U.S. $12.95

"I have focused a great deal of attention on training concepts. To say the least, most of the concepts I have brought forth have been on the radical extreme in terms of what is the common practice. To be sure, these concepts have been challenged, not for the lack of experimental and theoretical evidence, but more for the lack of having produced a recognizable "elite" athlete. In order to provide some practical support for the training model, I extensively describe the details of the training program that I utilize."

David C. Salo, Ph.D.

**Includes 48 practices,
chapters on physiology
as applied to swimming, and
hundreds of workout design ideas.**

Perfect for self-trained adult swimmers, triathletes, and coaches who want to know the latest trends as described with personality by a young, creative, scientist/coach.

Sports Support Syndicate Inc.
Intelligence Products
& Progressive Publishing
Sales, Distribution & Development

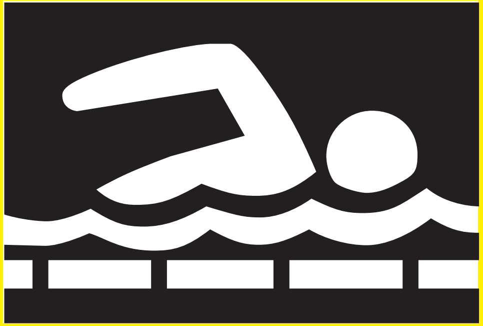
David C. Salo, Ph.D.
SprintSalo
Swim Training
Sports Support Syndicate

A cerebral approach
to training for peak
swimming performance.

SprintSalo

by

David C. Salo, Ph.D.



PDF Printing

SprintSalo

A cerebral approach to training for peak swimming performance

by

David C. Salo, Ph.D.

Published by the

Sports Support Syndicate, Inc.

•

Printed in the U.S.A.

•

Printed on Recycled Paper

•

SprintSalo

This book is © 1993 by David C. Salo and the Sports Support Syndicate Inc. All rights reserved. Reproduction of any type, physical or electronic is not permitted. For permission to re-print for reviews and research write to:

Sports Support Syndicate
108 South 12th Street
Pittsburgh, PA 15203-1226 USA

office: 412-481-2497
fax: 412-481-2540
orders: 800-869-0758

ISBN: 1-878602-01-2

Sports
Support
Syndicate

Author Update
Ph.D. Edition

David C. Salo, Ph.D. The Ph.D. part to David's name arrived after the first edition of this book was published in 1989. When David completed this original manuscript, David was in the doctoral program at USC with studies in physiology and also working on-deck under the, now retired, guidance of Peter Dayland. In the late 1980s, David had already made quite a name for himself with his ideas through the articles he had published in Swimming World and Swimming Technique magazines.

David is a soft-spoken, low-profile person. He isn't a big self-promoter. Hence, no author photo on the book cover. At meets, David is far more content to get into personal discussions with the swimmers in and around the team he is coaching, rather than stage a round-table lecture on training principles with other coaches. None-the-less, David speaks softly, and carries a big following.

This is at least the third printing of the original book and the fourth one is already being scheduled. Furthermore, the next edition with new workouts, and perhaps an author photo, is already under development. The success of this book is attributed to great word-of-mouth marketing by other coaches and swimmers who have done these practices already.

Back in 1989, many people in the upper levels of the sport of swimming in America and beyond were saying, "Who is this David Salo anyway? Who has he coached?" Many of the old-time coaches said that David's theories might work on a group of white rats in an experiment in some physiology laboratory, but that David's ideas would not hold water in a swim pool with a team, especially at the nationals.

Since then, David has coached a USS team in southern California, at Irvine. His kids have swum at Far Westerns, Junior Nationals, Senior Nationals and the Olympic Games. David's track-record is alive and well. Now David has the Ph.D., the kids in the big meets, (Did we fail to mention the Junior National West Meet Record in the 200 Backstroke?) and another printing of this book.

Look for more information in the next edition due in 1993.

About The Author

David C. Salo, a former swimmer for Long Beach State University under Jon Urbanchek (Head Coach at the University of Michigan), has continued his involvement in the sport at the University of Southern California. At USC, he is splitting his time between his duties as the Assistant Men's Swimming Coach while working on his Ph.D. in Exercise Science and a Master's Degree in Toxicology.

To David's credit he was the Head Coach of the Downey Swim Club for six years with additional stints with the Irvine Novas and Beach Swim Club as well as the Assistant Women's Coach at Long Beach State. In addition, David guides a summer training program (SprintSalo) utilizing his controversial training methods.

Besides his coaching exploits, David has been a featured columnist for *Swimming World* Magazine with additional articles published in *Swimming Technique* on the subject of training physiology. Along with writing, David has been a featured speaker at the ASCA World Clinic as well many regional clinics and is also a coaching educator with the Amateur Athletic Foundation of Southern California.

David completed both his Bachelor's and Master's degrees at Long Beach State University.

Acknowledgements

It is with pride and sincerity that I make a few acknowledgements of those people who have made a contribution in my life and thus made this publishing effort possible.

Such an acknowledgement would be incomplete without first recognizing Dr. Joseph Mastropaolo who early in my education proposed some very interesting questions regarding training concepts for peak performance. His interest and enthusiasm began my search of the answers. I also am grateful to Dr. jane A. Kent who shared the enthusiasm, especially when the answers were not always easy to come by.

The development of this book came over the course of several years with the workouts themselves being the direct result of a single summer season of training. I'm indebted to several individuals who chose to attempt to become the best athletes they could be in a seemingly unorthodox method. Specifically, I want to express my appreciation to Ken Rhodes, Rob Mulloy, Suze Fila, Eric Liff, Brian Keith, Ian Jaquiss, Rod Snyder and Javier Careaga who believed enough to challenge themselves. In addition, I want to especially acknowledge Judith Kattermann who at an early and opportune time posed the question, "Don't you think 4,000 yards is too much?"

Finally, I want to express my special appreciation for my family, Jack and Marlys Salo (my parents) and my brothers, Dan and Charlie, for their support and understanding through the years.

David C. Salo

Warning!

Swim training can be beneficial to your health!

Nevertheless, if you are just now beginning an exercise program or are about to take one up where you lodt off several years abo, it is highly recommended that you have a physical examination by a qualified physicialn before you begin this or any training program.

The author, editor, publisher and anyone associatied with this book take no liabilities for the information contained in this program. This is a strenuous program and should be conducted under supervision of a professional coach in a structured program. Consult with your physician before you begin any exercise program.

Contents

Editor's Forward

by Mark Rauterkus, Publisher, Sports Support Syndicate

The *SprintSalo* book evolved from the on-deck diary of coach David Salo. When Dave first recorded these practices, his notes served as a personal reference to the past. After continual urging from others, Dave decided to go ahead and publish his practice diary.

Building a communications bridge from Dave Salo, a scientist and coach full of creative energy, to the eager swimmers throughout the world can cause some frustration. The editorial challenge was to present the practices on these pages in an understandable format. The practices were filtered through a series of re-writing and editing stages.

Dave created some new terminology to describe his practice tasks. "PulsePlots", "Out/In's" and "PreSet" are meaningful new words easily understood after an explanation. Then came the notation. "H.R. $_{23}$", "Broken R.I. :05", and "P_{200}" are a few of the phrases which may frustrate first time readers.

Use the glossary, called SaloSlang, to help curb questions as you follow the practices. The documentation is simplified with the lingo and directions clearly stated.

We simplified without sterilizing. Dave's practices have a vibrant energy. They are fast paced. They are woven full of dynamic directions and parenthetical statements. We hope you can pick-up the vocabulary and learn to understand the full meaning of the *SprintSalo* program.

Transforming Dave's diary into an understandable set of directions was one goal, but all along, we strived for more. Dave wants this book to help the readers reach beyond traditional boundaries and stimulate the cerebral side of the swimmer's experience. Perhaps it is striving toward intimacy along with Peak Performance. We like the title, The Practice Companion.*SprintSalo* should spark an interchange and relationship with its users.

Diaries are personal accounts and so is the relationship between a coach and a swimmer. As the coach and swimmers lived these practices, their interaction went far beyond what could ever be conveyed on paper. Whatever role the *SprintSalo* program comes to play in your activities, we know it isn't going to be exactly the same as the swimmer/coach relationship at pool-side.

To most of our readers, David C. Salo is a total stranger. However, you can use your imagination and visualize him as a scientist who could have been that unassuming, soft-spoken gentleman who observed your last practice from the other end of the pool.

Diaries are revealing. Regardless of the overall interpretation, this diary is radical. Engage yourself with this program, learn the lingo and start making Dave's diary a part of your diary.

Chapter One:

INTRODUCTION

In writing this training book its intent has been to satisfy the interest of many readers familiar with my articles on the subject of **high-intensity, low-yardage** training which have appeared in *Swimming World* and *Swimming Technique* since 1982. This book was written to serve as a guide for those coaches and swimmers who are seeking an alternative to the traditional approach to training.

I began my coaching career in the same manner as most other coaches, i.e. accepting the training methods handed down to me. However, I was always intrigued with the concept of training 10,000 to 15,000 yards per day for an event less than 1/100th of that distance. Further, as I brought my athletes to newer levels of training distances, I found myself asking, "How does swimming slow for thousands and thousands of yards make them fast for a couple hundred?" Finally I had to pose the question, "As a coach, shouldn't my goal be to see how little I have to train for peak performance?"

To put training yardage into perspective, consider the training of the 400 meter swimmer and the runner who competes in the mile event. Both events are performed in just under 4:00, therefore energetically they represent similar events. The swimmer will train on average about 12,000 meters per day. This distance is some 30 times farther than the event. The runner, by conventional wisdom, would need to train 30 miles per day (or more than a marathon) in order to achieve similar performance successes. Clearly, the runner would never consider such an extensive training regimen as this. It must be considered that because the swimmer simply can swim 30 times farther per day than the distance he will compete, may be the very reason why he does it, and for no other. Surely, the physiological principles which govern exercise adaptation would prove our present training methods lack sound justification.

As I discovered a more appropriate method of training for peak athletic performance, I found I preferred watching swimmers training 'fast'. The training required considerably less yardage, and as a coach, I found myself more involved in each training session. Aside from the physiological justifications for high-intensity training, I have found that each practice becomes a competitive experience which better prepares the athletes. Further, I have found that those swimmers who have trained with this method are happierand readily accept their exhaustion. They are always willing to give their best and complete effort with each workout. In the long run the athlete willing to give his best effort, regardless of the training program -- traditional vs *SprintSalo* -- will succeed.

I trust this guidebook will be of value to those who choose to utilize it. And while its use would probably be improved with the coach experienced and versed in the concepts which I espouse I would hope that it is uncomplicated and succinct.

The workouts in this book were the direct result of a compilation of workouts performed by a group of collegiate swimmers in the summer of 1988. They follow in the order that they were given such that the final seven workouts constitute the "fine-tuning" phase of the program prior to the final meet of the season. Though the intervals that are detailed in the book are the actual ones used with this group of swimmers they may not be appropriate for the individual utilizing this book. Because of this I have supplied rest intervals which appear in brackets ([ ]) and should serve as a guide for the coach and swimmer.

Chapter Two:

PHYSIOLOGY

The intent of this section is to present those physiological principles which may be considered important for the athlete in training, specifically for swimming competition. While there is clearly a tremendous amount of information that may be detailed regarding the physiology of exercise, space limits an excessive amount of such information. Hence, only the pertinent details are considered here, which is hoped to provide the interested readers with sufficient knowledge to adequately prepare for swimming competition.

The primary focus of this section is the association between appropriate training guidelines and competitive success. Basic physiological concepts will be introduced and the relationship to training and competition will be stressed. This section is subdivided into several areas which are important for such preparation. These areas include strength, flexibility, speed training and conditioning for endurance.

MUSCLE STRUCTURE

Prior to fully understanding the principles of athletic training a basic appreciation of skeletal muscle architecture is necessary. Figure 1 is a representation of the ultrastructure of the skeletal muscle.

The whole muscle can be broken down into its components. Muscles include the individual muscle fibers. The fibers are composed of packages of smaller fibers (myofibrils) which can be further broken down into the contractile proteins which allow the muscle to contract.

Figure 2 is another view of the muscle, and it shows some of the details at the cellular level.

Dispersed throughout the muscle cell are many components which are essential in providing the exercising muscle with energy. Of these components, easily the most important are the mitochondrion which generate high energy in the form of adenosine triphosphate, ATP. Glycogen, seen as

Figure 1

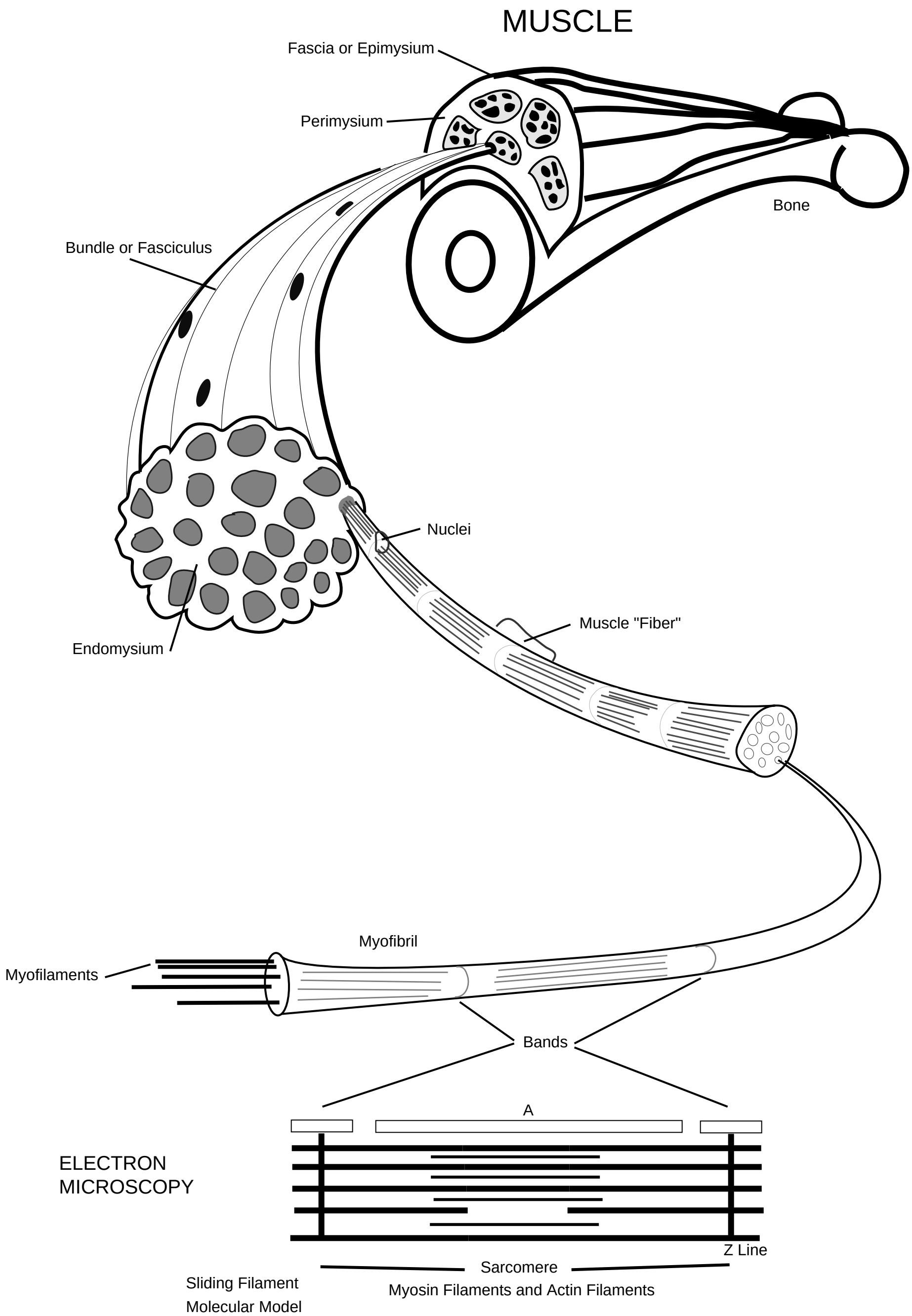
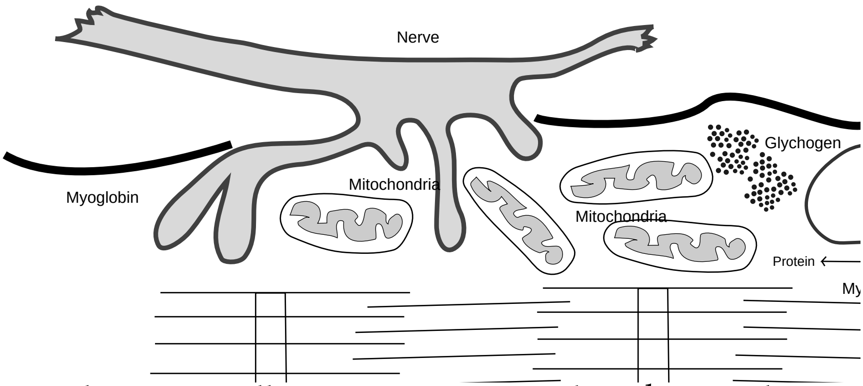

MUSCLE
Fascia or Epimysium
Perimysium
Bone
Bundle or Fasciculus
Nuclei
Muscle "Fiber"
Endomysium
Myofibril
Myofilaments
Bands
A
ELECTRON
MICROSCOPY
Z Line
Sarcomere
Sliding Filament
Molecular Model
Myosin Filaments and Actin Filaments

Figure 2



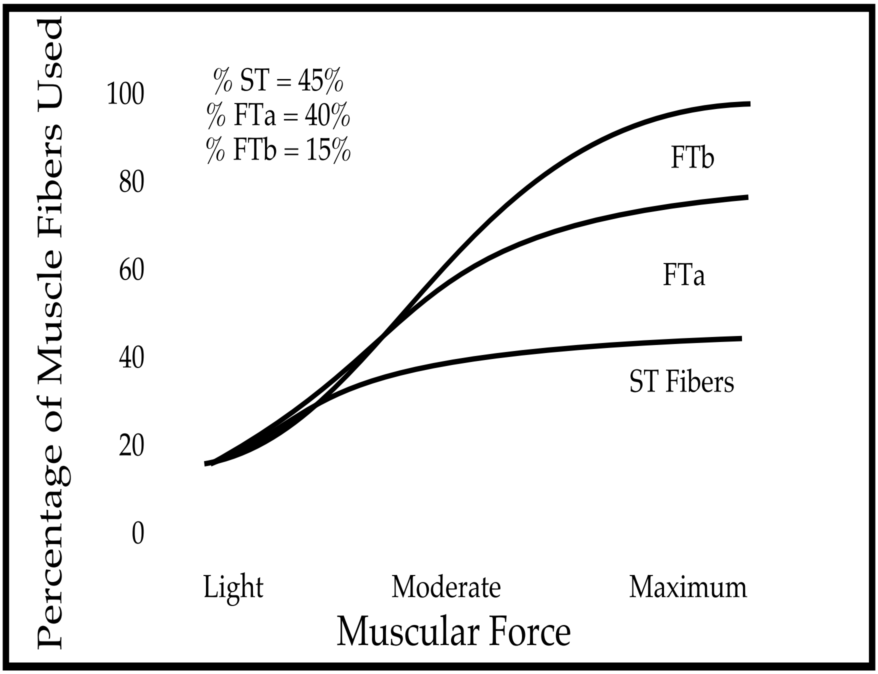
granular packets, is equally important in providing the muscle with energy, especially during occasions of intensive racing. The muscle fibers can be classified into three distinctly different fiber types. According to their individual characteristics, these different fibers are generally discussed in terms of how quickly they can contract when stimulated. Characteristically, therefore, there are fast twitch (FT) and slow twitch (ST) fibers. The FT fibers can be further described in terms of their tendency to fatigue, either quickly or more slowly. Important considerations for training of the different fiber types must, therefore, be considered.

The ST fibers are characterized by their high oxidative capacity and fatigue resistance. In other words, they can be considered **endurance** fibers. They don't generate a great deal of power, but they are capable of providing a low level of power for a long time. Muscles that are involved in maintaining posture are generally composed primarily of slow twitch fibers for this very reason.

On the other hand, the FT fibers are characteristically involved in the explosive generation of power for short periods of time (e.g. an event lasting :30 seconds).

As previously mentioned, the FT fibers are further characterized according to their oxidative capacity and ability to resist fatigue. FTa fibers tend to be more fatigue resistant than FTb fibers, while the FTb fibers can generate a greater level of muscle power. Depending upon the amount of force required, the muscle fiber types are selectively recruited. In Figure 3 this relationship can be seen. As the amount of force required is increased an increased contribution of the FT fibers results with the FTb fibers preferentially recruited last.

Figure 3



ENERGY SYSTEMS

The observation that muscle fibers can be classified according to different characteristics related to their performance capacity, suggests that the components as described in Figure 1 and 2 may also differ with ST and FT fibers. The ST fiber is found to contain greater numbers of mitochondria and is well supplied with a vast blood supply. These fibers rely primarily on the ability to oxidize glucose and fats for energy supply. The FT fibers, especially the FTb fibers, have fewer mitochondria and lower blood-supply-development. Consequently, these fibers rely to a greater extent on the non-oxidative generation of energy or ATP.

In exercise physiology the generation of energy can best be described by **three energy systems**. Each system generates ATP by different means.

For the immediate generation of ATP, which would be required during the first several seconds of a race, the muscle relies on the **ATP-PC** system. This system involves the conversion of phosphocreatine (PC) into ATP by an enzymatic reaction that does not require oxygen. Because oxygen is not required for this to take place ATP can be supplied to the muscle very rapidly. The cost of such a mechanism, however, is that the supply of PC is rather limited and can only supply enough energy for a few seconds of intense effort.

While the ATP-PC system is limited in its ability to form ATP the muscle has a second line of supply of ATP involving the non-oxidative metabolism of glucose or glycogen. This system, referred to as **anaerobic glycolysis**, breakdowns glucose in the absence of oxygen. Because oxygen is not required, ATP can be formed readily and quickly.

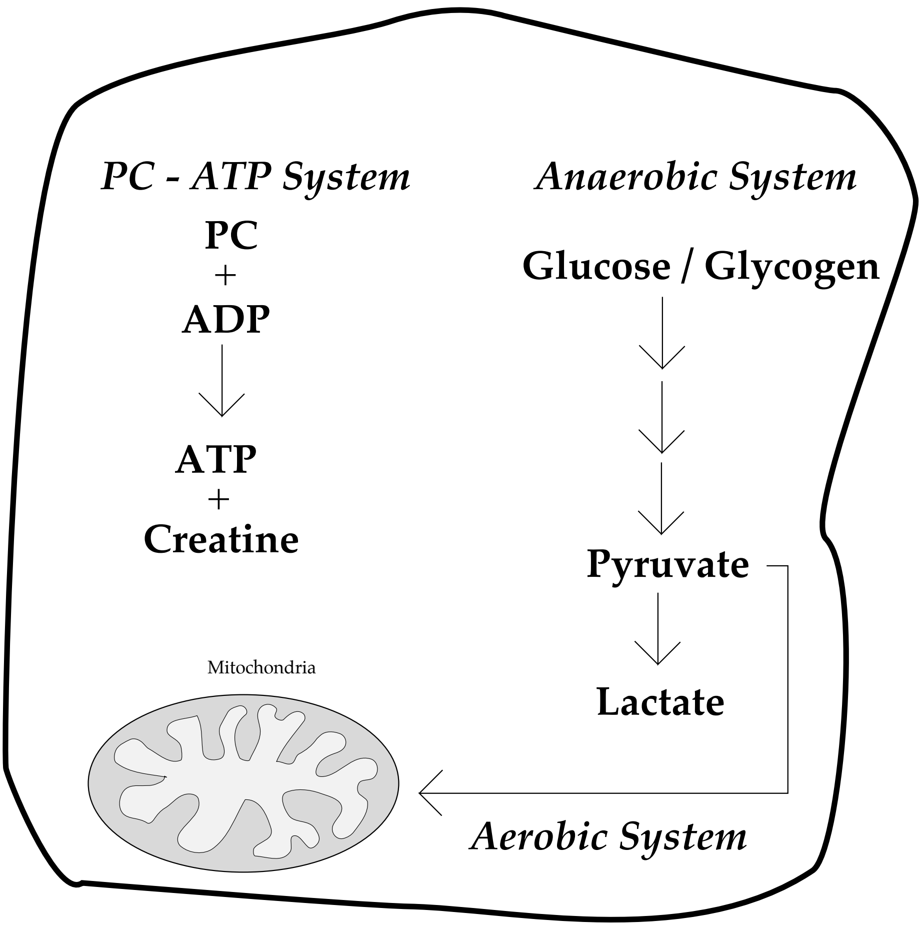
The main limit to the anaerobic glycolysis system is the eventual formation of lactic acid. The amount of glucose or glycogen available is less of a limit for this system except in long-term exercise activities.

When non-oxidative breakdown of glucose occurs, especially at high rates of exercise, the ability of the mitochondria to take up the by-products of this breakdown (i.e. pyruvate) becomes saturated. In other words too much pyruvate builds up and has no where to go. In this instance, which occurs during very fast and intense swims, the pyruvate is converted to lactic acid. While lactic acid has been regarded as a waste product of intense exercise, it is more accurate to consider it a "holding bin" for the accumulating pyruvate. This is because the lactic acid can eventually be metabolized, much like glucose, when the swimmer begins swimming at a slower rate.

The next line of supply of ATP comes from the oxidative breakdown of glucose, **aerobic glycolysis**. The process of aerobic glycolysis involves the first several steps of anaerobic glycolysis. At the point where glucose eventually is broken down into pyruvate, the pyruvate is transformed into a form which can be taken up by the mitochondria. In the mitochondria a systematic and complex process occurs which eventually generates large amounts of ATP (19-fold greater than the non-oxidative process). ATP crosses out of the mitochondria where it can then be utilized by the working muscle.

Figure 4 represents a simplified cell and the three systems that are capable of generating energy in the form of ATP.

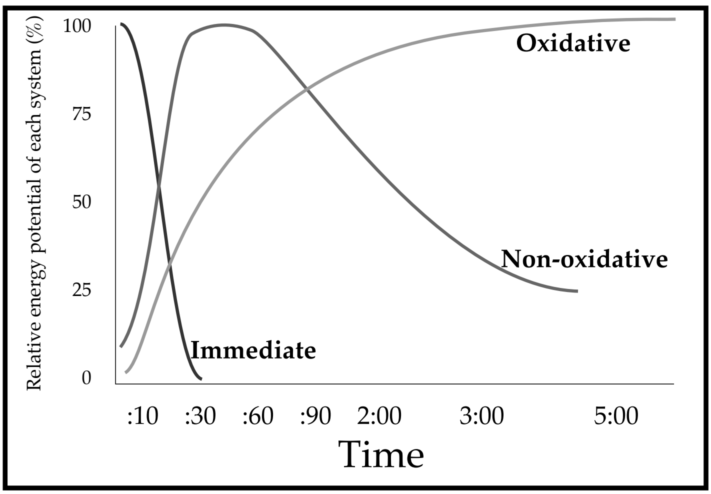
Figure 4



It is important to note that while the systems are unique and somewhat mechanistically different they act dynamically to provide energy to the muscle for contraction. While many swimming coaches design their workouts in an attempt to exclusively train a given system, it is highly unlikely that this takes place. It is more likely that all three systems work in conjunction to maintain adequate supply of energy. In relation to which systems are important for a given event, it is important to realize that each system contributes to a different degree depending on the duration of the race. Obviously the longer the race, e.g. 1650 freestyle, the greater requirement of the oxidative system (aerobic glycolysis). The endurance events, therefore, demand that the race be paced at a speed less than maximum. In the short events, where the emphasis is clearly on speed, a greater reliance on ATP formation via the ATP-PC system and the anaerobic system is seen. However, regardless of the duration of the event the ATP-PC system as well as the anaerobic system is utilized to some extent at some point in the race.

Figure 5 shows the contribution of each system dependent upon the duration of the event. What is important to note is that for most swimming competitors the duration of their events fall well below five minutes which require a significantly greater contribution from non-oxidative processes as opposed to the oxidative metabolism of glucose.

Figure 5



ENDURANCE

Traditionally, swimmers have been trained under the guise that the more one trains the faster one gets. The primary concern of the coach should be for the event the swimmer will be swimming in competition. As indicated in Figure 5 most events for most athletes will last no longer than five minutes. The primary system involved in events of this nature is the ATP-PC system and the anaerobic system. This would suggest that primary emphasis should be placed on training these systems. In swimming, the coach needs to ask "Am I training the swimmer to swim forever?" Or rather, "Am I training the swimmer to go fast for a given distance?" If this were taken into consideration a greater emphasis in training would be placed on intensity and less on the mileage of training.

Increasing the aerobic capacity is often linked, by coaches and athletes to elevating the VO_2 max. The VO_2 max can best be defined as the maximum amount of oxygen that can be consumed. The importance of the ability to maximize the aerobic capacity is emphasized in most early season training programs. This is accomplished, by the majority of coaches, by training programs which involve long-slow over-distance training at submaximal intensity. This type of training tends to stress the aerobic system, resulting in improvements in this system. While endurance training can indeed increase VO_2 max as much as 20%, higher intensity, sprint type training, can result in the same adaptation in this physiological parameter. While VO_2 max has long been held as a measure of endurance capacity, recent research indicates that this may not necessarily be the case. In fact it has been demonstrated that VO_2 max correlates better with the speed at which an athlete can maintain their VO_2 max rather than the ability to exercise for a long period of time.

One of the important consequences of endurance training is the increased number of mitochondria in the muscle cell. In races that will last less than a few minutes, the mitochondria may not play a significant role in providing ATP energy, however, the mitochondria can play an essential role following an intense race.

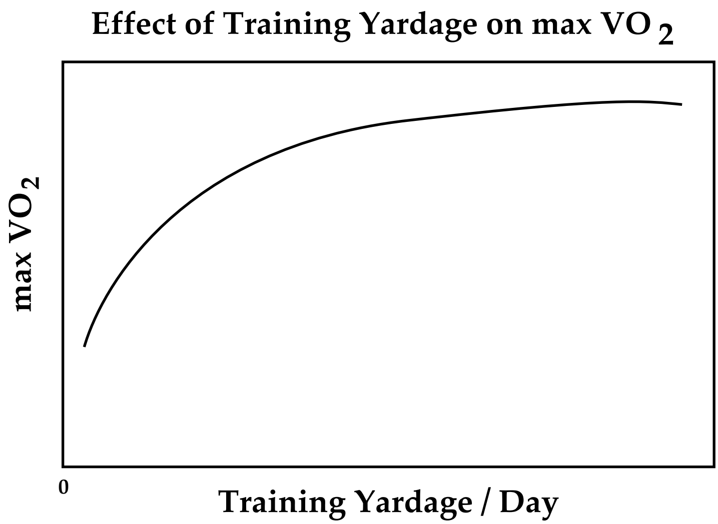
As previously described, mitochondria is the site of oxidative or aerobic metabolism (the breakdown of glucose involving oxygen). Following an intense race the swimmer can be tremendously fatigued, possibly due to the build-up of lactic acid in the muscle. One should recall that it is not appropriate nor accurate to consider lactic acid as a waste product, but rather an altered form of pyruvate which is taken up by the mitochondria to form ATP. It should be clear that the greater the number of individual mitochondrion that are present in the muscle, the faster the lactic acid (via pyruvate) can be taken up and utilized to produce ATP energy. Increasing the number of mitochondria in the muscle can be significant during intense training by removing and utilizing lactic acid quickly, allowing increased recovery between workouts. This will allow the swimmer to train with maximum intensity during each training session. Further, for the swimmer that will be competing in several events, especially in a single day, an increase in the number of mitochondria will speed the swimmer's recovery between events, again maximizing the swimmers racing capacity.

Most swimmers are "endurance trained" the first few months of the season to "build an aerobic base." While many coaches define the aerobic base differently, the physiological changes that occur include both central and peripheral adaptations. Central adaptations are related to cardiovascular conditioning in which the efficiency of the heart and its supporting cast (i.e. capillaries, blood, etc.) is enhanced. Peripheral adaptations refer to those changes which occur at the level of the muscle tissue, which includes the increase in mitochondria, as previously described.

This process of adaptation occurs over six to ten weeks with increasing workload. Figure 6 shows the effect of increasing workload on aerobic capacity, VO_2 max.

It is important to keep in mind that once the maximum -- or near maximum -- has been attained, further increases in workload does not significantly increase the aerobic capacity. In addition, it takes very little training stimulus to maintain the adaptations that occur with endurance training. As little as three

Figure 6



training sessions per week, of minimal yardage (3,000 yards) may be required to sustain the aerobic capacity. At this point it becomes essential that the athlete begin to focus his/her training on those components more specific to speed and power.

SPEED - ANAEROBIC CAPACITY

Previously it has been suggested that development of speed or power is or should be the major focus of the swimmers training program. Under circumstances of intense racing many things are happening in the swimmers body, as a whole and specifically in the muscle. Increased levels of hormones (norepinephrine, epinephrine - adrenalin); blood flow changes; selective recruitment of muscle fibers; accumulation of lactic acid, etc. As these changes rapidly occur during a race, the body, as a whole, attempts to regain homeostasis or a balance. When a swimmer is untrained, a much longer time for recovery will be necessary in order to regain the balance maintained when at rest. With training, the time needed to fully recover from strenuous exercise is reduced significantly as the body has adapted to the stress of exercise. Why is this important? When considering how a swimmer will be trained for a particular race it is important to keep in mind what the swimmer's body will experience during the race.

As an example, a swimmer who competes in a 100 meter event lasting about one-minute or less, will experience a high level of lactic acid accumulation, as well as decreased levels of phosphocreatine and some changes in ATP levels etc.

For this reason it is important that the body experience this type of stress in order that appropriate adaptations can occur that will allow the body to recover quickly from this particular stress. For the most part, when discussing the competing athlete, we are talking about the anaerobic capacity of the individual. Adaptations that will accompany intense training that will enhance the anaerobic capacity include the increase in the ATP stores in the muscles along with increases in glycogen and phosphocreatine. In addition, it is probable that when the body is stressed, during training, to the level that it would experience in a race, the ability to remove and buffer lactic acid that is generated in the working muscles will increase. Training to enhance the anaerobic capacity, therefore, must involve intense race pace swims, as well as swims faster than race pace.

STRENGTH

Strength is often associated with speed and is probably quite appropriate. With increased muscle mass, more muscle becomes available to provide power during muscle contraction. The important consideration when training to improve strength is the specificity of the training to the skill of swimming. It must be kept in mind that many muscles play only a small role in swimming a particular stroke. For example, the biceps muscle of the arm is thought not to contribute much to swimming propulsion. Yet when you go into the weight room to watch swimmers workout, many can be found working the biceps muscle quite vigorously. While improved strength and size of the biceps muscle will improve an appearance in a T-shirt, little value toward swimming success will be gained. Greater emphasis with those muscles which are specifically involved in moving the body through the water should be trained for increased strength. When training, then, a simple guideline is to lift or move weights in a manner similar to those movements performed during swimming. A second consideration that should be made when designing a strength training or dryland program is to keep in mind that swimming is a **power-limited sport**.

Power is mathematically defined as:

$$\frac{\textbf{force x distance}}{\textbf{time}}$$

Or,

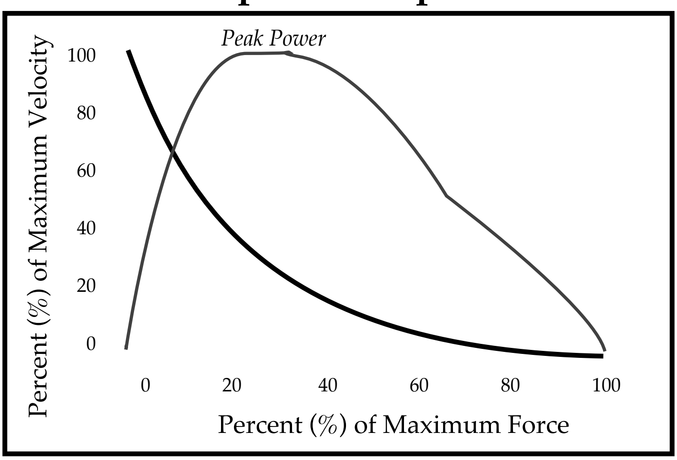
force x speed

In training for strength generally the concern is "How much weight can I move?" Rather than, "How much power can be generated?" The maximum amount of power that can be generated occurs at a weight (or force) between 30% and 60% of the maximum weight one can move for a given movement. When the weight is moved as rapidly, yet controlled, as possible, power is maximized.

A suggested guideline for strength training is to perform two sets of **power oriented lifts**. Each set lasts :12 seconds at 30%

Figure 7

Relationship of force and velocity to power output



to 60% of the maximum weight that can be moved. This is then followed by one to two sets of **strength oriented lifts**. The first set of strength oriented lifts has five reps at 75% of the maximum weight and the second set has three reps at 90% to 100% of the maximum. Many coaches and trainers have different methods of strength training which have been demonstrated to be effective, but the key for improved swimming success is, again, being as specific to swimming as possible.

For strength training which is even more specific to swimming, several things can be done in the water, itself, to improve swimming power. Drag suits can be used which forces the swimmer to increase the amount of force output at a given speed in order to maintain a constant power output (see the equation for power, above). In addition, a plastic bucket tied to the swimmer by a long nylon rope can provide a similar effect.

STRETCHING AND FLEXIBILITY

It is assumed that stretching plays an important role in adequately preparing the swimmer for competition. Most, if not all, swimmers engage in some pre-warmUp stretching routine before swimming. The actual effect of stretching from a physiological standpoint is not clear but it does seem to help swimmers stave off the feeling of "tightening up", especially during an intensive training session.

A stretching program can help increase the swimmers range of motion. In the case of the swimmer with very tight joints (e.g. shoulders) stretching may allow for more efficient movement in the water. In the case of many swimmers, the lack of good flexibility in the shoulders can be a problem depending on the stroke being swum. Poor flexibility in the shoulders does not allow, especially in the butterfly, the ability to adequately clear the water on recovery. Consequently the energy cost for each stroke is very high.

A program of stretching to improve flexibility is important, but must be done properly or damage to joints and tissue can result. In order to stretch properly, and to reduce the potential for injury, the athlete should first perform some preliminary warmUp activities of light exercise. This functions to increase the temperature of the muscle. This is important, in that a warmed muscle can more readily be stretched through its proper range of motion.

Stretching should be a gradual process which does not involve taking a stretch to a painful limit. When determining the stretches that should be performed it is essential that all the major joints, including the shoulders, ankles, hips and knees be stretched. Because the swimmer relies heavily on the upper body the shoulder region requires considerably more attention to flexibility than many other areas.

Chapter Three:

FINE TUNING - AKA TAPER

The taper in conventional swimming is the most mysterious aspect of a coaches program ever conceived. Few coaches and swimmers really understand the concept of rest. I've always been amused by swimmers following the taper and the championship meet. The assumption is that they are in the best shape of their lives. Ask them to do a workout, and they can barely get through it. In light of this observation one has to ask, "Are they really in the best shape of their lives?"

I've seen more than one coach who will not let there swimmers do any fast swimming during the later stages of the taper. "Save it for the meet!" is the usual response. It is my belief that for many of these swimmers they are in a flux of detraining and unbeknownst to the coach, the swimmer will probably be competing in the meet somewhere beyond their peak performance capability. Timing has to be perfect with the traditional taper. As an example Figure 8 represents the course of a taper and its relationship to performance.

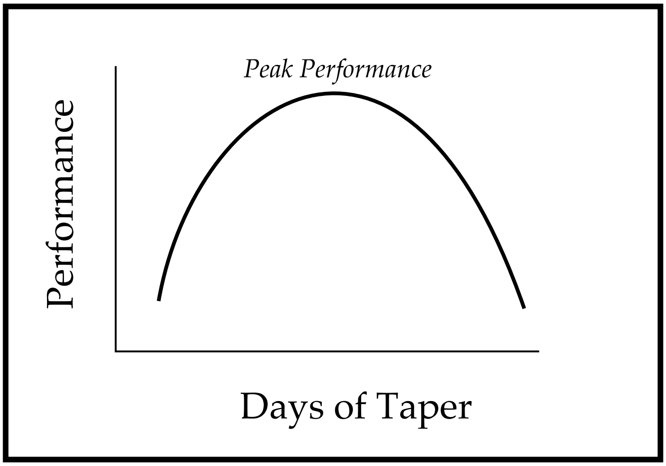
In the first few days of the taper the performance level that might be expected would be very low. Several days into the taper the performance level increases to a peak potential. Beyond this point, however, the potential performance begins to decline and probably does so very rapidly depending upon the level of intensity of swimming during the taper. It is rather foolish to assume that fast swimming of short duration even a day before the "big" meet would be harmful to a swimmers performance, given 24 hours to recover.

An observation I have made over the last several years in traditional programs, is that many swimmers, especially sprinters, experience some muscle soreness during the early taper period. This may be due in large part to the recruitment of muscle fibers that have not been adequately recruited during the traditional workout that encourages slower than race pace swimming. In essence, the fast-twitch fibers which are recruited preferentially during fast swimming may not be adequately trained until the taper time - as long as there is fast and intense swimming performed.

It needs to be kept in mind that very little is altered between the regular training session and the workout session during the fine-tuning phase. The taper in the *SprintSalo* program is termed fine-tuning for several reasons. One reason is the fact that it is tough to conceive of tapering off of 3,000 yards-per-day. Yardage, as seen in the following workouts did decrease from about 3,000 yards to as little as 1,000 yards, however for the most part the intensity level remained high.

Each workout must be thought of as an opportunity to

Figure 8



increase ones' power. If properly done this in fact is the case. With every meet through the course of the season, times should be improving without any interruption of the training program. Prior to the major meet the only change is a greater focus of attention on the details of the swimmer's event. The turns, starts, approach to the walls, the strategy, etc. all are taken to their most serious and intense level. Rehearsal swims are one of the best means to assure that a swimmer is prepared for the upcoming competition, consequently these are a part of the fine-tuning phase. It seems to me that the swimmer that can do their goal time in a practice session will have greater confidence going into the meet rather than hiding behind the illusion of great expectations with broken swims.

WORKOUT DESIGN

Most coaches design their workouts with the major focus of **mileage** in mind and less on the content. In fact the season plan is usually designed around yardage per workout with little attention to anything else. With the recent interest in exercise physiology and the advent of the United States Swimming Sports Medicine Committee an increasing focus on training schemes has been infused into workout design. At a rather basic level many coaches have begun designing their programs around an Aerobic:Anaerobic cycle. Even more sophistication is being seen in daily workouts as coaches are exposed to the concepts of lactate tolerance, aerobic capacity, anaerobic threshold, etc, etc.

The workouts in this book appear rather simplistic, but they are designed with a focus on content rather than yardage. In fact I have deliberately left out the total yardage per workout. When initially designed, the focus of each workout is not on, "How Much?" but rather "How?".

Each workout is primarily designed with four phases in mind. As with most coaches, regardless of the type of program, these include the WarmUp, the PreSet, the MainSet, and the WarmDown.

The WarmUp is found to be identical in every workout and is purposely done this way. This is because I see each training session as a rehearsal for the eventual sanctioned competition. The body has a knack of becoming familiar with its surroundings, which include habitual behaviors. We all recognize that after years of daily 5:00 a.m. workouts we find ourselves waking up at the same hour every morning with or without an alarm clock to jolt us out of bed. The same occurs with physical activity. Athletes know when they are warmed up and ready to increase their intensity. For many this is accomplished by performing a ritualistic WarmUp after which they are prepared to compete or train. By performing the same WarmUp on a regular basis the swimmer begins to get a sense of when they are ready to put out a maximal effort.

While the intensity of the *SprintSalo* training sessions is maximal, the WarmUp is progressive and serves to prepare the athlete for the intense swimming sets to follow. It is important that the swimmer understand this concept for the WarmUp to be of any benefit.

Following the WarmUp the next series of sets, labeled as PreSets, serve two functions. First, they are essentially an extension of the WarmUp to ensure that the swimmers are adequately prepared for the MainSet. Secondly, these sets function as "drill" sets. For the most part, they include kicking and pulling sets as well as sets which include buckets, fins, sculling, etc. By the middle of the first PreSet the swimming intensity is "turned all the way up" and effort is expected to be maximal.

The MainSet which follows the PreSet focuses attention on specific training for the primary event of each swimmer. The sets are designed such that the swimmer's main concern is swimming faster than race speed. It is important to remember that I am speaking in terms of the eventual final season's goal time. Regardless of the point in the season, either beginning or fine-tuning/taper the efforts in the MainSet are with the focus on the final season's swim. Assuredly a swimmer in the beginning of the season will face difficulty in maintaining speeds equivalent to goal times, but, it is essential that the swimmer is always thinking and preparing for the goal time during each training session. This is where the Cerebral Approach comes into play. It is my firm belief that with every swim a swimmer performs in a practice session, he is swimming each swim with a very specific goal in mind. The swimmer never just goes through the motions.

As with the PreSets, the MainSet is generally broken down into a series of three rounds of a given set. This is as much designed psychologically as it is physiologically. As an example think of a swimmer competing in a 200 yard event. With nearly every swimmer the third 50 is almost always the slowest part of the race. The swimmer is almost instinctively thinking, "Ah, the third 50, I can rest here and really jump on that final 50!" In the *SprintSalo* design the swimmer begins to think, "Ah, the third round, this is the last round. I better make this one count!" This thinking and pace shows up in races. The swimmer has rehearsed over and over again to keep the effort through the third phase of the set.

Many times the MainSet consists of specifically described Rehearsal Swims. These swims are rehearsals of the swimmers primary event, and consist of one to three all-out efforts at the full race distance.

I believe that there are basically two components to swim training. The first component involves the training of the physiology which can be accomplished either traditionally or by very non-traditional means. The second component consists of learning "how" to swim the race. This involves learning to feel the pace of the race, feeling the distance of the race, acclimatizing to long course, etc. This is secondary to training of the physiology, simply because if the body isn't prepared to swim a peak performance you aren't going to be able to teach it what it can't do.

The swimmer that utilizes this approach to training will find with a great deal of fascination how 3,000 to 3,500 yards can feel as intense as any 8,000 to 9,000 yard workout. As a coach I find that as the swimmer reaches the point where they just can not put out any more effort, they have reached the final yard of a 3,000 to 3,500 yard workout. Because the design of the *SprintSalo* program involves only one-a-day workouts rather than the customary double-workouts, the swimmer can recover within 24 hours and be ready to put in another intense training session the following day.

Following each training session I suggest the WarmDown. The swimmer takes 200 to 400 yards to adequately loosen down and recover. An adequate amount of recovery swimming is best determined by asking the swimmer to WarmDown until they feel they could do another intense Rehearsal Swim.

Chapter Five:

THE PULSE PLOT ALTERNATIVE

(Edited and reprinted with permission from *Swimming World*.)

If you listen to the conversations between coaches and their swimmers at swim meets, especially following a poor race, you hear some very interesting things. I recently overheard a rather technical talk a coach was giving his swimmer after the girl failed miserably to make her national cuts in the 500 freestyle. The conversation went something like this:

Swimmer: "What happened!? I felt awful on that swim."

Coach: "Well, from your lactates I'd say that you're tired and you did about the best you could expect. Once the lactate profile begins to shift to the right and your V4 shifts to a higher speed, then we can expect to see an improved performance...."

As coaches we have all tried to explain away our swimmers' poor performances and it used to suffice to simply regard bad swims as "too early in the season to swim fast" or " swimming tired - remember the 3 x 2000 swims last night." As we have become more and more sophisticated in the training of our swimmers, so too have the explanation for poor swims or excellent swims. Now we have such things as lactate profiles to show our swimmers why they are swimming as they are (good or bad), along with terminology like lactate profiles, V2 speed, threshold speed, etc.

Dave's former writings have addressed the issue of lactate testing and the limitations to its application in training as as interpretation. It should be reiterated that blood lactates cannot give a coach a conclusive picture as to what is going on with the swimmer. But what about an alternative to lactate testing, especially for those coaches who don't have the financial capability to invest in such elaborate testing, or, for that matter, don't feel confident or are skeptical in the use of lactate profiling.

As a coach, and probably more so as a swimmer, we all would like to be able to look at something as definitive as a graph and be able to adequately describe what is happening during training. Generally we assess a training program by the improvements made in sets repeated from season to season. This helps in distinguishing whether a swimmer is getting better each year, but does not adequately address the effectiveness of a given training program through the course of a season. Without expensive equipment (i.e. lactate analyzer) it is possible for a coach to test his swimmers on a regular basis and not interrupt the basic training scheme. One of the major drawbacks to lactate profiling is the exorbitant amount of time needed too collect blood samples and to make analysis of the data.

May years ago I was introduced to a method of testing termed "Pulse Plots" by Larry Lack (formerly Petaluma Swim Club, CA) which uses the relationship between work intensity and heart rate response to generate a profile that can easily and adequately assess a swimmer's training program. Clearly, it is understood that as the intensity of swimming is increased the heart rate response increases in alike manner. Further, as a swimmer gets into better condition the heart rate response at a given workload will decrease. For example, if a swimmer swims his best time of :55 seconds in the 100 yard freestyle and has a heart rate response of 145 beats per minute, when he gets into better condition where :55 seconds is only 80 percent of his best time his heart rate response will decrease to some value less than 145 beats per minute. It is also clear that the well-trained swimmer will recover to a resting level from an exercise bout more rapidly than the untrained swimmer.

It is based on these ideas that the method of Pulse Plots was developed and can be used for interpretation of the training program. The Pulse Plot procedure involves swimming a series of eight 100 to 200 yard/meter swims in a "locomotor" or "pyramidal- type" fashion. Descend the performance time of the first four 100 yard repeats while increasing the percentage of effort on each at 65%, 75%, 85%, and 100% effort. Then ascend the performance time in the last four at 100 yard repeats, while doing 85%, 75%, and 65 percent effort. The series of eight swims is run on an interval of four minutes for 100's and seven minutes for 200's, which allows enough time for a coach to record all the data and the swimmer gets enough rest between each swim.

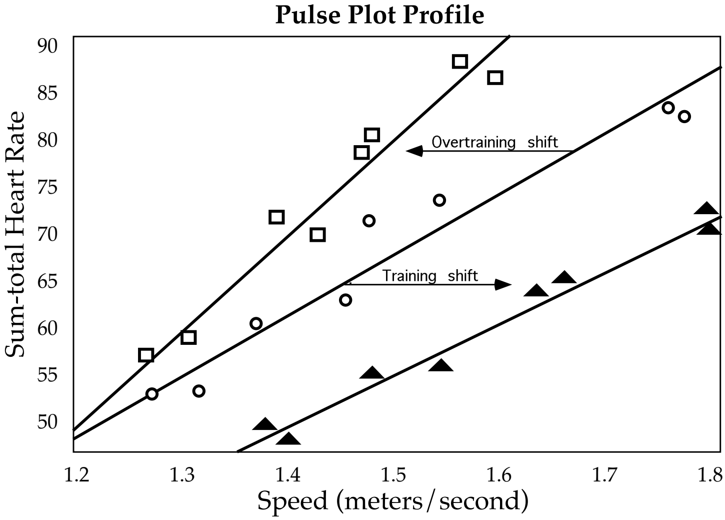
Each swim needs to be performed as outlined above at the given percent of effort and also should be performed at an even pace. With each swim the swimmer takes a :10-second heart rate count immediately after finishing the swim and then additional :10-second heart rate counts at :30 seconds and one-minute after finishing the swim. The coach then records the sum total of the three heart rate counts and the time for the swim.

The data collected can then be analyzed by plotting the sum-total heart rate versus the swimming speed. A line, called a linear regression or best fit line is then drawn through the middle of the points. It is then used as the reference line for successive testing.

Like the lactate profile, as the swimmer becomes better conditioned a shift in the reference line will occur. As previously stated, at any given swimming speed the heart rate response will be lower as the swimmer gets into better "shape" and the heart rate will recover to a resting value more rapidly. As a result the sum-total heart rate at any given speed will be lower and there will be a shift in the curve to the right. The Pulse Plot graph can be used to help the coach determine if his swimmers are overtraining at any point in the season as there would be an expected leftward shift in the Plot. In other words, the swimmer that is overtrained will have a higher heart rate response at low intensities of swimming and his recovery would be slower, which would result in the sum-total heart rate being higher than if he was not overtrained.

The Pulse Plot assessment can be made on a regular basis. I suggest every three weeks. This assessment can assist the coach in maintaining appropriate training levels without overtraining the swimmer. In addition, this method of assessing a swimmer's training program is not nearly as time consuming as lactate profiling and can easily be done with the equipment at hand by all levels of swimmers.

Workout #1 has the Pulse Plot set, and it is repeated every three to four weeks as a measure of the training adaptation. It is important to keep in mind that if a swimming performance test, of any kind, is utilized it should be performed under the same set of circumstances each time. In other words, whether it be a test involving lactate measurements, PulsePlots, etc, the WarmUp and any PreSet should be exactly the same. In this way the test can be



fairly compared from one test to the next.

The PreSets designed in Workout #1 are, in essence, an extension of the WarmUp. It is important that the swimmer is properly prepared to perform the PulsePlot set, though it is not a difficult set to perform.

PulsePlot is based on two concepts. First, an increase in the heart rate (or cardiovascular work) accompanies an increase in swimming intensity. Second, the better conditioned swimmer will recover more quickly following a swim. The set involves swimming eight 100's at a 4:30 interval. The first four 100's have a descending finish time, (70% to 100% effort), and then the last four 100's have an ascending finish time, (100% to 70% effort). Following each swim the swimmer takes a :10 second heart rate count immediately after finishing (i.e. :00 to :10 seconds), :30 seconds after finishing (i.e. :30 to :40 seconds) and then :60 seconds after finishing (i.e. :60 to :70 seconds).

The times and the cumulative heart rates should then be plotted and a line drawn through them. The line or PulsePlot describes the effect of swimming intensity on cardiovascular condition.

By repeating this set periodically the swimmer and the coach can better monitor the training. This practice is again repeated for Workout #25 and Workout #44.

Chapter Six:

THEORY IN PRACTICE

(Edited and reprinted with permission from *Swimming World*.)

Since beginning this enterprise of writing a regular column on physiology I have focused a great deal of attention on training concepts. To say the least, most of the concepts I have brought forth have been on the radical extreme in terms of what is the common practice. To be sure, these concepts have been challenged, not for the lack of experimental and theoretical evidence, but more for the lack of having produced a recognizable "elite" athlete. In order to provide some practical support for the training model that I have attempted to describe, I trained a group of swimmers, all Masters athletes except for one, utilizing the concepts that I have extensively described. In this chapter I want to detail the training program that I utilized and the results of the program for the one athlete that was training to compete in national competition.

At the outset of the training program I limited training to 4,000 yards per training session, one session per day. I held to this limit for a period of three weeks when I did some soul-searching and felt that 4,000 yards was more than enough. From the fourth week on the training distance rarely surpassed 3,000 yards. It is important to also note that the training over the eight week period, described herein, was done in a 25-yard pool with only occasional access, three times, to a 50-meter pool.

Training sessions were generally composed of a WarmUp of less than 1,000 yards, followed by pulling or kicking sets, generally between 500 to 1,000 yards total, followed then by sprint-specific training. Sprint-specific training consisted of short sets of above race-speed swimming with sufficient rest to ensure that each swim would be maximal. The repeat distances during these sets for the majority were 75 yards or less. In order to focus greater attention on performance the swimmers were given time specific goals for every distance, including 25 yards, as minimum performance requirements. Following an extensive WarmDown the final set could be described as a Rehearsal Swim, one in which the swimmers would swim their particular event, under race-like conditions. In several instances they would perform three such Rehearsal Swims (up to 200 yards) with three to four minutes rest between each. These types of sets are similar to the commonly referred lactate tolerance swims. Beyond the first set, following the WarmUp, the remaining yardage was always performed at maximal effort.

Many of the rest intervals between swims are often dictated by what I have referred to as Heart Rate 23, H.R. $_{23}$. Between swims the swimmers rest until their heart rates return to 23 beats in a :10 second count. Recovery, therefore, was individualized with the swimmers in better shape swimming at a faster pace and needing less rest.

Every two weeks the swimmers were tested to determine the affect of the high-intensity training program utilizing what I have previously described as Pulse Plots.

In the course of these eight weeks there were 32 actual training days. In addition, Rod competed in four meets, shaving for the final meet on day 55. Rod experienced improvements at all distances in a progressive manner. Despite the fact that the program was extremely limited in yardage and there was no need for a taper, Rod had substantial improvement at all race distances upon shaving in the final meet. In fact, in one week's time Rod had an eight-second improvement in the 200 free to qualify for the Junior National Championships, and narrowly missed qualifying for the 400 and 800 meter events with time drops of :13 and :17 seconds, respectively from one week previously.

Since originally proposing these concepts of swim training the primary concern of coaches has been the lack of substantial mileage that they believe is necessary to provide the distance swimmer with sufficient aerobic endurance to swim the longer distances. A table is provided at the end of this chapter to demonstrate that the performances noted were well swum and surely do not appear to be the swims of a swimmer carting around a "piano" on his back.

High-intensity training, as I have described it, is effective in providing the necessary aerobic base and at the same time enhancing the anaerobic capacity needed to swim successfully at distances between 50 and 800 meters. This training is successful at least to the same extent as that expected with the traditional training program. Further, it appears that high-intensity training, as has been previously detailed, is less time-intensive (i.e. only eight weeks) and does not necessitate a customary taper to be effective. High-intensity training should be regarded as an efficient means of training. One additional observation that is important to recognize is the fact that the effect of the shave results in substantial time drops, as might be expected during a full traditional taper and shave.

It should be evident that a program of less than 4,000 yards per day (and I would speculate that even less than 3,000 yards) will indeed result in performance improvements at all race distances, if done appropriately. I can, however, understand a coaches reluctance to jump on the bandwagon and drop all preconceived notions regarding training to begin a limited program as I have described. I can further understand a greater reluctance on the part of coaches of distance swimmers. For those athletes training for events of 400 meters and less, however, I must continue to question the the justification of such training principles that dictate daily peak mileage figures to the extreme that they are. As a friend of mine recently expressed to me, "If you're going to play the piano ... don't practice the tuba!"

SPLIT TIMES FOR FREESTYLE EVENTS - 50 TO 800 METERS

50 Meters	100 Meters	200 Meters	400 Meters	800 Meters
25.66	27.0	58.4	1:01.3	1:02.8
	55.8(28.8)	1:58.9 (1:00.5)	2:06.3 (1:05.0)	2:08.8 (1:06.0)
			3:11.6 (1:05.3)	3:15.2 (1:06.4)
			4:13.8 (1:02.2)	4:22.7 (1:07.5)
				5:30.7 (1:08.0)
				6:38.4 (1:07.7)
				7:45.7 (1:07.3)
				8:49.9 (1:04.2)

Chapter Seven:

SaloSlang Glossary

@	On, as in a send-off time interval. For example, 4 x 50 yards @ (on) 1:00 minute each.
3:3 (right arm:left arm)	3 pulls with the Right Arm only :3 pulls with the Left Arm only. 3:3:3 is 3 with R.A., 3 L.A., 3 Both Arms.
B.C.	Breath Control. B.C. 3, 5, 7 means to breath after three strokes, then take another breath after five strokes, then take another breath after seven strokes. This cycle repeats with the next breath after three strokes, etc. Also called Hypoxic Swimming.
Broken R.I. :10	Broken rest interval found between different segments of a whole. i.e. 50 yds. + 25 yds. Broken R.I. @ :10 @ 1:15. Swimmer completes the 50 yds. then takes the Broken Rest Interval of :10 seconds. Then the swimmer completes the 25 yds. The entire interval for the 50 + 25 is 1:15.
Buckets	This is similar to using a drag suit but harder, less expensive and more noticeable. Swimmer attaches a belt around the waist. Then one end of a rope is tied to the belt and the other end is tied to a normal, plastic, household bucket. Putting a hole in the bottom of the bucket lets air escape. The rope's length allows the bucket to extend two feet beyond the swimmer's feet. The swimmer then swims and pulls the attached bucket which created a large amount of drag, especially as the speed increases. Different size buckets make different levels of difficulty. Idea source: Richard Schoulberg, Germantown Academy, PA.
Build	Start at a gradual speed and effort and conclude at full speeds. Accelerate into top speed by the conclusion or finish.
Catch-Up	A freestyle stroke drill where one hand is always extended in front of the head in a streamlined glide position while the other arm pulls with a proper stroke mechanics. One hand catches up to the other hand at the entry part of the stroke, then the other hand which was in the extended glide position begins to make its pull. This is slower than normal swimming.
C.I.	Coaches Interval. The coach say's "Go" instead of looking for the exact time from the pace clock. C.I. sets have alternative rest intervals in brackets.
Descend by 25's	The last 25 yards is the fastest time, the first 25 is the slowest time. The finish time needed to complete the same distance is less, hence the numbers descend.

Descend in sets of three: Example: 9 x 50 has #1 = slow; #2 = medium; #3 = fast; #4 = slow; #5 = medium; etc.

Double underwater pull-through: Used in breastroke swimming to exaggerate the mechanics of the push-off and underwater pull-out at the start of each length.

In/Outs: Not to be confused with Out/Ins.

Fists: A stroke drill in which the swimmer's hands are closed and made into a tight grip or fist. The fists reduces the normal surface area of the pulling hand.

GoalPace: The swimmer's end-of-season goal time is used to figure GoalPace. The total race time is divided into the matching segment desired to figure GoalPace. For example, a swimmer's end of season goal time for the 200 yard free is 1:50.00. That is equal to 110 total seconds. Use division to get GoalPace for a 25 yard distance (8 lengths) = 13.75. Goal pace for any practice distance can be figured. Do not worry about different splits throughout the race or other factors, such as the dive, turns, etc. GoalPace is also used to figure P_{100}'s, etc.

Holding P_{100}: Holding Pace 100's means the swimmers strive to repeat the pace 100 time in each of the swims in that set. Hold means to consistently repeat or perform a time that is the prescribed speed. See GoalPace.

H.R.: Stands for Heart Rate. One's heart rate is normally the number of beat per minute. One's maximum heart rate is normally 220 - age in years.

H.R. $_{23}$: Heart Rate 23 is a term used in *SprintSalo* that dictates rest intervals. Between swims the swimmer rests until his or her heart rate returns to 23 beats in a :10 second count. Recovery is individualized. Swimmers in better shape swim at a faster pace and need less rest.

KickWidths: Kicking across the shorter width of the pool instead of the length. Sometimes done underwater so the lane lines do not have to be removed.

Kick - Stroke into wall: Often Kicking sets are done with the swimmer instructed to take a stroke into each wall. This helps keep the arms fresh and helps with the proper turn mechanics at fast pace.

Kick - Wall-&-Scull Kick Sprints — A drill which is always described inside the practice description.

Kick - WallKick — A method of kicking against the wall for added strength and resistance. This is often followed by a flip turn against the same wall.

MiniGym — A strength training machine often used with swimmers for its ability to offer variable resistance at controlled speeds. Push-ups, press-ups or surgical tubing could serve as a replacement exercise for the use inside the practice.

Naked Paddles — Swim with hand paddles placed against the hands but do not strap or fasten the fingers to the paddles. When pulling, keep the paddles pressed against the hand with the pressure of the water. When recovering between strokes, clasp the paddles around the outside with the finger tips. Source is Don Watkinds, Bellflower, CA.

Odd lengths — Every other length of a swim (i.e. first, third, fifth, etc..) as opposed to every even length.

Out/Ins — Start at the wall at the end of the lane. Sprint out toward the middle of the pool for the prescribed distance and do a flip-turn in the middle of the lane without the benefit of a wall for a push-off. Attempt to maintain full-speed with the change of direction even though there is no wall to flip against.

Open Water Turn — A Flip Turn intentionally executed away from the wall so there can be no push-off from the wall. Open Water Turns are done with Out/Ins drills.

P_{200} — Pace 200. See Holding $P1_{00}$ and GoalPace.

PeekSwim — A drill that teaches motor-nervous adaptations through a sensation where the eyes are closed for a short period and the body performs without the sight sensory input. The swimmer takes constant peeks to keep a safe distance from everything. Do not do this drill with other swimmers in your lane or anywhere the walls. Be Careful! Tell those around you what you are doing and have them watch and protect you.

Perimeter Kick — A kicking drill where the swimmers transverse around the pool instead of the normal back-in-forth pattern inside one lane.

Primary Stroke — This is the swimmer's best stroke or one used most often for the team's line-up. Freestyle can be a Primary Stroke.

Pulse Plots	A swimming fitness test where swim speed and heart rates can show a relationship to fitness. Workout #1, Workout #25, Workout #44. An chapter is dedicated to this theory.
Recovery	Rest
Rehearsal Swim	A practice challenge to simulate a race-day setting and performance.
[R. I.] [R. I. :30]	Rest Interval. Rest Interval for :30 seconds.
[R.I. :20/:10/:20]	Rest Interval is :20 seconds for #1, then :10 seconds for #2 and then :20 seconds for #3.
Sprint	This is what it is all about.
Stationary sculling	Sometimes done under the flags for :10 seconds before resuming the length. Stationary sculling is a drill which is much like treading water.
Stationary Kick	Sometimes done under the flags for :10 seconds.
Stretch	Stretch swimming is to go with long, easy, slow strokes to exaggerate the length of pull and to stretch the arms in a recovery method. Same as StretchSwim.
Stroke	Stroke swimming is not freestyle, but either backstroke, breastroke or butterfly.
Stroke Drill	There are a countless variety of stroke drills.
Scull	A stroke drill that practices a feel for the water where the hands move in a pitched palm position in a side to side action instead of pulling forward and backwards.
yds.	Abbreviation for yards. Not always present in every practice explanation.
VO_2	Maximal oxygen consumption capacity - max oxygenuptake.
VK Vertical Kick	Vertical Kick 6 x :20 seconds with :40 seconds rest. Example: Push off bottom into streamline kick holding the streamline.
Vertical Board	Kicking drill used in the last 5 yards of each length on some kicking sets. Swimmer grabs the kick board and holds it in a vertical position under the water creating a great deal of increased resistance as the board acts like a submerged wall which the swimmer pushes against.

Chapter Eight:

Practice Phrases and Set Directions

The following instructions are written for those who already understand how to follow intervals and use a pace clock. If you have never been exposed to typical swim practice writings, then seek some assistance. Ask a friend, lifeguard, experienced swimmer or best yet, a swim coach, to explain "interval training and how to use a pace clock."

SprintSalo Example:

Pull - 3 x (2x50 + 4x25 + 2x50) @ :50/:30/:50 [R.I. :20/:15/:20]
50's = Even Pace.
25's = Fast without breathing regardless of stroke.

First hint, read the entire paragraph. Each set of instructions are separated by a blank line. Expect to re-read the instructional paragraph a few times before comprehending all the different details.

All time interval numbers are written with a colon, such as "**:50**." Another key to finding the intervals is to look after the "**@**", which stands for "on."

An important set of information occurs inside the brackets. The numbers in the [brackets] are alternative rest intervals. These rest interval times can serve a substitutes to the prescribed intervals and send-offs. The intervals in the *SprintSalo* practices were established for college level swimmers, and most swimmers will have to adjust the intervals to match their respected speeds.

In the example above, the rest intervals in the brackets can take the place of the prescribed send-off interval. Instead of doing the first two fifty yards on :50 seconds each, an individual can swim fifty yards followed by :20 second rest then go for the next repeat. With the times in the brackets, swimmers of different speeds can adjust their own intervals according to the amount of rest intervals.

Another advantage to the alternative brackets containing [R.I. :seconds] is the freedom from the use of a pace clock. If your facility lacks a working clock, or you can not see the time from in the pool, the rest intervals make a suitable substitution.

The alternative times in the brackets are not need in many of the sets. the bracket alternatives are not needed in these instances as the set is written for universal rest intervals. These universal rest intervals are dependant on either rest interval seconds or heart rates, which are written like, "H.R. $_{23}$."

The number of repeats precedes the yardage numbers. Some times in more complex statements the term, "**yds.**" is used following a number to designate that number as a distance number instead of a repeat number.

When possible, a space is used around the "**x**". In longer statements, with the repetitions and yardage change frequently, the space is removed. Removing the space before and after the "**x**" shows the relationship between the sub-sets in the formula.

The Plus Sign "**+**" is used to connect different segments, one after another. Sometimes additional rest occurs at the place of the "**+**" sign and sometimes there isn't. Extra rest or recovery time is signaled by the Broken Interval followed by the time often stated as "**B.I. :05**." In the example above, the set of four x 25 yds. should follow after the second 50 yds. on :50 second interval.

Most of the lines that follow the lead statement are for modification and additional details. Specific stroke directions, break intervals, and other fine points are listed on their own line which modify the top line.

Periods and semi-colon marks also aid in understanding.

1

WarmUp:
400 + 4x100 + 4x50

PreSet:
4 x (3x25 Free + 25 Stroke) @ :25/:30 [R.I. :10]

Kick - 4 x 20 yds. (widths) each stroke
Streamline Kick underwater @ C.I. [R.I. :10]

MainSet:
Pulse Plots - 8 x 100 @ 4:30 Primary Stroke [R.I. 3:00]
Percentage Effort is:
70 - 80 - 90 - 100 - 100 - 90 - 80 - 70

WarmDown:
200 - 400

This workout is repeated every three to four weeks as a measure of the training adaptation. It is important to keep in mind that if a swimming performance test, of any kind, is utilized it should be performed under the same set of circumstances each time. In other words, whether it be a test involving lactate measurements, PulsePlots, etc, the WarmUp and any PreSet be exactly the same. In this way the test can be fairly compared from one test to the next.

The PreSets designed above are, in essence, an extension of the WarmUp. It is important that the swimmer is properly prepared to perform the PulsePlot set, though it is not a difficult set to perform.

The basis behind the PulsePlot set is described in the appendix. Briefly, the PulsePlot is based on two concepts. First, an increase in the heart rate (or cardiovascular work) accompanies an increase in swimming intensity. Second, the better conditioned swimmer will recover more quickly following a swim. As indicated above, the set involves swimming eight 100's at a 4:30 interval. The first four 100's have a descending finish time, (70 to 100% effort), and then the last four 100's have an ascending finish time, (100 to 70% effort). Following each swim the swimmer takes a :10 second heart rate count immediately after finishing (i.e. :00 to :10 seconds), :30 seconds after finishing (i.e. :30 to :40 seconds) and then :60 seconds after finishing (i.e. :60 to :70 seconds).

The times and the cumulative heart rates should then be plotted and a line drawn through them. The line or PulsePlot describes the effect of swimming intensity on cardiovascular condition.

By repeating this set periodically the swimmer and the coach can better monitor the training. This practice is again repeated for workout #25 and workout #44. For more detailed information the reader is instructed to consult the appendix.

2

WarmUp: 400 + 4x100 + 4x50

PreSet: 3 x 200 I.M. - Kick one-half lap/Sprint Swim one-half lap @ H.R. $_{23}$

6 x 75 I.M. Order Alternate 50+25/25+50 Broken R.I. :05 @ 1:10 [R.I. :10]
#1 = 50 Fly + 25 Back;
#2 = 25 Fly + 50 Back;
#3 = 50 Back + 25 Breast;
#4 = 25 Back + 50 Breast;
#5 = 50 Breast + 25 Free;
#6 = 25 Breast + 50 Free.

Pull/Scull - 6 x 100 @ 1:30 - 1:45 [R.I. :15]
20 yds. Head-up Scull + 55 Pull + 25 Sprint Pull.

MainSet: **Sprinters:** - 3 x (3x25 + 50 yds.)
25's @ R.I. :05, Sprinting.
50's @ R.I. 2:00, Holding P_{100}.

Or: Others:
- 3 x (3x25 @ R.I. :05 + 75) @ R.I. 2:00
25's = Sprinting.
75 = Holding P_{200}.

200 yds. StretchSwim
3 x (3x50) @ H.R. $_{23}$ Holding P_{200}.

WarmDown: 200 - 400

3

WarmUp:

400 + 4x100 + 4x50

PreSet:

9 x 50 I.M. Order @ 1:00 Kick + swim through walls [R.I. :15] i.e.: #1 = 25 yds. Fly + 25 yds. Back; #2 = Back/Breast; #3 = Breast/Free.

MainSet:

Kick/Swim Drill - 2 x (6 x 50) @ 1:00 [R.I. :15]

Round #1 = Stationary kick at flags for first :10 seconds;

Round #2 = Stationary kick at flags for :05 seconds.

2 x (6 x 25) @ :35 [R.I. :10]

Round #1 = Stationary kick at flags for :10 seconds;
Round #2 = Stationary kick at flags for :05 seconds.
(Note: Breast and Fly kick is done against the wall.)

Vertical Kick - 6 x :20 seconds @ R.I. :40

Push off bottom into streamline kick holding the streamline keeping the arms extended upward.

3 x 225 Primary Stroke @ C.I. [R.I. :30]

Breast = 50 yds. Kick + 50 yds. Pull + 25 yds. Build + 50 yds. Kick + 50 yds. Pull.
Back & Fly = 50 yds. Right Arm + 50 Left Arm + 25 Build + 50 yds. Right Arm + 50 Left Arm.
Free = 50 yds. Catch-up + 25 yds. Build + Repeat + Repeat

Sprinters:

4 x 8 yds. (in/out of flip turn) Sprint @ R.I. :30
150 Stretch - Breath Control (B.C.) 3,5,7
4 x 15 yds. (in/out of flip turn) Sprint @ H.R. $_{30}$
150 Stretch - B.C. 3,5,7
4 x 20 yds. (in/out of flip turn) Sprint @ R.I. :30
150 Stretch - B.C. 3,5,7

Or - Stroke:

10 x 20 yds. (in/out of flip turn) @ 1:00 [R.I. :30]

WarmDown:

200 Minimum

WarmUp: 400 + 4x100 + 4x50

PreSet: 6 x (75 I.M. Order + 50 Free) @ Broken R.I.
:10 @ 2:00 [R.I. :15]
Take 1:00 Recovery after #3.
75's = Build.
50's = Sprint 50's.

Pull - 4 x (2x25 @ :25; + 50 @ :50; + 100 @ 1:15; + 50 @ :50; + 2x25 @ :25) @ :30 - :45 seconds rest before each round.
[R.I. :10/:20/:10/:20/:10]

Kick - 3 x (4x25 + 50) @ :30/1:00 [R.I. :10/:20]
25's = Sprint.
50's = Stretch while working walls.

MainSet: 3x50 + 50 @ R.I. :10 + :30 extra rest before final 50 yds.
Hold P_{200}.

WarmDown: 200 - 400

5

WarmUp: 400 + 4x100 + 4x50

PreSet: 12 x 25 @ :20 finish with flip [R.I. :05]

6 x 8 yds. (in/out of flip turn) @ R.I. :15
100 Sprint for time.
6 x 15 yds. (in/out of flip turn) @ R.I. :15
100 Sprint for time.
6 x 20 yds. (in/out of flip turn) @ R.I. :15
Take an extra 1:00 rest.
100 Sprint for time.

MainSet:

Pull - 1 x (50 Pace + 100 Fast + 50 Pace) @
1:00/1:15/1:00 Free or
@ :1:05/1:30/1:05 Stroke [R.I. :30/:10/:30]
2 x (50 Pace + 50 Fast + 50 Pace) @
:50/1:15/:50 Free or @ :55/1:30/:55 Stroke
[R.I. :20/:10/:20]
1 x (50 Pace + 100 Fast + 50 Pace) @
:40/1:15/:40 Free or @ :45/1:30/:45 Stroke
[R.I. :10/:10/:10]

5 x (2x25 + 50) @ R.I. :10 @ C.I. [R.I. :30 - 1:00]
Hold P_{100}.

7 x 75 Holding P_{200} of stroke. [R.I. :30 - :45]
Alternate:
Odd #'s = Free @ 1:30.
Even #'s = Primary Stroke @ 1:45.

WarmDown: 200 - 400 Minimum

WarmUp: 400 + 4x100 + 4x50

PreSet: Drills - 20 x 25 yds. @ C.I. [R.I. :20]

MainSet:

4 x 150 Breast - Kick 100 yds. + Pull Drill 50 yds.
with double underwater pull-through on odd lengths.

3 x 100 Freestyle - Catch-up 75 yds. + Sprint for 25 yds.

2 x 75 Backstroke - One-arm for 25 yds. using 3:3 (right arm:left arm) + 25 yds. Double-arm (simultaneous) + 25 Sprint

1 x 50 Fly - half-lap Scull + half-lap Kick + 25 Sprint

WarmDown: 200 - 400

7

WarmUp:
400 + 4x100 + 4x50

PreSet:
Kick - 3 x (3x50 + 100)
50's = Fast @ 1:00 with stroke into walls.
100's = Descend by 25's @ 2:15.
[R.I. :15 for 50's and :30 for 100's
Pull - 4 x (2x50 Pace with paddles + 50 Fast with full gear + 3x25 Sprint with full gear)
If Freestyle then @ :45.
If Stroke then @ 1:00.
Take :30 Recovery between rounds.
[R.I. :15]

MainSet:
3 x (3x25 + 50) @ :40/1:00 [R.I. :20/:40]
Hold P_{100}

WarmDown:
200 yds.

MainSet:
3 x 200 @ 4:00 [R.I. 3:00]
Race Simulation

WarmDown:
200 - 400

8

WarmUp:

400 + 4x100 + 4x50

PreSet:

Pull - 3 x (3x50 + 100)
50's = Paddles only @ R.I. :10.
100 = Full Gear @ R.I. :30.
Descend each round.

Swim - 4 x (50 + 75 + 50)
@ R.I. :15/ R.I. :20 /R.I. :25 /R.I. :30.
Choice Stroke per round.
Hold H.R. $_{30}$.

MainSet:

I.M. - 4 x [(75+25) + 50] (@ Broken R.I. :10 between the 75 and 25) @ 1:30. The 50 yds. @ 1:00.
One round of each stroke for the (75+25) + 50 Free
Hold pace for 400 I.M. the 50 free being the same speed as the next stroke in I.M. order.
[R.I. :15/:30]

Stroke/Free - 4 x (3x50 + 75) @ H.R. $_{23}$
50's = Hold P_{100} + :05
75 = Hold P_{200}.
Take 1:00 Recovery between rounds.

Sprint - 4 x (3x25 + 75) @ R.I. :35.
25's = Drill.
75 = P_{200}.
Drills: Lap 1 - Clenched fists;
Lap 2 - Rapid turnover;
Lap 3 - Sprint.
Take 1:00 Recovery between rounds.

WarmDown:

200 - 400

9

WarmUp:
400 + 4x100 + 4x50

PreSet:
9 x 50 I.M. Order @ 1:00 [R.I. :20]
Descend in sets of three.

Kick - 4 x (3x25 + 100) @ :30 for the 25 yds. @ 2:15 for the 100's. [R.I. :10/:30]
25's = Sprint with stroke into wall.
100's = Stretch.

Pull - 4 x (2x50 + 100) @ :50 for the 50's and @ 1:45 for the 100's. [R.I. :20/:30]
Build into pace 50's/Hold fast pace 100's.

8 x 25 @ :45 Sprint [R.I. :30]

MainSet:
Rehearsal Swim
6 x 100 @ 8:00 [R.I. 7:00]
Take Heart Rate at 0-10; 30-40; 60-70 seconds after each swim.

WarmDown:
200 -400

WarmUp:

400 + 4x100 + 4x50

PreSet:

Kick - 3 x (3x25 + 2x75) @ :40 for the 25's and @ 1:30 for the 75's. [R.I. :20/:30]
25's = :10 seconds stationary sculling under flags at start of each 25.
75's = Kick 25 yds. + Swim 25 yds. + Kick 25 yds.
Maintain tight streamline.

8 x 25 Kick @ :40 Sprint [R.I. :20]

Pull - 4 x (2x50 + 100 + 2x50) Freestyle intervals @ :40/1:20/1:00
Or, Stroke intervals @ :50/1:40/1:30
#1 = Build; #2; = Pace #3; = 100 yds. normal; #4 = Sprint; #5 = Sprint.
[R.I. :10/:15/:30]

8 x 25 Pull @ :40 Sprint [R.I. :20]

MainSet:

Buckets - 4 x (3x25 + 50) @ :45 for the 25's and @ 1:30 for the 50's.
[R.I. :15/1:00]
25's with bucket.
50's without buckets.

WarmDown:

200 - 400

11

WarmUp: 400 + 4x100 + 4x50

PreSet: 6 x (50 + 25 + 50) @ :50/:50/:50 [R.I. :10/:10/:30]
#1 = 50 yds. Kick; #2 = 25 yds. Kick; #3 = 50 yds. Pull; or:
#1 = 50 yds. Catch-up; #2 = 25 yds. Head-up scull; #3 = 50 yds. Build Sprint.

3 x (3 x 75) @ :50 for #1-3; @ :55 for #4-6; @ 1:00 for #7-9.
[R.I. :05/:10/:15 per round]
Holding P_{200}.

MainSet: 4 x (50 + 2x25 + 50)
Round 1 = @ :40 [R.I. :10/:20/:10]
Round 2 = @ :45 [R.I. :15/:25/:15]
Round 3 = @ :50 [R.I. :20/:30/:20]
Round 4 = @ :55 [R.I. :25/:35/:25]
#1 = 50 yds. holding P_{200}; #2 & #3 = 25 yds. Sprint; #4 = 50 yds. holding P_{100} + :02.
Take 1:00 Recovery between rounds.

WarmDown: 200 - 400

12

WarmUp:

400 + 4x100 + 4x50

PreSet:

4 x 100 Broken @ 1:30 to 1:40 [R.I. :30]
#1 = 75 yds. + 25 yds; #2 = 50 + 50; #3 = 25 + 75; #4 = 100 yds. without a break.
Broken R.I. :05 as indicated.

6 x 75 @ 1:15 [R.I. :15]
Lap 1 = Half-lap Streamline Kick + half-lap Sprint;
Lap 2 = Half-lap Fists only + half-lap Sprint;
Lap 3 = Full-lap Sprint.

6 x 75 @ 1:15 [R.I. :15]
Lap 1 = Half-lap fast turnover/half-lap Sprint;
Lap 2 = Full-lap PeekSwims;
Lap 3 = Full-lap Sprint.

MainSet:

4 x (3x25 + 50)
Round 1 = @ R.I. :05;
Round 2 = @ R.I. :10;
Round 3 = @ R.I. :15;
Round 4 = @ R.I. :20.
25's = Sprint.
50 = Hold P_{200}.
Take :30 Recovery between rounds.

1 x (50 + 75 + 50) @ 1:00/1:00/1:00 [R.I. :30/:15/:30]
Hold P_{200}.

WarmDown:

200 - 400

13

WarmUp:

400 + 4x100 + 4x50

PreSet:

WallKick - 6 x 50 @ 1:00 [R.I. :20]
Streamline kick against wall for :05 seconds without a breath. Immediately flip and Sprint 50 yds. finishing with another flip turn.

Kick Fast - 2 x 50 @ 1:00 [R.I. :20]
Kick Fast - 3 x 75 @ $H.R._{23}$ [R.I. :20]
Kick Fast - 2 x 50 @1:00 [R.I. :20]
Important: This entire set is performed fast!

Pull - 3 x (75 + 50) Broken R.I. :10 @ 1:45 [R.I. :15]
#1 = (Build 50 + Sprint 25) + 50 Sprint;
#2 = (Build 25 + Sprint 50) + 50 Sprint;
#3 = (Sprint 75) + 50 Sprint.

3 x (75 + 50) R.I. :15 @ 2:00 [R.I. :30]
As outlined above.

MainSet:

3 x 50 @ :45 [R.I. :15] + 100 + 25 @ R.I. :05
100 StretchSwim
3 x 50 @ :50 [R.I. :20] + 100 + 50 @ R.I. :05
100 StretchSwim
3 x 50 @ :55 [R.I. :25] + 100 + 75 @ R.I. :05
100 StretchSwim
3 x 50 @ :60 [R.I. :30] + 100 + 100 @ R.I. :05
Each round 50's = hold P_{200}.
Each broken swim hold P_{200} + :01.5.

WarmDown:

200 - 400

WarmUp:

400 + 4x100 + 4x50

PreSet:

6 x 75 I.M. Order @ 1:10 [R.I. :10]
Alternate Broken Stops:
Odd #'s = 50 yds. + Broken R.I. :05 + 25 yds.;
Even #'s = 25 yds. + Broken R.I. :05 + 50 yds.
Alternate I.M. Order Stokes:
#1 = 50 Fly + 25 Back; #2 = 25 Fly + 50 Back;
#3 = 50 Back + 25 Breast; #4 = 25 Back + 50 Breast;
#5 = 50 Breast + 25 Free; #6 = 25 Breast + 50 Free.

Kick/Swim - 3 x (3x25 yds. @ R.I. :10 + 100 yds. @ 1:30 [R.I. :20])
25's = :10 seconds stationary kick before 25 yds. Sprint. Then finish with a flip turn.
100's = 100 yds. Sprint swim with streamline kick 5 yds. in/out of every turn.

KickWidths - 3 x 40 @ :45 [R.I. :15]
(2 laps across width of pool) each stroke. Streamline kick except the last 5 yds. Sprint swim into wall.

MainSet:

3 x (4x25 yds. + 75 yds.)
#1-3 of the 25's = Sprint @ R.I. :05;
#4 of the 25's = Stretch @ R.I. :15.
75 yds. = Hold P_{200}.
Take extra 1:00 Recovery between rounds.

WarmDown:

200 - 400

15

WarmUp:
400 + 4x100 + 4x50

PreSet:
VK = Vertical Kick
3 x (VK :15 sec. + 50 yds.) @ 1:15 [R.I. :30]
50 yds. StretchSwim
3 x (VK :15 sec. + 50 yds.) @ 1:15 [R.I. :30]
50 yds. StretchSwim
3 x (VK :15 sec. + 50 yds.) @ 1:15 [R.I. :30]
50 yds. StretchSwim

Pull - 3 x (3x50 + 100) 50's @ :50 and 100's @ 1:30-1:45 [R.I. :15/:30]
50's = Hold P_{200} + :05
100's = Descend 1 to 3 to P_{200} + :02

6 x 25 @ :30 [R.I. :15]
Paddles only - Build to Sprint.

100

MainSet:
5 x (50 + 25 @ Broken R.I. :10 @ 1:15) [R.I. :10/:45]
50 yds. = Build to Sprint and hold P_{200};
25 yds. = Sprint.

WarmDown:
200 - 400

WarmUp: 400 + 4x100 + 4x50

PreSet: 3 x (2x75 + 100 + 2x75) @ 1:15 [R.I. :15/R.I. :30/R.I. :15]
Alternate 75's:
Odd laps = Naked Paddle Sculling;
Even laps = Naked Paddle Swimming.
100 = Descend to full Sprint.

Kick - 16 x 25 @ :35 [R.I. :15]
Last 5 yds. hold board in vertical position.

MainSet: 3 x 50 @ H.R. $_{23}$ Holding P_{200}
LoosenDown for 100 yds.
4 x 75 @ 1:00 Holding P_{200} [R.I. :20]
LoosenDown for 100 yds.
3 x 50 @ H.R. 23 Holding P_{200}
LoosenDown for 100 yds.
4 x 75 @ 1:00 Holding P_{200} [R.I. :20]
3 x 50 @ H.R. $_{23}$ Holding P_{200}

WarmDown: 200 - 400

17

WarmUp: 400 + 4x100 + 4x50

PreSet: Kick - 3 x (4x25 + 100) 25's @ :30 and 100's @ H.R. $_{23}$ [R.I. :20]

25's = Sprint.
100 = Take 100 out like 25 yds. and try to hold speed.
Take stroke into each wall.

Pull - 3 x (3x50 + 100 + 50)
50's = Holding P_{200}.
100 + 50 = Swim with paddles only and broken with the appropriate interval as indicated.
Round 1 = 50's @ 1:00; Broken R.I. :10 [R.I. :30];
Round 2 = 50's @ :50 ; Broken R.I. :15 [R.I. :20];
Round 3 = 50's @ :40; Broken R.I. :20 [R.I. :10];
Take 1:00 Recovery between rounds.

200 WarmDown

MainSet: 16 x 50 @ 1:00 [R.I. :15]
Alternate 25 yds. Sprint + 25 yds. Stretch Swim
#4, #8, #12 & #16 = Sprint the entire distance.

8 x 50 @ H.R. $_{23}$
Each 50 is a maximum effort swim.

200 WarmDown

200 Rehearsal Swim

WarmDown: 200 - 400

WarmUp: 400 + 4x100 + 4x50

PreSet: 4 x (3x50 + 3x25) 50's @ C.I. and
25's @ :30 [R.I. :15] 50's broken R.I. :20 during
which time the swimmer exits the pool to complete :10
seconds of triceps extension on a MiniGym. Descend 25's.

Pull - 3 x (3 x 75)
Round 1 = Free @ 1:00 [R.I. :10];
Round 2 = 25 stroke + 50 Free @ Broken R.I. :05 @ 1:10 [R.I. :10];
Round 3 = 50 stroke + 25 Free @ Broken R.I. :05 @1:20 [R.I. :10].
Attempt to hold P_{200} for the primary stroke other than freestyle.

Kick - Vertical Board/Horizontal Board
3 x (20 feet + 55 feet) Broken R.I. :10 @ H.R. $_{23}$
3 x (30 feet + 45 feet) Broken R.I. :10 @ H.R. $_{23}$
3 x (40 feet + 35 feet) Broken R.I. :10 @ H.R. $_{23}$

Out/Ins - 10 x (12.5 yds. + 12.5 yds.) @ C.I. [R.I. :30]
Sprint to middle of pool and complete a quick
and effective flip-turn attempting to not loose
any speed with the change of direction.

MainSet:

3 x 25 @ R.I. :05 + (50 + 75) @ H.R. $_{23}$

3 x 25 @ R.I. :10 + (50 + 50) @ H.R. $_{23}$

3 x 25 @ R.I. :15 + (25 + 75 + 25) @ H.R. $_{23}$
All swims are maximum effort.
Swims in parentheses are performed faster than P_{200}.

WarmDown: 200 - 400

19

WarmUp: 400 + 4x100 + 4x50

PreSet: Pull - 4 x (2x25 + 50 + 100 + 50 + 2x25) @ Broken R.I. :10
2 x 25's = Build to pace; 50 = Hold Pace; 100 = Faster; 50 = Sprint; 2 x 25's = Sprint
Heart rate should recover to about 70% of max. before subsequent round is begun.

Kick (no board) - 3 x (3 x 75) @ R.I. :45
Streamline kick against wall for :15 seconds. Then do a flip turn on the same wall. Then streamline kick for 25 yds. Then Vertical Kick for :15 seconds. Then Sprint swim 50 yds. maintaining a strong kick.

MainSet: Buckets - 3 x (4 x 25) @ 1:00 [R.I. :40]
Take 1:00 extra rest between rounds.

200 WarmDown

4 x (3x25 + 25 yds. + 50 yds.)
3 x 25's @ R.I. :05; 25 yds. @ R.I. :15; 50 yds. @ H.R. 23

WarmDown: 200 - 400

WarmUp: 400 + 4x100 + 4x50

PreSet: 16 x 25 @ :20-:25 [R.I. :05]
Finish with flip when doing freestyle.

Pull - 3 x (2x50 + 4x25 + 2x50) @ :50/:30/:50 [R.I. :20/:15/:20]
50's = Even pace.
25's = Fast without breathing regardless of stroke.

Kick - 4 x (2x50 + 100) 50's @ 1:00; 100 yds. @ 1:45 [R.I. :20/:30]
One round of each stroke.
50's = with board.
100's = 100 yds. I.M. - Kick one-half lap/Sprint one-half lap.

MainSet: 3 x (3x50 + 200) 50's @ :40; 200 yds. @ 4:00 [R.I. :10/2:00]
The 50's in Round 1= P_{200} + :05.
The 50's in Round 2 = P_{200} yds. + :02
The 50's in Round 3 = P_{200} yds.
All 200's = 200 yds. stretch swim with a Sprint 5 yds. in/out of every flip turn.

WarmDown: 200 - 400

21

WarmUp:

400 + 4x100 + 4x50

PreSet:

Kick - 3 x (200 + 4x50 + 200) 200 @ R.I. :10; 50's @ 1:00; last 200 @ R.I. :30 [R.I. :20]
Odd laps of 200's = Build swim to flags then Stationary Kick as fast as possible for :10 seconds.
Even laps of 200's = Sprint Swim with strong kick.
50's = Sprint Kick with stroke into wall.

Pull - 3 x (200 yds. + 3x75 + 200 yds.)
Intervals: #1 = 200 yds. @ R.I. :30; #2 = 75 @ 1:10; #3 = 75 @ 1:00; #4 = 75 @ :50; #5 = 200 yds. @ R.I. :45. [R.I. :30/:15/:05].
200's = Stretch Swim and concentrate on stroke.
75's = hold P_{200} + :02.

100 WarmDown

MainSet:

12 x 50 @ 1:00 [R.I. :15]
Alternate: Odd #'s = 25 yds. Sprint
Even #'s = 25 yds. Stretch.

100 WarmDown

3 x 50 @ H.R. $_{23}$. Hold P_{100}.

100 WarmDown

200 Rehearsal Swim

WarmDown:

200 - 400

WarmUp: 400 + 4x100 + 4x50

PreSet: 10 x 50 @ :45 [R.I. :10]
Maintain H.R. 30.

200 WarmDown

MainSet: Rehearsal Swim 200

200 WarmDown

Rehearsal Swim 200

200 WarmDown

Naked Paddles Drill - 3 x 200 @ R.I. :30

Rehearsal Swim 200

WarmDown: 200 - 400

23

WarmUp:

400 + 4x100 + 4x50

PreSet:

Kick/Swim - 9 x 50 I.M. Order @ 1:05 [R.I. :30]
25 yds. Kick + 25 yds. build swim.

Pull - 3 x (2x25 + 75 + 2x25) @ :30/1:10/:30
75 = Hold P_{200}.
Take :30 Recovery between rounds.

MainSet:

Distance Group:

10 x (75 + 25) @ 1:15 with R.I. :05; P_{500} [R.I. :15]

Or - Sprinter Group:

3 x (3x25 + 75 + 25) @ R.I. :05
Take 1:00 Recovery between rounds.

All: Stroke - 4 x (3x50) @ H.R. $_{23}$

Take an extra minute Recovery between rounds.

SwimDown until H.R. = 17 beats in :10 seconds.

100 Rehersal Swim on Stoke

WarmDown:

400

WarmUp:

400 + 4x100 + 4x50

PreSet:

4 x (3 x 25) @ C.I. [R.I. :25]
Streamline Kick for half lap. Then Sprint Swim for half-lap.
One Round of each stroke.

4 Rounds of :30 sec. of Vertical Kick @ :30
Recovery with arms at side sculling.

Pull - 4 x (3x50 + 6x25 + 3x50) @ :45 [R.I. :10/:20/:10]
50's = Descend to full sprint.
25's = No breath Sprint and finish with a Flip Turn.

MainSet:

Buckets/Drag Suit - 4 x (100 + 3x25)
100 @ 1:30 with Stretch stroke maintaining constant speed.
25's @ R.I. :05 Maximum Effort.

100 yds. LoosenDown

75 + 25 @ Broken R.I. :10; @ R.I. 1:00;
75 + 50 @ Broken R.I. :10; @ R.I. 1:00;
75 + 75 @ Broken R.I. :10; @ R.I. 1:00;
75 + 100 @ Broken R.I. :10; @ R.I. 1:00;
75 + 125 @ Broken R.I. :10; @ R.I. 1:00.
75's = Hold appropriate pace for first 100 split of 200 event goal time.
25 - 125 = Hold appropriate pace for second 100 split of 200 event goal time.

WarmDown:

200 - 400

25

WarmUp:

400 + 4x100 + 4x50

PreSet:

4 x (3x25 Free + 25 Stroke) #1-3 @ :25; #4 @ :30 [R.I. :10/:10]

Streamline Kick Underwater - 4 x (4 x 20 widths) @ C.I. [R.I. :10]
Do one round of every stroke.
Round One = Fly
Round Two = Back
Round Three = Breast
Round Four = Free

MainSet:

Pulse Plots - 8 x 100 @ 4:30 Primary Stroke [R.I. 3:00]
70 - 80 - 90 - 100 - 100 - 90 - 80 - 70
Percentage Effort

WarmDown:

200 - 400

WarmUp:

400 + 4x100 + 4x50

Kick - 12 x (Stationary Scull Kick at flags for :15 seconds + 25 yds. Sprint) @ :45 [R.I. :10]

PreSet:

Paddles - 3 x 200 yds. Choice
Odd laps = Stroke Drill.
Even laps = Build Sprint.
Breast = Kick #1 & #2 and Pull #3;
Back = 3:3:3 (i.e. 3 pulls on right arm, then 3 pulls on left arm, then three pulls with both arms.);
Fly = 3:3:3;
Free = Catch-up.

MainSet:

Free Group:

4 x (4 x 100) @ H.R. $_{23}$, Hold P400
One round of each stroke.
Alternate:
#1 = 25 + 75;
#2 = 50 + 50;
#3 = 75 + 25;
#4 = 100.
Broken R.I. :10 throughout.

Or - I.M. Group:

3 x (3 x 100) I.M. Order @ 1:20 [R.I. :15]
Round 1 = 75 + 25 with Broken R.I. :10; P400;
#1 = 75 yds. fly + 25 yds. back;
#2 = 75 back + 25 breast;
#3 = 75 breast + 25 free.
Round 2 = 50 + 50 with Broken R.I. 10; P$_{200}$;
#1 = 50 yds. fly + 50 yds. back;
#2 = 50 back + 50 breast;
#3 = 50 breast + 50 free.
Round 3 = 25 + 75 with Broken R.I. 10;
#1 = 25 yds. fly + 75 yds. free;
#2 = 25 back + 75 free;
#3 = 25 breast + 75 free.

WarmDown:

200 - 400 WarmDown

27

WarmUp:

400 + 4x100 + 4x50

PreSet:

Kick - 3 x (100 + 3x50) 100's @ 2:00: 50's @ 1:15 [R.I. :30/:45]

100's = Vertical Board last 5 yds. into all walls.
50's = alternate:
#1 = 25 yds. fast + 25 yds. easy;
#2 = easy + fast;
#3 = Sprint.

Pull - 4 x (100 I.M. + 50 Free) @ Broken R.I. :10 @ 2:30 [R.I. :30]

50 Free = hold P_{200} I.M. for the freestyle split segment.

MainSet:

3 x 50 @ H.R. $_{23}$
100 WarmDown
3 x 50 @ R.I. :05

100 WarmDown
3 x 50 + 75 @ H.R. $_{23}$

100 WarmDown
3 x 50 + 75 @ R.I. :05

100 WarmDown
Hold P_{200}.

Rehearsal Swim - 150 yds. + 50 yds. with Broken R.I. :30. Goal time or faster!

WarmDown:

200 - 400

28

WarmUp: 400 + 4x100 + 4x50

PreSet:

Pull - 3 x (3x50 yds. + 150 yds.)
50's = Descend.
Round 1 = 50's @ 1:00 [R.I. :30]; 150 yds. = hold speed of last 50;
Round 2 = 50's @ :50 [R.I. :20]; 150 = same as above;
Round 3 = 50's @ :40 [R.I. :10]; 150 = same as above;
Take 1:00 Recovery between rounds.

Naked Paddles - 3 x (3x50 + 75) 50's @ 1:00; 75 @ 1:45 [R.I. :30/:45]
Primary stroke
50's = Build and concentrate on stroke.
75's = Swim without paddles at P_{200}.

Kick - 8 rounds x Perimeter Kick (25 meter x 20 yard pool)
Streamline Kick underwater for 20 yds. Then Vertical Kick for :15 seconds. Then 25 yds. with half-lap streamline kick/half-lap Sprint. Then streamline kick against wall for :15 seconds. Then Flip Turn. Then streamline kick 20 yds. Then vertical kick for :15 seconds. Then Sprint swim for 25 yds.
Take :45 Recovery between each round.

MainSet: 3 x (4x25 + 3x100)
Round 1 = 25 yds. @ :30; 100's @ 1:40 [R.I. :15/:45];
Round 2 = 25 yds. @ :30; 100's @ 1:30 [R.I. :15/:35];
Round 3 = 25 yds. @ :30; 100's @ 1:20 [R.I. :15/:25].
25's = Sprint.
100's = Maintain fast pace.

WarmDown: 200 - 400

29

WarmUp: 400 + 4x100 + 4x50

PreSet: Kick - 8 Rounds x Wall-&-Scull Kick Sprints
Streamline kick against wall for :10 seconds. Then flip and Sprint swim 20 yds. to far flags. Then stationary scull kick for :10 seconds. Then Sprint swim 50+ yds.
Take :45 Recovery between rounds.

Pull - 3 x (2x25 + 2x50 + 100)
25's = Sprint @ :25.
50's = P_{200} @ 1:00.
100's = First 100 split of 200 @ 1:45.
[R.I. :10/:30/:45]

Swim - 3 x 100 @ 1:30 [R.I. :30]
Hold P_{200} + :05.

Pull - 3 x (2x25 + 2x50 + 100)
25's = Sprint @ :25.
50's = P_{200} @ 1:00.
100's = First 100 split of 200 @ 1:45.
[R.I. :10/:30/:45]

Swim - 3 x 100 @ 1:15 [R.I. :15]
Hold P_{200} + :05.

MainSet: 3 x (150 + 50) @ Broken R.I. :10.
Rest with 3:00 Recovery between rounds.
Beat Goal Time!

WarmDown: 200 - 400

WarmUp: 400 + 4x100 + 4x50

PreSet: 3 x 200 I.M. Kick half-lap/Sprint Swim half-lap @ H.R. $_{23}$.

Pull - 4 x (3 x 50)
Round 1 = @ :55 [R.I. :35]
Round 2 = @ :50 [R.I. :20]
Round 3 = @ :45 [R.I. :15]
Round 4 = @ :40 [R.I. :10]
No extra Recovery between rounds.
Attempt to hold P_{200}.

MainSet: 3 x (3 x 25 + 75) @ R.I. :05/1:00 Recovery between rounds.
25's = Sprint.
75's = P_{200}.

100 WarmDown

3 x (3x50 + 75) @ H.R. $_{23}$
50's = P_{100}.
75's Attempt to Hold P_{100}.
Take 1:00 Recovery between rounds.

WarmDown: 200 - 400

31

WarmUp: 400 + 4x100 + 4x50

PreSet: 3 x (75 + 50 + 2x25)
75's @ 1:15 = Stroke improvement drills (i.e. Free = Catch-up; Breast = K/K/P with naked paddles; Fly = 3 pulls right arm: 3 pulls left arm: 3 pulls both arms; Back = 3:3:3 also).
50 @ :50 = Build.
25's @ :30 = Sprint with paddles only.
[R.I. :15/:20/:15]

Pull - 12 x 50 @ 1:00 [R.I. :15]
Alternate 25 yds. Fast + 25 yds. Easy.

Kick - 12 x 50 @ 1:00 [R.I. :15]
Alternate 25 yds. Fast + 25 yds. Easy.

MainSet: 4 x 100 (broken) @ 3:00 [R.I. 2:00]
Round 1 = 75 yds. + 25 yds. with Broken R.I. :05;
Round 2 = 50 + 50 with Broken R.I. :05;
Round 3 = 25 + 75 with Broken R.I. :05;
Round 4 = Straight 100's without any break.

200 WarmDown

3 x 200 (broken) @ 1:00 Recovery between rounds.
Round 1 = Straight;
Round 2 = 50 + 50 + 50 + 50 @ Broken R.I. :10;
Round 3 = 75 + 75 + 50 @ H.R. $_{23}$.

WarmDown: 200 - 400

WarmUp: 400 + 4x100 + 4x50

PreSet: Kick - Between 500 yds. to 750 yds. of own design.

Pull - Between 750 yds. to 1,000 yds. of own design.

MainSet: Buckets - 12 x 25 @ H.R. 23

200 WarmDown

3 x 50 Pace @ R.I. :15

200 WarmDown

Rehearsal Swim to Goal Time!
Maximum effort swim to the distance corresponding to goal time for the event.

WarmDown: 200 - 400

33

WarmUp: 400 + 4x100 + 4x50

PreSet: Kick - 8 x :30 seconds Vertical Kick @ :30 R.I. Between Rounds.
Alternate: Odd #'s = streamline position with the arm extended above the head;
Even #'s = Arms at side sculling.

Kick, Vertical Board / Horizontal Board - 12 x 25 @ :35 [R.I. :10]
Half-lap vertical board then half-lap horizontal board.

3 x 100 @ 1:15 Even Paced P_{200} [R.I. :15]

MainSet: 2x25 + 75 + 2x25 Holding P_{200}.
25's @ :20; 75 @ :1:00. [R.I. :05/:15/:05]

3 x 75 @ 1:00 Even Paced P_{200} [R.I. :15]

2x25 + 75 + 2x25 Holding P_{200}.
25's @ :25; 75 @ :1:15. [R.I. :10:/:30/:10]

3 x 50 @ :45 Even Paced P_{200} [R.I. :15]

2x25 + 75 + 2x25 Holding P_{200}.
25's @ :25; 75 @ :1:15. [R.I. :15:/:45/:15]
200 WarmDown

Rehearsal Swim - 100

WarmDown: 200 - 400

WarmUp: 400 + 4x100 + 4x50

MainSet: 3 x (3x50 + 200 + 100 WarmDown)
50's @ H.R. $_{23}$ Holding P_{100}.
200's = Descend.

WarmDown: 200 - 400

35

WarmUp:

400 + 4x100 + 4x50

PreSet:

Kick - 4 Rounds x Wall-&-FlagFlip Kick Sprints
(Stationary wall kick for :15 seconds. Then Flip turn. Then Sprint swim to far flags. Then flip at the far flags. Then Sprint 25 yards.)
Take :45 Recovery between rounds.

Kick - 4 Rounds x Wall-&-FlagFlip Kick Sprints
(Stationary wall kick for :15 seconds. Then Flip turn. Then Sprint swim to far flags. Then flip at the far flags. Then Sprint 50 yds.)
Take :45 Recovery between rounds.

Pull - 3 x (75 + 2x50 + 75) @ 1:00 [R.I. :10/:30/:10]
Additional :30 Recovery between rounds.

MainSet:

Buckets - 16 x 25 @ 1:15 [R.I. :45]
Alternate: #1 & #2 = Build. #3 & #4 = Sprint. etc.

n x (3 x 75 yds.) @ H.R. $_{23}$ Hold P_{200}
Take 1:00 Recovery between rounds.
n = number of rounds - minimum of one round - when swimmer can hold prescribed time for all 3 x 75's no further round is required.

WarmDown:

200 - 400

WarmUp:

400 + 4x100 + 4x50

PreSet:

9 x 50 I.M. Order @ 1:00 [R.I. :20]
Descend in sets of three.

Kick - 4 x (3x25 + 100)
25's @ :30 Sprint with stroke into the walls.
100's @ 2:15 Stretch.
[R.I. :10/:30]

Pull - 4 x (2x50 + 100)
50's @ :50 with Build into pace 50's.
100 @ 1:45 and Hold fast pace 100's.
[R.I. :20/:30]

8 x 25 @ :45 Sprint [R.I. :30]

MainSet:

Rehearsal Swim - 6 x 100 @ 8:00 [R.I. 7:00]
Take Heart Rate three different times for :10 seconds at these times following the finishing touch of the swim:
:00-:10;
:30-:40;
:60-:70.

WarmDown:

200 - 400

37

WarmUp:
400 + 4x100 + 4x50

PreSet:
Kick - 3 x (3x25 + 2x75) @ :45/1:30 [R.I. :20/ :20]
25's @ :45 with :10 seconds scull kick at flags.
75's @ 1:30 Maximum Effort with 25 yds. Kick + 25 yds. Swim + 25 yds. Kick.

Kick - 8 x 25 @ :40 [R.I. :10]
Holding Breath.

Pull - 4 x (2x50 Build + 100 Fast Pace + 2x50 Sprint)
50's @ :40.
100's @ 1:20.
Take :30 Recovery between rounds.
[R.I. :10/:15/:10]

MainSet:
8 x 25 @ 1:00 [R.I. :45]
4 x 25 Buckets @ H.R. 23
8 x 25 @ 1:00 [R.I. :45]
4 x 25 Buckets @ H.R. 23
8 x 25 @ 1:00 [R.I. :45]

WarmDown:
200 - 400

WarmUp: 400 + 4x100 + 4x50

PreSet: 6 x (50 Drill + 25 Scull + 50 Build Sprint) @ R.I. :10
Take :30 Recovery between rounds.

3 x (3 x 75) with 5 yds. in/out of every flip turn with a streamline kick.
Round 1 @ R.I. :05
Round 2 @ R.I. :10
Round 3 @ R.I. :15
Take :30 Recovery between rounds.

MainSet: 4 x (50 + 2x25 + 50) All at Maximum Effort Swimming!
Round 1 @ :40 [R.I. :10/:20/:10];
Round 2 @ :45 [R.I. :15/:25/:15];
Round 3 @ :50 [R.I. :20/:30/:20];
Round 4 @ H.R. $_{23}$.
Take 1:00 Recovery between rounds.

WarmDown: 200 - 400

39

WarmUp:
400 + 4x100 + 4x50

PreSet:
Kick - 3 x 100 @ R.I. :20 Stretch, but work all walls.
Kick without a board - 6 x 25 @ R.I. :05 with Fast Streamline Sprint Swim last 5 yds.

Pull - 4 x (25 @ :25 + 50 @ :45 + 75 @ 1:00) [R.I. :10/:10/:10]
Hold as fast a velocity as possible through each swim.
Take and extra 1:00 Recovery before the final round.

200 yds. LoosenDown

MainSet:
Rehearsal Swim - 6 x 100 @ R.I. 3:00

Or

4 x 200 @ R.I. 5:00

Or

2 x 500 @ R.I. 7:00

Or

1 x 1000 or 1650

WarmDown:
200 - 400

WarmUp: 400 + 4x100 + 4x50

PreSet: Streamline Kick/Swim -
4 x (3 x 20 yds.) @ C.I.
20 yds. = widths of the pool.
Streamline kick underwater with the last 5 yds. sprinting into the wall.

6 x 50 @ 1:00 [R.I. :15]
Stationary streamline kick against the wall for the first :10.

Kick - (2x50 + 3x75 + 2x50)
50's @ 1:00; 75's @ H.R. $_{23}$. [R.I. :40/:40/:40]

Pull - 3 x (75 + 50 Sprint) @ Broken R.I. @ :10 @ 2:15 [R.I. :45]
#1 = 50 yds. Build + 25 Sprint + Broken R.I. :10 + 50 yds.;
#2 = 25 yds. Build + 50 Sprint + Broken R.I. :10 + 50 yds.;
#3 = 75 yds Build + Broken R.I. :10 + 50 yds.

Pull - 3 x (75 + 50 Sprint) @ Broken R.I. @ :15 @ 2:30 [R.I. :55]
#1 = 50 yds. Build + 25 Sprint + Broken R.I. :15 + 50 yds. ;
#2 = 25 yds. Build + 50 Sprint + Broken R.I. :15 + 50 yds. ;
#3 = 75 yds Build + Broken R.I. :15 + 50 yds.

MainSet: 3x50 + 125 yds.
3x50 + 150 yds.
3x50 + 175 yds.
3x50 + 200 yds.
50's @ H.R. $_{23}$.
125 - 200 yds. = Broken at 100 yds. with Broken R.I. :05.
Attempt to maintain GoalPace.
Take 1:00 Recovery between rounds.

WarmDown: 200 - 400

41

WarmUp:

400 + 4x100 + 4x50

PreSet:

6 x 75 I.M. Order @ 1:10
#1 = 50 Fly + 25 Back with Broken R.I. :05.
#2 = 25 Fly + 50 Back with Broken R.I. :05.
#3 = 50 Back + 25 Breast with Broken R.I. :05.
#4 = 25 Back + 50 Breast with Broken R.I. :05.
#5 = 50 Breast + 25 Free with Broken R.I. :05.
#6 = 25 Breast + 50 Free with Broken R.I. :05.

Kick - 10 Rounds x (Kick-Sprint-Vertical-Sprints) @ R.I. :20
Streamline Kick against the wall for :10 seconds. Then Flip Turn. Then Sprint Swim to far flags. Then Vertical Kick for :10 seconds. Then Sprint 50 yds. emphasizing kicking.

MainSet:

3 x (3x25 Sprint + 25 Stretch +75 Holding P_{200}) @ :20/:45/1:30 [R.I. :05/:15/:45]

WarmDown:

200 - 400

WarmUp:

400 + 4x100 + 4x50

PreSet:

4 Rounds of 3 x
(:15 sec. Vertical Kick + 50 Swim) @1:15 [R.I. :30]
Build each 50 Swim.
Descend each 50 down to P_{100}.
One Round for each stroke.

Pull - 3 x (3x50 + 100) @ :50/H.R. $_{23}$ [R.I. :20]
50's = P_{200} + :05.
100's = Descend to P_{200}.

Pull with Paddles only - 8 x 25 @ :30 [R.I. :15]
Odd #'s = Build.
Even #'s = Maximum Efforts.

MainSet:

4 x (3x25) @ R.I. :15
Take 1:00 Recovery between rounds.
WarmDown: 200 yds.

Stroke Group:

6 x 75 @ 1:30 [R.I. :30-:40]
Odd #'s = Free
Even #'s = Primary Stroke Holding P_{200} for that stroke.

Note: If swimming freestyle as the primary stroke, alternate Odd #'s = P_{1000} and Even #'s = P_{200}.

3 x 75 @ 1:00 [R.I. :15]
25 yds. Free + 25 yds. Stroke + 25 Free holding P_{200} (stroke)

Or - Free Group:

3 x (3x25 + 75) @ R.I. :10
Take 2:00 Recovery between rounds.
25's = Maximum effort with buckets.
75's = P_{100}.

3 x 75 @ 1:15 [R.I. :30]
25 yds. Free + 25 yds. Stroke + 25 Free holding P_{200} (stroke)

WarmDown:

200 - 400 WarmDown.

43

WarmUp: 400 + 4x100 + 4x50

PreSet: 3 x 200 @ R.I. :30 Emphasize stroke not speed!
Alternate: 100 yds. Naked Paddles + 100 yds. Build

Kick - 6x25 + 200 + 6x25 + 200 + 6x25
25's @ R.I. :05 Maximum Effort with board and stroke into wall.
200's @ R.I. :30 Swim with overemphasized kick.

12 x (20 + 20) In/Out with Open Water Turn @ :45 [R.I. :20]

MainSet: Buckets - 3 x (3 x 50) @ :40 [R.I. :05 - :10]
Take 1:00 Recovery between rounds.

2 x (3x50 + 50) @ H.R. 27 with :15 additional Recovery prior to last 50 yds. Take 1:00 Recovery between rounds.

WarmDown: 200 - 400

WarmUp:
400 + 4x100 + 4x50

PreSet:
4 x (3x25 Free + 25 Stroke) #1-3 @ :25;
#4 @ :30 [R.I. :10/:10]

Streamline Kick Underwater - 4 x (4 x 20 widths) @ C.I. [R.I. :10]
Do one rund of every stroke.
Found One = Fly
Round Two = Back
Round Three = Breast
Round Four = Free

MainSet:
Pulse Plots - 8 x 100 @ 4:30 Primary Stroke [R.I. 3:00]
70 - 80 - 90 - 100 - 100 - 90 - 80 - 70 Percent Effort

WarmDown:
200 - 400

45

WarmUp: 400 + 4x100 + 4x50

PreSet: Pull - 3 x (2x50 Build to Pace + 100 Pace + 2x50 Sprint)
50's @ 1:00.
100's @ 2:00.
[R.I. :30/1:00/:30]

Kick - 6 x (25 + 50). 25 @ R.I. :10; 50 @ R.I. :15
25 = Streamline kick underwater then last 5 yds. Sprint swim into finish.
50 = Half-lap kick. Then Sprint Swim with strong emphasis on kick to the finish.

MainSet: 3 x (3 x 50)
Round 1 @ H.R. $_{23}$ and Hold 1st 50 split of 200 primary stroke;
Round 2 @ H.R. $_{25}$ and Hold 2nd 50 split of 200 primary stroke;
Round 3 @ H.R. $_{27}$ and Hold 3rd 50 split of 200 primary stroke.
Take 1:00 Recovery between rounds.

WarmDown: 200

6 x 25 @ C.I. PeekSwims with dive.
Dive and swim while peeking the eyes for sensory training and extra feeling.

WarmDown: 200 - 400

WarmUp:
400 + 4x100 + 4x50

PreSet:
12 x 25 @ :20 [R.I. :05]

Pull - 8 x 75 @ 1:20 [R.I. :15]
75 = 25 yds. Sculling + 50 yds. regular pull.

MainSet:
3 x 200 @ 5:00 [R.I. 3:00]

WarmDown:
200 - 400

47

WarmUp: 400 + 4x100 + 4x50

PreSet: 500 yds. Naked Paddles and speed is not emphasized.

Kick 12 x 25 @ :35 [R.I. :15]
Odd #'s = Underwater kick with board.
Even #'s = Regular board kick.

Pull - 3 x (3 x 50)
Round 1 @ 1:00 [R.I. :30];
Round 2 @ :55 [R.I. :25];
Round 3 @ :50 [R.I. :20].

MainSet: 2 x (75 + 2x50 + 75) @ H.R. 27
Take 2:00 Recovery between rounds.

2 x (50 + 2x25) @ H.R. 23
Take 2:00 Recovery between rounds.

WarmDown: 200 - 400

WarmUp: 400 + 4x100 + 4x50

PreSet: Pull - 750 Choice at least 25 % Fast.

Kick - 500 Choice at least 25% Fast.

MainSet: 12 x 25 @ 1:00 Maximum Effort [R.I. :45]

WarmDown: 100

3 x 50 @ H.R. $_{23}$ Holding Pace for event.

WarmDown: 200 - 400

Expanded Bibliography

Cohen, K. Metabolic alterations with sprint versus endurance interval training in females. *Dissertation Abstracts International*, 1975, 36, A3485.

Connett, R. J., Gayeski, T.E.J., & Honig, C.R., Energy sources in fully aerobic rest-work transitions: a new role for glycolysis. *American Journal of Physiology*, 1985, 248, H922-H929.

Coyle, E.F., Feiring, D.C., Rotkis, T.C., Cote, R.W., Roby, F.B., Lee, W., & Wilmore, J. H., Specificity of power inprovements through slow and fast isokinetic training, *Journal of Applied Physiology*, 1981, 51, 1437-1442.

Dolgener, F.A., & Brooks, W.B., The effects of interval and continuous training on VO2 max and performance in the one mile run. *International Journal of Sports and Medicine*, 1978, 18, 345-352.

Dudley, G.A., Araham, W.M., & Terjug, R.L., Influence on exercise intensity and duration on biochemical adaptations in skeletal muscle. *Journal of Applied Physiology*, 1982, 53, 844-850.

Farfel, V.S., & Maroti, E.Y., Training swimmers with usee of competitive speeds and "leading". *Teoriya i Praktika Fizicheskoi Kultury*, 1978, 7, 53-56.

Fox, E.L., Bartels, R.L., Klinzing, J., & Ragg, K., Metabolic responses to interval training programs of high and low power output. *Medicine and Science in Sports and Exercise*, 1977, 9, 191-196.

Gaesser, G.A., & Brooks, G.A., Metabolic bases of excess post-exercise oxygen consumption: a review. *Medicine and Science in Sports and Exercise*, 1984, 16, 29-43.

Hellegrandt, F.A., Methods of muscle training: influence of pacing. *Physical Therapy Review*, 1958, 38, 319-326.

Hellebrandt, F.A., & Houtz, S.J., Mechanisms of muscle training: experimental; demonstration of the overload principle. *Physical Therapy Review*, 1956, 36, 371-383.

Ibarra, G.H., The effects of anaerobic training on selected components of the aerobic system. *Dissertation Abstracts International*, 1982, 43, B3151.

Kickson, R.C., Heusner, W.W., & Van Huss, W.D., Skeletal muscle enzyme alterations after sprint and endurance training. *Joural of Applied Physiology*, 1975, 40, 868-871.

Leinonen, H., Effects of sprint and endurance training on capillary circulation in human skeletal muscle. *Acta Physiologica Skandinavica*, 1980, 108, 425-427.

Mastropaolo, J., & Takei, Y., Spectral power changes after power overload training. *Medicine and Science in Sports and Exercise*, 1981, 13, 116.

Moffroid, M., & Whipple, R., Specificity of speed of exercise. *Journal of the American Physical Therapy Association*, 1970, 50, 1692-1699.

Noakes, T.D., Implications of exercise testing for prediction of athletic performance: a contemporary perspective. *Medicine and Science in Sports and Exercise*, 1988, 20, 319-330.

Parkhouse, W.S., & McKenzie, Possible contribution of skeletal muscle buffers to enhance anaerobic performance: a brief review. *Medicine and Science in Sports and Exercise*, 1984, 16, 328-338.

Pette, D., Activity-induced fast to slow transitions in mammalian muscle. *Medicine and Science in Sports and Exercise*, 1984, 16, 517-528.

Other Books from the

Sports Support Syndicate

Tide Teamwork by Don Gambril and Jonty Skinner $19.95
Learn how a swim season works with the University of Alabama.

Mastering Masters Swimming by George Bole $14.95
Workouts in a handy book that allows you to go pool-side.

Coaching the Young Swimmer by Madsen and Wilke $30.95
Learn long-term, technical swimming—originally from Germany.

A DAM Good Year by Michael Collins.................................$25.00
The Davis Aquatic Masters team is huge and fast, thanks to Mike.

Search for Greatness by Dr. Judd Biasiotto $16.00
A great mind–body authority shows how to do the impossible.

United States Tactical Water Polo by Monte Nitzkowski $35.95
Learn plays, defense, and inside tricks from 4-time Olympic coach.
"The best book ever (for polo)."
Watch for Monte's new book, *Water Polo Basics,* due in 1997.

Supertraining by Mel C. Siff and Yuri V. Verkhoshansky...........$62.00
Special strength training for sporting excellence. New to USA in 1997. Textbook, 447 pages.

Facts and Fallacies of Fitness by Mel C. Siff $31.00
Many discussions about fitness that we all should know.

The Treasure Within by Kevin DeForrest......................................$25.00
A Swimmer's Log Book - for four part harmony!

For further information on any of these books, send internet e-mail to the publisher, Mark Rauterkus.
mrauterkus@pittsburgh.net

Sprint Salo is a joint publishing endeavor with the author and the Sports Support Syndicate, Inc.

To order additional *Sprint Salo* books, price $12.95 write to:

Sports Support Syndicate
108 South 12th Street
Pittsburgh, PA 15203-1226 USA

Office: 412-481-2497
Fax: 412-381-7759

E-mail to the publisher: mrauterkus@pittsburgh.net
E-mail to the author: SprintSalo@aol.com

Master Card, VISA and American Express credit cards accepted. Shipping and handling charges are $3.00 for the first item and $.75 for each additional item. Written school P.O. s accepted. Foreign orders add $5.00. Foreign payments in US $ on US bank or international money order. Allow up to six weeks for delivery. Dealer and publisher inquiries are welcome.

Additional products by other authors are available.

Selected Quotations

What They Are Saying About SprintSalo

I'm a big yardage coach who took over a womens' program that won one meet during the 1987-88 season. This season I used any and all of the workouts you listed in past issues of S.W. ... My girls attacked each workout, enjoyed the difference from traditional workouts, plus learned to race! Our 1988-89 record was 8-3.

Malachi Cunningham
LaSalle University
Philadelphia, PA

I have been moving in the direction you mention over the past few years and have been very satisfied with our results.

Pat Haws
St. John's University
Collegeville, MN

We Alaskans can benefit from your workout book.

Ken Hickey
Anchorage, Alaska

Thanks for your articles in S.W. They have been a great help in my program. I'm a Master's swimmer with limited time to workout each day and your articles have helped me improve greatly over the last two years. Three years ago I found I had to sprint more in my workouts to reach my desired times and it worked. Then along came your articles to reinforce my new knowledge. I'm 39 years old and have done some times that are really close to my old collegiate times when I was 21 and 22. My best 100 free was 51.5 and 200 free was 1:56.1 in 1971. April of 1988 I went 52.7 for the 100 and 1:58.01 for the 200. Needless to say I could never have come this close without quality workouts.

Stephen Van Der Beken
Manchester, NH

I'd like to tell you that basically using your principles I had a 14-year-old boy go 2:11.20 in the 200 breast last year. This is in a four lane pool on two hours a day.

Lenny DeMuro
Bar Harbor, ME

I have long subscribed to the theories that you propound in your March article. I have been able to maintain college-type times for the period that I swam for Purdue University from 1963-1967. It is interesting to note that my long-distance times continue to improve. I attribute this phenomena to forward-thinking coaches as yourself who have furnished me with the improved training techniques that have, at least for this swimmer, diminished the effects of the aging process.

Jeffrey A. Cooke
Lafayette, IN

I also am a firm believer in this relatively "new" concept. It's not the quantity, rather it is the quality of work. Having a background in exercise physiology, I couldn't agree with the principles you've outlined more. Thanks for supporting this position.

Andrew Salm
Valparaiso University
Valparaiso, IN

Our high school team only has an hour and 20-30 minutes of pool time a doay. That's about all the yardage (3,000) we get in. We had a successful season, but are always looking for new ideas and workouts to improve performance.

Gwen Donovan
Westford Academy
Westford, MA

For the past 33 years as a high school, college and age group coach I have used this type of training method... It works! Keep up the research.

Charles J. Smith
Springfield College
Springfield, MA

I am fascinated by your articles, and am looking forward to studying your ideas more!

Paul Fugere
DeForest H.S., WI

I have been working with your training methods the last two seasons with my high school with great results.

Rob Wennstedt
Millard South H.S.
Omaha, NE

I never had a high school state champion before 1985 and have now nine different kids turn in 20 state champion swims. Five of those have been in the 500. When my first state champ improved from 2 minutes in the 200 yard free to 1:48.50, on my new methods between November and February, I felt I was onto something.

Craig Taylor
Limerick, ME

Several of my friends also enjoyed this article and we have decided to train under the plan described in your article.

Bill Janssen
Uniontown, OH

It is believed that your alternative approach of training is of great importance and will lead to more effective workout methods, higher performance and to a higher quality of life for athletes. With training methods similar to that of your publication I won a number of international swim races, was a member of the Olympic Team in Hungary and West Germany - when I was younger, and won three World Championships as a Master swimmer in the last years.

Dr. Tegze P. Haraszti
Newport Beach, CA

My husband and I, both Ph.D.'s in Biophysics, are so relieved to find someone putting some science and common sense into the swimming leterature. You've made a muc needed change in the attitude of your 17 year old swimming daughter...

Vivian Ryan
Nutley, NJ