholarly and swimming credentials for authoring this unique text. Dr. Salo whose graduate degrees are in exercise physiology is the longtime USC men's and women's head swimming coach with *bona fides* as coach of a number of former swimming Olympians. Dr. Riewald has an extensive background in biomechanics along with strength and conditioning. He has served at the Olympic Training Center in Colorado Springs and for the U.S. Olympic Committee. Their individual expertise areas both complement and supplement each other to produce an exceptionally comprehensive text for assisting serious swimmers of all levels and abilities to improve flexibility, strength, and endurance and to prevent injuries. It is likely that the casual recreational fitness swimmer may benefit from these conditioning exercises, but the text is clearly intended for more intense age group, open, and Masters competitive swimmers and triathletes.

The text is accompanied by an informative 80 minute DVD that I personally found to be very useful for supplementing the written information. The digital videos on the DVD illustrate each exercise and their variations in a simple and straightforward fashion that allows one to really understand how to perform the exercises as designed. The subjects on the video do a nice job of demonstrating each exercise from several angles so that it is very easy to copy the appropriate performance of the exercise. They demonstrated the exercises on the pool deck using very common and simple pieces of equipment such as exercise bands, stretch cords, medicine and exercise balls, and exercise mats. At the same time, a narrator provides instructions and key points to the viewer and listener to assure safe use and to get maximum benefit. The titles and menus for the DVD were organized in a typical hierarchic fashion that I found reasonably easy to use. The only complaint I have about the DVD was that I found the background music that played whenever one of the menus or submenus were on the screen to be quite annoying. I found myself turning off the volume only to have to turn it back on to hear the video narration.

Although initially I was disappointed that there were not more actual in-water swimming drills, I still am impressed by the extensive number of conditioning drills, both in the water and especially on the pool deck, as well as how the authors have organized them across 11 chapters. The first chapter contains a set of five fitness tests including a core stability test, three shoulder girdle tests, and one for explosive leg power. Until I used the text and DVD together, I did not fully understand how each of the fitness tests was diagnostic. The DVD merely demonstrates how to

perform each fitness test, but without the text information, it was not clear to me how the “tests” were anything really more than a drill. Fortunately chapter 1 of the text does provide some, although not a great deal, of information about how the test results should inform swimmers. I would suggest that including more interpretive information on the DVD could reinforce how and why these five fitness tests were chosen and are appropriate for assessing swimmers’ conditioning and fitness. I am still not convinced that the vertical jump test is one that predicts whether swimmers have a strong kick or not. I think some research evidence to support the appropriateness of that particular test might have been helpful to overcome reader skepticism such as mine.

In the text, the authors have linked subsequent drills to each test so that swimmers can improve any area in which they may be somewhat deficient. It is important to note that the authors recommend the involvement of a health care professional in administering four of the five tests (core stability, shoulder flexibility, scapular (i.e., shoulder blade) stability, and rotator cuff strength tests). While this is sound advice for risk management reasons, it does limit the utility of these tests somewhat for many average fitness and competitive swimmers or triathletes who may not have ready access to such a medical professional.

I found it helpful that this fitness test chapter begins and concludes with several useful tests for measuring efficiency, efficacy, and fitness in the water. The first two measures are for calculating stroke rate and distance per stroke, which are the two product score components that together determine how fast anyone can move in the water. To these two measures, I personally would have added a combined measure known as *arm stroke index*. I also think that if the authors had demonstrated how to calculate the stroke rate and distance per stroke on the DVD, it might have made those two measures even more clear to lay users of the text.

This first chapter concludes with several in water performance tests including a 3×300 test set, pulse plots for heart rate recovery (HRR) and a second HRR test. The 3×300 test allows the coach and swimmer to establish the swimmer’s ideal threshold pace per hundred in practices to optimize the development of swimming fitness. The authors recommend performing this test on a monthly basis to allow swimmers to observe their improvement. The pulse plot technique uses the times for a set of 8×100 s plus heart rates to determine conditioning through examining heart rate recovery. As with the 3×300 test, this measure can be plotted on a monthly basis to determine whether one is making training adaptations or perhaps is overtraining. Finally, the HRR test allows swimmers to see whether their heart rate recovers normally or more quickly, a sign of positive training. I find these last three tests to be very interesting and am recommending that my Masters team use them to keep track of our progress this season.

Chapter 2 describes dynamic dry land warm up exercises to perform prior to getting into the water for a practice session. After watching the DVD, I became intrigued and taught five of those exercises to my Masters teammates who gave them an initial thumbs-up. The exercises can be done in 4-5 minutes and allow swimmers to “warm up” on the deck using the caterpillar (for stretching the hamstring and lower back muscles), torso rotations and helicopter lunges for trunk stretching, internal and external shoulder rotations and arm circles for the arms and shoulders, and ankle rotations, knee hugs, and leg cradles for hip, leg, and ankle stretching. I found the five exercises demonstrated on the DVD to be particularly helpful in

understanding how to perform each safely and appropriately. This chapter also includes information on in-water warming up for practice and prior to competitions as well as post-practice and post-race cool-down guidelines. Anyone who followed the swimming events at the recent 2008 Beijing Olympics learned quite a bit about how the elite swimmers such as Michael Phelps pay close attention to warm up before and cool down after races. Chapter 2 certainly reinforces what we saw occurring at the Olympics and provides valuable professional information for users of this text.

The subsequent five chapters systematically identify extensive sets of conditioning drills for building strength for specific strokes and events, endurance, core stability, explosive power, and improved flexibility. These chapters illustrate how well the text has blended the individual strengths and talents of Dr. Salo, the exercise physiologist, and Dr. Riewald, the biomechanist and conditioning specialist. Chapter 3, tailoring training for specific strokes and events, after summarizing the three main energy systems upon which swimming draws, provides a wide variety of on-land plus a few in-water conditioning drills designed to help improve foundational strength specific to swimming as well as strength designed for each stroke. Dr. Salo describes the swimming-specific training philosophy he employs with his teams to assure that swimmers' physiological and neuromuscular systems are optimally adjusted to their events. Sets of lower-body and upper-body foundational strength exercises are described before stroke-specific strength exercises are presented for front and back crawl and for breaststroke and butterfly strokes. The few in-water exercises include sculling, kicking with fins, pulling with hand paddles, and swimming against resistance (using elastic tubing, buckets, or parachutes). The authors' advocacy of using fins and paddles to build in-water strength may seem somewhat controversial to some individuals. I have heard these devices referred to as "cheaters" because swimmers can move through the water faster while using them. It is important to note that the authors insist they should be used while pulling or kicking at high speeds so as to actually promote strength development.

Chapter 4, building endurance, is surprisingly short. It describes the philosophy of using race-pace intervals rather than long, slow distance for swim training and how to use post-pace interval heart rates to indicate the level of cardiorespiratory endurance. The authors also present a section on cross-training for swimmers that includes participating in cycling, jogging, deep water running, or even using an elliptical trainer to provide a change of pace while still stressing the vascular system. Contemporary readers may not realize how radical this concept would have seemed less than two decades ago when coaches were convinced that swimmers simply could not improve their swimming endurance by doing anything other than water work.

Chapter 5, training for core stability, emphasizes a major theme for this text. The authors help the reader understand the critical importance of maintaining balance and streamlining through providing a strong and stable body core. They see the basis for developing a strong pull and kick as arising from a well-conditioned torso. They also present the critically important motor control and biomechanics concept of viewing swimming as an open kinetic chain activity, that is, that the body acts as a complex system of linked components that affect the motion of each other part. From this perspective, it is critical that the arm and leg actions emanate from a stable and properly conditioned trunk. The chapter includes a wide and

diverse set of core conditioning exercises designed to improve the stability of the trunk in every plane of action.

Chapter 6, developing explosive power, is a fascinating chapter that may be unique to aquatic training materials. Few, if any, swimming materials have heretofore stressed the importance of swimmers developing explosive power. And, as the authors illustrate, it is a critically important conditioning area since the best swimmers must possess the ability to apply strength with maximum speed. Throughout chapter 6, the authors illustrate both plyometric and other power building exercises.

The final chapter describing important fitness qualities for swimming is chapter 7, enhancing flexibility for better strokes. Perhaps more than almost any other sport, swimming requires optimal flexibility, the capacity to apply strength and power across a full range of motion. The authors promote the importance of stretching exercises, but *after* practice, not before, to take advantage of muscles already being warmed up and pliant. I find this concept to be quite unique, but both logical and beneficial. The stretching exercises in chapter 7, including several from the dynamic warm up group described in chapter 2, provide a basis for improving the range of motion across all the important joints used for swimming. I found one caveat particularly important: The all too common bilateral straight arm shoulder stretch often used by swimmers is particularly unsafe and dangerous because it can weaken the anterior (front) of the shoulder capsule. Our Masters team has dropped the use of that exercise in favor of bent elbow “chest stretch” described in this chapter.

The authors make a very compelling case for the importance of chapter 8, preventing, coping with, and returning from injury. In particular, they identify that swimmers take between 250,000 and 1.5 million arm strokes per annum, putting them at great risk for repetitive shoulder and other upper extremity neuromuscular injuries. This chapter builds upon the information from the previous conditioning chapters to illustrate how to employ strength, endurance, power, and flexibility to both prevent and recuperate from injuries that may occur to as many as 80% of all swimmers at some time in their career.

Chapter 9, nutrition and hydration for swimmers, presents up-to-date, valuable nutritional information to allow swimmers to have appropriate stores of energy as a means for providing optimal swimming performances. This chapter reviews the main types of nutrients (i.e., carbohydrates, proteins, and fats) plus vitamins, minerals, and supplements that can benefit swimming performance. The authors recommend using a nutritional periodization approach that is consonant with their recommended training periodization. In general, carbohydrate and protein consumption should increase as the rigor of training progresses from the preliminary to training to competition and championship phases. Fat consumption remains constant except for an increase during the competition and championship training phases where there is a brief increase. The authors also present valuable information about the glycemic index and how to match the glycemic index value of foods to the body's need for nutrients.

The final two chapters present a template for creating a strength and conditioning program for swimming seasons (chapter 10) as well as a set of year round training programs (chapter 11). The authors recommend the use of a time-tested periodization process for organizing the swimming season into well-defined training phases, mentioned previously. The five specific training phases for swimming

include the preliminary phase, the training phase, the competition phase, the championship phase, and the active rest phase. Each phase is accompanied by very specific conditioning exercises as well as particular types of swimming workouts. Chapter 10 also describes how to taper and peak for championships including when championships are located close together in time.

Chapter 11 is the most pragmatic of all in this text. The authors have provided very explicit sample periodic strength and conditioning programs for age group swimmers, high school competitive swimmers, college swimmers, Masters swimmers and triathletes, and for fitness swimmers. Each sample is based upon assumptions about the primary strength and conditioning needs for that particular group. The conditioning programs illustrate the exercises paired to the types of conditioning (e.g., core stability, strength, flexibility, power) and how they need to be implemented at each of the different training phases for each swimming group.

The text wraps up with two appendices. Appendix A provides average data (i.e., citing stroke rate, distance per stroke, and velocity measures) for male and female elite swimmers, U.S. Olympic trial, and Olympic finalist participants for each of the long course Olympic events. Appendix B provides the same measures (i.e., stroke rate, distance per stroke, and velocity) for different elite swimming groups (i.e., U.S. Olympic trial participants, semifinalists, and finalists) as they change over the course of each race by 50 and 100 meters. These appendices provide a basis of comparison for individuals who wish to track changes in their own stroke rate and distance per stroke to determine the efficacy of their conditioning programs.

Complete Conditioning for Swimming represents another valuable aquatic publication from Human Kinetics for coaches, caregivers, swimmers, and triathletes. It is neither an easy nor light read and not for the casual lay swimmer. It will take substantial and concentrated study for most individuals in order to take advantage of the information, exercises, and sample programs contained within. The DVD certainly is a valuable addition that provides clear visual demonstrations to illustrate how to safely and appropriately perform the exercises. I can recommend this volume to serious swimmers and triathletes and their coaches who wish to optimize swimming performance.