Refocus on 2020!

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Aquatics is the second largest Olympic sport based on the number of athletes competing and is as popular as ever. SA swimmers have proofed to be medal winners in numerous Olympics and there are many more to come. Our Refocus on our new, young swimming talent starts now!

This unnatural sport requires higher neural demands as humans are not born with the capability to swim. In what other aerobic sport do you constantly use a motion that is completely unnatural? Swimming forces athletes to move through an unstable medium that is unfamiliar to humans. To develop elite skills, manipulation of this different medium requires long hours of staring at a black line. High-volume swimming is essential to turn this unnatural mode of transportation into a fluid, effortless movement.

Therefore, the best mode for swimming improvement is … swimming! However, strength and conditioning is essential for every competitive swimmer.

Despite their notoriety for being klutzes on land (Michael Phelps breaks wrist getting out of car door), swimmers do require strength and conditioning for success. These unique amphibians typically endure unimaginable hours in the pool for sporting success. Many outside of the sport consider this atrocious time in the pool a form of dogmatic overtraining, but in a sport driven by "feel," countless laps staring at a black line are essential. "Feel" is an ancient term used by swimmers describing motor control. All sports require high neural demands, but swimming is an especially different beast.

Water is a unique medium when compared to the rigid, stable ground. Swimming also requires a high volume of overhead movements. In fact, there are a staggeringly large number of overhead movements in swimming when compared to baseball or tennis. Additionally, there is no limit, or stroke count, to protect the shoulders of a swimmer like there is for baseball pitchers. According to Wilk, swimmers perform approximately sixteen times the volume of overhead movements when compared to baseball pitchers (Wilk, 2008). This conundrum is unsettling at first, but considered essential to developing sport-specific "feel" in an unnatural medium, which is a necessity for competitive swimmers.

Consider a runner who takes a break from their sport. If a track star misses a few days, they are able to hop on the starting blocks and perform best times. If a swimmer misses a few days, they will hit the water like a wet noodle and be far from their best times. This difference is due to high the neural input required in swimming, specific to the unnatural medium of water.

Swimming and strength training have a unique relationship compared to other sports. In fact, the swimming community broadly calls all forms of strength training "dry-land". This blanket term suggests the unfamiliarity with strength training which is noted in many "dry-land"

programmes across the globe. If you want to cringe, head to your local swim team and watch countless hours of band exercises, sit-ups, swim bench, or push-ups.

These forms of "dry-land" training were introduced to the swimming community as swim coaches are weary of strength training and not without reason. Many studies suggest out of water strength does not correlate with swimming success (Costill 1983; Tanaka 1993; Crowe 1999). Even more discouraging, many studies have studied the effects of resistance training with swimmers and found minimal improvement (Crosser 1999; Cronin 2007; Bulgakova 1987; Tanaka 1993; Breed 2000). However, strength training is suggested to correlate with sprint swimming (25 and 50 distances … aka one lap!) (Carl 2010; Sharp 1982; Hsu 1997). Moreover, more up-to-date training programs may positively influence the few ground-based movements (start and turn) in swimming (Kilduff 2011; West 2011; Potdevin 2011) It is hard to argue these studies as many of you reading this is likely able to squat twice their body weight, but are unlikely to finish one lap of butterfly! However, strength training is more than just improving strength, especially in sports where the neural demands and biomechanics are the driving factor for success. Strength training for swimming must prevent injuries, muscular imbalances, improve speed, enhance recovery, increase force production, and address any impairments impeding success.

5 Considerations when Training Swimmers

1. Don't be too specific:

A lot of emphasis is put on "sport-specific" movements (swim bench, cable crossovers, straight arm pulldowns, etc.). Unfortunately, the transference of these movements is uncertain and likely minimal to the sports of swimming. Every land exercise you create is far from the demands in the pool. Despite visual similarities, every swimmer uses unique yet imperceptible micro-adjustments in their strokes to optimize balance, force, and deceleration. It is impossible to replicate these movements on land and attempting to be too "sport specific" may lead to confused motor programming (McGuff 2009). Therefore, stay away from specificity to prevent motor programme confusion and returning to these resisted patterns when fatigue occurs in the pool. Instead, building motor control and learning the big movements (squats, push ups, box jumps, commandos) is ideal. Moreover, performing the similar movements outside of the pool increases the chance of overuse injuries and time away from the most specific form of training…swimming (Stiff 2000; Vermeil 2004).

2. Respiratory Training:

The relationship between breathing and swimming is unique in the sport world, as land-based sports do not require breath holding. Swimming in adolescence is even believed to enhance lung volumes (Courteix 1997). Moreover, inspiratory muscle fatigue is noted as a cause of fatigue at the end of a swimming race (Cruichshank 2007; Jakovljevic 2009). Many studies have suggested inspiratory muscle strengthening is beneficial in endurance underwater (Ray 2008; Ray 2010; Wylegala 2007). If you are able to improve their inspiratory muscle endurance, you can prevent muscle fatigue and enhance their swimming performance, the ultimate end game, not maximal pull-up number. Lastly, understanding the intricate role of breathing and shoulder health is essential for preventing and improving the high volume of shoulder injuries in the sport.

A method for improving breathing is repeated maximal inhalations and breath holds.

For example:
30 seconds of normal breathing with 10 second exhalations
30 seconds of holding your breath
60 seconds of normal breathing with 10 second exhalations
60 seconds of holding your breath
90 seconds of normal breathing with 10 second exhalations
90 seconds of holding your breath
120 seconds of normal breathing with 10 second exhalations
120 seconds of holding your breath

3. Keep Them Healthy:

Like all athletes, keeping them in their arena and out of the training room is quintessential. Too often overzealous strength coaches throw swimmers in the weight room, only to be injured. In fact, weight training was the most common ground for injuries in freshmen swimmers (Wolf 2009)! Just because you are working with a National level swimmer doesn't mean they are a good athlete in the weight room! If they are a novice, treat them like one, take some time and teach them proper form on the basic lifts (bench, deadlift, squat). Make sure these uncoordinated athletes are safe, with proper biomechanics, and loads. Also, don't make them overly sore during weights, as this impairs their "feel" or motor control in the pool, potentially increasing their risk of injury. Remember, many swim programmes perform high volume training, 20 hours of swimming a week is not uncommon, make sure you are not burning the candle on both ends and increasing the likelihood of overtraining.

4. Improve Weak Points:

Even though many people idolize a swimmer's body, many weak points are evident. Like all strength programmes, screening swimmers is essential. When I'm screening swimmers, I am taking a close look at their shoulders, low-back, knees, and respiration. Relating to point #3, keeping them healthy is essential and overuse is the most common reason for shoulder injury, but guess what, this isn't going to change! Therefore, finding their weak points and addressing and improving them with proper preventative care are essential! Don't neglect the core when you see six-pack abs! These internal rotation excessive creatures need instruction for shoulder stability and differentiation between the cervical spine, and shoulder stabilizer muscles.

5. Don't Neglect Synergy:

Many novice swimmers suffer in the pool due to an inability to synchronize their movements. For example, if you hop in the pool and flex every body part, you're going to sink. Elite swimmers make this difficult task simple by timing the correct muscles for the movement pattern. Therefore, learning the task of turning on and off muscles is essential in this sport where sensory input is essential. Teaching proper neck, shoulder, core, and hip differentiation helps these athletes improve motor control with the goal of improving the ease of biomechanical corrections in the pool. Make sure you're a valuable asset to their improvement in the water!

Basic Assumptions

The design of these programmes are influenced by several principles of growth and development. It is believed that these principles should be adhered to because they are in the best interests of age-group swimmers. The design assumptions are listed below.

1. **Age-groupers are not miniature adults.** Age-group swimmers are structurally and physiologically different to adults. Consequently, beneficial training activities are likely to be different to those employed for adults even though the aims of such activities might be similar.

2. **Age-group swimmers are better served by general programmes of development than specialized programmes.** The question of whether age-groupers should specialize in particular sports at an early age has been asked for many years. The evidence now seems to support programming activities that develop overall capacities rather than specialized functions while young athletes grow. Consequently, even though a young athlete may be training for one sport, any auxiliary training should promote balanced overall growth stimulation. Some of that stimulation will be appropriate for the sport in question.

3. **Age-group swimmers are better served by auxiliary training activities that do not employ localized restrictive apparatus.** If resistance training is to be done with children and young adolescents, exercises should involve submaximal loads, such as one's own body weight, light dumbbells, weighted bags and/or medicine balls. Sophisticated and restrictive weight exercises, particularly on machines, are note ideal for children. General whole-body activities are more important and beneficial for young swimmers than the exercises used for adult or mature athletes.

4. **Flexibility and strength/power development should be developed concurrently in age-group athletes.** As young people mature, it is important to maintain a high degree of flexibility while increasing strength and power. Such an emphasis will maintain the athlete's capacity to employ improved capacities through the full range of movement potential.

5. **Auxiliary training should occur after the sport training session so that any fatigue will not interfere with the potential for skill development.**

All sports, and swimming in particular, require a high degree of skill for superior performance. The major emphasis of an age-group swimming programme should be skill excellence. For skills to be developed, learning should occur in non-fatigued states. If exhaustive auxiliary training was to occur prior to a swimming practice, fatigue would reduce the learning potential of the swimming session. Thus, it is advisable to schedule auxiliary training sessions either after a swimming session or at some time that allows complete recovery from its execution so that no residual fatigue is carried into the swimming practice. If fatiguing auxiliary training occurs prior to a practice, it is advisable to have the following pool training session emphasize energy training rather than intense skill development.

When performing the routines coaches and swimmers should avoid stressing working each exercise and the programmes to fatigue failure. The programmes must be designed to produce body coordination, functional strength, and explosiveness. Those capacities are compromised when an athlete works in high states of fatigue because the development of these qualities, like skills, are neurally based, not energy driven.

6. **Progress rates in strength and power will be particularly individual in age-group athletes.** The development of physical capacities is governed by the stage of maturation of the individual. Since growth rates of children and young adolescents vary considerably, it is only appropriate to judge improvements within the athlete. It is inappropriate to compare athletes. Thus, no child should be made to feel that he/she has to improve as much as another when participating in auxiliary training activities.

7. **The types and amounts of auxiliary activity improvements will be governed by the stage of maturation of the individual.** The developmental stages of growing children and adolescents dictate the physical capacities that can be improved. There are particular times when forms of activity are initiated so that they will coincide with the growth potential of each individual. This phenomenon further complicates social comparisons between athletes. When some individuals improve rapidly on some exercises, others may not be "ready" to progress in a similar manner because their "biological clocks" have not been turned on.

8. **It is better to do too little than too much auxiliary training.** If a programming error was to be made it would be best to schedule few auxiliary training sessions than too many. It has been shown that when developed slowly strength, power, and flexibility achieve higher levels and are retained longer in periods of detraining than programmes that attempt quick development. It may be beneficial to limit the number of auxiliary training sessions to two or three per week. Excessive auxiliary training may reduce participant motivation and may not facilitate improvement in an optimal manner.

9. **There is an optimal level of strength and power that is appropriate for swimming.** Excessive capacities in these factors do not enhance swimming capabilities. Thus, training needs to develop capacities to a certain level. A preoccupation with auxiliary training would usually be to the detriment of the age-group athlete.

10. **Auxiliary training activities should either be explosive or static.** The many hours of long distance swimming which is a necessary part of training has a tendency to stifle quick and powerful movements. Auxiliary training programmes can be used to counteract this suppression. Activities should be either explosive and powerful, as in sprint swimming, or static, as in holding postures and stabilizing movement bases or ideally both.

For many new age-group swimmers their muscular condition and capacities may not be sufficient to engage in the prescribed activities. Consequently, it is necessary to evaluate the status of each swimmer before embarking on these conditioning programmes. There are three levels of preliminary fitness testing that are recommended. It is only after all the activities of the third level are performed satisfactorily that a swimmer should be allowed to participate in this foundational conditioning programme.

1. The conduct of these activities is dependent upon complete cooperation between athletes as they function in their paired activities. Cooperation will be facilitated if the pairings comprise athletes of similar abilities in this category of exercises.

2. Activities are performed in *SEQUENCE IN A CONTINUOUS MANNER.* Because there is considerable partner activity, there are intermittent short rests while the resistance object is passed from one partner to the other.

3. The resistance to be used should be one that is "suitable," that is, it can be handled by the athletes, so that the skilled activities can be performed well and with effort. The type of resistance should be a weighted soft bag or a medicine ball. It is advised that bags/balls be of 3, 4.5, and 6 kilogram sizes.

4. The activities are skills which require catching and throwing from a variety of positions and in several manners. Early participation should be devoted to developing the skills of catching and throwing in the prescribed exercises so that there will be no threat of injury or accident. At all times the skill of executing the throws and catches and the delivery of the object to the most accommodating position for the partner should be emphasized.

5. Overload is developed by increasing the number of repetitions of each exercise, the number of "circuits" of the exercises, and/or increasing the weight of the object thrown. It is desirable to work with a heavy object so that strength and power will be the main physical capacities developed. The resistance of the activities should be such that obvious "effort" is always required of participants.

There are other sports that are highly recommended to develop young swimmers into future Olympians:

- **Volleyball:** In this instance, it's more of a matter of correlation than causation. The same body type that makes for good volleyball players makes for good swimmers. The exploding off of the legs can really help with starts and turns however. I've also had several swimmers report that the strength they develop from swimming does a lot to improve their volleyball serves.

- **Cross-Country Running**: Cross-country runners often make good swimmers because they have great overall conditioning which allows them to train long and hard. The mental conditioning of long runs also helps prepare them. Finally, they develop highly efficient muscles that are needed for swimming. Couple this with some upper-body development, and you've got the beginnings of a great swimmer. Note, however, that this combination is more effective when the athletes are younger. Most adult runners struggle mightily in the pool.

- **Dance:** Dancers develop perfect muscles for swimming, that is to say long and lean, and powerful legs. Plus, they have great ankle flexibility (point your toes like a ballerina!) which gives them powerful kicks.

- **Baseball/Softball:** The key here is the way stickball players use their hips. In both baseball and swimming, the big key to generating power is the hips. This is much more obvious in the baseball swing, however, than it is in the freestyle stroke. It is also something that is difficult to think out, and requires swimmers to feel it out. Swimmers who start developing this feeling on the diamond really seem to have a much easier time grasping it in the water. Shoulders is the real thing to look out for here, so make sure your kid gets a quality coach who teaches them proper throwing mechanics.

- **Soccer**: There are many soccer players who, without even training, I've seen demonstrate a lot of ability in the pool. Soccer helps develop overall conditioning, along with lower body strength and fast-twitch muscles. It also puts very little strain on the shoulders which might manifest itself in the form of tendinosis/ rotator cuffs/etc. as the swimmer ages and logs more pool time.

- **Water Polo**: Ok, this might seem like a no-brainer. But aside from the obvious (swimming), it helps the swimmers get a very good feel of how their bodies move in the water. It can also help strike a balance between keeping a swimmer in the pool/swimming shape year round, and not making them swim monotonous laps year round.

- **Gymnastics/tumbling**: For evidence, see one Kukla Yolane, who in just 3 years went from gymnast to a 14-year old swimming Phenom and Australian National Champ. You can always tell a gymnast in the pool, because their turns are awesome, and they learn very quickly. All of the flipping and twisting helps them develop incredible core strength, but even more importantly, they develop the body awareness to recognize what their body is doing wrong and how to correct their strokes. Most other swimmers don't really get this skill until they're teenagers. Gymnasts also have incredible starts, derived from their power.

6 Questions Regarding Resistance Training for Teenage Swimmers

Back to resistance training for teenage swimmers. Here are the most common questions I receive regarding resistance training for teenage swimmers:

- **Is it safe?**

  In all honesty, it often isn't. This doesn't mean it can't be safe with proper guidance, progressions and supervision, but if a swim coach with no education in resistance training is teaching weightlifting to your growing child, I'd argue it isn't safe. Just because you lift weights or did as a swimmer doesn't make it safe. A proper programme is safe, but must start with many basics and progress to weight training. Once again, when done properly with proper guidance, weight training scientifically is safe for all ages; however you must be able to perform proper body weight form correctly, master all body weight exercises first, then progress to weight training. Also, performing some type of lower-body loading (i.e. body weight training, weight training, jumping) during years of maturation is likely beneficial for preventing low bone mineral density (BMD) in the hips. This increases the risk of osteoporosis and fractures later in life. These formative years are a huge opportunity for bone growth and health! Too often, people are allowed to lift weights on a club team once they reach a certain age. Just because they are a certain age doesn't make them competent and safe.

- **Does it help swimming?**

  In all honesty, it hasn't been scientifically proven. However, few things are scientifically proven in swimming or sport, as results are very individual. Nonetheless, I believe dryland is beneficial for many things — swimming performance being one of them — but a poorly-designed dryland programme is likely more harmful and wasteful than not doing one (at least have them perform another sport or run around so they can develop BMD, see above).

- **If Not weight training, then what?**

  A well-designed dryland programme must be a unified and consistent program within an entire club. Many clubs have their coaches run their programmes separate from one another, resulting in confused swimmers as they progress through programmes. Ideally, a club should provide a progressive programme from the time children enter the programme to the time they leave. This well-planned programme must start with the basics: dynamic warm-up, coordination, games, and biomechanics. Next, improving strength, power, and improving muscular imbalances are the next key areas. It should build on these principles, preventing muscular imbalances, while continually developing strength without creating habitual soreness. Once movement mastery with challenging body weight exercises in varying planes of motion occurs, then consider weight training.

- **Should we run for dryland?**

  Running is a great way of warming up for dryland. However, dryland is a practice, just like swimming. You should have a purpose and goal for everything in your dryland

- **Will I get too bulky?**

  Body weight training and dryland can certainly put on muscle. Some feel more mass can benefit certain swimmers by increasing their potential for force production and/or increase surface areas for grabbing water. Others feel it adds unwanted resistance in the water, resulting in drag. Luckily, there are methods for increasing strength with putting on muscle mass and without putting on muscle mass. If you are looking for the latter, performing low volume, high-intensity lifts, but not to failure. This routine can build power and strength without adding excess muscle mass. This type of training is also the most supported in the literature for improving maximal swimming velocity.

- **Will I get too stiff?**

  One misconception about resistance training is the idea that resistance training reduces mobility. Resistance training can certainly cause soreness by causing muscular damage believed to result from the cross-bridging of actin and myosin, especially during the eccentric phase of a lift. This soreness will acutely limit motion and the sensation of "stiffness." However, resistance training over a longer period appears not to reduce range of motion and more likely facilitates greater range of motion when combined with static stretching. Therefore, if you are worried about becoming stiff, start light with low volume, and start when stiffness is less vital (during the off-season, although a brief window for most). Then progress slowly, hopefully through a progressive approach set-up at your club from the age-group to the senior level.

We are very fortunate to welcome some new great talent at our HPC school and TUKS swimmimg:


James Freeman


Suné Liebenberg


Ruan Breytenbach

Images: Reg Caldecott

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