MEET WARMUP SECRETS | DEVELOPING THE "BOXERS MUSCLE" | BRAIN OVER BRAWN

SWIMMING TECHNIQUE

NOVEMBER 2015 • VOLUME 42 • NO 3

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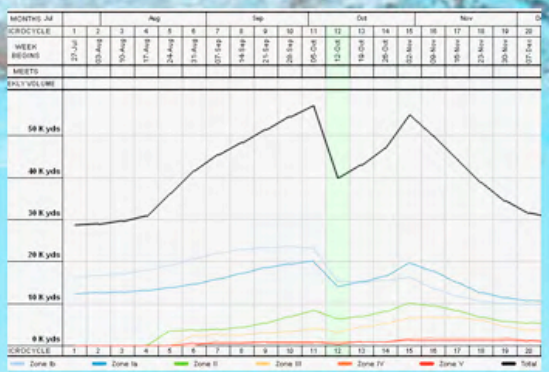
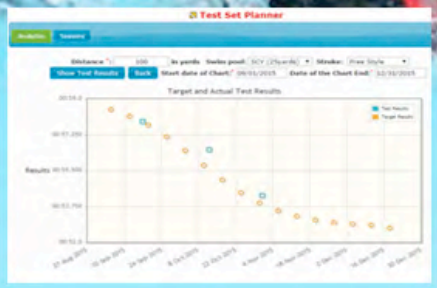
The Ultimate Training Management Platform

Workouts and Sets Manager



Flexible Season Planner



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FEATURES

In the new version of Swimming Technique Magazine, we are dedicated to bringing you the best information in the areas we feel are vital to swimming and coaching better. We've broken down our content in six categories, and every issue we will do our best to give info in each. The categories are as follows:

- MP — MENTAL PREPAREDNESS
- T/D — TECHNIQUE/DRILLS
- N/R — NUTRITION/RECOVERY
- WO — WORKOUTS
- DL — DRYLAND
- RS — RACE STRATGEY/PREP

So dive into our new issue, and we hope you enjoy Swimming Technique!

On the Cover: Michael Phelps
by Peter H. Bick

SEE OUR HOLIDAY GIFT GUIDE ON PAGE 33!

[Photo Courtesy: Peter H. Bick]

THE ROLE OF AN ASSISTANT COACH

The assistant coaches are the true backbone of a club because, in many cases, 80% of the club's athletes are coached by assistants. Assistant coaches lay the foundation that eventually produces the elite athlete. Their influence on the lives of young athletes can be as powerful as any teacher or parent.

Many assistant coaches are comfortable as assistants and do not aspire to become the head coach. Others are waiting to conduct their own program or for the right opportunity to move into another career. Whatever the case, the assistant coach needs to understand that he or she works for the head coach and not the board of directors. The head coach was the one who hired them and the head coach should be the one to supervise them. The board of directors generally does not get involved in these matters.

Once the assistant coach becomes a part of the coaching staff, he or she needs to understand the existing program before suggesting changes. He or she needs to communicate likes and dislikes to the head coach and accept that the assistant coach will be held on close reins to ensure that his or her attitudes will grow within the philosophy of the head coach, parents, and club.

Assistant coaches should be mature enough to approach the head coach with concerns and problems. If frustrated assistant coaches vent to whomever will listen, the result is usually a divided parent group, a backstabbing staff, a rumor driven program, and a leery head coach.

It is common for new assistant coaches to want to challenge policies or start new aspects of the program. This generally is healthy and productive within an existing framework. However, because most assistant coaches remain with a club for only a period of 8 to 18 months, head coaches are naturally reluctant to divert from proven paths to placate assistant coaches. New assistant coaches need to understand their role as assistants. They need to be patient and try to succeed within the vision of the head coach.

-Excerpt from Below the Surface by Brent Rutemiller

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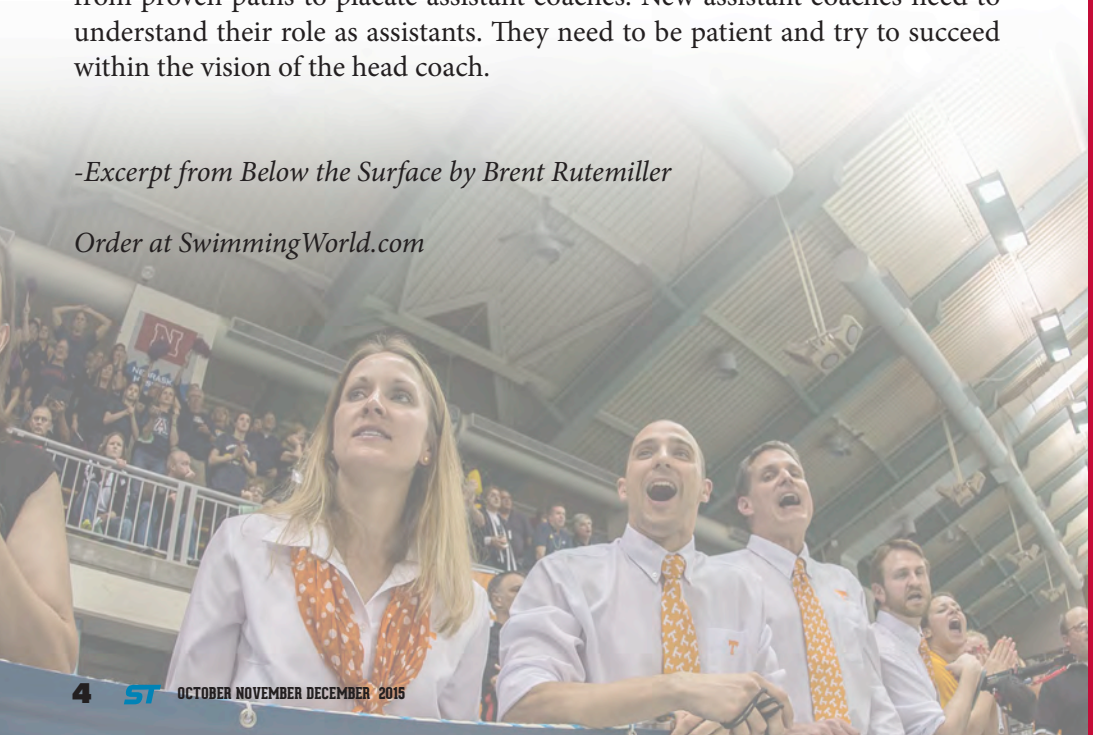

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T/D

TECHNIQUE PREPARATION FOR THE 2016 OLYMPICS

by Rod Havriluk, Ph.D.
Swimming Technology Research

[PHOTO COURTESY: PETER H. BICK]

With the Olympics less than a year away, it's time to plan for optimizing performance. However, improving technique is not always part of the plan, and often for very good reasons.

ARE YOUR SWIMMERS AFRAID TO MESS WITH SUCCESS?

Swimmers hoping to qualify for the Olympics may be reluctant to change their technique for a variety of valid reasons:

1) They have been successful with their current technique.

2) They are not convinced that changes will make them faster.

3) They do not want to sacrifice conditioning time to master new technique elements.

Any/all of the above rationale is understandable. However, it's also important to consider the flipside.

WHAT ARE THE CHANCES OF QUALIFYING WITHOUT A TECHNIQUE CHANGE?

For all but a select few, the chances are slim. (Even for the select few, everything else has to go right!) However, many swimmers get to the point where they know that their technique is pretty good. Naked eye observation or an underwater video by a coach may confirm the swimmer's personal assessment. Unfortunately, even video does not adequately assess technique, especially in the case of elite swimmers.

WHAT'S BETTER THAN A VIDEO ANALYSIS?

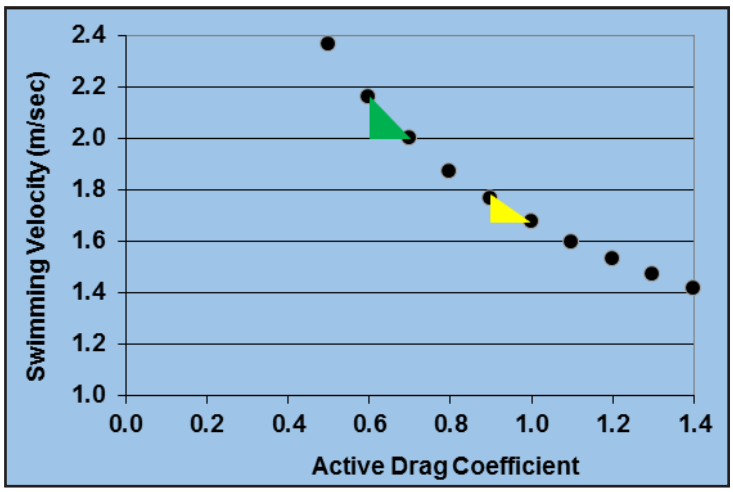
A quantitative analysis is essential to make an informed decision about whether or not to change technique. Measurement of the active drag coefficient (Cd) is the only way to really determine if a swimmer's technique is "good enough." The Cd simplifies technique evaluation to a single objective number, as opposed to a subjective assessment.

WHAT ARE GUIDELINES FOR THE ACTIVE DRAG COEFFICIENT?

The active drag coefficient (Cd) is the overall best measure of a swimmer's technique. The more effective the technique, the lower the Cd. There is a considerable range of Cd values – from over 2.0 for a very ineffective technique to under .7 for very effective technique. An average value for freestyle for competitive swimmers is 1.0. Values under .7 are rare.

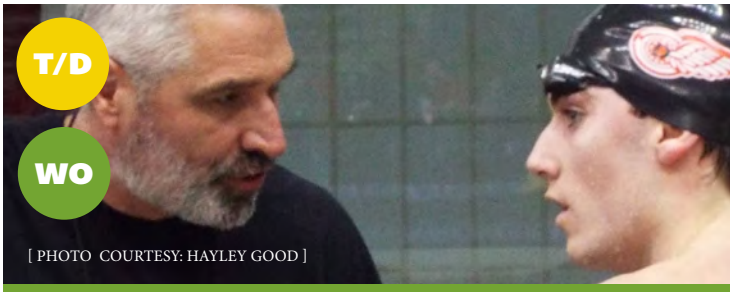
HOW DO WE KNOW WHEN A SWIMMER'S TECHNIQUE IS GOOD ENOUGH?

As shown in the graph below, there are **proportionally bigger improvements** in velocity with each incremental improvement (decrease) in the Cd. For example, a decrease in the Cd from 1.0 to .9 increases velocity by .1 m/sec (yellow triangle). In comparison, a Cd decrease from .7 to .6 increases velocity by almost .2 m/sec (green triangle). So, even if a swimmer's technique is "really good," he/she can still swim substantially faster by continuing to improve technique.



The data points for the graph were calculated from the drag equation (F = .5ρv2CdX), which shows the relationship of swimming velocity (v) and the active drag coefficient (Cd), assuming an average force (F) of 31 lbs and a body cross sectional area (X) of 1000 cm2 (typical values for an elite male swimmer). The values of .5 and ρ are constants.

The bottom line is that the **most technically proficient swimmers** can benefit the most by continuing to improve their technique. A quantitative analysis, however, is necessary to pinpoint the changes to decrease the Cd and get swimmers to qualify for Rio! ◂



[PHOTO COURTESY: HAYLEY GOOD]

EFFECT OF AN INSTRUCTIONAL INTERVENTION ON SWIMMING TECHNIQUE & PERFORMANCE

by Rod Havriluk, Ph.D.
Swimming Technology Research

DELIBERATE PRACTICE AND YOUNG TEENS

In competitive swim programs, training distance is often given priority at the expense of technique instruction. The lack of emphasis on technique may be related to a misperception about the potential impact on performance. The purpose of this study was to determine the magnitude of the effect of an instructional intervention on technique (as measured by the active drag coefficient, Cd) and performance (swimming velocity, SV).

METHOD

The subjects were 18 competitive swimmers (12 males and 6 females) between the ages of 12 and 15. They were pretested with Aquanex+Video. The instrumentation and testing protocol were previously described and validated (1). After the pretest, a one-week intervention included three classroom and five poolside instructional sessions. The treatment included technique feedback with specific visual and kinesthetic cues designed to improve the Cd and SV. The subjects were then posttested.

RESULTS

There was an overall significant improvement in both Cd and SV. The Cd decreased by .31s ($p<.05$) and the SV increased by .26s ($p<.05$).

DISCUSSION

A one-week instructional intervention significantly improved both technique and performance. The magnitude of the effect compares favorably with differences previously found (1) between faster and slower performance levels in Cd (.46s) and SV (.65s). The results demonstrate that even a relatively short duration of carefully targeted instruction can make a meaningful improvement in technique and performance and will hopefully encourage coaches to reconsider training time allocation.


[PHOTO COURTESY: PETER H. BICK]

DELIBERATE PRACTICE AND ELITE SWIMMERS

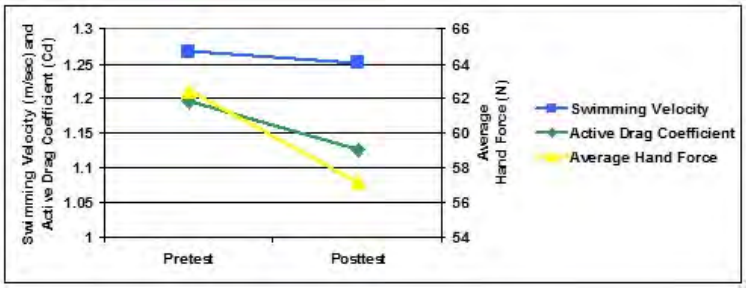
Previous research showed a significant effect for an intervention using deliberate practice with age group swimmers (Havriluk, 2006). The purpose of the present study was to determine the effect of deliberate practice on the technique of national caliber swimmers where, in comparison to the age groupers, the habit strength would likely be more resistant to change.

METHOD

The subjects included 19 national caliber swimmers (11 male and 8 female). The swimmers were pretested with Aquanex+Video on all four strokes. An instructional intervention included two classroom and three poolside sessions designed to improve technique (as measured by the active drag coefficient, Cd). The intervention was consistent with the concepts of deliberate practice (Ericsson, Krampe, & Tesch-Romer, 1993) and included clear instructions, appropriate task difficulty, immediate feedback, individualized supervision, a variety of learning strategies, tasks designed to maintain swimmer's focus in the cognitive and associative learning stages, and replication of superior performance. After the intervention, the swimmers were asked to continue to practice deliberately for one month during regular team training and were then posttested.

RESULTS

There was a significant decrease (improvement) in the Cd ($p<.05$). There was no significant change in swimming velocity, but there was a significant decrease in average hand force ($p<.05$).



CONCLUSIONS

The results demonstrate that even a relatively short duration of deliberate practice can make a meaningful improvement in technique for swimmers of a very high ability level. Because of the technique improvement, the swimmers were able to swim as fast on the posttest with less force, and therefore, less effort. ◄

T/D

[PHOTO COURTESY: PETER H. BICK]

IMPROVE YOUR BACKSTROKE STARTS

by Bryan Craig - Head coach of the GT Shamrocks | demonstrated by: Natalie Gibbons | photos by: Bryan Craig

About the author: Bryan Craig is the head coach of the GT Shamrocks in Albury, New South Wales in Australia. He holds a Level 5 certification with the American Swimming Coaches Association.

BACKSTROKE STARTS PROGRESSION & DRILLS

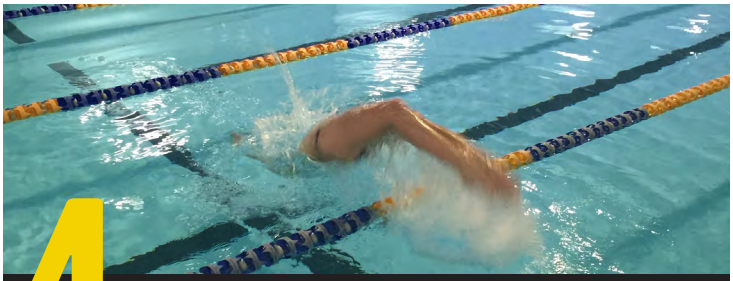
To become better at backstroke starts we need to be more flexible through the lumbar regions of our back, as you can see we include some flexibility drills in the backstroke starts progressions here.

Due to the nature of our training facility we have no starting platforms, however this has not stopped our program developing some of the best starts in the area.

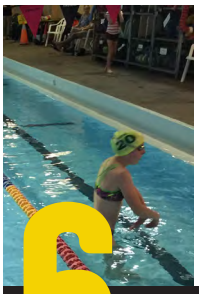
I will show you our progression of backstroke starts from stretching through to progression of simple and useful drills that can be performed anywhere in any pool at any depth using simple tools, following through these progression drills.

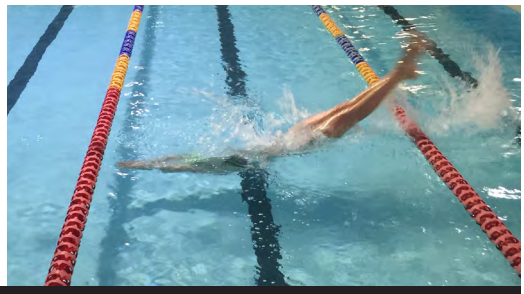
1 Starting off on the foam roller rolling out the lumbar spine for simple stretching of the muscles, it's important to remain flexible for all forms of swimming. The more flexibility you have in your lower back the better your backstroke starts become due to the unique nature of the 'back dive'.

2 We progress to the big ball, stretching the same as the foam roller but a little more fun, rather than it being a basic stretching we get the swimmers to roll right over the ball until their hands touch the floor, with some swimmers they will have their feet off the ground during this.

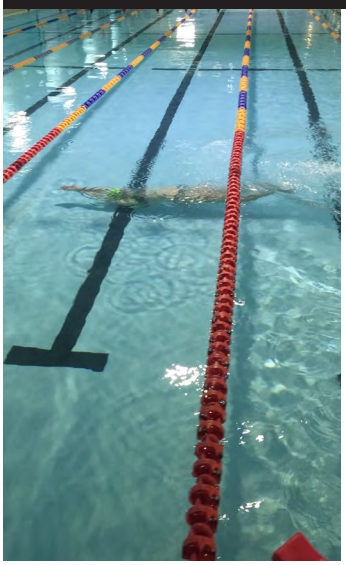


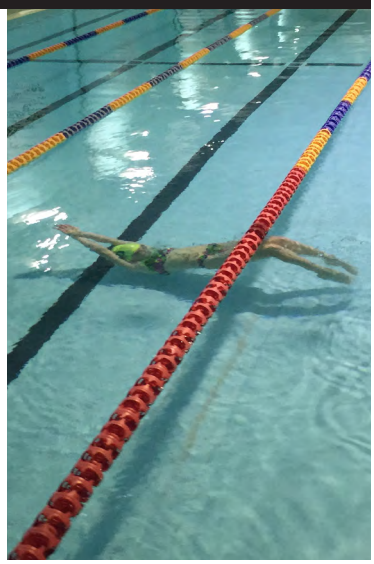
4 We progress this drill into deeper water, which is harder to high jump over the ropes whilst still remaining fun and engaging. Progressing into deeper water serves the purpose of advancing the drill to make it harder for the swimmers, especially younger swimmers where we get lots of laughs and back flops.

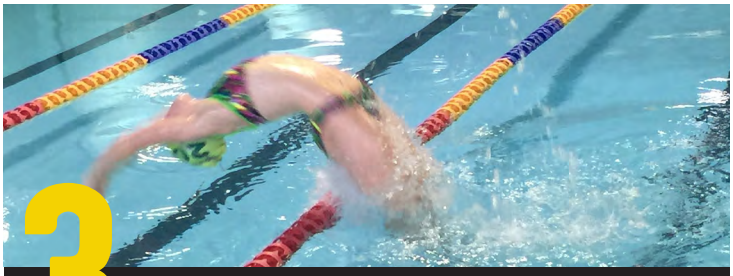




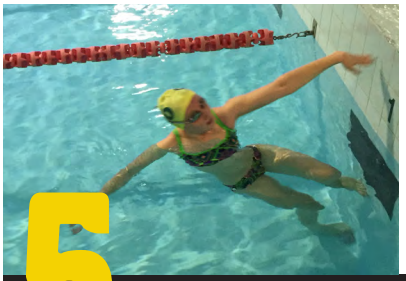
6 We return to the shallow end and 'back dive' over the first rope then under rope 2,3 and 4 in streamline position, mimicking coming off the wall in a backstroke start.

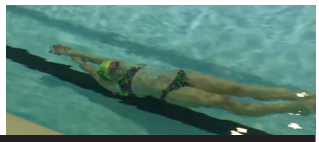




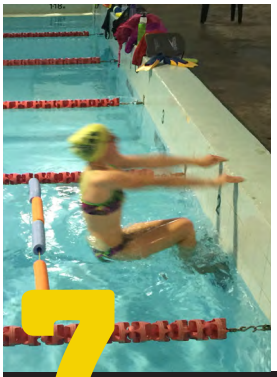


3 Into the pool we go! The swimmers start off in the shallow end, high jumping over each rope as you can see in the picture below, over every rope.





5 We come to the wall with the aim of doing a 'drop push'- dropping down, pushing off on back. With streamlines in my program we work to a kicking number rather than a distance. Our kicking number is 8 fly kicks; the reason for the number 8 is that as the swimmers grow they will always do 8 kicks off each wall on starts and turns. Typically, younger kids will struggle to get to a set distance underwater but will easily do 8 kicks. As the children grow their kicks become stronger and more natural, leading to them getting a greater distance off the wall with their 8 kicks.



7 Full backstroke start working through from flat handed on our wall. I tend to get the kids to think purely about the speed of their hands leaving the wall/pole and then the drive force upwards of the feet. During this last segment I put a noodle rope across the pool about one metre out to make sure the kids clear it. They then kick out 8 kicks into breakout.

Typically we do these progression drills on a Friday morning, by the end of the school week and coaching week for me the kids and myself are tired and we don't need a heavy workout as we have had a pretty full on week before this session.

You can have fun with the swimmers but in the same vein they can learn essential drills and skills without feeling like its hard work. ◄

RS

PHOTO COURTESY BECCA WYANT

DIVING INTO MEET WARMUP

by Sarah Lloyd

The warm-up portion of a swim meet is best described as organized chaos. It's the time when the pool churns with hundreds of swimmers, each one trying to avoid kicking someone, or being kicked.

The purpose of warm-up that most people probably think of is the literal warming up of muscles so that a swimmer can race comfortably and at a high capacity immediately. Cold, tight muscles just don't perform the way that warm, loosened ones do, so a warm-up is key to a good performance in a race. This extends not only to the initial, longer warm-up session at the beginning of a meet, but also to the subsequent, shorter ones n between races during the meet session.

Warm-ups are arguably the most important part of any swim meet. While the process of using the time to get the mind and body ready to race certainly evolves as a swimmer gets older, there are some basic elements that absolutely stay the same.

Familiarity with the physical aspects of the pool is key for all swimmers, but there is a major emphasis put on this with age-group swimmers. Dina Ellsworth of Peddie Aquatics Association says this is of the utmost importance for the 10-and-under swimmers she coaches.

"Our goal is to get the swimmers familiar with the pool, especially the backstroke flags, the walls, the blocks, and the water temperature," she said. "It is also important that they understand that they need to pay attention to the pool, so that they are comfortable with these things when they dive into race."

But familiarity with the pool is not just for younger swimmers, though the older swimmers do not often have to be told to pay attention to their surroundings. Molly Mucciarone, a senior at the United States Military Academy is a sprinter, so a big focus during meet warm-ups also includes close attention to the walls and blocks so that her short races can be as flawless as possible.

"I focus on hitting my walls and accelerating out of my turns during the beginning of my warm-up, as well as a good start with a bunch of 15-meter sprints from the blocks," she said.

Being familiar with the pool can make or break a race, which is why both collegiate and age-group swimmers should really pay attention to changes in depth and the use of bulkheads, as well as certain "landmarks" in relation to the flags or walls.

Initial warm-up sessions for age-groupers are fairly general. Ellsworth says that her swimmers have a predetermined meet warm-up that they practice several days before, to eliminate surprises.

"We do the same warm-up each meet, so that the swimmers

know what to expect at a meet," she said. "It is one less unknown variable, and I feel like this cuts down on anxiety, especially in a crowded warm up pool."

With the same 800-yard warm up at every meet, Ellsworth's swimmers can focus on getting their body warm and ready to swim fast and not worry about what comes next. The same routine can also put a swimmer's body into the same race-ready state more quickly than if they change it up every time.

Mucciarone tries to stick to the same warm-up at every meet:

Between 800-1000 yards consisting of a 400-yard loosen period, with sculling and kicking thrown in the mix, a set of 100s and 75s build, and 15-meter sprints.

"I try to stick to the same thing, but with me, it's all about how I feel, so I change it up a bit if I need to accommodate that," she said.

This routine works for Mucciarone, who has dramatically lessened the yardage in her warm-ups. It's become shorter and more specified as she has gotten older and more comfortable making decisions for herself.

For Ellsworth's swimmers, the focus is getting in the routine of warming up for races, getting comfortable in the pool environment, and to learn to keep moving in the pool, despite crowded conditions. As a swimmer matures and begins to take more responsibility, experimentation becomes important. For Mucciarone, doing a general 2000-yard warm-up with the team left her feeling sluggish and tired, and it had a negative impact on her races. When she shortened it and eliminated extraneous yardage, she began to perform better. But the process is still evolving for her, even though she is in the last year of her collegiate career.

The evolution of a meet warm-up for swimmers is something that comes with experience and age. As swimmers at Peddie mature and begin to find their stroke specializations, their warm-ups naturally change to accommodate those needs: distance freestylers do 1000 more yards than a sprint freestyler, while IMers and stroke swimmers tend to fall somewhere in the middle. It depends on the needs of each individual swimmer at the higher levels.

Meet warm-ups are a stressful, but necessary, part of competition. Crowded conditions, unfamiliar surroundings, and the stress of competing can certainly have an impact on the session, but by focusing on eliminating uncertainty and on specifics of races, swimmers can maximize their performance in the warm up pool, and thus their races. ◂

MOLLY MUCCIARONE'S 3 WARM-UP TIPS:

Don't overthink how you feel before a meet. Feeling awkward during warm-up doesn't mean that you won't swim well during a race. The reverse is true if you are feeling great during warm-up.

Don't do someone else's warm-up! Everyone's body needs a different amount of yards and combination of strokes, drills, and kick to swim fast.

Don't complain to coaches about warming up. As much as I want to believe that I could swim a fast race with no warm up, our coaches are experts and know what we need, so listen to them.

[PHOTO COURTESY: BRYAN CRAIG]

A LITTLE BIT OF MAGIC

by Bryan Craig

When I started coaching, I was mentored by Bob Gillett, the legendary coach behind much of Misty Hyman's amazing success. Bob always told me to do it my way and add a bit of the unusual to everything I do. More than 10 years later, I have carried this forward through my coaching career and now understand what he meant by the "But what-if factor."

Here's an example. Suppose you give your athletes 10x100 IM with 30 seconds rest. That is a very boring set in which the swimmer becomes a north-south swimmer, swimming up and down the pool but getting nowhere.

Things can change for the swimmer (and the coach) if you add a little bit of magic:

10×100 IM in reverse order: sprint the free and fly, count strokes in back and breast

This is the same set, all changed up with focus points and mind tricks inserted to keep the kids thinking about exactly what they are doing. When a child does this kind of session, they tend not to get lost and tend to not get bored.

When high-end aerobic day comes along, every child should get bored with a very long distance swim (i.e. 1000 free). How about 1000 free, where they sprint non-freestyle on every fourth length? That's a lot less boring!

Many coaches come onto deck exhausted and do not have the passion to coach. They tend to give out the norm in training sessions, and then wonder why they lose children to louder, more inventive coaches. If you change it up every day, you're more likely to keep your swimmers from defecting.

Don't get stuck with the "Well, this is how we did it when I swam 40 years ago and it made me good" philosophy. Children and parents have a different frame of mind these days.

If a child changes coach and suddenly starts to get faster, is it because they started working with a new coach? That might be true in a mental capacity, but no so much physically, at least for the first six weeks in a new program.

The first six weeks of new training will help, but you won't observe improvement until the next six-week block, so each coach is only as good as the last six-week block. The automatic change comes when a swimmer comes to workout more per week. Then the adaptation period is slightly quicker – roughly four weeks – but the swimmer will fatigue faster over that period as well.

My challenge to all coaches and parents is to be patient. Things will come around, but it may take that six weeks before it does.

Change it. Mix it. Don't be boring. One of the greatest coaches I have seen do this is now my assistant coach. He is a very strange character, but he's a genius. He has the ability to turn 10×100 free into a game for the kids.

Earlier I mentioned the "but what-if factor." It comes from asking the following question: But what if I do it this way? Open your mind to the new unusual and inventive and you will in turn become a great coach. Eliminate the "what-ifs" from the equation.

Bill Sweetenham, the legendary coach to many Olympic medalists, once asked me what I do with my swimmers and how I do it. My reply: "The same as you, but I add a whole lot of me." Right there is my little bit of magic. ◄

SWIMMING BREASTSTROKE FROM THE HANDS DOWN

by Bryan Craig

There are many ways to swim breaststroke. No one does it absolutely perfectly in every way, though the best do a lot of things right. I think about breaststroke in the following way. I invite you to take one thing and make it your own.

Let's start with the pull phase of the stroke.

POSITIONING THE HANDS

Obviously, the fingers should be together on the pull, but how? Should they be bent or straight? The best position is a relaxed position, neither forced together nor forced wide apart.

The most productive position to achieve maximum velocity and full use of the pull, has the hands one on top of the other, but this can be very stressful on shoulders and can interrupt the pull path. It would also play havoc with the leveling of shoulders as you would have one hand below the other. I advise my swimmers to adopt the prayer position: one thumb overlapping but not gripping the other thumb. This enables the forefingers to be together, and the pitch of the hands would be as if you had your palms over the top of a soccer ball, not flat but not overly curved. This is a faster way to adopt the initial catch of the water. Why rotate the hands 180 degrees when a 45-degree angle is shorter and faster?

As the shoulders relax, the hands dip with thumbs down like breaking an egg from the prayer position. The hands still extend forward and outward about six inches wider than the line of the shoulders. (See photo #1) The elbows start to bend as if pulling yourself up on a wall.

The elbows stay high, but the hands stay in the peripheral vision to the point at which the hands are directly below the elbows. The forearms, hands and elbows come together in a fast sweeping motion, with hands staying within the vision and meeting in the middle with elbows under the rib cage as close together as feels comfortable for the swimmer. It is important to stress that the elbows at this point should be within the frame of the body line. The hands surge forward on or slightly above the surface of the water in the prayer position.

The breath should be taken on the way to the top of the stroke, to finish inhaling right at the highest point in the pull phase.

THE KICK

Frogs legs? No!

The kick should be at its widest six inches outside the body line, with the feet drawn up and outwards, making sure that the knees stay down. Don't draw the knees up below the stomach! Kick back and out, snap together, drive the feet to the surface in an upward butterfly motion.

When looking at a breaststroke swimmer from behind them you should be able to see a "W" leg formation. A good drill for this is kicking with the pull buoy.

TRAINING BREASTSTROKE

Think of breaststroke as two separate strokes – the kick and the pull. Here's how you break it down:

Take the pull and recover the arms. Count "one, two" as you stretch the arms forward. Then, perform the kick and do the "one, two" count again. Repeat.

Why should the stroke be trained that way? If you train with an overlapping of the kick and pull, that overlap becomes much smaller when it comes to sprinting, creating a stop-and-go approach to the stroke where you lose all forward propulsion at per leg and arm action. You will see a hopping motion in your swimmer: Stroke, stop, stroke, stop, stroke, stop.

Training with a split stroke means that when you come to race and the gap between the pull and kick gets smaller, you have the ability to create constant forward propulsion at all times. This makes your stroke look more fluid through the water and also makes sure you are getting maximum propulsion from each pull and kick.

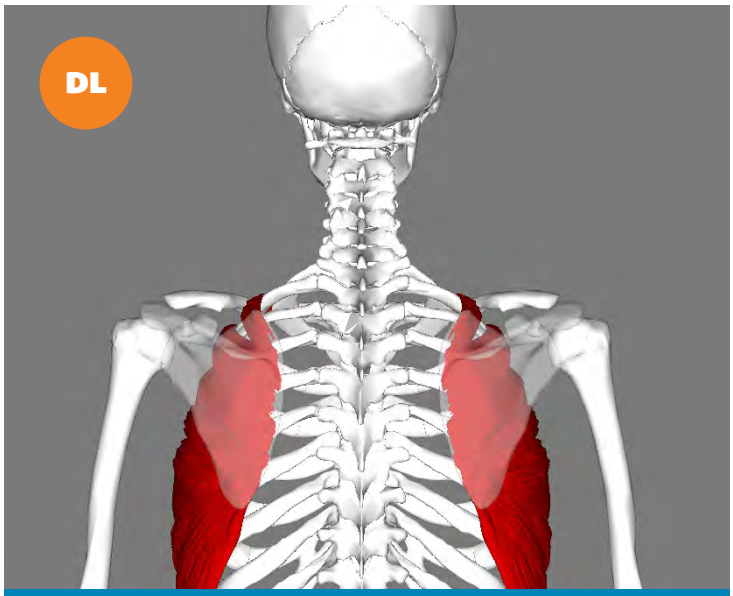
THE UNDERWATER PULL

The underwater pull in breaststroke is vital, especially in short course. When executing the breaststroke turn in practice, try to relax and count yourself through the process:

- Push off the wall, 1, 2
- Power pull down 1, 2
- Bring arms forward 1
- Break out stroke 2

Remember that the first 3 strokes off the dive and turns are more important than any other stroke in that length. They must be fast and very, very strong.

About the author: *Bryan Craig is the head coach of the GT Shamrocks in Albury, New South Wales in Australia. He holds a Level 5 certification with the American Swimming Coaches Association.* ◄



DEVELOPING THE "BOXER'S MUSCLE" FOR SWIMMING

by Jan Homolak

If you get mad easily and don't hold back from throwing a few punches, you might have realized that the serratus anterior is the muscle that gets tired easily. Because of its insertions, the serratus anterior is largely responsible for the protraction of the scapula, or, in layman's terms, pulling the shoulder blade forward and around the rib cage to allow you to throw a punch. When anatomists realized its function, they decided to put "big swing muscle" and "boxer's muscle" captions next to the original muscle name.

The serratus anterior is a muscle that originates on the surface from the first to eighth ribs at the side of the chest and inserts along the entire anterior length of the medial border of the shoulder blade. If you are one of those swimmers with not very much subcutaneous fat, this is the muscle your friends who skipped anatomy classes thought was ribs when they were making fun of you for how skinny you are.

WHY IS THIS MUSCLE IMPORTANT IN SWIMMING?

The serratus anterior is a scapular stabilizer. The shoulder blade (or scapula) is very important in swimming. Because there is only one little joint called the sternoclavicular that keeps the arm attached to the body, scapular stabilization becomes of crucial importance in movement execution. The importance of the serratus anterior in swimming, where great amount of propulsive force is created with arm movements, is even greater. Because of this, the serratus anterior gets special attention in the swimming community.

Many coaches and sport scientists proved that the incidence of "swimmer's shoulder" injuries is much greater in athletes with poor scapular rotator muscles and serratus anterior strength. Since the serratus anterior is active throughout most of the freestyle stroke cycle and fatigues easily, weakness could cause change of the muscle activity pattern and result in improper pull with great risk of injury. This conclusion, along with the electromyographical findings that many traditional exercises do not strengthen the boxer's muscle, led many coaches to implement exercises designed specifically for increasing the strength of the serratus anterior in their dryland training programs.

In addition to allowing the swimmers to hold their shoulder blade in place and create a lever to propel themselves through the water, the serratus anterior has another important purpose that could be interesting for swimmers and other athletes. The boxer's muscle is also an important accessory muscle for respiration. The diaphragm, a thin dome-shaped muscle between the abdominal and thoracic cavity, is the major muscle responsible for breathing. The serratus anterior is one of the muscles that helps the diaphragm when you have to create additional pressure to inhale more air or inhale it faster, especially during physical activity. When accessory muscles are activated, the respiratory system machinery works at the peak of its potential. However, with most of the helper muscles being prone to fatigue, the respiratory engine could also fade after a short time. This observation is what made some coaches reconsider the physiological idea that the cardiovascular system is the limiting factor of sports performance.

HOW CAN SWIMMERS IMPROVE THE SERRATUS ANTERIOR?

Training the accessory respiratory muscles, such as the serratus anterior that serves as an important accessory inspiratory muscle, could allow an athlete to prolong the duration of their peak pulmonary performance and, therefore, better their chances of optimal performance. Research has confirmed these ideas.

Inspiratory muscle training can improve the rate of recovery during high intensity interval training. Inspiratory muscle training can have a positive impact on 100- and 200-meter swimming races. Inspiratory muscle training also improves anaerobic capacity in cyclists and sport performance in rowers.

Don't let the term "boxer's muscle" fool you. Swimmers who take care of this muscle reduce the risk of shoulder injury, but also can improve their breathing during training and during a race. Implementing specific exercises to target these muscles, and adding resistance inspiratory training to regular breathing training is something every coach should consider. ◄

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[PHOTO COURTESY: PETER H. BICK]

IN LINE WITH THE SPINE

Your head position during the breath on breaststroke is vital to setting up the kick phase of the stroke. Looking directly in front of you at the opposite wall sinks the hips. Looking directly downward during the breath affects the pull. The best place to look on the breath is at a 45-degree angle. When done correctly, you'll see your hands shoot forward at lightning speed on the recovery.

UP AND OVER

The backstroke start should create little disturbance with the water. The advent of the backstroke starting wedge gives athletes the peace of mind that they won't slip on the touchpad, but will allow for a better trajectory. Arch your back once you've pushed away from the wall, to allow your body to enter a hole created by your hands. Your feet should not drag along the surface of the water, but kick up slightly and over the water to enter that hole.

[PHOTO COURTESY: PETER H. BICK]

MP

BRAIN OVER BRAWN

WHAT CAN NEUROSCIENCE TEACH US ABOUT SWIMMING PERFORMANCE?

BY JAN HOMOLAK

I was more than just a competitive swimmer. I was one who always had the impulse to look for the ways to improve in the pool, which sparked my curiosity during lectures in neuroscience at the Croatian Institute for brain research. This was not just through the ears of a medical student interested in concepts of neuroscience, but also through the ears of a young man passionate about the royal water sport.

It is easy to understand the importance of the brain in a sport as complex as swimming if you understand the importance of the brain overall. To put it simply: the brain is the one that swims. This 3-pound, gelatin-like structure imprisoned by your skull dictates every single muscle movement you make, every breath you take and partially even the fuel you will use to touch the wall first and grant your place on the podium!

The more lectures passed, the more I realized that sport science, for some reason, circumvents some of the principles of neuroscience.

As it always is in competitive sport, the lack of an opponent's knowledge is your chance to gain an advantage. In the spirit of the aforementioned rule, more coaches are trying to implement knowledge from every corner of science to allow their athletes to work and compete on the highest level possible.

Neuroscience isn't the exception anymore, and I am not talking only about the psychological aspect. Germany's golden boy, Marco Koch, is one example. A few months before taking the gold medal in the 200 breaststroke at the World Championships in Kazan from Hungarian breaststroke king Daniel Gyurta, Koch exposed one of his secret weapons—hypnosis.

"I feel better prepared, and it helps me get my absolute top performances," Koch told the German newspaper Darmstädter Tagblatt. "With hypnosis, I can find out where there are still hidden problems because you get to know your body well, and I'm able to bring myself into the right flow."

Koch is just one of the athletes exploring the uses of mystical hypnosis —inducing focused attention and reduced peripheral awareness through this method— in the realms of sports performance. Although the number of Google searches for "gold medal swimming hypnosis" in the days after the German's triumph experienced exponential growth, this not a new idea in swimming. You can even find the act of "helping the university swimming team win the NCAA championship through hypnosis" listed under LinkedIn accomplishments back in 1995.

Hypnosis is not the only way athletes are trying to be the best version of themselves when it matters the most. Transcranial direct current stimulation (tDCS) is a fancy name for supercharging your brain with small electroshocks delivered through the electrodes on the scalp.

Besides making you look like Mary Shelley's Frankenstein, the space technology—with use for brain-zapping dating back to 1804—could allow you to break through the current limits of human performance. Furthermore, the alien hat doesn't only make you more powerful; it also makes you smarter.

Supercharging your memory could lead to great improvements in learning the technique that will allow you to move faster through the water. Finland is already using the technology for their military training, and scientists are readily applying the technology in the field of sport sciences. I think not so many scientists would disagree if I say the times of neurodoping are coming.

Now you know how important neuroscience perspective can be in the context of sport. It is time to apply some of its basic principles in your training routine to improve your chances of taking the gold.

Here are five neuroscientific ideas that I believe anyone can use to improve his or her swimming performance without impractical wiring on their head:

1. THE FALSE STAGE FRIGHT

Stage fright—or performance anxiety—is the unpleasant feeling associated with the requirement to perform in front of an audience.

Many swimmers know what I'm talking about. Your big race starts in several minutes. It's the moment for which you have been working before the first ray of sun comes out every day for the last six months. You pushed yourself through the sleepiness, sickness, mental and physical pain...and everything is going to pay off in the third lap of your 200-meter race in the next minute.

Or it won't! Your heart is pounding wildly, your hands are sweating, and your mouth is so dry that you could light a match on your tongue! I know you've been through this. The reason why I know this is because this scenario is not a result of you being scared of the race, but your brain preparing your body to swim the good race.

In order to have the needed fuel for the swim, the brain has to send signals to turn on your sleepy engines so you don't have to do it in the beginning of your precious race for which you've been preparing. The muscles have to get ready, too, and your nerves have to send the right signals to assure that the signals they send in the race to activate your muscles are strong enough to allow them to propel you through the water.

Moreover, the great part of that preparation for the race was your brain learning when and how to turn on the mechanisms that start the domino effect leading to symptoms similar to stage fright.

Many swimmers feel their heart pounding and their palms sweating, and that's where the real anxiety enters. You think to yourself, "My heart is pounding, so I must be scared of the race, and I will probably swim badly." With thoughts like that, you have already lost your race focus over the simple "brain warm-up."

Instead, embrace your brain turning on your engines. Accept it as a sign you are ready for the race of your life. Moreover, put a wide smile on and play it cool...because everyone around you is probably having a false stage fright at the moment—and you're the only one who knows why!

2. MOTIVATE AND BE MOTIVATED

Be aware that motivation is the single thing that divides the best from the rest. When you are motivated, your brain brings out the big guns. Your limbic system gets flooded with neurotransmitters, resulting in you getting an extra kick to finish the race, finish the set or add another repetition at the gym.

Acknowledge this fact and use it consciously whenever you can. Write your swimming goal on one of those sticky notes and put it around your room. Write your favorite quote on your water bottle—the one that makes you get goose bumps—and use it when you need extra drive.

Finally, motivate your teammates. We tend to act like the people with whom we are surrounded. Surround yourself with motivation by motivating others to achieve their goals.

3. CLENCH YOUR JAW

Clench your jaw, roar—it may sound silly, but there is a solid reason for monkeying around.

The science behind this funny advice is called concurrent activation potentiation. It's another simple principle hidden behind some fancy words! When you want to move your muscle, the brain has to send signals through the nerves telling the muscle to start the contraction. A stronger signal means stronger contraction...and, of course, greater force is produced.

Since the nerves exit your brain together—not one by one—they can interact as long as they go together. Think of it as the extra-excited guy on the team who makes everyone get excited. Positive energy is contagious. Nerves are similar—excited nerves can make your friends around you get excited, too! To use this rule to your advantage, just mobilize more muscles when you need to produce greater contraction. Many people use this subconsciously from time to time. Use it consciously, and add some Newtons to your push, pull or squat.

4. BE AWARE OF UNCONSCIOUS LEARNING

When your brain stores memory, it usually uses associations. Most of you have probably played the "association game" when you were kids. Your brain plays the same game every day. However, many of these associations are kept under the radar of your conscious self.

Many of you have a favorite pool. For most of you, it is the pool associated with your first victories, smashed personal bests or national records. Every time you come to this specific pool, you feel great before you even jump in the water. You feel powerful the moment the first chlorine molecules hit your nasal nerves, which predestines you to demolish the pool—in swimming vocabulary, of course.

Some coaches try to take advantage of associative thinking. Dave Salo is one great example. He makes his swimmers use the same warm-up day after day. In addition to allowing his swimmers to assess how they are feeling in comparison with the day or week before, this kind of warm-up activates the same neurons every time. The brain senses the warm-up and knows that the intense swimming practice will immediately follow. The simple association starts the similar aforementioned domino effect, and your body starts to prepare for the following session. Salo also states that consistency behind this "boring" warm-up should extend to competitions to allow your body to pre-set the well-known feeling of swimming fast.

5. THE FAMOUS ZONE

Finally, appreciate the complexity behind everything that is going on. Appreciate the power behind your thoughts—both positive and negative—and learn to find the celebrated mind zone for swimming fast. The key is to feel comfortable.

With everything I have communicated, you are now quite aware that many thoughts are running around inside your unconscious mind—including right now in front of your laptop or as you stand with one leg on the starting block on the day of your competition.

With so much going on, your conscious worries are the last thing you need. Try to relax and enjoy the show—that's when the zone usually magically appears.

* * *

In conclusion, I would like to add that neuroscience will probably offer a lot more to the field of sport science. We still have so much to learn when it comes to understanding the mind.

A growing number of scientists are proposing that the brain is the actual villain in the decades-old debate about the limiting factor of sport performance. It is the responsibility of future generations to accept or dismiss this idea.

Meanwhile, I encourage everyone not to make the same mistake as those who believe that when it comes to sport, the first association should be the brawn. Rather, it is the brain that counts. ◄

About the Author: *Jan Homolak, a student at the University of Zagreb Medical School in Croatia, has done research in neuroscience and exercise sciences. He is the associate editor of the student neuroscience journal, Gyrus, at the Croatian Institute for Brain Research, School of Medicine, University of Zagreb. Homolak, also a lecturer and author, swims for Zagrebacki plivacki klub (ZPK) in Zagreb with Coach Pero Kuterovac.*

[PHOTO COURTESY OF AZARIA BASILE]

THE BREASTSTROKE TURN

by Jozsef Nagy and Dr. Janos Egressy | photos by Christopher Rattray

The goal of this article is not to describe the turn of a world-class breaststroker. The goal is to illustrate a turn that is -- according to the laws of physics and our knowledge of biomechanics -- quickly doable.

It is crucial that the swimmer does not alter his or her technique during the last few strokes before the wall, but only attempts to move quicker and more dramatically into the wall. The faster a swimmer arrives at the wall, the faster and easier the turn will be. Even though the energy carried into the turn somewhat halts as the hands touch the wall, everything that is behind these hands on the wall is still greatly accelerating towards it. The swimmer only needs to "position" the body parts so the least amount of resistance is created, and the least amount of deceleration occurs.

PART 1: APPROACHING THE WALL, PULLING BACK THE ARM

The body parts approaching the wall must approach at the fastest possible pace while causing the least amount of resistance. For this, the swimmer must be in perfect streamline, since the point of attack on the wall is directly in front of the swimmer, at the surface of the water. At the last stroke the swimmer practically throws himself onto the wall so that the fingers --at the same time and same level -- arrive at the wall, about 10 centimeters apart. The arms must be straight, and the head must be looking downward to the bottom of the pool so that the head is between the shoulders. The entire body must be in a streamline.

If the swimmer approaches with bent arms, he will fully stop at the wall. Instead of a continuous motion, he will have to wait for his legs to be pulled up underneath him. This would break the continuum of the motions of the turn.

After the hands have touched the wall, the swimmer pulls down one of the arms with a bent elbow under and beside the upper body and pulls backwards. The pulled-down arm helps the entire body to reach the wall faster, and then helps the body to turn onto its side. Finally, while the underwater arm is going deeper than any other part of the body, it is working energy upward to allow the upper body to go under water in the easiest and fastest possible way.

During the "pulling down" of one arm, the other hand rests on the wall and bends. Due to this, the head approaches the wall (with the head still facing down). The entire upper body must not lose elevation. The hip, the head, and back level of the shoulders move forward at the surface of the water as the arm that is left on the wall bends.

PART 2: PULLING IN THE LEGS


#1

While the arms are doing their work, the longest movement (in length) is done by the legs. The feet, with toes pointing backwards and soles facing upwards directly under the surface of the water, move toward the wall. The legs must be pulled up in such a way, so that the hips and the legs do not sink. The feet that are moving forward directly under the surface of the water can only get deeper when the bent legs and knees have gotten under the stomach. The legs under the body must be as close to the swimmer's core as possible.

The swimmer turns around his vertical axis as the knee and feet have gotten close enough to the core of the body. Simultaneously, the swimmer turns around the central point of gravity with the sinking of the hip. (See photo #1)

Swimmers most often make mistakes when they slow down before the wall and drop their hip before fully pulling up their leg.

During this part of the turn, four different body-movement sequences take place at once:

1. The arm on the wall bends.

2. The other hand begins to move backwards and goes deeper under the body, preparing to point toward the other end of the pool.

3. The swimmer "pulls in" his legs.

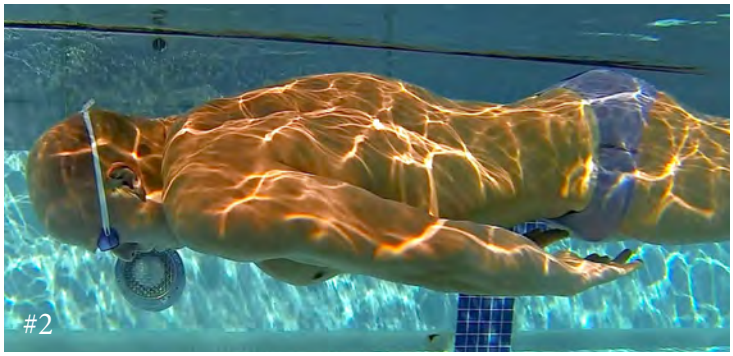
4. The upper body turns and from that point the swimmer is on his side.

The body must turn onto its side so the pull-down arm is now in front of the body. Ideally, we should see a straight line from hand to hand. The line extends from one hand through the head, shoulders and hips.

These aligned body parts must create a right angle with the wall. While underneath, the legs move toward the wall. At this point, the head elevates and leaves the wall. This is the point when the swimmer takes a breath. This short period of time is only enough to take a breath if the swimmer exhales all of his air while bending the arm that is left on the wall.

PART 3: SECOND HAND LEAVES THE WALL

The hand that is left on the wall remains there until the swimmer's body reaches a vertical point (with the shoulders up and the legs bent underneath). The legs must be moving toward the wall, and the hand that is in the front must move under the water as fast as possible and push upward on the water. At this point, the hand that is left on the wall leaves the wall. Immediately after leaving the wall, it bends, and reaches just in front of and beside the head. (See photo #2)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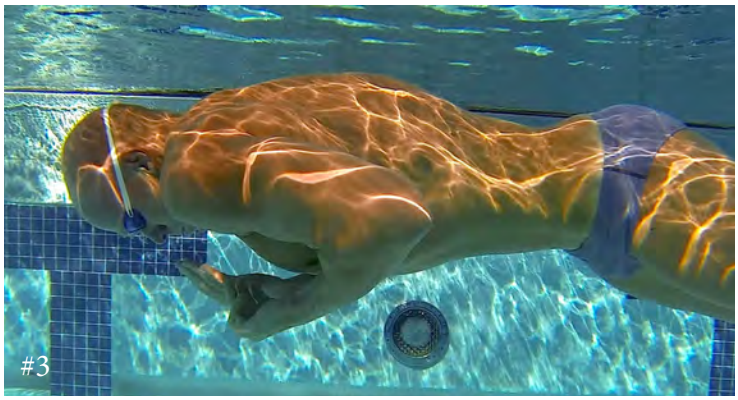
Optimally, the hands, head, hips and legs become parallel and aligned with the surface of the water, about 50-60 centimeters below the surface. The turning of the body must last until this parallel state occurs. There will be a moment when no body part will be touching the wall. The hand that was previously on the wall will have left it and the legs will have yet to touch it. At this point, the legs kick into the wall and the push off begins. It is very important that the swimmer does not turn too far, as the legs would come up too high and he would only be able to push himself downwards at that point. If this happens (in 99% of the cases), the dynamic push will be facing downwards and backwards rather than forward. During the push-off, the legs stretch as they push while the body twists steadily onto the stomach. The arms reach forward and the entire body takes a position that causes the least resistance and glides the most. (See photo #3)


#3

PART 4: THE UNDERWATER PULL

Now that the swimmer has turned and left the wall, it's time for the underwater pull.

Many swimmers make mistakes when their legs leave the wall, as they do not point their toes to be elongated in one level with their calves. The top of the feet (which are now facing toward the bottom of the pool) should serve as a steer wheel for a boat. Compared to the size of a boat, even a small oar can successfully change the boat's direction. In the same way, if the feet are not level with the calves, they will bring the legs and entire lower body upward, and create more resistance. Thus, controlling the body's direction is very crucial when beginning the underwater pull.

It is obvious that the swimmer is fastest right after he has pushed off the wall. Therefore, the underwater pull must be started when the swimmer has slowed down enough that the underwater pull is needed to maintain the pace that the swimmer will be swimming and when he begins his first stroke at the surface of the water. The underwater pull should be like the underwater component of the butterfly stroke.

In the underwater pull, the swimmer must a position himself so that by the end of the underwater pull he will have reached the surface of the water. If this is not successful, they will either reach the surface too quickly or they will have to use their first actual stroke to elevate themselves to the surface. While doing the underwater pull, the swimmer should slightly arch his back by the end of the pullout. *continued on pg. 22 >>>*

During the underwater pull, we can aid the upcoming first stroke with the dolphin kick. Since the rules allow for only one dolphin kick, it is very crucial how we teach the timing of that one dolphin kick to our swimmers. It is not recommended to do it before starting the underwater pull because at that point the swimmer is already gliding much faster than he will during his strokes. Therefore, due to the momentum of the push off, the dolphin kick is not needed as much right after the wall as it is after the underwater pull. And that is why the dolphin kick is preferred at the final push phase of the underwater pullout. The hands must finish the push directly under or touching the side of the thighs. The head must be facing downwards and at the level of the body, which is angled forward and slightly upward. (See photo #4)


#4

Most swimmers practically stop after having brought their arms forward and pulled their legs up at the end of the underwater pull. This is the most critical point in breaststroke. This is where it is easiest to make a mistake. And this is also where it is easiest to create advantage over the other competitors who may be making this mistake. If we do the underwater stroke exactly at the pace of the swimming strokes, then by bringing forward our arms on the recovery phase of the pullout, we will lose about 50 percent of our speed, and with the pulling up of our legs we will lose the other 50 percent.

This arm recovery starts begins by pulling up the shoulders beside our ears, and making our bodies much thinner (by about 5 centimeters wide at the widest part). The hands move forward with the elbows being still and the hands being very close to the body. They cross over each other at the stomach and go beyond the chest. The hands and elbows are moving forward together only from that point. Here, the most common mistake is that swimmers don't bring their hands in close to their body during this movement, and don't cross them over. Because of this, they lift their elbows up on the side wide, creating a great amount of resistance. (See photo #5)

When the hands are in front of the face, the hands should be with their palms facing up, moving forward parallel to each other. Once past the head, they should be moving forward along the central axis of the head (and entire body) until in a straight and elongated position. It is a mistake if the hands or the arms finish the underwater pull under or above the level of the rest of the body.


#5

In a "normal" breaststroke stroke, at this point, the legs shoulhave already started pushing backwards. But here, in the underwater stroke, it is much more efficient to do the kick later and to only start bringing up the legs after fully finishing the complete bringing forward of the arms. Therefore, the pace and the rhythm, is not the same as with other breaststroke strokes. Here, you must definitely delay the kick. In this case, we still have 25 percent remaining of the original speed! Therefore, this is why these motions must be done one after the other, rather than all at the same time.

And with this, the breaststroke turn finishes. If we did everything perfectly, then the swimmer starts his first pull close to the surface of the water. (See photo #6)The mistake that most often occurs is that the arms are not completely straight at the beginning of the first pull. The other mistake is that the swimmer either glides too much after the finishing of the kick, or the exact opposite, that he begins the next pull too soon. But the most common mistake is when the swimmer does not reach the surface of the water by the end of the underwater stroke, and therefore must use his first real stroke to elevate himself out of the water, rather than to pull himself forward.


#6

The turn itself – from the touching of the wall to the legs pushing off the wall – should take less than a second. Because of this, the motions described here in detail should all individually take about one tenth of a second to conduct. It is therefore recommended to first practice the turn very slowly and to teach it with patience. ◄

About the authors: *Jozsef Nagy was the innovator behind the wave breaststroke in the 1980s and coached Mike Barrowman and Sergio Lopez, among others, to Olympic medals. He is currently coaching at the Vancouver High Performance National Swim Centre. Dr. Janos Egressy is an associate professor and swimming coach at the University of Physical Education in Budapest.*

[PHOTO COURTESY: PETER H. BICK]

A SOFT HEAD ON BACKSTROKE

Imagine your head resting on a pillow when you are swimming backstroke. Rest it comfortably on that pillow, which is traveling mere inches below the surface of the water, and – ta da! – you'll get rid of that nasty angle in your body line which has your legs way too deep. Keep the head still and relaxed.

WO

OUT IN THE OPEN [WATER]

[Photo Courtesy of Tyler Fenwick]

The University of Tennessee is leading the way in a new trend of ditching the pool at the start of the college swim season and heading to the open water. *By Lillian Nelson*

Across the country, college programs are constantly looking for new and innovative ways to train. Whether it is in or out of the water, a switch-up of training can greatly enhance athletes' skills and boost team morale.

One of these newly emerging strategies is the use of an open water venue for training. The University of Tennessee swim program has implemented this for a few years since the arrival of Associate Coach Tyler Fenwick to the staff, and it has reaped benefits for distance swimmers and sprinters on the squad.

Fenwick described this aspect of training as "a canvas to paint on that is somewhat unlimited." The team trains weekly throughout the year in the Tennessee River, which runs through their campus. They also use a quarry just outside of campus, a rowing basin, and their pool with the lane lines taken out. Additionally, the team goes on an annual surf trip to the beaches of North Carolina, where the swimmers have the opportunity to work with a surf instructor. Tennessee's exploration of "outside-the-box" training strategies has proven to be beneficial to athletes in their program.

There are not only physical benefits to this technique, but Fenwick also emphasized the "break from staring at a black line" that it offers. Fenwick also explained that many of their targeted "energy zones" that they aim to hit during the week can be attained "swimming in zigzags in a pool with no lane lines just as well as swimming back and forth." As long as athletes are doing their individual and collective parts and training with the correct intensity, open water training can ultimately transfer added benefits to their races.

In order for this type of training to be as effective as possible, there has to be a mutual trust between coaches and athletes, Fenwick said. He pointed out that when he asks his athletes to hit max speed, he is confident that they are pushing themselves to do so. If there is no common understanding, the training technique will turn out to be much less effective.

Not only is there a necessary mutual respect and trust needed, but Fenwick also stated that "it allows [his swimmers] to take ownership of their swimming and it allows them to be creative." Fenwick will even give them the opportunity to create their own workouts within the parameters he provides.

When swimmers are given extra opportunities to take ownership of their sport, thus taking ownership of their own success in the sport, there is an enhanced sense of pride and responsibility added in to the mix. It is much less of a mental taxation on a swimmer when they are allowed and encouraged to add their own components to their training, as opposed to being told exactly what to swim and how to swim it, no questions asked.

Fenwick went on to explain that once their distance group began to feel the benefits of open water training, head coach Matt Kredich saw that this type of workout "really applies to everyone on the team in different formats." This year, they have even begun to train their sprint group in open water, and have again seen many positives come out of it. Each open water session is "tailored" for each different training group, whether it is sprint, distance, middle distance, or stroke and IMers. Everyone is given the opportunity to get what they need.

Any time there is a switch-up or a change of pace in the grind of swim practice, swimmers will get excited. Fenwick relayed that his athletes "get excited for open water workouts. They're

on the pool deck before an open water workout, and there is a different energy to it." For an athlete to get better, faster and stronger, any spark of positive energy can do wonders for the effectiveness of their training on a day-to-day basis.

In regards to the benefits of open water training transferring into racing, Fenwick commented that it has greatly sharpened his athletes' skills. The swimmers have been able to "play off of each other" and enhance their racing strategies in ways that training in a lane and swimming back and forth for two hours wouldn't quite help them grasp to the same extent. Fenwick described that while getting comfortable training with each other in open water, they have developed the skill of being able to "feel what they have to do next."

This is a huge asset in the realm of the swimming world. There are countless racing strategies out there, and each individual swimmer has their own. But having the ability to sense and anticipate how an opponent is going to execute a race, and then being able to react reasonably and adjust accordingly is a skill that not many swimmers even consider developing.

Open water training fosters an environment where athletes get in the habit of being on the same page as their teammates, while at the same time being challenged by one another. Having the opportunity "to train with a pack opens the door for some great new techniques," Fenwick stated.

Emphasizing the distance program, Fenwick made it a point to state that he "wants swimmers that are excited and passionate about swimming. It doesn't have to be a grind if your perspective isn't that it's a grind, and you motivate." Training open water allows swimmers to get used to being on their toes in the water through the practice of communication with their teammates and anticipation of what comes next.

Coach Fenwick expressed much excitement about the direction and velocity of his program and was very optimistic about the ways in which open water training has been and will benefit his swimmers.

Open water training, he said, "is something that hasn't ever really been done before and it has opened a lot of doors for our program." ◄

[Photo Courtesy of Tyler Fenwick]

[PHOTO COURTESY: PETER H. BICK]

STARTING THINGS OFF RIGHT

A poor start can mean the difference between a gold medal and a silver medal around your neck.

When you hear the starting signal, every muscle in your body – from your head to your toes – should spring into action to get you into the water quickly and with blazing fast speed.

Throw your head forward to start the motion, then the rest of your body should use the starting block as a launchpad for a great race.

T/D

KICKING UNDERWATER TO 15 METERS: IS IT FOR EVERYONE?

by Delaney Lanker

[PHOTO COURTESY: FINA DOHA 2014]

Underwater kicking has become the buzz among many swimmers and coaches in the past few years. Since the turn of the century, swimmers have found that the best way to get faster in butterfly, backstroke and freestyle is to go deep.

In early July, Ryan Lochte challenged the underwater kicking rules at the 2015 Athens Sectionals. He kicked on his back underwater when he pushed off the wall in his 200 freestyle, and did the same when starting the freestyle leg of the 200 IM. Lochte said he and his coach, David Marsh, discovered that he was not only extremely fast underwater, but he was fastest when kicking on his back. The technique raised a lot of questions about underwater kicking in the swimming community, but got a lot of people talking.

"It is not for everyone, but for those who can do it well, it is an advantage," said Chris Plumb, the head coach at Carmel Swim Club. "If you are not proficient at kicking underwater, you are getting passed by someone who is."

The rules state that swimmers can kick for no more than 15 meters underwater in butterfly, backstroke and freestyle, but not every world-class swimmer pushes that limit. Missy Franklin barely goes 10 meters off her walls. Michael Phelps, who was once regarded as the king of the underwater kick, doesn't go that far underwater anymore. Look at an elite backstroke race, however, and almost all of the eight in a championship final are emerging right at 15 meters.

Plumb acknowledges that not all swimmers need to go as far underwater as others, but proficiency is crucial.

"The key is to look at cost versus reward," Plumb said. "How much does it cost an athlete in terms of energy versus how much of advantage they gain against the rest of the field?"

That was a question one of Plumb's top athletes faced at the USA Swimming nationals in August. Claire Adams was one of the top kickers in the field, and used that to set what was then the junior world record of 59.58 in the 100 backstroke.

"Consistency is key," Plumb said. "Each athlete must decide how much they are going to kick in a race and develop the ability to kick that far and fast each day."

With a set called "Carmel Shooters," Plumb's team works on dolphin kicks with a challenge thrown in.

"Every day we train for underwaters," Plumb said. "We use kickout buoys that force athletes to go a certain distance off the wall each day in workout."

The Carmel Swim Club often uses these "kickout buoys" to get his swimmers to kick underwater past seven meters, teaching them to believe in the power of their kicks.

Science has shown that swimmers are unequivocally faster underwater. Many would like the sport to return to the way it was in the mid-1990s, when athletes didn't have a set limit on underwater kicking. Plumb said he would prefer the 15-meter rule stay in place.

"I think for spectators – and for the good of the sport – people want to be able to see (a race) with their eyes," Plumb said. "If swimmers are underwater, then the spectating value is diminished."

The 15-meter rule is not going away anytime soon, so athletes such as Lochte will continue to challenge the rules. As the importance of underwater kicking has grown over the years, Plumb realizes these strategies must be implemented by swimmers at a very young age.

"It is certainly something you want athletes to be able to do and to develop at young ages." ◄

RS

[PHOTO COURTESY PETER HICKS]

RACE SIMULATION: THE KEY TO OPTIMAL MEET PERFORMANCE

by Bryan Craig

Race simulation in a training situation is just that –a simulation. How close is simulation to the real thing? It might look the same, feel the same, but the results are not even close.

For example, a flight simulator looks the same – you will see all those buttons on the flight console. It even feels the same as the computer simulates the feelings of turbulence. But it's not close to being real, as you are not flying that 100-ton plane in reality and you do not have the thought of killing everyone onboard if you crash, if you run out of fuel or if you miss the runway.

When I set up my athletes for a racing simulation, it is true that they are racing, but they are missing a few key things which change the whole game. No crowd, no true opponents, no adrenaline, no pump-up music, no previous races to watch to get the synapses moving in the brain.

So why do it?

The better we get at a simulation, the better swimmer we will be in the end game. If your current time in a race is 25 seconds but in simulation you keep doing 27, you might get frustrated. However, the better you get at the simulation, the better the chances of bringing your time down to 26 in the simulation. Then, in theory, your time in a race should drop by that same difference to perhaps 24.

So when is the best time to perform one of these simulations? Any time! On my team, we simulate twice per month. One of the race simulations happens during a morning workout, while the other is during an afternoon workout.

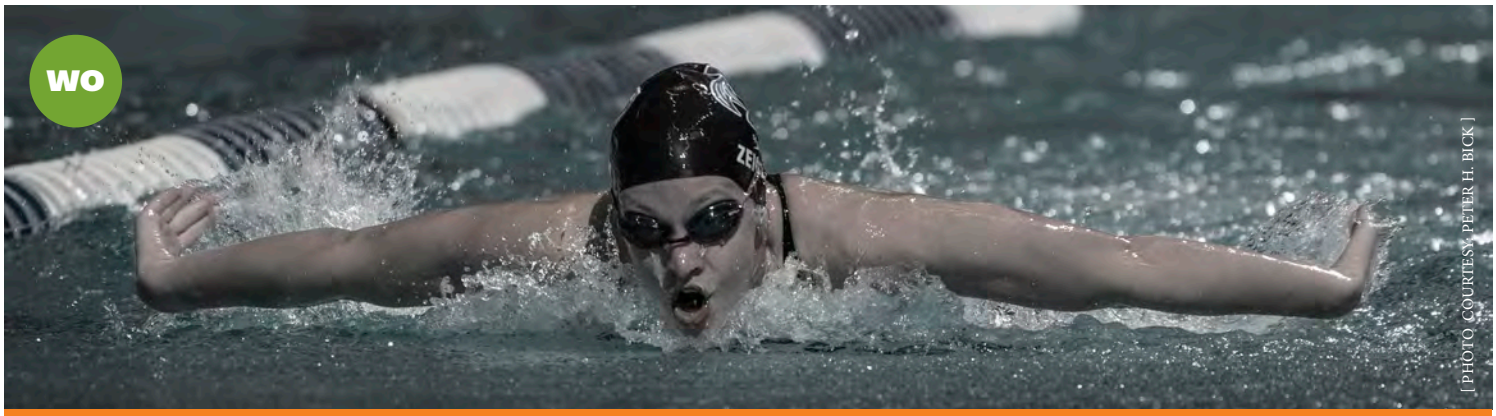
At any point a swimmer should be ready to get up and race, as this will help increase the adrenaline. At any point in time I can tell my swimmers to get out and get ready to race. They should all perform within 1 percent of their best time. When we push this thought process, the swimmer's mind is always ready to do what they do best – race.

We set our simulation up with a simple meet warm up. The kids are unaware that they will be simulating racing as the aim is to get the kids to manage to perform at their best at any time. Due to the nature of our pool (shallow depth, no starting blocks), I take into account a three-second buffer.

We chart the target times, but we also chart health and well-being before each simulation by asking simple questions with answers coming on a scale of 1 to 10. If the kid is way off on his time, we are aware of what may or may not be the issue.

Breed the mentality from a young age. Get the younglings to open a chart and track their progress. Once a week, make them get up and go for one sprint. As the child progresses, it keeps the mind fresh within training and encourages a safe competitive spirit.

At any point in time you can and you will get up and race like you are in a race situation. ◄



[PHOTO COURTESY PETER H. BICK]

TRAINING SETS FOR YOUR 200 IM AND BUTTERFLY SPECIALISTS

by Evan Dulaney

IM TRAINING

Cory Kephart, the head age group coach at Seminole Aquatics in Sanford, Fla., uses the following set once or twice a month throughout the season to focus on 200 IM preparation. The set will often pop up a few days before a meet.

Three rounds:

3x50 on 1:00
(25 fly/25 back on round 1, 25 back/25 breast on round 2, 25 breast/25 free on round 3)

1x50 stroke fast on 1:00
(Fly for round 1, back for round 2, breast for round 3)

1x100 IM fast + 1x50 free recovery on 3:00

Kephart says:

"This set, although short, covers a lot of important IM groundwork. The three 50s in the beginning focus on fast transition turns, which can ultimately be the difference maker in an IM race. The fast 50s are intended to be at or below the swimmer's best 200 IM split for that stroke. In a sense, it's pacing for a 200 IM.

"Next, the swimmers need to blast the 100 IM so their time is faster than half their best 200 IM time."

The set is manageable for virtually every age group who swims 200 IMs, Kephart says. Consistent practice with it, he adds, should yield a solid IM swim. Before major meets, feel free to go from a dive on the fast 100 IMs and 50 fly. During taper, tinker with the cycles for a max taper effort.

BUTTERFLY SET

The name of the game for this fly set is consistency. Chad Rehkamp, head age group coach at the Northern Kentucky Clippers, utilizes this set with his top age-group swimmers.

20 x 25 fly hold even pace and even stroke count on :25
1 x 200 recovery on 4:00
10 x 50 fly hold even pace and even stroke count on :55
1 x 200 recovery on 4:00
5 x 100 fly hold even pace and even stroke count on 1:50
1 x 200 recovery on 4:00
2 x 200 fly hold even pace and even stroke count on 3:40

Maintaining an even stroke count and pace throughout the set develops butterfly endurance, Rehkamp says.

"As the distance builds, it'll be tougher for swimmers to hold an even pace and stroke count," Rehkamp continues. "It's crucial they stay long, continue to incorporate their legs, and work every wall the same.

"The intervals aren't fast, giving the swimmers an opportunity to focus more on stroke count and pace rather than going fast to make (the interval). That doesn't mean the swimmers can't hold a relatively fast pace. Butterfly specialists in particular should be holding a fairly fast pace."

Holding an even stroke count and pace will obviously become more difficult as the distance shifts from 25s and 50s to 100s and 200s. This presents the ultimate challenge to the swimmers. If they're able to conquer that aspect of the set, their fly is in an excellent rhythm.

As a coach, hold your swimmers accountable throughout the set. Ask about their stroke counts often to make sure they're always thinking about it. Call out times so they know what pace they're hitting.

Sets like this help swimmers in longer fly races keep a consistent stroke throughout their races. The 1900 yards of fly will certainly make the 200 fly seem like a cakewalk. ◄

About the author: *Evan Dulaney is the lead national prep coach with the Northern Kentucky Clippers.*

FLY LOW

There's a reason why Michael Phelps is the best butterfly swimmer in history. The energy during his strokes are focused more on moving forward, not up and down. Body position during the breath on butterfly should be almost flat, with the chin resting mere centimeters above the wave you've created during your swim. To maximize the potential for a flatter stroke, recover the arms close to the surface of the water. The higher the arm recovery, the greater the body angle during the breath, which causes unnecessary drag.

[PHOTO COURTESY: PETER H. BICK]

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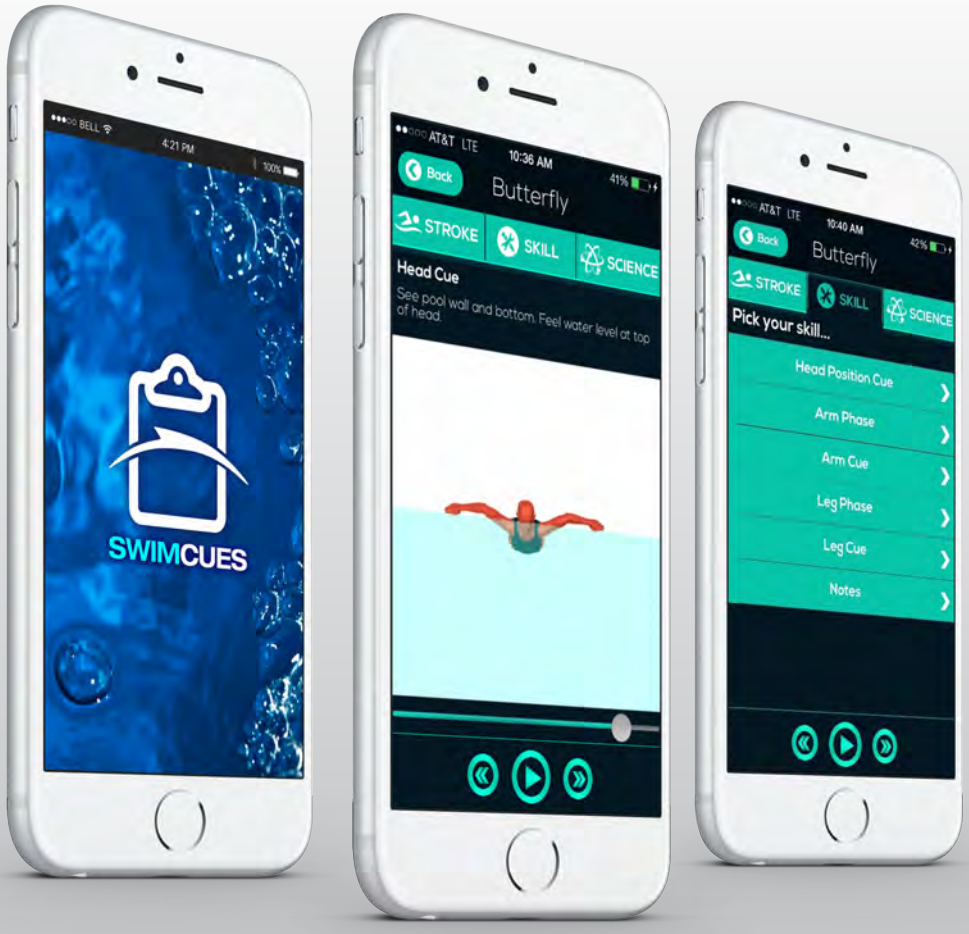

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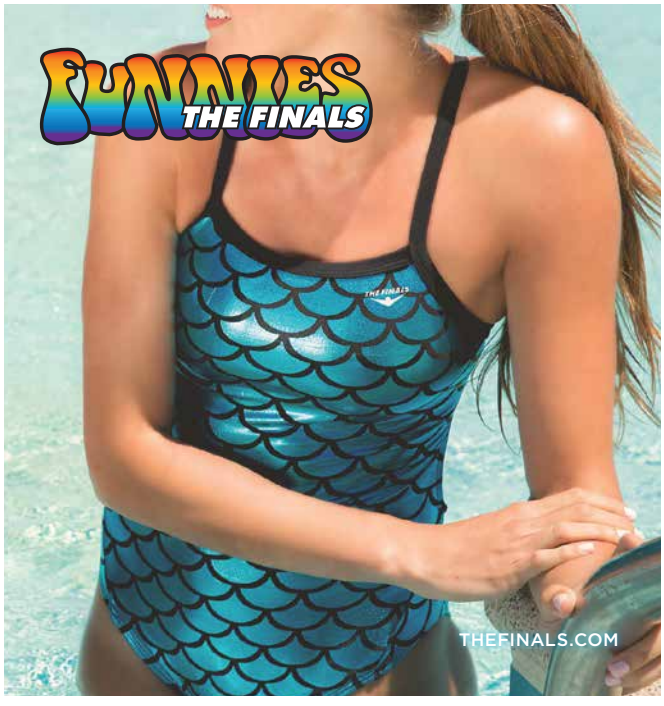

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