STROKEARCS

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ASSOCIATION OF ROWING COACHES, SOUTH AFRICA

PRINCIPLES OF TRAINING

24 PRINCIPLES OF ATHLETIC TRAINING AND CONDITIONING

Some of this you already know and apply in your own coaching. But Kernan sneaks in a few things here like "modeling." He's not talking about walking down the fashion runway. If you made a chart, how much of this do you do now? Should you want to investigate further, there is a list of sources at the end. For those who may want to master Tudor Bompa's principles, you may want to hunt down the workbook that accompained Theory and Methodology of Training. *Coaching Education, Level II, digs into this Bompa material quite well.*

INTRODUCTION

The theory and methodology of training, as a distinct unit of physical education and sports, has its own specific principles based on the biological, psychological, and pedagogical sciences. These guidelines and regulations which systematically direct the whole process of training are known as the "principles of training." (Tudor Bompa, 1994)

The coach of any sport needs to consider all aspects of the training process before he or she designs a training program. All athletic events have specific components that make up the true nature and scope of that sport, whether it is cyclic or acyclic. The following are 24 consensus principles from various sport training and science experts, such as Bompa, Harre, Costill, Epley, et al. These principles should be considered by coaches when establishing any exercise or training regimen for their athletes.

Principle #1: Physical Examination

1.) Everyone gets one; youth, masters, elite, junior elite, professionals—everyone!
2.) A thorough examination should be undertaken: EKG, blood analysis, body composition, and cardiorespiratory assessment!
3.) The assessment should be completed by competent medical professionals and from the coaching and sport medicine staffs.
4.) DO NOT COACH, TEACH, nor INSTRUCT anyone who has not taken a physical exam unless he/ she possesses a current physical examination waiver.

Principle #2: Active Participation in Training

1.) The coach should communicate training information with his/her athletes.
2.) The athlete should actively participate in planning and analyzing long and short-term training programs.
3.) The athlete must periodically take and pass prescribed standard tests.
4.) The athlete must undertake individual assignments and/or individual training sessions without supervision of the coach or manager.

Principle #3: Multi-Lateral Development

"The necessity of a multilateral development appears to be an accepted requirement or value in most fields of education and human endeavor. Parents should check that their children are properly conditioned in all areas of fitness before a program begins. All biomotor areas of an athlete should be developed before embarking on a specific sports training program." (Bompa, 1994)

Principle #4: Individualization

1.) Each athlete will react differently to any training stimulus.
2.) There are differences by age, gender, and training age.
3.) No effective training program can be simply a copy of another athlete's program, no matter how elite or successful that athlete may be, or was!

Principle #5: Feasibility

"This principle simply states that the planned training load must be realistic for the athlete's age, sex, training age, level of ability, and mental capacity." (Freeman, 1996)

Principle #6: Specificity/ Specialization

1.) Specialization/Specificity represents the main element required to obtain success in a sport.
2.) All athletes will be what you physiologically train them to be.

3.) Exercises specific to a sport or event lead to anatomical and physiological changes related to the demands of that sport or event.

Principle #7: Ground-Based Activities
1.) Most sport skills are initiated by applying force against the ground. The more force your athletes can apply against the ground, the faster they will run, and the more effective they will be in sport skills.
2.) You need to select exercises and conditioning drills that apply force with the feet against the ground. (Epley, 1998)

Principle #8: Multiple Joint Actions
1.) Your strength and conditioning program should be based on exercises and drills involving multiple joint actions to improve athletic performance. Sport skills, such as running, jumping, or tackling in football, require multiple joint actions timed in the proper neuromuscular recruitment patterns.
2.) Isolating single joint actions might work for body builders to improve their appearance, but athletes need to concentrate on activities involving sequential multiple joint actions to improve performance. (Epley, 1998)

Principle #9: Three-Dimensional Movements
1.) Sport skills involve movements in the three planes of space simultaneously: forward-backward, up-down, and from side to side. Your strength and conditioning program should improve functional strength with exercises and drills approximating these skills.
2.) In strength training, only free weights allow movement in three dimensions simultaneously. This makes the transfer of strength and power easier to merge with the development of sport skills. Machines limit the development of sport skills. (Epley, 1998)

Principle #10: Progressive Overload
1.) Specific exercise overload must be applied to bring about physiologic improvement.
2.) Overload can be achieved by manipulating volume and intensity.
3.) The training program must place a demand on the body's biomotor systems for improvement to occur.
4.) Training loads must be gradually increased and manipulated.

Principle #11: Train the Correct Energy System
"The primary objective of conditioning is to improve the energy capacity of an athlete to improve performance. Many coaches and athletes are confused or misinformed on how to implement the correct conditioning methods for a particular sport. For effective conditioning, training must occur at the same intensity and duration as you will face in competition in order to develop the proper energy system predominately used." (Epley, 1998)

Principle #12: Interval Training
1.) Your conditioning program should be based on interval training principles.
2.) Interval training is work or exercise followed by a prescribed rest interval.
3.) The program must meet the specific metabolic conditions of each sport or event.
4.) A common training error that coaches make in their conditioning programs is making their rest intervals too short. If the rest period is too short, the amount of energy is not sufficient to meet the demands of the next effort. (Epley, 1998)

Principle #13: Train Explosively
1.) Strength gains may be determined by the size of the muscles, but many times an athlete will get stronger because of an improved ability of the nervous system to recruit motor units.
2.) Through proper training, the body learns to recruit more motor units so that more force can be generated.
3.) Training explosively with free weights allows more fast-twitch muscle fi bers to be recruited and in return improves an athlete's performance potential. (Epley, 1998)

Principle #14: Adaptation
1.) This is the process of the body responding to a training load.
2.) Adaptation to training is the sum of transformations brought about by the systematic repetition of specific exercise. SAID=Specific Adaptation to Increased Demand!
3.) Proper levels of load must be prescribed; if not, undertraining or overtraining could occur.

Principle #15: Consistency
"Sometimes positive adaptations only occur after months and years of consistent hard work." (USOC, 1997)

Principle #16: Variety/Variation
The training needs to be varied to prevent staleness. Varying the load causes the body to adapt. This may mean varying the durations and intensities of different workouts or performing a myriad of drills.

Principle #17: Split Routine
Most strength and conditioning programs use three workouts per week. However, this training can be done daily if a "split routine" is used. This means alternating the types of exercises performed and executing them on consecutive days. With the split routine, you get at least two full days of recovery from each exercise.

Principle #18: Hard-Easy System
1.) You can make more progress over longer periods of time if you do not work at maximum loads during each workout.
2.) A "Hard-Easy" system eliminates overtraining and mental burnout.

3.) Design one or two hard workouts per week, and have the other days involve light to moderate training.

Principle #19: Modeling
"Through model training the coach attempts to direct and organize his/her training lessons in such a way that the objectives, methods, and content are similar to those of a competition. The coach or athlete needs to know his or her sports ergogenesis [work production]." (Bompa, 1994).

Principle #20: Warmup
1.) Warmup prepares the body for action.
2.) Warmup involves doing low-intensity type activity, helping to get blood flow to the working muscles, and preparing them to perform high intensity tasks.
3.) Physiologically, the body temperature needs to increase 1-2 degrees.

Principle #21: Cooldown
1.) The cooldown helps to get the blood away from working muscles back to vital organs.
2.) It is essential to remove metabolic wastes from the body and muscles.
3.) Cooldown is commonly neglected.
4.) Latest studies show that an extended cooldown session may slow illness and injury.

Principle #22: Rest and Recovery
1.) Rest allows the biomotor systems to regenerate and become better and stronger than before.
2.) Recovery techniques include sleep, active rest activities, massage, ultrasound/ electrostimulation, sauna/ steam baths, and hot/cold immersion baths.
3.) Every athlete should strive for a bedtime of 10:30 pm or earlier, every day during training.
4.) "An athlete needs to establish a pattern or a regimen for his sleep as well as his training." (Pat Porter, US Olympian)

Principle #23: Reversibility
1.) Detraining occurs rapidly when a person stops exercising or training.
2.) Fitness can decline rather rapidly, at about a 1/2 ratio.
3.) Because of the reversibility principle, it's important to maintain some sort of fi tness through cross training or active rest activities.

Principle #24: Long-Term Periodization and Planning
1.) The process of training is a long term phenomenon.
2.) It involves planning for the entire year, from the off-season to a competitive peak.
3.) It is also important to keep track of your workouts from day to day, month to month, and from year to year in some kind of file and retrieval system.

SUMMARY
A coach or trainer of any sport or fitness activity will enhance his/her success by following these principles of training when designing and planning training or lesson plans for athletes and teams.

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ASSOCIATION OF ROWING COACHES, SOUTH AFRICA

COACHES BURNOUT

CAUSES, SYMPTOMS AND PREVENTION

Coaching is potentially a very rewarding pursuit due to the joy of working with aspiring athletes, the challenge of building a successful program, the satisfaction derived from teaching sport skills, and the opportunity to facilitate an athlete's psychosocial development. At the same time, coaching can be a very time-consuming, demanding and frustrating experience. Not surprisingly, some coaches thrive in the coaching profession and are passionate about their involvement. Others have a less positive view of their coaching experiences, which in some cases culminates in burnout and/or the individual leaving the coaching ranks.

Each year a substantial number of individuals stop coaching. Although coaches discontinue for a variety of reasons, recent years have been marked by increased public interest in burnout.
Burnout is a psychological syndrome characterised by emotional exhaustion, depersonalisation, and reduced personal accomplishment.

What causes coach burnout?
Several factors that have been linked to burnout in coaches are:
• pressure from administrators
• role conflict or ambiguity
• too much time spent travelling
• low control over job
• low social support
• democratic leadership style
• recurrent conflict with athletes
• pressure from parents of athletes.

What are the symptoms of burnout?
Recognising the signs of burnout is critical for coaches. These signs are:
• coaching seems to have lost its fun and dynamic edge
• preparation and planning become more arduous as the seasons wear on
• your athletes have become accustomed to receiving criticism rather than praise from you
• you turn to excuse-making, instead of searching for answers when faced with an issue.

Strategies to prevent burnout
It is critical to note that burnout is not a result of flawed character, behaviour or drive. It is the result of job stress and the nature of the coaching environment. There are several keys for preventing burnout:
• Take care of your own health by eating properly, getting sufficient sleep and getting involved in exercise.
• Spend less time on paperwork and administration, and more time involved in the enjoyable aspects of coaching.
• Break up your routine by introducing new training drills and activities.
• Find time to have fun during work hours.
• Seek out a mentor to gain support and advice during difficult times.
• If possible, restrict the amount of travel you do with teams and athletes.
• It is okay to say no, especially relating to committees and non-critical projects.
• Do not take 'coaching' home with you.

Conclusion
Burnout is a serious concern for coaches at all levels. Recognising the causes and symptoms, and knowing a few things about how to prevent burnout, can help coaches maintain a positive attitude and continue to love the work that they do.

ASSOCIATION OF ROWING COACHES, SOUTH AFRICA

ATHLETE DEVELOPMENT

FROM BEGINNER TO WORLD CHAMPION JUNIOR

1. Criteria and performance-determining factors for rowing

Research of competitive rowing has found that rowing performance is determined decisively by the degree to which the following abilities and skills are developed:

Rowing technique and coordination
Competition performance in rowing is determined primarily by the degree to which acquired fitness (endurance, strength, quickness) is converted into propulsion. A perfect rowing technique is required for a highest possible degree of conversion. Learning a faulty rowing technique has serious consequences on competition performance since mistakes accumulate on the course and thus the acquired fitness can not be converted into propulsion in the best possible manner. There are close connections between the level of rowing technique and coordinative abilities like *balance, rhythm, differentiation, and flexibility.*

To take advantage of the good learning age of 11-13 for boys and 10-12 for girls, it is necessary to emphasize an accurate rowing technique in all different phases of beginner instruction and basic training. The training of differentiation, balance, flexibility, and adaptation positively influences the acquisition of rowing technique (from the beginner level up to the control of a racing boat even in difficult situations like wind and waves), the acquisition of boat experience, and the avoidance of mistakes in rowing technique.

Endurance capacity
Competitive rowing is an endurance sport. In the organism, energy is provided on an aerobic basis. Since the level of endurance is determined decisively by aerobic capacity, endurance is a very important factor in competitive rowing.

Strength capacities
Rowers have to push their boat permanently against water resistance. Since resistance is equal to the speed squared, it is easy to see that rowers also need a considerable amount of strength in addition to endurance. In competition, they have to develop a relatively large power about 100 to 260 times, depending on boat category, course, and stroke frequency. Moreover, this power has to be mobilized in a relatively short time span, since the stroke lasts only about 0.45 to 0.8 seconds. Thus, competitive rowers especially need strength endurance and elasticity, but also a high maximum power, since this influences strength endurance and elasticity.

Velocity and velocity endurance
The relatively high stroke frequency and the short stroke duration during competition necessitate a certain degree of velocity and velocity endurance. Both are bound to the lactic and alactic systems, which provide energy in the body.

Competitiveness
Rowing is an endurance sport performed in a team. When exercised on a competitive level, it demands a training characterized by a relatively high physical stress over a number of years. Next to a highly efficient and sustained motivation for the training, competition rowers thus need the capacity for sustained concentration, toughness, the ability to mobilize and improve, a performance-oriented self-confidence, and team spirit.

2. General principles of training method

At higher instruction levels, the desired competition results can be reached through qualitative improvement of the training while maintaining a fixed minimum amount of training. It is also necessary to include all training levels - from basic through high performance training - in a coordinated system.

The following principles can be used for orientation:

- The principle "from the general to the specific" is to be observed in the course of several as well as the individual training year. That is in the lower age groups and at the beginning of training in each of the macrocycles of the training season, a variety of skills on land and water should be developed, and at the higher levels of instruction and towards the end of each season, the training should be increasingly specialized.
- The principle of "increasing load" should guide each step of the training, from the beginning of the training season to the peak of competition.
- A certain training rhythm is necessary to ensure a best possible ratio of workload and relaxation during the course of the day, the week, and several weeks. At the same time, a minimum training amount must be realized. This means:
  - Depending on the different amounts of time available to athletes and coaches, weekly training plans should be based on a fixed minimum amount according to the basic guidelines, and arranged in a module system.
  - Training elements with similar aims, like strength training, endurance training, or rowing technique should be combined into exercise blocks during the course of the week or several weeks.
  - A fixed sequence of training elements should be kept during the course of the week.

- Competitions should be organized and take place in accordance with the aims of the training method of the specific phases. They should be prepared by appropriate types of exercise.
    - To take advantage of the natural competitiveness of children and youths, general and rowing-specific competitions are recommended throughout the whole year. The form of competition should be determined by training content.
    - The higher age groups should be oriented towards a bi-weekly competition rhythm during the regatta-season; the level of performance-determining factors such as strength, endurance, rowing technique etc. should be tested every 6 to 8 weeks during preparation periods.

- Rowing technique must be perfected by:
    - The use of age group-specific boat material with appropriate trim (i.e. 1x, 4x+ in all children's age groups),
    - The following two principles: beginner instruction should start in the scull, and rowing instruction should begin only after scull technique has been mastered in previous training,
    - By accepting rowing beginners to competitions only after they have proven command of rowing technique in a test,
    - Conveying basic knowledge and terminology of rowing technique and boat trim in a form appropriate for the age group,
    - The use of objective methods for rating and assessing rowing technique (video, picture sequences etc.).

- The principle "training - performance - training" ensures a high quality of training. This means including a minimum of necessary performance controls, tests, and documentation the training program.

To realize these methodological training requirements, trainers and coaches must be highly qualified. It is their responsibility to achieve a close attachment of the athletes to their sport and their club by providing a training that is pleasurable and emotionally satisfying, and to create the prerequisites for a rowing training that can last years.

3. Methodological guidelines for the development of rowing technique

3.1. General rules for the development of rowing technique
In principle, beginners should learn sculling first.
All clubs are advised to follow the guidelines below for sculling instruction:

- the right hand is closer to the body than the left
- the right hand is underneath the left

This rule applies to stroke and recovery. Large discrepancies in stroke angle between right and left hand are to be avoided. The insertion angles should differ as little as possible. A flowing and harmonious sequence of the different movements is especially important, since any uneven movement of body or extremities negatively influences propulsion and boat movement.

3.2. Guidelines for movement structure
The following rules are applicable for both sculling and rowing. The special features of rowing will be dealt with in an extra paragraph at the end of this section.

- Catching water begins out of recovery with a wide forward lean (lower legs vertical, upper body almost parallel to the thighs), without delay and without double pulling, with naturally extended arms. Before the catch, the blades are moved towards the water by a light lifting of the hands/arms, which is supported slightly in the shoulders. After the fast, vertical insertion of the blade (splash less towards the bow), pressure is exerted immediately through the opening of the hip angle and the tension of the shoulders at the beginning of the leg kick, so that a continuous acceleration of the inboard part of the sculls can take place while maintaining an even pressure on the footrest.
-

Main errors in this phase
- forward-leaning angle is too small
- forward-leaning angle is too extreme
- upper body is ducked
- arms are bent too much or prematurely

- inboard parts of the oar are pushed inward
- arms are lifted excessively
- hips give way, i.e. leg kick takes place too early
- upper body deployment (Einsatz) takes place too early
- head is leaned back strongly and back is straight
- head is pulled between the arms and looks to the footrest

- To achieve the combination of the separate components of body force necessary for the further acceleration of the inboard part of the oar, hips and legs are extended swiftly while the upper body and shoulders are taken back slowly. The arms are bent actively through the extension of the hips and legs only after the hands have reached the knees. In this phase, the extension of the legs is completed.

Main errors:
← hips and upper body give way
← premature deployment of the arms
← missing deployment of the arms
← shoulders are taken back
← hanging shoulders
← arched pull of the inboard parts of the oars

- In the following phase, the further increase of speed of the inboard parts of the oars is realized mainly through a bending of the arms and a taking back of the shoulders. While doing so, the upper body is stabilized at a lie-back angle of about 110-120 degrees. The back is bent slightly in the lumbar area of the spine, but remains straight in the chest area. The inboard parts of the oars are moved to a thumb's breadth towards the lower costal arch. Scullers pull with inboard parts of the oars at the same level right and left. Elbows are guided closely past the body.

Main errors:
← lie-back too small
← lie-back to extreme
← stroke is broken off too early
← upper body falls over the inboard parts of the oars
← knees are over-extended
← "hands away" takes place too slow

- A quick finish of stroke begins the lifting phase. Here, the hands slightly push down the inboard parts of the oars and tilt in the wrist. Immediately after the lifting of the blades, the hands are guided swiftly to the knees. The upper body follows the hand movement and is righted from the lie-back position in a fluid motion. Sliding begins only after the upper body has returned to an upright position. Sliding action takes place in a conscious and relaxed fashion. Rolling speed is steady while the naturally extended arms and the upper body is brought into a forward-leaning position. The reversing movement takes place quickly and fluidly out of a medium stretching of the muscles.

Main errors:
← (sliding) seat holds still too long during lifting
← uneven beginning of the sliding movement
← uneven stopping of the (sliding) seat
← upper body falls into a forward-leaning position
← catching water while the sliding seat is still

Special features of rowing

While the basic motions of sculling and rowing are the same, the mechanical differences between the two lead to the following divergence in the rowing technique:

While sliding forward, the rower follows the inboard part of the oar, so that at recovery, the lateral shoulder axis is almost parallel to the inboard part of the oar. The inner arm is extended and the outer arm ends with the end of the oar shaft. During the stroke, the inboard part of the oar is guided parallel to the side and accelerated. The shoulders are straight and the lateral shoulder axis follows the inboard part of the oar (tangential pull).

Main errors:
← bending of the inner arm
← ducking of the outer shoulder

3.3. Guidelines for stroke structure
The stroke structure should feature a thrust stroke emphasized on the forward pull. This means that while maintaining a maximum stroke angle (scull about 100-105 degrees, oars about 80-85 degrees), a steady acceleration of the inboard part of the oar should distribute the force used at blade deployment over the whole stroke. This means that:

- at the point of catching water, pressure is immediately taken up through a fast increase of swivel force at an oar angle of 50-70 degrees,
- a high level of swivel force is secured through further acceleration of the inboard parts of the oars while maintaining an oar angle of 70-110 degrees,
- thrust is maintained beginning at an oar angle of 110 degrees through the high speed of the inboard part of the oar, while the of force used by the rowers decreases strongly.

3.4. Conditions for an effective development of rowing technique
There are two basic conditions for an effective development of rowing technique:
- correct trim of the boat material, and the use of boats appropriate to the age. Often, a faulty rowing technique is traceable to defects in boat trim. Therefore, the following instructions should be followed:

- Footrest adjustment
The basic adjustment of the footrest is such that the stoppers can be reached from a forward-leaning position at the stern end of the track. The part of the slide actually used by the rowers depends on their size and leg length. Hitting the bow or stern stoppers is to be avoided by all means. Scullers should take care that they can pull the

ends of the sculls up to a thumb's breadth to the lower costal arch in the lie-back position. The different reaches of rowers can be accommodated in the crew boat by adjusting the footrests. If the footrest is moved sternward (rowers are closer to the swivel), the forward pull is increased, if the footrest is moved bow ward (rowers are further from the swivel), the forward pull is decreased.

- Determination of swivel height

The vertical distance between the lowest point of the seat and the contact surface of the swivel is called swivel height. It must be chosen in such a way that stroke, reverse movement, and coasting phase are not impaired. To achieve this, it is necessary to let the blades coast unimpaired in calm water. At finish of stroke, the inboard parts of the oars must reach the lower costal arch with blade fully submerged or flat on the water. As a general orientation, before the coasting of the blades, the following measurements have proven useful:

- Scull up to 80 kg average 135 mm swivel height
- over 80 kg average 155 mm swivel height

Children's

- Single scull 120 mm swivel height
- Boat with oars 150 mm swivel height

Contrary to existing guidelines, the difference between swivel heights starboard (higher) and portside (lower) in scull boats should not exceed 5 mm. Swivel height can be changed by adjusting the rowing pins or by inserting a disk between boat and outrigger.

Rule of thumb: a 1 mm disk changes the swivel height by 10 mm.

To prevent the outrigger from warping, the disks under the separate rigger stays must be equally thick. It is important to remember that any change in swivel height brings about a change in swivel distance and swivel height.

- Determination of blade angle

The blade angle is the deviation of the blade from a vertical line. For normal blades, it should be 6-8 degrees, which are composed of 3-4 degrees for sculls or oars and 3-4 degrees deviation from the medium position of the swivel. Adjustment of blade angle is done with the help of an eccentric. Older scull swivels are adjusted by moving the adjustment slide on which the swivel rests. The blade angle is measured with the help of a blade angle caliper, on which the angle can be read directly. It can also be determined by measuring the deviation of the blade from the vertical line. To do this, the boat must be jacked up on land horizontally, the scull or oar inserted in the swivel and brought to a 90-degree angle with the boat's longitudinal axis. With the seat in sternward position, the grip ends are 30 cm over the seat (floating position of the blades). A plumb line is held 10 cm away from the upper end of the blade while an assistant pushes the oar with its contact surface against the swivel. After the plumb line has ceased swinging, the distance between line and blade at the lower edge is measured. When problems occur at the beginning or the end of the stroke (blade inserted too deep, blade lifted too early), the blade angle must be checked at the beginning, the middle, and the finish of the stroke. Due to the force vectors during the stroke, higher swivel height necessitates a smaller, lower swivel height a larger blade angle.

- Determination of the swivel distances

The swivel distance is the distance between the middle of the boat and the center of the rowing pin (i.e. the fulcrum of the swivel). In sculls, the double swivel distance is called the span.

The inboard part of the oar should measure swivel distance plus 30 cm, swivel distance plus about 8 cm in the scull. Even if exceptional cases necessitate a change of swivel distance the ratio between inboard and outboard part of the oar must be retained

Hard transmission means: small swivel distance, small inboard, and large outboard part of the oar.

Soft transmission means: large swivel distance, large inboard, and small outboard part of the oar.

- Leverage ratio

To avoid mistakes on all levels of rowing technique development, it is necessary to adjust the leverage ratio to the fitness level of the young rowers. The leverage ratio can be changed by adjusting the overall length of the oars, the inboard parts of the oars, and, in extreme cases, by adjusting the swivel distance.

A harder leverage ratio can be chosen for athletes whose physical attributes (height, weight) gives them a better fitness level. Big blades are not recommended for the training of children and youths because of the amount of physical fitness necessary to control them in terms of rowing technique.

3.5. Methodological guidelines for the development of rowing technique

The instruction of rowing technique should be based on the following rules:

- Beginner instruction should be lead by experienced trainers/instructors in the clubs. The use of "rowing teachers" has proven successful for beginner instruction.
- If possible, basic instruction should take place in the 1x or K1x (children's skiff). An exception can be made for clubs which lie at waters with strong current. The boats must be trimmed correctly. The settings of footrest and outrigger height must be adjusted to the needs of the rowers.
- All phases of instruction must be geared toward developing a feeling for movement and stroke structure.
- The different phases of beginner instruction should be kept distinct. That is, there should be enough time for excercises to get used to the boat, and details or sequences of movement elements should be practiced only when the previous practice sequences have been mastered.
- No long explanations during practice. Athletes should be able to learn movements through experience. The subsequent next step must follow these experiences. For the instructor, this means:
    - use feedback for constant control and demand steady involvement from the athletes. Once movements are experienced, they are quickly imprinted into body and mind. This is true for correct and incorrect movements. Thus the exercises should be performed correctly and in high quality from the beginning.
    - Excessive demands upon the athletes should be avoided, and the ability of the group to concentrate must be kept in mind. It is generally better to concentrate for 3x20 minutes than to practice distractedly for 60 minutes.
- Vacation training courses where a relatively high practice frequency is possible have proven ideal for beginner instruction. This compact form of practice enables participants to experience a sense of achievement which strengthens the attachment to the sport. For successful training, fun during practice should be combined with competition forms at the end of each training phase, like f.e.
    - tilting of the boat from side to side with inboard parts of the oars pushed completely down
    - balance exercises
    - turns
    - reboarding from the water
    - rowing skill tests

Although after completion of beginner instruction, the crew boat is used more frequently, the development and stabilization of rowing skills should continue to remain a fixed part of the training. Even in competition situations, athletes should be in control of rowing technique. Thus it is just as important in long-distance training to

- correct mistakes immediately when they occur,
- use methodic aids (picture, video, partner examples, practice sequences) to clarify the connections between cause and effect,
- execute practice units even under unfavorable exterior circumstances (wind, waves), and to
- deliberately use the training on water to develop a propulsion-effective rowing technique while approximating a 1(stroke) to 2(coasting) ratio.

ASSOCIATION OF ROWING COACHES, SOUTH AFRICA

PHYSIOLOGY

MAXIMUM OXYGEN CONSUMPTION

If you walk into the locker room of a bunch of American Football players, bragging rights are reserved for the man with the heaviest bench press. Similarly, talk to a group of endurance athletes that are "in the know", and conversation will eventually turn to "What is your VO2 max?" A high maximal oxygen consumption is indeed one of the hallmark characteristics of great endurance performers in running, cycling, rowing and cross-country skiing, so it must be pretty important.

What is it and how is it measured?

VO2max defined

VO2 max is the maximum volume of oxygen that by the body can consume during intense, wholebody exercise, while breathing air at sea level. This volume is expressed as a rate, either liters per minute (L/min) or millilitres per kg bodyweight per minute (ml/kg/min). Because oxygen consumption is linearly related to energy expenditure, when we measure oxygen consumption, we are indirectly measuring an individual's maximal capacity to do work aerobically.

Why is his bigger than mine?

To rephrase, we might start by asking "what are the physiological determinants of VO2 max?" Every cell consumes oxygen in order to convert food energy to usable ATP for cellular work. However, it is muscle that has the greatest range in oxygen consumption. At rest, muscle uses little energy. However, muscle cells that are contracting have high demands for ATP. So it follows that they will consume more oxygen during exercise.

The sum total of billions of cells throughout the body consuming oxygen, and generating carbon dioxide, can be measured at the breath using a combination of ventilation volume measuring and O2/CO2-sensing equipment. The figure to the left, borrowed from Prof.

Frank Katch, summarizes this process of moving O2 to the muscle and delivering CO2 back to the lungs. So, if we measure a greater consumption of oxygen during exercise, we know that the working muscle is working at a higher intensity. To receive this oxygen and use it to make ATP for muscle contraction, our muscle fibers are absolutely dependent on 2 things: 1) an external delivery system to bring oxygen from the atmosphere to the working muscle cells, and 2) mitochondria to carry out the process of aerobic energy transfer. Endurance athletes are characterized by both a very good cardiovascular system, and well developed oxidative capacity in their skeletal muscles. We need a big and efficient pump to deliver oxygen rich blood to the muscles, and we need mitochondria-rich muscles to use the oxygen and support high rates of exercise. Which variable is the limiting factor in VO2 max, oxygen delivery or oxygen utilization? This is a central question that has created considerable debate among exercise physiologists over the years, but for most the jury is now out.

In the well-trained, oxygen delivery limits VO2 max

Several experiments of different types support the concept that, in trained individuals, it is oxygen delivery, not oxygen utilization that limits VO2 max. By performing exercise with one leg and directly measuring muscle oxygen consumption of a small mass of muscle (using arterial catheterisation) it has been shown that the capacity of skeletal muscle to use oxygen exceeds the heart's capacity for delivery. Thus although the average male has about 30 to 35 kg of muscle, only a portion of this muscle can be well perfused with blood at any one time. The heart can't deliver a high blood flow to all skeletal muscle, and still maintain adequate blood pressure. This limitation is analogous to the water pressure in your house. If you turn all the faucets on while trying to take a shower, the shower pressure will be inadequate because there is not enough driving pressure.

Without getting in to deep on the hemodynamics, it seems that blood pressure is a centrally controlled variable; the body will not "open the valves" to more muscle than can be perfused without compromising central pressure, and blood flow to the brain. The bigger the pumping capacity of the heart, the more muscle can be perfused while maintaining all-important blood pressure.

As further evidence for a delivery limitation, long-term endurance training can result in a 300% increase in muscle oxidative capacity, but only about a 15 to 25% increase in VO2 max. VO2 max can be altered artificially by changing the oxygen concentration in the air. VO2 max also increases in previously untrained subjects before a change in skeletal muscle aerobic capacity occurs. All of these observations demonstrate that VO2 max can be dissociated from skeletal muscle characteristics.

Stroke volume, in contrast, is linearly related to VO2 max. Training results in an increase in stroke volume and therefore, an increase in maximal cardiac output. Greater capacity for oxygen delivery is the result. More muscle can be supplied with oxygen simultaneously while still maintaining necessary blood pressure levels.

In the untrained, skeletal muscle capacity can be limiting

Now, having convinced you that heart performance dictates VO2 max, it is important to also explain the contributing, or accepting, role of muscle oxidative capacity. Measured directly, Oxygen consumption= Cardiac output x arterial-venous oxygen difference (a-v O2 diff). As the oxygen rich blood passes through the capillary network of a working skeletal muscle, oxygen diffuses out of the capillaries and to the mitochondria (following the concentration gradient). The higher the oxygen consumption rate by the mitochondria, the greater the oxygen extraction, and the higher the a-v O2 difference at any given blood flow rate. Delivery is the limiting factor because even the best-trained muscle cannot use oxygen that isn't delivered. But, if the blood is delivered to muscles that are poorly trained for endurance, VO2 max will be lower despite a high delivery capacity. When we perform VO2 max tests on untrained persons, we often see that they stop at a at a time point in the test when their VO2 max seems to still be on the way up. The problem is that they just do not have the aerobic capacity in their working muscles and become fatigued locally prior to fully exploiting their cardiovascular capacity. In contrast, when we test athletes, they will usually show a nice flattening out of VO2 despite increasing intensity towards the end of the test. Heart rate peaks out,

VO2 maxes out, and even though some of the best trained can hold out at VO2 max for several minutes,

max is max and they eventually hit a wall due to the accumulation of protons and other changes at the muscular level that inhibit muscular force production and bring on exhaustion.

How is VO2 max measured?
In order to determine an athlete's true maximal aerobic capacity, exercise conditions must be created that maximally stress the blood delivery capacity of the heart. A physical test that meets this requirement must:

_ * Employ at least 50% of the total muscle mass. Activities which meet this requirement include running, cycling, and rowing. The most common laboratory method is the treadmill running test. A motorized treadmill with variable speed and variable incline is employed.
_ * Be independent of strength, speed, body size, and skill. The exception to this rule is specialized tests for swimmers, rowers, skaters, etc.
_ * Be of sufficient duration for cardiovascular responses to be maximized. Generally, maximal tests using continuous exercise protocols are completed in 6 to 12 minutes.
_ * Be performed by someone who is highly motivated! VO2 max tests are very tough, but they don't last too long. If we use a treadmill test as an example, here is what will happen. You will go to a good laboratory at a University fitness program, performance testing lab, or hospital wellness center. After a medical exam, and after being hooked up to an ECG machine to monitor cardiac electrical activity, you might start the test by walking on the treadmill at low speed and zero grade. If your fitness level is quite high, the test might be initiated at a running speed. Then, depending on the exact protocol, speed or inclination (or both) of the treadmill will increase at regular intervals (30 sec to 2 minutes). While running, you will be breathing through a 2-way valve system. Air will come in from the room, but will be expired through sensors that measure both volume and oxygen concentration. Using these values and some math, your oxygen uptake will be calculated by a computer at each stage. With each increase in speed or incline, more muscle mass will be employed at a greater intensity. Oxygen consumption will increase linearly with increasing workload. However, at some point, an increase in intensity will not result in an “appropriate” increase in oxygen consumption. Ideally, the oxygen consumption will completely flatten out despite ever-increasing workload. This is the true indication of achieving VO2 max.

In the figure below, we see the results of actual test on a well trained runner performed in our lab with the treadmill incline a constant 5% and velocity increased 0.75km/h each minute.

Even well trained athletes cannot stay at their VO2 max very long due to concurrent skeletal muscle fatigue. Other indications of max VO2 are extreme hyperventilation, and a heart rate of very near 220 minus age that does not increase further with increased workload.

The value you are given by the test administrator will be in one of two forms. The first is called your absolute VO2 max. This value will be in liters/min and will probably be between 3.0 and 6.0 liters/min if you're a man and between 2.5 and 4.5 l/min if you’re a woman. This absolute value does not take into account differences in body size, so a second way of expressing VO2 max is common.

This is called your relative VO2 max. It will be expressed in milliliters per min per kg bodyweight (ml/min/kg). So if your absolute VO2 max was 4.0 liters/min and you weighed 75 kg, then your relative VO2 max would be 4000 divided by 75, or 53.3 ml/min/kg. In general, absolute VO2 max favors the large endurance athlete, while relative VO2 tends to be higher in smaller athletes.

For comparison, the average maximal oxygen consumption of an untrained male in his mid 30s is about 40-45 ml/min/kg, and decreases with age. The same person who undergoes a regular endurance exercise program might increase to 50-55 ml/min/kg. A champion male masters runner age 50 will probably have a value of over 60 ml/min/kg. An Olympic champion 10,000-meter runner will probably have a VO2 max over 80 ml/min/kg! What about females? I talk about gender differences in performance in another section. The underlying physiology is the same, however specific differences result in lower population values for VO2 max in untrained, trained and champion females when

compared to men at a similar relative capacity.

Genetics play a big role
I grew up being told that I could do anything and be anything I set my mind to. I think that was nice of my mother to encourage me that way. However, the biological reality is that there is a significant genetic component to most of the underlying physical qualities that limit just how “Citius, altius, fortius” we can be with training. VO2 max is no exception. The reality is that if an adult male with a natural, untrained VO2 max of 45 ml/min/kg trains optimally for 5 years, they might see their VO2 max climb to around 60-65 ml/min/kg. This is a huge improvement. But ,alas, the best runners have a VO2 max of 75 to 85 ml/kg. So our hard training normal guy is still going to come up way short against the likes of these aerobic beasts. If they were to stop training for a year, their VO2 max might fall to about where the average guy’s topped out after years of optimal training. How unfair is that? The bottom line is that Olympic champions are born with unique genetic potential that is transformed into performance capacity with years of hard training. Recent studies focusing on the genetics of exercise adaptation have also demonstrated that not only is our starting point genetically determined, but our adaptability to training (how much we improve) is also quite variable and genetically influenced. While the typical person will show a substantial increasing in VO2 max with 6 months of exercise, carefully controlled research studies have shown that a small percentage of people will hardly show an increase in VO2 max at all. For example,

One more thing. Just to put things in perspective, the VO2 of a typical 500kg thoroughbred horse is about 75 liters/min or 150 ml/min/kg! So compared to a horse, even an Olympic endurance champion human comes out looking like a couch potato.

TECHNIQUE

TECHNIQUE TIPS FROM PETER HAINING

A) POWER PHASE
- Rowing is the art of using ones weight to move the boat
- Movements must be performed as eaily and naturally as possible
- Shove the boat, don’t shove water

1. Feet Connection
   - Fix the blade firmly at the catch
   - The water is gripped at the catch with the feet. Gripping is different to pulling
   - The upper body is not used
   - Stretch is felt in the Lats (Lattisimus Dorsi)
   - The hands are left out where the catchwas taken
   - The athlete feels they could stand off the footstretcher
2. Leg Drive
   - Accelerate through the drive
   - The power of the stroke comes from the legs and back
   - Emphasize coordination of the leg drive and hanging back action of the upper body
   - The shoulders and arms are loose and relaxed
   - The drive feels loose and aggressive rather than hard
   - Squeeze the legs slowly and open the back quickly through the sweet spot
   - The athletes weight continues to hang between the handle and feet
   - In the early stages of skill development it is more important that the legs are applied in the correct way rather than the hardest way
3. Arm Draw
   - A very late arm break. The pull is made with the lats and biceps
   - Sit over the handle
   - Sit level in the boat
   - Shoulders are level
   - Do not emphasize the outside shoulder
   - Posture is maintained. i.e sat up, firm abdominals and lower back
   - Keep both forearms flat
   - As the boat type gets faster the role the arms can have in accelerating the boat decreases

B) RECOVERY PHASE
- The recovery is when the boat travels the fastest
- Athletes must be aware of their weight and sensitive of the movement and speed of the boat so they don’t slow it down

1. Finish
   - Sit level in the boat
   - Fast, low hands away
   - Definite strike of the hands away
   - Hands move at the speed of the boat
   - Feather out of the water with the inside fingers only
2. Prepare
   - Move quickly, at the same speed of the boat, to the poise position
   - The poise position is the key to balance, rhythm and a good catch
   - In the poised position the athlete should feel every movement of the boat through his feet and hands
   - Separate and organize the body movements
   - The crew uses the poise position and a reference point
3. Slide
   - Float up the slide
   - Sliding forward must be a relaxed but controlled movement
   - Continue to reach and stretch out during the recovery so that the body weight stays in front of the seat, and increases on the feet steadily

- Nearly all beginners and far to many experienced oarsmen rush the recovery
- Feel the boat and move with it
- The athlete sits relaxed as the boat moves forward underneath his seat
- The shoes come to the athlete, not the athlete to the shoes
- The upper body stays in a strong position, and doesn't need to lurch into the catch

B3/A1) Catch

- The body position is the same as it was at the poised position, with the shoulders rotated but not dropped round to the strokeside/bowside
- It needs to be relaxed, not a violent action
- It is a question of timing rather than brute strength
- Square early and roll the spoon down into the water
- Hands move up and forwards and are high at the catch
- The seat keeps moving in, and then out. The hands are timed to this
- Sit up
- The blade should not start moving sternward in the air, when it should have been in the water
- Feel for pressure before starting to work against the water
- Grip the water
- The catch is a quick, big, deliberate, loose, accurate and bow-ward movement
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-

ASSOCIATION OF ROWING COACHES, SOUTH AFRICA

TECHNIQUE

SPEED VS EFFORT

I think that this is an excellent article about developing speed and all the principles can be applied to rowing boats in some way. A great example of what we can learn from other sports. – Jamie

Swimming is a simple sport. Jump in at one end and get to the other end before anyone else.

In the most basic analysis, It's a game of speed. Speed is the most crucial element in the sport. It's fundamental.

The swimmer who swims fastest, wins the race.

But is it really that simple? We know from biomechanical analysis of champions at major swimming competitions that the fastest swimmer doesn't always win. Sometimes the fastest swimmer (ie the person with the highest swimming speed) loses the race because of inferior skills, turns, starts and finishes.

We know sometimes the fastest swimmer doesn't win because they weren't mentally focussed in on the task.

In the end however, skills, fitness, mental attitude, flexibility and all the other elements of the sport come down to one question ...how fast can you swim?

What is swimming speed? Technically it is the velocity that your body moves through the water.

If you ask a little kid to swim as fast as they can, they throw their arms and legs as fast as possible with lots of effort, but without much speed. They grit their teeth, tighten their arms, hold their breath and generally fight the water. They make lots of splash, but not much dash! There is a difference between effort and speed.

Great swimmers often report that when they experience REAL SPEED, it seems to come with little EFFORT.

The great South African breaststroke swimmer Penny Heyns recently broke the world records for 100 and 200 metres. She commented:
"When I touched the wall I thought, maybe a 2:30, and this felt too easy for that," Heyns said."I really don't know what happened."

Australia's own Grant Hackett interviewed after his amazing world record effort over 200 metres freestyle said:
"I certainly hadn't prepared to break the world record - I was having pillow fights with Ky Hurst and the rest of the team before the race"

And it goes on...
"The swim itself just happened, just like Gennadi (coach) said it would, without really forcing it".
were Michael Klim's comments after his world record 100 butterfly swim.

When it all comes together, and swimmers feel real speed, it seems to come with little effort.

On other occasions, swimmers have reported feeling heavy, slow and sluggish, busting their guts and giving 100% effort, but have swum slow times.

What is the difference between EFFORT and SPEED?
Speed and relaxation appear to be somehow linked. It seems weird, but in many sports where excellence is measured in terms of how fast an athlete can move, the champions consistently say that their best performances have come when they were at their most relaxed.

When at his peak, multiple Olympic Gold Medallist sprinter Carl Lewis was an unbeatable athlete who understood speed as much as anyone. When asked about Lewis' success, his coach remarked, "the faster you want to go, the more relaxed you have to be".
The question then is can you learn to relax when trying to go fast?

Long, easy, even paced, even tempo swimming helps develop a sense of rhythm. Being in a swim rhythm is a comfortable feeling that helps develop relaxation. When arm stroke, kick and breathing are in a co-ordinated rhythm, real relaxation in the water is possible. From there, it is possible over time to learn to stay relaxed at faster speeds. Learning to relax at slow speeds first is the crucial step.

Swim techniques and drills have been developed to decrease the resistance your body experiences when swimming. Developing technical excellence means you move through the water with less effort.

Work on M.D.S. or D.P.S. (Maximum Distance per Stroke or Distance per Stroke) skills as a priority. The best swimmers in the world are able to maintain long strokes at top speed, when tired and under pressure. It all starts with learning to swim with less strokes in training. In warm up, try counting strokes on the first lap. Then aim to take one stroke less on the next lap and so on.

Try the MINI-MAX workout (MINIMUM STROKES, MAXIMUM SPEED) used to great effect by Bill Sweetenham. Count your strokes on your first 50 metres. Accurately note your time. Next, add the number of strokes to your time. For example, if you take 50 strokes and swim 45 seconds for the lap, your lap score is 95. Aim to swim a lap score of 94 on the second lap, which means you need to either swim a little faster, or stroke a little longer. Continue the process 6 times. Fewer strokes is good. Faster speed is great. Fewer strokes and faster speed is best.

Work on keeping strokes long and strong at training. In every effort ask yourself "Could I do this with fewer strokes?" When doing skills work like drills aim for technical perfection, then technical perfection with the minimum number of strokes and finally technical perfection with a minimum number of strokes at maximum speed.

Develop real speed by thinking about swimming FAST rather than trying too hard and increasing effort during your speed. Train fast to Race fast.

Every turn in training is a race turn, every dive is a race dive. Every finish should be completed on the wall with power and controlled aggression. Train as you would like to race.

Drills should be completed with precision and with 100% concentration. Think technique first at all times.

Challenge yourself to swim fast when tired. In training challenge yourself to jump up at the end of the session and swim fast. When racing, challenge yourself to swim fast when tired, to swim fast heats in the morning then faster finals at night, to swim as fast on the last day of the meet as you did on the first day etc.

Learn to enjoy pressure situations. Being nervous is a sign that something great is about to happen. Your body is getting ready to do something brilliant. Learn to enjoy the pressure of competition.

Part of the process of understanding the difference between effort and speed comes during TAPER - that period of time when you are freshening up and resting in preparation for a competition. Swimmers will often say that during a taper they feel "light", that training efforts "felt easy" that they feel like they are swimming "on top of the water".

This feeling, where speed comes with little effort, is an indication that you are ready to race and that your taper has worked well.

It also comes from listening to your coach and working with him or her in your fast work. If your coach uses the expression "Maximum Effort" your swimming response should be "I will do this at maximum speed, while staying relaxed and loose, with minimum strokes, great skills and technical excellence".

If it's speed you need, You need speed indeed,
And you need some dash, Without splash or trash,
Just keep your cool, In the swimming pool,
Stay relaxed and loose, And you'll make the news.

Association of Rowing Coaches

Membership Application Form

First Name: ________________________________

Surname: ________________________________

Gender: ________________________________

Nationality: ________________________________

ID Number (RSA): ________________________________

DoB: ________________________________

Postal Address: ________________________________

____

Cell Phone: ________________________________

Email: ________________________________

Club/Institution: ________________________________

Volunteer/Half paid/Full Paid: ___________________________

Coaching Qualification Level: ___________________________

Representation: International/National/Provincial:________________

This form must be completed and returned by fax to Jamie Croly (National Secretary) at 011 781 2987 or by Email at jcroly@stithian.com. You will be notified by email of the receipt and acceptance of the membership application.

Membership fee of R100.00 per year will be invoiced after membership has been accepted and processed.