

SWIMMING TECHNIQUE

A close-up photograph of a swimmer in a purple cap and goggles, splashing water. The swimmer's face is partially submerged, and their mouth is open, creating a large splash of white water. The background is a clear blue pool.

FEBRUARY 2017 • VOLUME 44 • NO. 1

**WHAT TO
DO WHEN
YOUR HEAT
TURNS COLD**



**RETURNING TO
COMPETITIVE LIFE
AFTER INJURY**




**HOW CANADA
PURSUES HIGH
PERFORMANCE**

**THE IMPACT
OF SCIENCE ON
WORLD RECORDS
IN SWIMMING:
PART II**

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On the Cover: Ivana Ninkovic of Arizona State University. Photo by Matthew Rubel

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

MP MENTAL PREPAREDNESS

EV ENVIRONMENT

TC TECHNICAL

S/T STRATEGY/TACTICS

N/R NUTRITION/RECOVERY

SI SCIENCE & INNOVATION

TR TRAINING

PRIVATE LESSONS WITH WAYNE: PROFESSOR, SWIMMING COACH, Ph.D.? GETTING YOUR COACHING B.A.S.E. RIGHT

by Wayne Goldsmith

“**A**nyone who’s spent 20 years on deck, working with swimmers every day, figuring out how to help them get the best out of themselves and giving everything they’ve got to being the best coach they can be, has earned a Ph.D. in coaching...and then some.” (Australian Swimming Coach)

All swimming coaches—from the first lesson on the first day of their coach education journey is encouraged to at least try to integrate a little sports science into their coaching program.

It could be something as simple as understanding how a swimmer’s heart rate increases when they start swimming laps (physiology). It could be learning how to count strokes and take stroke rates (basic biomechanics and performance analysis). It could be understanding the importance of encouraging swimmers to drink fresh, clean water regularly throughout their training sessions (nutrition). Or it could be learning how to listen to a swimmer and trying to understand his or her personal motivation and drive to swim (psychology).

The intention of the swimming coach educators and coach developers is not to try and turn all swimming coaches into “performance professors.” There is no expectation that every swimming coach will develop Ph.D.-level expertise in any one or all of the sports sciences. There’s no need for swimming coaches to spend years and years at a university to earn the right to list 100 letters after their name.

Sports science is a tool—and it’s only one tool—that coaches have to help the swimmers in their program improve.

And like all other tools—sports science is best wielded by an “artist” who understands how, when and why to use the tool to create something special.

BALANCE OF ART AND SCIENCE

Swimming coaching is, at its finest, the integration—the balance—of art and science—i.e., the blending of the art of coaching and the science of swimming. Herein lies one of the great challenges for all swimming coaches: How do you as a coach balance the art and the science in your program?

Over the past 25 years, I have worked with three fundamentally different types of swimming coaches:

1) *Those who do it by “feel”—by instinct, by personality and by their*

capacity to work with and connect with other human beings.... The ARTISTS.

2) *Those with strong sports science backgrounds—those who understand the subtleties of heart rates, stroke dynamics and performance technologies, etc.... The SCIENTISTS.*

3) *Those who understand how to balance the art of coaching with the science of swimming—the B.A.S.E. coaches (BALANCE of ART and SCIENCE for EXCELLENCE).*

Think of the best swimming coaches you’ve known. Maybe you’ve worked with them on deck...or read about them...or listened to them talk at conferences or conventions...or maybe you were coached by them.

Were they artists? Were they scientists? Were they B.A.S.E. coaches?

LEGENDS OF COACHING

Consider for a moment just a few of the legends of swimming coaching:

Counsilman—brilliant mind, outstanding scientific thinker, excellent communication skills...a B.A.S.E. coach of the highest order.

Carlile—genius, creative and lateral thinker, strong scientific method in everything he did, outstanding communicator...B.A.S.E. coach? *Absolutely.*

There’s no doubt that some of the greatest swimming coaches we’ve seen over the past 50 years have been ostensibly more artist than scientist—i.e., they seem to be achieving success through plain old hard work, discipline, commitment and passion with little or no sports science evident in their programs.

There are many coaches who’ve seemingly produced outstanding results through nothing more than their own personal drive and ambition...and through their relentless pursuit of swimming excellence through a dogged determination to work harder than anyone else is prepared to work.

However, these “feel” coaches have also been smart enough to know when and where it’s the right time to be an artist and when and where it’s the right time to be a scientist. And where they’ve lacked the

knowledge, skills and expertise in sports science that they've needed to achieve success, they've been smart enough to recruit people who do.

Recent inductee into the Swimming Coaches Hall of Fame Coach Bill Sweetenham is a classic example of this.

Bill was born and raised in one of toughest mining towns in outback Australia, and his nature was to work hard, never give up, be uncompromising in the standards he expected of himself and his swimmers, and be more committed to winning than any of his competitors.

Yet, Bill was—and still is—one of the smartest coaches in world swimming because he realized that in order to reach the level of success he desired, his “art” needed to embrace cutting-edge swimming science—i.e., his art, by itself, was not enough.

Coach Sweetenham has become one of the greatest “students” of the sport of swimming. A voracious reader, a tenacious learner and a relentless student, he has pursued a lifelong commitment to mastering his art and understanding how he can best integrate sports science into his programs and philosophies. Coach Sweetenham is a genuine B.A.S.E. coach.

UNDERSTAND YOUR SWIMMERS' NEEDS

The danger for coaches entering the industry for the first time is to rely too heavily on sports science and to look to the sciences to solve every performance problem they face.

For example, it is common for inexperienced coaches to spend hours writing overly complicated workouts and to prescribe precisely detailed training sets and sessions based on complex physiology, training zones and heart rates.

Yet, more experienced coaches don't finalize their workout strategy until they observe the swimmers as they arrive at the pool, have engaged with them before and during warm-up and have spent a little time just watching how the swimmers move, how they communicate, how they “feel.”

The science of swimming is best delivered through the heart and mind of a coach—an artist—who understands the specific needs of his or her swimmers.

Last year, I had the great honor and privilege of spending a week with the living legend, Coach Eddie Reese, in Austin, Texas—home of the mighty Longhorns.

Coach Reese and I spent countless hours discussing workouts, coaching strategies, speed development philosophies, the future of the sport and 100 other topics. His knowledge and understanding of his “craft” is second to none. But what was most impressive was his connection with his team.

Coach Reese is an observer of humans. While his understanding of the science of swimming was impressive, his understanding of his swimmers and his ability to “read” the needs of each individual on his team was extraordinary. It is his ability as an artist that drives the science of his program.

I asked one of the team members, “What's so special about Eddie?” His reply—and I suspect I could have heard the same reply from any member of the team—“We love the guy.”

Coach Reese, a B.A.S.E. coach? Absolutely.

HOW TO BECOME A B.A.S.E. COACH

So the question for every swimming coach is this: How do I become a B.A.S.E. coach? How do I develop that balance of art and science that is inherent in swimming coaching success at the highest level?

1. Understand yourself. Why are you coaching? What's your motivation for coaching? What is it that's driving you to coach? What is your personal philosophy on coaching? What is it you're trying to achieve?

2. Understand your craft. Listen to and observe more experienced coaches. Talk to sports scientists. Read everything you can about technique, skills, strokes, racing strategies and, of course, sports science. Become a student of the sport of swimming.

3. Become a “how and why” thinker. Once you've gained a fundamental understanding of the “whats” of swimming coaching and sports science, deliberately evolve your thinking to ask how and why you do what you do.

4. Never stop learning. Just as you expect your swimmers to learn something new every day and get a little better every time they train or race, develop a learning mindset in which you are as committed to continuous improvement as your swimmers. Reflect on your coaching daily:

- Did I coach my best today?
- Did my coaching make a difference today?
- What did I learn today that will make me a better coach tomorrow?

5. Put People in Priority. Become a master of communication. Learn how to engage with people. Spend time understanding how to connect more effectively with others. ♦



*Wayne Goldsmith
Managing Editor of
Swimming Technique Magazine*



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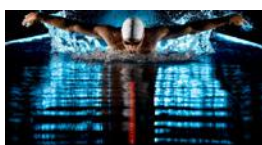
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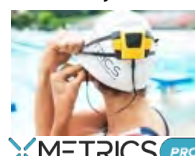
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The Impact of Science on World Records in Swimming: Part II -The Rise and Fall of Science

by Rod Havriluk, Ph.D. & Tyler Gambill

In the last issue of *Swimming Technique* (Oct-Nov-Dec 2016), Part I of this series explained the trial-and-error process of freestyle technique development from 1904-60. Most notably, the American Crawl (1912-32) and the Modern Australian Crawl (1956-60) had major improvements based substantially on science. While these national styles were popular, swimmers from the “style name” country set most of the world records.

This article (Part II) covers the rise and fall of the application of science to swimming. There are many indications that the use of science had a measurable positive effect on performance from 1960 to 1980. Likewise, when science fell out of favor—from 1980 to the present—the resulting negative impact on performance is both obvious and quantifiable.

Scientific Era I (1960-80): Carlile and Counsilman Lead a Scientific Revolution

The history of national styles provided a basis for changes in the rate of improvement (ROI) for the first half of the last century. By 1960, swimmers from most countries were using some variation of the science-based modern Australian crawl and paved the way for the appreciation of science. The average ROI for freestyle (graphed from 1904 to 2016) and all events (graphed from 1956 to 2016) dramatically increased in 1960 and remained high until 1980 (see Fig. 1-next page).

Not coincidentally, a considerable number of science-related events (i.e., publications and conferences) accompanied the high ROI from 1960 to 1980. For example, science-related publications figured prominently throughout the scientific era. *Swimming Technique* was first published in 1963 and featured research that could be applied by coaches. Two coaching legends, Forbes Carlile and Doc Counsilman, each

had science backgrounds in their education and as professors. Their books, published in 1963 and 1968, respectively, are still recognized as swimming classics.

In addition to the increase in publications, there was also an increase in science-based presentations. Swimming organizations began to focus entire conferences on science. FINA (Federation Internationale de Natation, the international governing body for swimming) hosted the first World Sports Medicine Conference in 1969. The following year, the first Biomechanics and Medicine in Swimming Conference (BMS) was held. The impact of the first BMS conference was readily apparent as presentations such as those by Counsilman and Dr. Mitsumasa Miyashita quickly gained popularity. In retrospect, the quadrennial series of conferences was called “the most important scientific congress in the swimming world” (Escalante & Saavedra, 2012).

Counsilman—who was a coach and a scientist—continued to be a driving force in promoting practically-applicable science—i.e., scientific principles that coaches could immediately use with their swimmers. He published his *Competitive Swimming Manual* in 1977, explaining the scientific principles and supporting research behind many technique elements. In 1980, he published a paper on the importance of hand speed and hand acceleration, which resulted in several presentations, inspired additional research and was widely disseminated. Counsilman’s efforts produced a lasting legacy that continues to have a profound impact on performance.

Although many coaches appreciated the value of applying science, not all scientific initiatives were completely embraced. The experience of one coach serves as an example.

As a doctoral student in sport science, Coach Terry Maul began to implement concepts that he had learned from his studies. He was also motivated to share these ideas with other coaches. As a board member of the National Collegiate Women's Swimming Coaches Association (NCWSCA), he suggested the formation of a research committee. Possibly because swimming was still in the scientific era, "the board was receptive to the idea" (Maul, 2016).

In 1978, the NCWSCA formed a research committee chaired by Maul, who then began publishing a quarterly newsletter. In 1979, a new publication designed for coaches (*Swimmers Coach*) backed Maul's effort and reprinted the newsletter. However, the NCWSCA soon merged with the College Swim Coaches Association (CSCA), resulting in the elimination of Maul's board position and cessation of newsletter publication.

Although science was generally well received during this time period, there were other indications of rising issues. For example, a thorough review of biomechanics research concluded that most research had been a "one-shot" study (Miller, 1975). A single study on a topic may produce a completely valid and applicable finding. However, it is also possible that such a finding is not generalizable, producing undesirable results and another reason to distrust science.

Another major issue, however, severely tainted belief in scientific methods. In 1976, the science program of East Germany was criticized for illegal and unethical use of drugs. The issue quickly became a valid reason for coaches and swimmers to question a scientist's recommendation.

The fervor over increasing training distance may have been the most obvious and prevalent indication of abandoning science. In 1978, Coach Larry Raymond complained about the "yardage crunch" and explained that the training distance for many swimmers averaged 15,000 yards per day. As a more sensible alternative, he cited an article by a physiologist (Atterborn, 1978), who recommended training "at higher intensity over shorter total distance." In what may have been the strongest indicator that the science era was ending, the swimming culture opted in almost wholesale fashion for a training method backed by successful experience (with an emphasis on training distance) instead of a science-based recommendation (with an emphasis on less distance and higher intensity).

Experience Era II (1980-2016): Science Becomes Less Popular

Beginning in 1980, there was a precipitous drop in the ROI, as well as more signs that the popularity of science was declining.

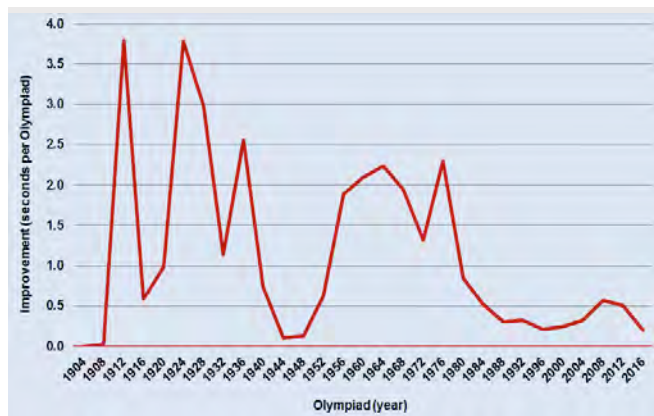


Figure 1. The average rate of improvement by Olympiad for all events from 1904 to 2016.

Perhaps the publishers of *Swimming Technique* had the best read on the swimming culture as they changed the format to de-emphasize science. With the revised format, each issue presented "a topic of concern to coaches or administrators" (Deal, 1980). The number of scientific articles decreased from about ten per issue to five or less. There was only one scientific article in the first issue with the revised format.

Perhaps Sands (1990) made the most definitive statement that experience was favored over science: "Coaches tend to acquire their information almost exclusively by experience." Clearly, the scientific era had ended, and the second experience era had begun.

There were, however, some notable exceptions of organizations continuing to stress the importance of science. For example, the Australian Institute of Sport was established in 1981. In 1983, the American Swim Coaches Association (ASCA) appointed a scientist (Keith Sutton, who held a Ph.D. in exercise physiology) as executive director. Although he died an untimely death less than a year later, Sutton left an important legacy: the *Journal of Swimming Research*, featuring scientific articles that were of practical value to coaches.

There are other isolated examples of applying science during this time frame. When he began coaching in the early 1980s, former Olympic coach Dave Salo had a revelation from his studies similar to Coach Maul: "I learned theories that were intriguing—and completely contrary to what I knew as an athlete" (Hedrick, 2015).

Salo further explained the need for science: "you have to justify what you tell your athletes." The educational backgrounds of coaches Salo and Maul, however, are fairly unique within the swim coaching profession. Consequently, many coaches rely on applying experience, as opposed to applying science.

In 1988, USA Swimming made a bold attempt to promote science by establishing the International Center for Aquatic

CONTINUED >>>

Research (ICAR). By 1991, however, the standard of work was already being questioned (Rushall, 1991). In 1992, the program was terminated for lacking credibility with both coaches and scientists. Even swimming's greatest science advocate (Counsilman) criticized ICAR for "sloppy and poorly-done experiments."

Other examples reveal the growing distrust of science—even by scientists. In a scathing editorial, Dr. Joel Stager criticized the outrageous (and inaccurate) "scientific" claims by swimsuit manufacturers (Stager, 2000). It wasn't just swimming—the public was bombarded with "pseudoscientific" claims where findings were presented with the appearance of science, but not the rigor of the scientific method. For example, products were advertised as "melting fat away" or "doubling muscle mass." Reasons to distrust scientists were confirmed when the products did not deliver on the promises.

Even research that was conducted using the scientific method was giving science a bad name because of the lack of application information for the findings. A 2004 landmark article on the "Downfall of Sport Science in the United States" (Stone, Sands & Stone, 2004) detailed the serious problems with communication between scientists and coaches, and the resulting lack of application of research findings. As further indicators that science had become less popular, *Swimming Technique* ceased publication in 2005, and the *Journal of Swimming Research* ceased publication in 2007.

In a recent panel at the MIT Sports Analytics Conference, Dr. David Martin (2016) went so far as to say that sport scientists are "rejected." An article in the *Washington Post* explained that the problem is widespread in culture and only getting worse: "On basically every measure, Americans are more skeptical of science's impact on American life than they were five years ago" (Blake, 2015). Will the swimming culture continue to rely on experience, or are we on the brink of another scientific revolution?

Summary

Largely due to coaches Carlile and Counsilman, a scientific era for swimming began in 1960. The implementation of scientific methods by coaches was prevalent for 20 years. During this time, science was generally applied. Many science-based publications and conferences began. Also during this time, world records dropped an average of about two seconds per Olympiad.

In 1980, science fell out of favor and scientists were generally not trusted. From 1980 to 2016, world records dropped at an average rate of less than one-half second per Olympiad. Perhaps, the obvious relationship between the application of science and swimming performance will encourage coaches and scientists to work together to usher in a second scientific revolution. ♦

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WHEN A SWIMMER PEAKS... NOW WHAT?



[Photos from Left: Kara Lynn Joyce. Peter Vanderkaay (Top), Davis Tarwater by Peter H. Bick. Dara Torres by Bill Collins]

by Michael J. Stott

When athletes are at the point of considering retirement, conversations are never easy. They require lots of honesty, soul searching and a heavy dose of reality testing. In all cases, the retiree-to-be ultimately faces a moment of truth. That moment has both mental and physical components.

“When does a person peak physically? I can’t tell you,” says National Team Director Frank Busch, “because it is unique to each individual. I can tell you that today’s athletes are 50 percent smarter and, perhaps, 50 percent stronger than in the ’90s. And technically, they see everything and anything in a single day because of the various technical equipment we have.”

Age, nutrition, strength, technique and training modalities all factor in: “There are a lot of variables,” says Busch. “If you cannot swim fast enough to win or be excited, that is usually the reason your career ends. Psychologically, you’re not going to continue to practice every day and work really, really hard because you realize you are not going to win or be a podium athlete,” he says.

A SCIENTIFIC COACH’S PERSPECTIVE

Olympic coach David Marsh describes Alabama University assistant and former world record holder Jonty Skinner as a scientific coach. In that role, he certainly has credibility. From 2000 to 2008, he served as USA Swimming’s Director of National Team Technical Support, which involves coordinating all testing, tracking and assessment of the national team athletes.

“With no money in swimming,” he chose not to swim after college. Skinner did, however, continue as a student of the sport. He notes that athletes reach their peaks when the

incentive to push harder or want more goes away. “Simply put, the body is an organism that adapts to stress. If the stress isn’t higher or exactly the same, then the chances of maintaining or surpassing your times is impossible,” says Skinner. “So the key is the willingness to find different ways to push the body and constantly change the adaptation challenges so the body is always working hard to keep up with the demand.”

There are two components, he says. The first is genetic—i.e., a God-given aerobic or cardio capacity level that can’t be manipulated. “Too many people mine this area with a reckless disregard for efficiency. So, when they reach their cardio peak, they compromise their ability to reach their full genetic peak,” he says.

“The real potential lies in maxing out the anaerobic system at the highest level of efficiency. Once cardio levels have been mined, they can be maintained fairly easily, and it doesn’t take huge volumes of aerobic work or long 20 x 200 sets to keep it there,” he says. “Training should not be pursued in a manner that takes away from the athlete’s ability to mine the anaerobic system.”

“Fitness is a moving target. As athletes get older, it takes longer to recover from anaerobic work. Most athletes go through a period where they reduce load and swim faster—their mistake, though, is thinking that they can do that all the time and still get faster. This results in many trying to maintain performance with smaller or shorter loading periods. While this will work for a short time, the aerobic system will eventually fade away,” he says. “Longer events get slower, and in time, the 50 becomes the only viable event. Many athletes in their career twilights turn to ‘airbrush’ training—doing just enough to make it look really good, but not enough to truly sustain and or push the body forward.”

WHY DO ATHLETES STAY IN THE SPORT?

Skinner answers that question, saying, “Mostly to make a living, but in some cases because they have no exit strategy. What to do after swimming scares them and leaving that life of simple structure isn’t something they give up easily.” Sponsor stipends can play a role as well.

“There is a point in every athlete’s career when their physical skills begin to diminish. It depends on genetics, training background, event options and their 24/7 strategy as to when this starts to occur,” says Skinner. “For most, this begins in the late 20s, but for some (very few), it might stretch into the mid-to-late 30s. By then, most athletes have shifted to airbrush training and diminishing skills. They may train just as hard, but for some reason, it’s just not there anymore. However, maintaining their position will only occur if they get back to the kind of work that really pushes the body. In many cases, the body isn’t ready to get back to that kind of work. It’s a real catch-22 since the work is essential, but the body can’t handle it anymore,” he says.

FOUR OLYMPIANS AND THEIR THOUGHTS ON RETIREMENT

Peter Vanderkaay

4 Olympic Medals (2004, 2008, 2012)

“I didn’t know what my performance trajectory would be as I got into my late 20s. I felt I could get faster, be competitive and fight for spots on the podium and the U.S. Olympic team, but I knew I was going to be fighting for tenths of a second. So, I looked at the little things that I could do differently—i.e., lifestyle or technique. There wasn’t a whole lot of room to try harder,” he says.

Vanderkaay also made a venue change. After 10 very successful years in Michigan, he moved to Florida to train with Gregg Troy’s post-grad group. “I needed to make a change and get out of my comfort zone,” he says. “It was a huge risk, but a challenge I needed to face—and I had a fantastic experience—and walked away with a bronze medal (London 2012, 400 meter free, 3:44.69).”

Vanderkaay attributes the different environment, stimulus, training style and training partners for his positive experience. The hard work was familiar: “It is about the effort and how hard you are invested in the plan. It was about getting comfortable with being uncomfortable.”

A return to his roots and increased higher volume training seemed to help. “At that age (27), it was tough. It broke me down. In-season times were not fast,” he says. “The idea that you can’t do as much volume as you get older is a fallacy. That’s an excuse people use to get out of training. Being 28

isn’t that old—it is more a state of mind.”

With medal in hand, Vanderkaay considered the future. Returning from London, he stayed in shape throughout the fall. “I didn’t want to make a knee-jerk decision. I’d enjoyed great sponsors, support from all sides and was ready for a new challenge. When the holidays rolled around, I made the decision to retire.

“I’d be lying if I said I didn’t miss it from time to time. It’s a great sport, great lifestyle, great people—but you can’t do it forever.” These days, Vanderkaay is in commercial real estate with Signature Associates in Southfield, Mich.

Kara Lynn Joyce

4 Olympic Medals (2004, 2008, 2012)

She never worried about peaking as an athlete, confident that the normal plateaus could be overcome by hard training and necessary adjustments. “When you are committed to a sport, I don’t think you can stay in it wholeheartedly knowing your best is behind you. You view it as what can I do, what can I change to get better because my best is still ahead of me,” she says.

Joyce was an Olympian at ages 18, 22 and 26. While it wasn’t an epiphany, “I did have a feeling when I knew I was going to be done,” she says. “It was in the ready room of Olympic Trials in 2012.” She was preparing for finals in her favorite event, the 50 free, after a disappointing 100 freestyle performance (18th).

“In the ready room, you have 10 minutes to ponder life. Some people like to chat, to listen to music, to stretch, to do their own thing. I like to keep to myself,” she says. “I remember sitting there and thinking how the last four years had gone, decisions I’d made, things that didn’t work out (four coaching changes). I said, ‘Kara, why are you thinking all these negative thoughts. Swimming is supposed to be fun. You do this because it is fun.’”

From there, Joyce reflected on the seven-year-old who watched her first Olympics, the 10-year-old who told her fourth-grade class she would be an Olympian, who endured unending hours in cold pools, whose body ached the last 15 meters of every race and practice. “I thought of all those beautiful moments that led me to that point. It put a big smile on my face. I told myself, ‘Whatever comes of this will be OK. I just want to give it my best right now. After that, I’m going to be done.’ Then we marched out, and I was the most happy and relaxed I’ve ever been before a race.”

A surprising second-place finish propelled her to London, after which she retired from competitive swimming. “Since

CONTINUED >>>

then, not once have I had the urge to get back in the water. I am lucky. My career didn't end because of an injury, being a senior or because of financial reasons. I was able to take swimming as far and as long as I wanted. Now married (Williamson) and living in Denver these days, she teaches competitive swim lessons and technique to swimmers ages seven to 65.

Davis Tarwater

1 Olympic Medal (2012)

Davis Tarwater—a 13-time NCAA All-American, multi-time U.S. national champion and an Olympic gold medalist—trained under the likes of Jon Urbanchek, Bob Bowman, Matt Kredich and David Marsh. Armed with two sponsors and a training spot at alma mater Michigan, Tarwater pressed on toward the 2008 Olympic Trials. He missed the team and was devastated.

He returned home to Knoxville and underwent stroke retooling under Matt Kredich and made the 2009 World Championship team, but it was not until 2011 when he went to SwimMAC's post-grad program that he hit his peak. "At SwimMAC, I really made a huge commitment to doing things the right way. For me, it was a convergence of technical, physical and general maturity factors," he says.

In the past, Tarwater had gotten by focusing on physical training. "At SwimMAC, (Coach) David (Marsh) gave us the tools to do the right things in and out of the water. He understood that I could do beneficial things away from SwimMAC. So, I went back to Knoxville and touched up technique with Matt, and did some extended training blocks with Mike Bottom and the Michigan crew at Colorado Springs. It really helped keep it fresh for me while giving me the tools and guidance I needed for success."

Tarwater got his Olympic medal as a part of the U.S. prelim team in the 4 x 200 free relay in London. He turned in lifetime bests in the 50 free and 200 fly at winter nationals in 2012, but an elbow injury that required repair—along with a promising business opportunity—sealed the deal. Today, he is the managing partner of Gulfstream Capital, a private wealth management firm in Knoxville.

Dara Torres

12 Olympic Medals (1984, 1988, 1992, 2000, 2008)

Frank Busch calls her "a freak of nature." She says she's "genetically gifted." Both are right. Torres set multiple American records in the 50 meter free, the first at age 15 (25.69 as a ninth-grader), the last at 41—before and after two layoffs of seven years each. "When I retired after 1992, I was 25 years old and wanted nothing to do with the pool," she says.

In 1999, she changed her mind and returned to California. Under the guidance of Richard Quick, she changed her training, going from nine-time to five-time weekly in-water sessions (morning-only workouts) and taking days off. She earned gold medals in the 4 x 100 free and medley relays and bronze in the 50 and 100 freestyles and the 100 meter fly. "When I swam my last event, Richard said, 'You know, Dara, the sad thing is that you haven't reached your peak yet.' I thought he was nuts, crazy. I think if I truly thought he was correct, I might have kept swimming," she says.

"Fast forward to training for 2008. I had no idea what my body could do, if my shoulders would hang in there, how I would recover." Torres quickly learned she couldn't do doubles. She began to listen to her body and surrounded herself with a trusted team/entourage led by Michael Lohberg and sprint coach Chris Jackson, along with strength, stretching, chiropractic and massage professionals. Strength training became more body weight-based. Stretching was paramount... efficiency was everything...muscle memory was critical...and sponsors appeared. "It was a team effort," she says. And in August 2007, she reset the American record in the 50 meter free with a 24.53.

She kept going because... "I love the challenges."

After having a child, her thought regarding the Olympics was, 'Let's just try this; I've got nothing to lose.' In my mind, I was winning a gold medal. That's all I thought the whole time training for 2008." And in Beijing, it was "gold-plus-1-hundredth-of-a-second," as she finished second to Germany's Britta Steffen in the 50 (24.06 to 24.07, another American record). She also took home two more silvers in the 4 x 100 medley and freestyle relays.

"I knew I had peaked at the Olympics in 2008," she admitted. Still, Torres made it to the 2009 World Championships, but "couldn't start, kick, do anything." Then she underwent major knee reconstruction and a cartilage transplant. With Lohberg very sick and her team in place, she soldiered on, "giving Michael (Phelps) something to live for," she says.

At the 2012 Trials, Torres finished fourth in the 50 free. "I was bummed that I missed the team by 9-hundredths of a second. It is very rare for me to be OK if I don't make a goal, but I knew I had nothing left to give."

When asked if she missed it, she replied, "I don't. That's why I know I'm done." ♦

About the Author: Michael J. Stott is an ASCA Level 5 coach whose Collegiate School (Richmond, Va.) teams have won nine state high school championships. He has been named a 2017 recipient of NISCA's Outstanding Service Award.

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WHEN YOUR HEAT TURNS COLD

S/T

by Wayne Goldsmith

You've trained for weeks...months...maybe even years for this meet.

Everything's ready:

- Diet: perfect.
- Training: haven't missed a workout for six months.
- You and your coach are happy... the world is wonderful!

You can't wait to get to the meet and show the world—and yourself—the result of so much hard work, dedication and commitment.

You're in Heat 6 of 7 of the 100 breast with a personal best of 1:22.51. The gun sounds. You're off...swimming fast and smooth for the first 50. You turn...kick off hard and streamline like a spear cutting through the water. You keep stroking...working hard to the finish and finally hit the end of the pool with a driving, surging two-handed touch.

You look up at the scoreboard...look for your name and see... AND SEE...1:24.91!!

You're shocked... disappointed... appalled... confused... angry...sad. You're not even sure how you feel right now. Your coach is standing there just as flabbergasted and as stunned as you are.

You've made it to the final...but only barely. You're in the outside lane...and you're more than four seconds behind the fastest qualifier in Lane 4!

The question now is: "How can you—and will you—swim seconds faster in the final in just a few hours?"

FIRST, FIND THE RIGHT SOLUTION TO THE RIGHT PROBLEM

When things haven't gone to plan in the heats, the key is to figure out what went wrong in your heat swim, what you learned from the experience and what you need to do to turn things around before the final.

1. Is the problem physical?

For example, a physical issue could be any one—or a combination—of the following factors:

- Start
- Turns
- Finish
- Warm-up—i.e., too much, too little, intensity too high or too low, warm-up too early or too late relative to race start time, etc.
- Fatigue
- Stroke technique
- Breathing rhythm and timing
- Race tactics, pacing and overall race strategy
- Hydration
- Nutrition

2. Is the problem mental?

- Too nervous
- Unable to relax before the race
- Not mentally tough enough when it mattered
- Lacked "killer-instinct"
- Not "aroused" enough—i.e., felt down, slow and flat even before you started
- Overly "aroused"—i.e., too excited, wasted too much energy before the race
- Didn't focus on the key aspects of your race plan, race strategies, technique and skills
- Lost concentration for one reason or another
- Didn't relax during the race and "tightened" up over the final 50

3. Is the problem a combination of both physical and mental factors?

After a disappointing heat swim, it's important you and your coach systematically and methodically look for a solution—and it needs to be the right solution—to the right problem. Improving your kick will only make a difference IF your kick was the problem in the first place. Changing when and where you breathe will only improve your final swim IF your breathing was the thing that caused you to swim slowly in the heat.

10 WAYS TO GET FASTER FROM HEATS TO FINALS

1. Do nothing. That's right. Sometimes the right strategy to improve from heats to finals is to do nothing. Sometimes the most effective strategy is just to shrug your shoulders, accept that not every swim can go the way you want it to go...and move on.

2. Rest. One of the most common factors leading to a poor heat swim is to go in "over-cooked"—i.e., be tired...maybe from a poor sleep the night before. Find a quiet place. Put on some eye shades. Put in some ear plugs. Lay your head on a soft, comfortable pillow and get some ZZZs. Doesn't need to

be a long, deep sleep—but the difference a one-hour power nap can make will sometimes astound you.

3. Swim. Go for a swim. Not just a swim-down—but an easy, relaxed, slow, comfortable “flowing-through-the-water,” playing-type swim. Just move loosely and quietly through the water and become friends with it again. Don’t take times. Don’t record distances. Don’t count laps. Just you and the water...peaceful and relaxed.

4. Eat and drink something. It’s important to swim “light,” but it’s also important to refuel and rehydrate. Try snacking on some light, natural foods and drinking some cool, clean water. Give yourself a little “treat,” but don’t go crazy—maybe one or two pieces of chocolate or your favorite candy. It may not be the perfect high-performance food recommended by sports dieticians, but a small amount of your favorite treat will not hurt you and might even put a smile on your face—and smiles are a much underrated performance-enhancement tool!

5. Do things you love to do. If you love to read—read. If you enjoy music—listen to some music. If you’re passionate about art—do a drawing. Do something completely unrelated and disconnected to swimming that fills your heart with joy and leaves your mind at peace.

6. Work through the heat swim with your coach, but... try not to spend too much time on race analysis. Leave that to your coach. Your coach is trained to review races, identify ways of improving your performance and give you strategies to put them into practice in the final. Trust in your coach. Don’t spend too much time on reflection and review of the technical stuff by yourself.

7. Don’t listen to too many people. When you have a great heat swim, everyone is happy, relaxed and smiling. When you lose, everyone becomes a coach—Mom, Dad, your teammates, the media, your friends, fans...everyone. The best strategy is to listen to two people: your coach and you. Listen to your coach for the strategic and technical things that can help you swim faster in the final. Listen to your own “voice” for the confident, courageous, positive talk you need to improve your race performance in the final.

8. Look forward, not backward. It’s no use crying over spilt milk—or in this case, spilt chlorinated water. Look forward to the final with excitement, with focus and with a calm, cool confidence—knowing that your final will be fast. Forget the past. You can’t change it. You can’t deduct a few seconds from the heat time you swam by staring over and over at the results sheet. Just accept it...look forward...move on—and swim fast.

9. Simplify...clarify. As the final gets closer, simplify and clarify your race in your mind. Work with your coach to



identify just one or two things you need to focus on to improve your race performance. Keep the “self-talk” simple. Words and phrases such as “Explode off the blocks,” “Attack the wall,” “Smooth arms first 25,” “Fast feet last 25” are very powerful in that they give your mind clarity of focus and simplify your swim when everything around you seems crazy and chaotic.

10. Start again. This is hard to do, but if you can master it, it’s a great way to get a lot faster from heats to finals. Basically, go to the pool for finals and forget that the heats ever happened. There were no heats! Arrive at the pool in clean and dry clothes—i.e., clothes that you didn’t wear in the morning. Put on a clean, dry swimsuit and swim with a different pair of goggles and cap. Do a great warm-up and swim your final like it’s the only race you’ve raced all day.

SUMMARY—HEATS TO FINALS

1. Having a poor heat swim is...just that—a poor heat swim. The sun will still rise tomorrow. The only thing that happened was you swam a race that wasn’t as fast as you hoped it would be. Big deal! Get over it. Learn from it. Do something about it. Go faster.

2. There’s a great saying: “It’s not what happens to you that matters...it’s how you choose to react to what happens to you that matters.” You can go back to your hotel and cry, scream, yell, eat a family-size jumbo pizza by yourself, get angry, be sad—sure, you can do all those things OR you can choose to move on quickly, come up with a strategy to turn things around and get on with your life. Win or lose... you choose.

3. The most important message is this: winning or losing doesn’t matter—(well...it does...but not in the way you might think). If you swim slowly in a heat swim, what will you do? Learn from it and figure out a way to go faster the next time. If you swim fast in a heat, what will you do? Learn from it and figure out a way to go faster next time. When you think about it, the way you react to a slow heat swim or a fast heat swim is exactly the same if long-term success is your goal. ♦

DEVELOPING MENTAL TOUGHNESS: TO SWIM LIKE A CHAMPION, FIRST THINK AND ACT LIKE ONE

by Dave Crampton

Mental toughness is one of the most important psychological aspects of swimming. Having that winning mindset not only separates the great swimmers from the good ones, it enables you to perform at your best and achieve your goals consistently.

Goal setting and mental toughness go hand in hand. Goal setting is particularly effective in enhancing performance and positively affecting behavior when focusing on a combination of outcome, performance and process goals.

To derive your goals, you first set your outcome goal (your optimal performance), and then set your performance and process goals (mental and technical preparation) to lead to that desired outcome. However, when you take steps to achieve that outcome, your process and performance goals (measured by how your training sessions and lower-level training meets improve your swimming) are first brought to bear.

But there is some confusion as to what mental toughness is. How you train your mind before you stand on the starting blocks (attitudes such as having self-belief, motivation, a positive approach and commitment) is quite distinct to your mental approach in the pool and afterward (abilities such as concentration, handling pressure and how to weather setbacks).

Abilities reflect attitudes.

Mental toughness is not just demonstrated by those who have superior athleticism or are talented enough to win national titles consistently as a 13-year-old. In fact, some young title holders may not be as mentally tough as their slower competitors—they may simply be more talented or bigger, stronger or taller.

But at the elite levels of swimming, talent is not synonymous with mental toughness any more than body size is. At pinnacle meets and Olympic Trials, it's what's between your ears that can give you the edge and that competitive advantage. Development of mental skills is naturally important for those with the desire to win, but also for those who want to be more consistent performers. If you are competing at the U.S. Olympic Trials, you don't want to break a world or national record in the heats only to finish third in the final. Yes, it has happened.

So, what is between your ears is just as important as what's below your neck—and more important than what music you pump yourself up with, who your coach is, what lane you are in or what your competitors' personal best times are. When you have demonstrated mental toughness at lower levels of ability and competition—including dealing with the absence of success—you are better placed to swim at your optimal performance at pinnacle meets.

ATTITUDINAL AND ABILITY FACTORS

Simon Crampton from the English Institute of Sport outlines four key attitudinal and some further ability factors in the context of sporting endeavor:

- **Belief in One's Ability to Achieve Goals.** This can be summed up as, "I can, therefore I do." To achieve set goals, a swimmer must have optimistic confidence and belief in their own potential.
- **Challenge Mindset**—how we see tough situations as development opportunities. When competition is perceived as a learning and development opportunity, and obstacles as challenges, this will mobilise an individual's effort in pursuit of their goals; that is, pursuit of optimal performance.



[PHOTO COURTESY/PETER H. BICK]

- **Discipline**—the standards that influence approaches to set goals. This refers to personal values and conviction in an athlete’s approach to manage the demands encountered in the engagement of exhaustive deliberate practice and regular performance (both in training and in competition) that is necessary for the attainment of their goals.

- **Drive**—the internal desire to reach and set goals. Those who are internally determined and motivated, and are ambitions and goal focused are more likely to reach their optimal performance.

But while a good mental attitude is helpful in any sporting endeavor, it’s how you put it into practice during crunch periods. Here are some further things to consider to develop attitudes into abilities to get those optimal performances:

- **Attention and Emotional Control**—the ability to regulate one’s focus and to control feelings and emotions to facilitate performance. While it is pointless to focus on—or even fleetingly consider—accepted factors that cannot be controlled once you walk out onto the pool deck, there are others that demand attention. Swimmers must manage tension, external and internal distractions, withdraw distracting or interfering thoughts and, instead, focus their attention toward performance cues and aspects of performance. Remember: tension is who you think you should be; relaxation is who you are.

- **Performance Intelligence**—an awareness, understanding of and ability to regulate the environment and performance to achieve goals. This requires an understanding of the processes required to perform well, a recognition of possible and real obstacles, and the ability to accurately self-assess performances.

- **Resilience**—the ability to persevere through and respond positively to adversity, including the ability to bounce back—

and learn from—performance setbacks.

Mentally tough athletes don’t pursue perfection; they pursue excellence. Unrealistic expectations set you up for failure before you start. They can create anxiety or frustration when you are unable to meet them. You can’t swim better than your best. But by being mentally tough, you can bring your talent, skills and hard work to life—and your goals to reality—as you consistently deliver high-level performances in relation to your ability level.

It is at that point when you will achieve optimal results. ♦

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Dave Crampton is a New Zealand sports journalist and public relations consultant. He has written for Sport Wellington and other sporting magazines. He currently writes for Swimming World, Swimming Technique, Runner’s World, Fairfax Media and Athletics Wellington. Dave has an honors degree in politics and social policy plus a diploma in journalism, both from Massey University. He also runs a popular internet news and information service on swimming in New Zealand and is a former swimming official and a current swimming parent.

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HOW SWIMMING CANADA PURSUES ITS DEFINITION OF HIGH PERFORMANCE

by Swimming Canada



[PHOTO COURTESY: ROB SCHUMACHER-USA TODAY SPORTS]

Swimming Canada enjoyed some of the country's greatest results ever at the Rio 2016 Olympic Games, especially compared to previous Games, including London 2012. But the success didn't happen overnight. When he joined the organization in 2013, High Performance Director John Atkinson inherited a country coming off a respectable, but modest two-medal performance in the London pool. He quickly realized, however, that the underlying depth was not necessarily putting Canada on track to match, let alone better, that success. Things needed to improve and begin moving in a new direction quickly.

One of the key focus points for Swimming Canada over the past four years has been improvement. In 2013, after the London Games and athlete retirements and with the equivalent of just five Olympic finals remaining in the program, the focus was on improvement—i.e., how a swimmer could improve between the Trials and the summer benchmark Championships and Games. This focus remained in 2014. In 2015, the focus turned toward progression, meaning all selection policies for all teams were established to see swimmers progress from heat swims into semifinals and/or finals. This past year, the focus was also on improvement and progression, and Swimming Canada began targeting conversion in final—i.e., putting athletes on the podium.

Atkinson identified in 2013 that relay team development would play a key part in target events for 2016, as well as maintaining targeted individual events. Having four relays make finals in Rio and two of them win medals shows how this strategy has worked and will continue to 2020.

All of these themes were key to Swimming Canada's targeted success at the Rio 2016 Olympic Games. Canadian swimmers won a total of six Olympic medals: one gold, one silver and four bronze (see *Fig. 1-next page*). This is more than in the previous four Olympics combined (5). The underlying numbers are also encouraging. Canadians competed in 15 finals (vs. 7 in 2012), set 14 Canadian records, four world junior records, two Americas records and one Olympic record.

Key highlights include:

- 11 swimmers won a medal
- 82 percent of swimmers progressed past heats (a key goal of selection strategy)
- 61 percent improvement rate from the Trials selection times (vs. 47 percent in 2012)
- 65 percent of swimmers improved in at least one event
- 72 percent of all swims improved or maintained on pre-competition ranking
- 40 percent personal best rate (vs. 32 percent in 2012)
- Taylor Ruck and Penny Oleksiak became the first swimmers born in the 2000s to win an Olympic medal

- The medal in the women's 4 x 100 freestyle relay was the first in this event since 1976—and the first medal in a women's relay at the Games since 1988 for Canada.
- The medal in the women's 4 x 200 freestyle relay was the first medal ever in that event for Canadian women.
- The team featured 20 females and 10 males (30 swimmers in total) and was supported by 19 staff members in Rio (The high performance director, six coaches, two managers and 10 IST members of staff).

Swimming Canada in the last quad, 2012 to 2016, proved itself to be a program capable of multi-medal success at the Olympic Games, both in individual events and relays. Following the 2012 Olympic Games, the program saw significant retirements from established athletes such as Brent Hayden, Scott Dickens and Julia Wilkinson, among others. In the quad from 2012 to 2016, the program rebuilt—and from three swimmers (including open water) winning a medal in 2012 at the Olympic Games, that number increased to 11 swimmers who returned with a medal from Rio.

The World Junior Championships (and Junior Pan Pacific Championships) also represent significant development opportunities for Canadian swimmers. Athletes who competed in these championships in 2013, 2014 and 2015 went on to transition to the 2016 Olympic Games, which is exactly what is required and was needed in order to rebuild between 2013 and 2016. The likes of Emily Overholt, Kennedy Goss, Taylor Ruck and Penny Oleksiak—all Olympic Games medalists—swam at the World Juniors in either 2013 and 2015, along with other swimmers such as Olympic finalists Markus Thormeyer, Sydney Pickrem and team member Javier Acevedo. This shows how the World Juniors will be an important development ground not only in 2024, but also 2020.

SWIMMING CANADA'S DEFINITION OF HIGH PERFORMANCE

Defining high performance was important for the Swimming Canada program. The definition is clear: "Top 8 world ranking with continual progression toward—and the achievement of—Olympic podium performances." That said, the pursuit of high performance is a continuum. Swimming Canada has three tiers of criteria: Olympic medals, followed by medals at the long course FINA World Championships, followed by swimming in a final at either of those major meets.

Swimming Canada also looks at identifying high performance potential through a variety of tools. This includes achieving Top 16 performances at the aforementioned meets or Top 8s at World Junior Championships or Junior Pan Pacific Championships. It also includes achieving published "On Track" times that show significant evidence of continued development potential. One thing that Swimming Canada has

CONTINUED >>>

Rank	Country	Gold	Silver	Bronze	Total
1	USA	16	8	9	33
2	Australia	3	4	3	10
3T	Hungary	3	2	2	7
3T	Japan	2	2	3	7
5T	Great Britain	1	5	0	6
5T	China	1	2	3	6
5T	Canada	1	1	4	6

figure 1. 2016 Olympic Games—Medal Count in Swimming

50 performers in world rankings. The major changes have been made to the development card status in an effort to fund the right athletes with that option. Swimming Canada is trying to identify athletes progressing to world-class swimming four years prior to the historical age of peak performers in a given event. Priority is awarded to swimmers achieving On Track times (see “On Track Times as a Targeting Tool” -below).

done to build a strong national team—and will continue to do—is invest in those who are on track to high performance when it counts.

The system is in place in Canada for athletes to train and fulfill their goals at the highest possible level.

TRAINING ENVIRONMENTS

Swimming Canada offers high performance centers, carding funding and individual support for the right athletes at the age-appropriate level, wherever they choose to train.

Swimming Canada’s high performance strategy includes the funding of three high performance centers. The objective of these high-performance entities is to provide an environment aimed at developing identified swimmers to their potential. Each center is serviced by expert coaching tasked solely with the high-performance needs of the resident swimmers. The ultimate goal is to develop a training and competition environment where Canadian swimmers can win at the highest levels. Athletes also benefit from a variety of support services such as sport science, medical support and easy access to some of the country’s top academic institutions. Also, university-based athletes have the advantage to compete within the Canadian Interuniversity Sport (U Sports) circuit. Entry is through an application process. The centers offer outreach and regional visitation opportunities.

Swimming Canada also oversees nearly \$1 million in carding funding through Sport Canada’s Athlete Assistance program, which contributes to the pursuit of excellence. Carding seeks to relieve some of the financial pressures associated with preparing for and participating in international sport, and assists high-performance Canadian athletes to combine their sport and academic or working careers while training intensively in pursuit of world-class performances. The assistance helps swimmers with their training and competition needs, and is paid directly to the swimmer. This allows Swimming Canada to support athletes in the training environment the athlete thinks is best—if appropriate to their progression—anywhere in the world.

Senior carding is based on international results—e.g., Top

Swimming Canada also offers targeted opportunities for camps and competitions outside the national team. For example, a group of four young athletes with the potential to make an impact in Tokyo was taken to InnoSportLab based at the Pieter van den Hoogenband Swim Stadium in Eindhoven, Netherlands. Swimming Canada also funded a small group of swimmers—some at the senior level—to gain more international experience on the 2016 Mare Nostrum tour. In previous years, Swimming Canada has offered distance camps or World Cup tours.

All these efforts relate back to the definition of high performance, focusing on athletes with potential to be Top 8 in the world.

ON TRACK TIMES AS A TARGETING TOOL

On Track times are central to a strategy focused on improving the probability of investing in the right athletes who can progress and improve.

Swimming Canada introduced On Track times in 2013 as a tool to better identify developing swimmers. Performance data from international competitions and average progression rates of Canadian age group swimmers were used to develop a series of three tracks for each Olympic event. The three tracks were meant to capture everyone from early to late developers who had the potential to represent Canada internationally.

Since the spring of 2014, Swimming Canada has had the opportunity to work closely with a sports analytics group established by Canadian Tire Bank in collaboration with Own The Podium. As a result, Swimming Canada has gained access to a number of valuable resources and tools to further enhance the On Track times tool. The analysts worked with more than two million sets of results from world-class athletes to help provide insight into their career progression. On Track times are a first indicator of knowing an athlete is on track at a specific age in a specific event. From there, other aspects are analyzed to determine whether an athlete can progress to a Top 8 world finish and to the podium.

Nation	Projected Medals					Actual Medals				DIFF	RANK
	G	S	B	TOTAL		G	S	B	TOTAL		
Canada	0	0	0	0		1	1	4	6	6	1
United States	9	9	9	27		16	8	9	33	6	1
Russia	0	0	1	1		0	2	2	4	3	3
Spain	0	0	0	0		1	0	1	2	2	4
Hungary	3	1	1	5		3	3	1	7	2	4
Belgium	0	0	0	0		0	1	0	1	1	6
Belarus	0	0	0	0		0	0	1	1	1	6
Denmark	0	1	0	1		1	0	1	2	1	6
Italy	1	0	1	2		1	0	2	3	1	6
Singapore	0	0	0	0		1	0	0	0	1	6
Sweden	2	0	0	2		1	1	1	3	1	6
Great Britain	1	2	3	6		1	5	0	6	0	12
Kazakhstan	0	1	0	1		1	0	0	1	0	12
South Africa	0	2	1	3		0	3	0	3	0	12
Brazil	0	1	0	1		0	0	0	0	-1	16
China	1	2	4	7		1	2	3	6	-1	16
Lithuania	0	1	0	1		0	0	0	0	-1	16
New Zealand	0	1	0	1		0	0	0	0	-1	16
Turkey	1	0	0	1		0	0	0	0	-1	16
Germany	1	0	1	2		0	0	0	0	-2	21
Japan	1	4	4	9		2	2	3	7	-2	21
Netherlands	0	1	3	4		0	0	0	0	-4	23
Australia	11	6	3	20		3	4	3	10	-10	24

figure 2 - 2016 Olympic Games—Projected Medal Count vs. Actual Medal Count

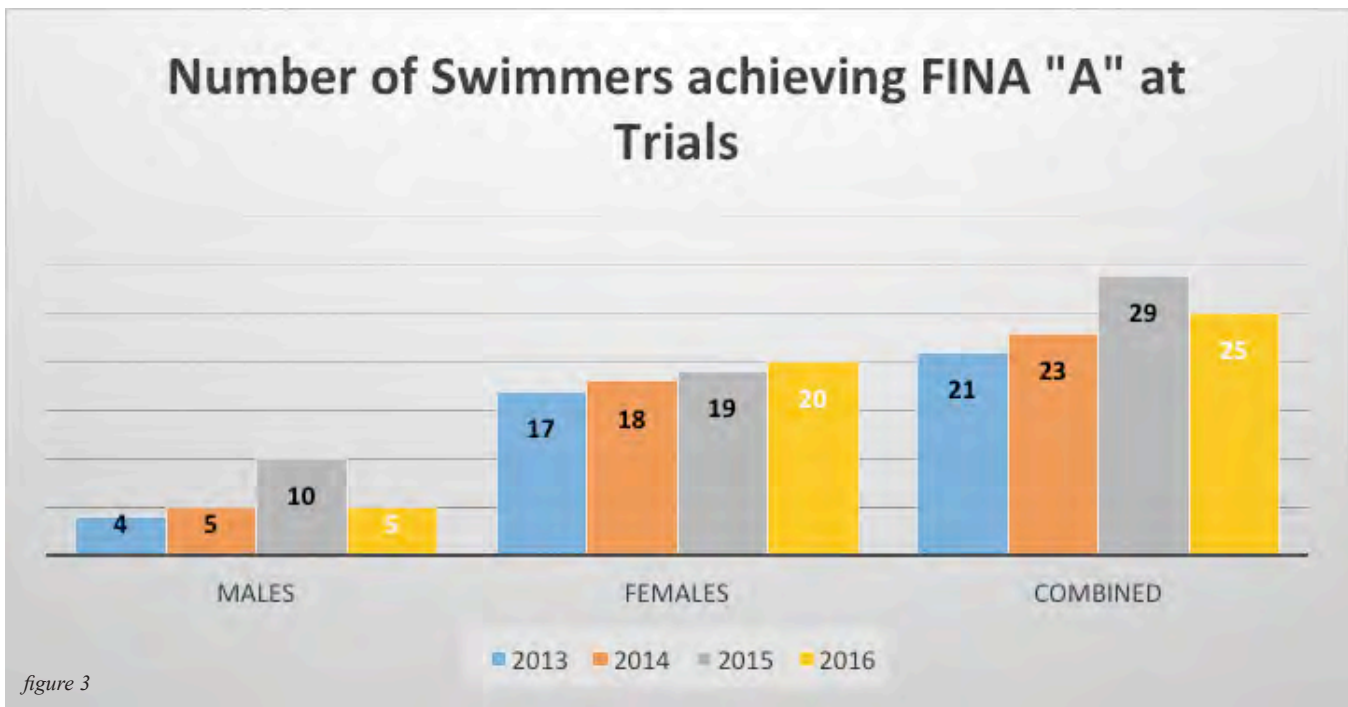
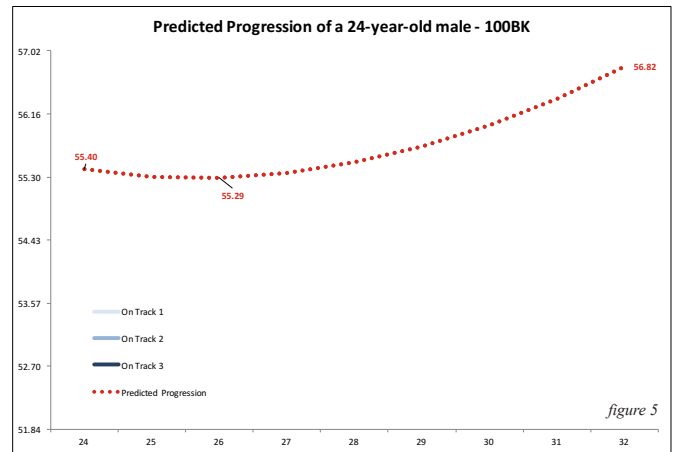
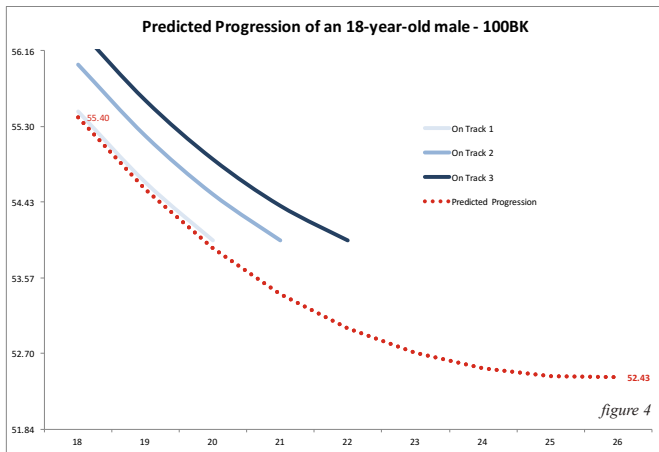


figure 3



Younger athletes are not as likely to be Top 8, but may swim a time that flags them as being five to eight years away from podium potential performances at international competitions such as the FINA World Championships and Olympic Games.

TEAM SELECTION AND MEANINGFUL COMPETITION PHILOSOPHY

High performance swimming is a level of performance not dictated by age or by simply being the best in Canada. Swimming Canada is selecting teams to perform in their environments—i.e., progress beyond heats. The philosophy is focused on progression at competitions that count—and converting those opportunities into medals (see Fig. 2-pg.27).

Many athletes and team staff—some with international experience all around the world—commented that the Rio 2016 Olympic team was the best team feeling they’ve ever experienced. This excitement rippled throughout the team as the competition continued, and the excitement was based on performance, not on team size. The goal is to select athletes who can progress and swim multiple events, which creates a focused team whose members are there to compete.

In some cases, even Canadian champions don’t qualify, such as was the case this summer with a handful of Canadians winning races at Trials, but just missing the Olympic qualifying time required to earn a spot at the Olympic Games (see Fig. 3-pg.27).

The 2016 Olympic qualifying times were outside Swimming Canada’s control. But, in general, just because a swimmer is fastest in Canada does not guarantee the potential to perform and progress on an international stage.

Take two swimmers performing at the same level, but at different ages. For example, an 18-year-old and a 24-year-old both swimming 55.40 in the 100 meter backstroke. Both would be ranked within the top 150 in the world, but at an average rate of progression, the 24-year-old is likely to improve only marginally. Meanwhile, the 18-year-old has the potential to produce a Top 8 or even a podium performance over time

(see Figs. 4 and 5).

Canada does not have the population, resources or funding of the United States, Japan, China, Great Britain or Australia. Canada, therefore, needed to develop a system that worked for Canada—and that’s to support targeted investment that gives Canada every opportunity to get to the podium.

“If an older athlete hasn’t improved for five years, is far from the podium and not making changes, it’s not a good investment. I’m not ashamed to say we’re about making the right investments. And that’s in athletes demonstrating high performance or improvement tracking to our definition of high performance.” —John Atkinson

Swimming Canada believes athletes develop best by swimming at appropriate events where they have a chance to progress in a meaningful competition, whether at the provincial, national or international level. A national champion ranked 200th in the world in his or her best event is not likely to be a competitive athlete at a major international competition. That athlete will have a more meaningful competition at a national championships, for example, where he or she can swim multiple events and further develop.

By having a coordinated competitive framework across the country, planning, developing and performing will all be part of a pathway to high performance in Canadian swimming. This includes national emphasis on aiming for peak performance twice per year in March/April and July/August, and allowing for proper blocks of training. This is preparing the whole Canadian swimming system for what is required to be successful international—i.e., performance on demand and done in a way that is unique for Canada

NEXT STEPS FOR 2017 ON THE ROAD TO TOKYO 2020 AND BEYOND

With the success of 2016 in the rearview mirror, Swimming Canada continues to identify and address gaps. That includes the competition framework, coach education and



development, athlete education and development, and making training locations available across Canada for swimmers of any age.

Swimming Canada is focused on working with and providing professional development for coaches working with targeted athletes as well as with the next generation of athletes identified by using On Track times.

For example, the Select Coaches program, now in its third year, plays a significant role. Eight coaches were selected for financial support this year to visit a mentor coach, with a focus on peer learning environments, including a presentation on their experience. The selected coaches also attended the FINA Gold Medal Clinic in Windsor, Ontario, and the first two days of the FINA World Swimming Championships (25m).

When making changes such as these, it is critical to monitor their effectiveness continually. Swimming Canada will evaluate the changes on an ongoing basis and make adjustments as necessary. The improvement needed to meet the nation's goals means making the most of every opportunity, maximizing assets and working together as a community to build a stronger, faster and deeper pool of swimmers to represent Canada.

Next goals include rebuilding the men's team, which takes more time. Athletes in the system are now matching the age profile needed to perform at the Olympic Games.

Major steps include the recent appointment of Mark Perry as Swimming Canada's distance/open water coach, with the announcement of another internationally renowned coach to come soon in a new role of senior coach.

"What took three years to build can go away very quickly. We can't miss a day, we need to continue to evolve and progress—as it's easier to build something, but it's harder to stay there."
—John Atkinson ♦

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RETURNING TO COMPETITIVE LIFE AFTER INJURY: THREE PERSPECTIVES

In swimming, recovery can take several forms. Catching one's breath after an exhausting set is one thing, but coming back from debilitating sickness or injury is quite another.

by Michael J. Stott

BILL DORENKOTT

Bill Dorenkott, women's coach at Ohio State, has mentored collegiate swimmers for the last 26 years. He believes that some of the best athletes to train are those who give a "blank check" to the coach. "Those are the athletes coaches lose sleep over," he says, "because they are all in. The danger here is that they will push themselves to the point of diminishing returns. The upside is that they tend to improve at a greater rate than the average athlete."

However, those diminishing returns can often involve injury and illness.

"Both are bad," he says, "as they cost the swimmer time away from the water or a reduced ability to train to potential." Here experience is key. "What may be an ideal training plan for one athlete might put another in a tough spot physically," Dorenkott says.

"Excellence or being elite, by nature, requires productive discomfort. There is a fine line between productive discomfort moving an individual toward a goal and testing an athlete's limits in a manner that may cause more harm than good. A coach's intuition is often the best guide in determining if a swimmer is adapting well to the training," says Dorenkott. "Over the years, I have learned to back off or send a swimmer out for blood work if they seem to be 'off.' More times than not, they come back with a defined reason why they are not on track," he says.

Dorenkott's past intuition has often been spot-on. In 2007, along with proper treatment and extensive rest, he coached Penn State senior Patrick Schirk from a lengthy illness to an NCAA 200 yard backstroke title. This past season, he trained sophomore Liz Li. "Based on the specific work she was doing in practice in early January, I was convinced that Liz was going to be the first woman under 21 seconds in the 50 free," he says. "I told her as much and even shared my thoughts with the team.

"Liz is a tough kid and will do whatever the coach asks. Within two weeks, she could not get out of her own way in

practice. Sets that were normally easy taxed her. She could not recover from them. I was very concerned when she said she could not sleep, was losing her appetite and her body was breaking down. I sent her to the trainer. The diagnosis was not good. Her iron counts were in the single digits, and she showed signs of a sprained shoulder.

"We ended up limiting her to single workouts and only kicking for almost three weeks in January. However, we never lost faith that she could perform at a high level at the end of the season. She is a positive person and loves her team. Those two qualities allowed her to come back from both injury and illness. She finished the season third at the NCAAs in the 50 free with a 21.4," Dorenkott says.

PHIL PERDUE

Phil Perdue is an orthopedic surgeon in Greenville, N.C. He was an ACC champion sprinter, NCAA All-American, former coach and father of an Olympian (Lauren Perdue, 2012 Olympic gold medalist, 4 x 200 free relay). He is also the team physician for East Carolina University and a resource for the East Carolina Aquatics club team.

"Any injury affecting a swimmer that potentially keeps him or her out of the water can be devastating to the swimmer, coach and parents involved. I continue to treat many swimmers ranging from age group to college to Masters. While there are many possible injuries, the most common injury is the painful shoulder. It's usually an injury or overuse syndrome involving the rotator cuff muscles. Only occasionally is there a full tear, so surgery isn't necessary," says Perdue.

"My first and most important rule is to keep the swimmer involved in practice in some way. Unfortunately, most orthopedic surgeons know very little about the rigors of swimming and what it takes to achieve a high level. Consequently, they often remove the swimmer from the pool completely. My advice, if it is a sore shoulder, is to keep the athlete involved, preferably in the pool with fins, arms by the side kicking or even one-arm swimming. It is important for them to maintain their feel for the water. Fins allow swimmers to keep up if pool space is limited and arms are not in use. Do

not isolate the swimmer. Make sure the coach knows what the injury is, how it occurred and how WE are going to help it get better,” he says.

“Secondly, everyone needs to know that the pain is not a sign of ‘weakness’ or a cop-out. I’ve seen many coaches label a swimmer as uncaring or unmotivated when injury occurs. No swimmer would invite shoulder pain and use it as an excuse to get out of practice sessions. There is the stigma of being injured and isolated from the team, which can be very hard for the swimmer. Some coaches have difficulty understanding this concept and are ill-prepared to handle the situation. The smart and insightful coach will work with the athlete, encourage them and utilize the physician and parents to get them through the trying times. Parents are a critical part of the equation and can be very helpful by encouraging the athlete, supporting them and assisting with the stretches or exercises that have been prescribed,” Perdue says.

“I’ve also found that some swimmers are just prone to injury in general. In some cases, despite rest, PT exercises, etc., the pain just will not go away. That’s just life. For the most part, it will improve—and I tell swimmers and parents that at some point, the pain will go away. I also say that MOST of the time, with an overuse injury, swimmers are not incurring permanent damage. The pain will stop, once their swimming career is over.

“That said, I generally do not want athletes swimming with sharp constant shoulder pain. Pain after the practice ends, at night and at rest is to be avoided. General muscle soreness is different—and expected. Once the acute pain is gone (i.e., no pain at rest or at night) and no pain with easy freestyle, I allow a return to easy, low-intensity freestyle—no fly or hard sprinting (less than 75 percent effort). The swimmer will need to continue prescribed exercise and other therapies for the rest of the season—even if it means to carry a weighted dumbbell to away meets,” says Perdue.

“Above all, coaches, parents and swimmers need to understand that this recovery is a process—one that can take months to resolve. Missing a few weeks, if absolutely necessary, doesn’t spell the end of a swimming career. My daughter, Lauren, missed five full weeks from back surgery (no swimming whatsoever) a mere three months before Olympic Trials in 2012...and still made the team. So, no one needs to get caught up in how many practice days have been missed. Ideally, if at all possible, the goal is to keep the swimmer in or around the pool. Lastly, cross training can also be utilized during the early period when rehabbing a sore shoulder,” he says.

TERI MCKEEVER

Working with college, postgrad and professional athletes, Cal women’s coach Teri McKeever has seen a litany of physical



issues. Some are acute, some a long time in the making and all virtually individual for which no magic cure exists.

“Swimming is a very demanding sport requiring a lot of physical, emotional and mental effort. Injuries are setbacks, but also an opportunity to move forward if framed and managed the right way,” she says. “For some, injuries let an athlete know how important swimming is. For others, the message may be swimming is not that important anymore.

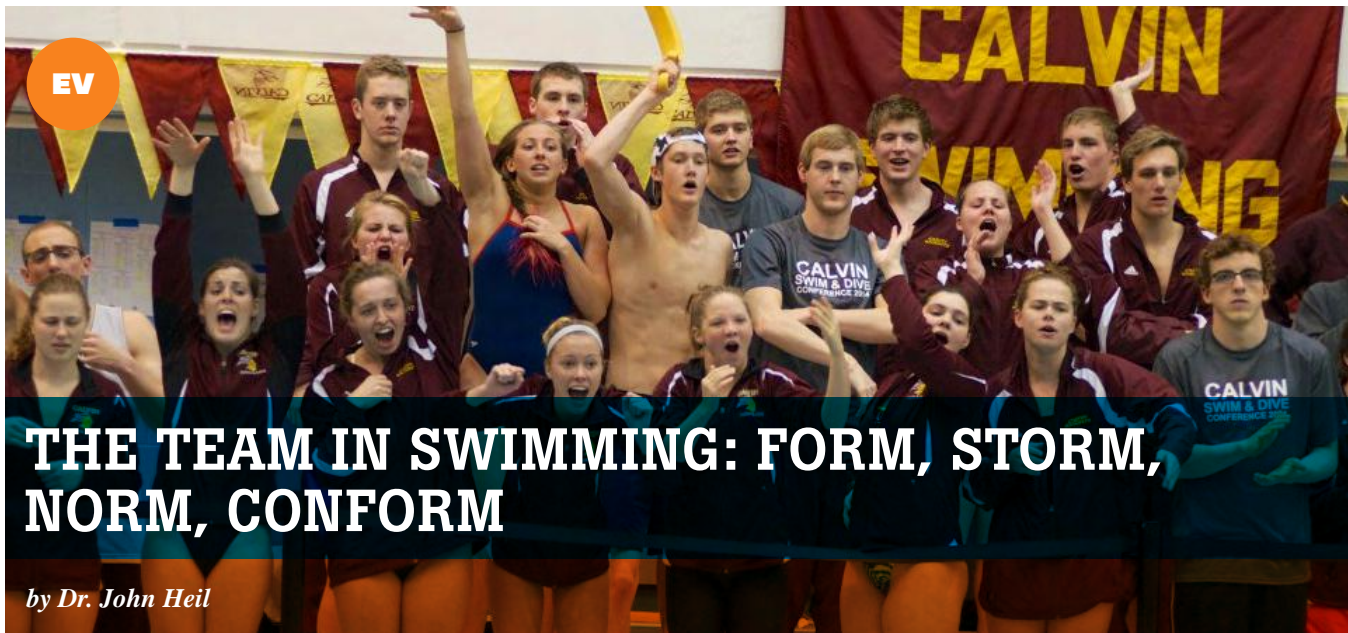
“Sometimes your body sends you messages so you start listening.” When athletes come to McKeever following injury, she will often initiate heart-to-heart discussions. “From a coach’s perspective, it’s about asking questions, listening and giving people time and space to find their own answers.

McKeever has considerable experience coaching world-class post-grad swimmers, foremost among them Olympians Natalie Coughlin and Dana Vollmer. Both women have world-class medical histories. “At the end of one’s career, there are chronic injuries that show up that are an accumulation of things,” says McKeever.

What Coughlin and Vollmer have done is buy-in to the required training and lifestyle to elevate them from good to great status. Each made extensive, healthy lifestyle changes to return to the sport and remain internationally competitive. ♦

About the Author:

Michael J. Stott is an ASCA Level 5 coach whose Collegiate School (Richmond, Va.) teams have won nine state high school championships. He has been named a 2017 recipient of NISCA’s Outstanding Service Award.



THE TEAM IN SWIMMING: FORM, STORM, NORM, CONFORM

by Dr. John Heil

When swimmers think “team,” they think relays. As the Rio Games show, these are the most exciting of all the swimming events. There is the shared exuberance and the thrill of victory times four. There is also a softening of defeat with the burden of sadness divided by four. But relays are just the tip of the iceberg of the team experience. What lies beneath the surface of swimming success are shared goals and experiences, mutual encouragement and support and the psychological quality of the training environment.

The quest for gold begins in training at your home pool with your team and training partners. The team environment is the psychological foundation of all that happens in the pool from training to competition. Count the hours spent in the pool with coaches and teammates. How you feel about the swimmer in the lane with you and the coach on the deck has a huge impact on your state of mind during training. A harmonious environment makes everything easier, including showing up to practice and training with intensity.

Tensions in the training environment are a distraction, and they cost energy. Less focus and less energy equal less quality in training. Dealing with negativity in the pool or on the pool deck makes training more of a challenge. A setting that is positive and supportive lifts the swimmer and makes the rigors of training more tolerable. In similar fashion, negativity and needless drama can weigh down the swimmer. Psychological drag can slow down a swimmer just as sure as wearing boardshorts in a race. How consistent and focused the swimmer is in training has a trickle-down effect on race day. In a sport where hundredths of a second can be the difference between victory and defeat, small things matter.

Conventional wisdom focuses on the ability of the team to lift up its members in adversity and give them a psychological

push in competition. But the team can be a destructive force as well, as is demonstrated in recent high-profile hazing incidents. Team building takes work—just like everything else that contributes to success.

The phrase, “form, storm, norm, conform,” describes the team-building process. At the beginning of each season, a team forms—most often blending new and established swimmers and coaches, cast against the blank slate of a new season. This gives way to a “storming” process, where the team creates an identity marked by a shared mission, competitive goals and a common code of behavior. This process begins with the coach who creates a vision for the program and sets the tone of the training environment. But everyone contributes for better or worse, some singing along with the tune and others moving to the beat of a different drummer. The storming process resolves with establishing a shared team “norm” to which the group ideally “conforms.”

With a team, not everyone can have their own way, hence being a team member entails some bending to the will of the group. The good news here is the evidence that a well-formed and normed team reveals a collective intelligence that is smarter than that of any individual within the team. This point is well demonstrated in the best-selling book, “The Wisdom of Crowds,” by James Surowiecki.

TAKING ACTION

Taking action begins with changing that one person over whom you have the greatest influence: yourself. A simple self-assessment and mindfulness exercise follows, as well as recommendations for a team-building/team-communication exercise.

Self-Assessment. Ask yourself, “What am I doing that

HAZING OR TEAM BUILDING?

By design, competitive sport is exclusive in its membership, with new players subject to an out-group/in-group transition. When a team forms, ideally it strives to create a shared mission and purpose, which becomes its norm. That said, a team will go through a sometimes stormy team-building process that typically includes on-field and off-field activities—some planned and supervised, and others of which may be inadvertent and spontaneous. Hopefully, this process is a positive and constructive one. But this is not necessarily so. The line between hazing and team building can easily blur.

Hazing includes behaviors that humiliate, degrade, abuse or endanger, regardless of the person's willingness to participate. Prototypical examples include: forced alcohol consumption, destruction of property, physical brutality and exclusion from social contact.

The National Study of Student Hazing, conducted by the University of Maine, surveyed 11,482 undergraduate students enrolled at 53 colleges and universities. It revealed that hazing is widespread—typically explained away as a “tradition”—and all too often leads to adverse consequences...with at least one hazing death a year on college campuses.

With a recent string of high-profile incidents, concerns have reached a flash point. The highly publicized hazing-turned-bullying of college All-American and NFL lineman, Jonathan Martin, by his Miami Dolphin teammates resulted in him leaving the team and attempting suicide. That an athlete with such an imposing physical presence could be traumatized demonstrated that any and all are vulnerable.

A group activity is considered to be a team-building activity when it is inclusive, purposeful, unfolds without undue harshness, is experienced as bonding and leads to a passage from out-group to in-group. Alternately, a group activity is considered to be hazing when it is exclusive, without authentic meaning or purpose, harsh or otherwise destructive or divisive.

Team building is most likely to have a positive impact when it is focused on performance. This can be as simple as giving the team input on selected coaching decisions or having a team discussion of psychological preparation for upcoming competitions.

Given the desire to belong, the complexities of group dynamics, the maturity of team members and the unique culture of sport, it can be difficult to distinguish hazing from team building. This points to a unique role for sport psychologists in hazing prevention and intervention. ♦

influences the team for better and worse?” If you don't have an answer, then carry this thought with you to the next training session. At some point, take a step back from your normal routine, sit quietly, review your recent interactions, and ask the question again. At the next practice, make a deliberate effort to do something positive. If all else fails, catch someone doing something well, and let them know you notice.

A point of clarification is in order here. There is a fundamental difference between being critical and being negative. Positive critique is a cornerstone of learning and personal improvement. In contrast, negativity is more a display of personal frustration. Critique has a constructive purpose, while negativity does not.

Team Communication. At the 2015 International Swim Coaches Association Conference, Mark Schubert made the point that team communication can be as simple as taking time to ask questions of the team and offer explanations as to the what, why and how of team training and competition.

Consider creating a plan for team communication. The process is direct and simple: ask the team members one-by-one what they prefer to hear—and not hear—from teammates before and after each race, and what type of coaching instruction is most helpful. Doing this in a group helps team members get to know one another better, and allows them to draw on each other's concerns and perspectives. Be sure to write it all down. Then periodically review and revise this plan, as trial-and-error teaches what works best and what needs to change. ♦

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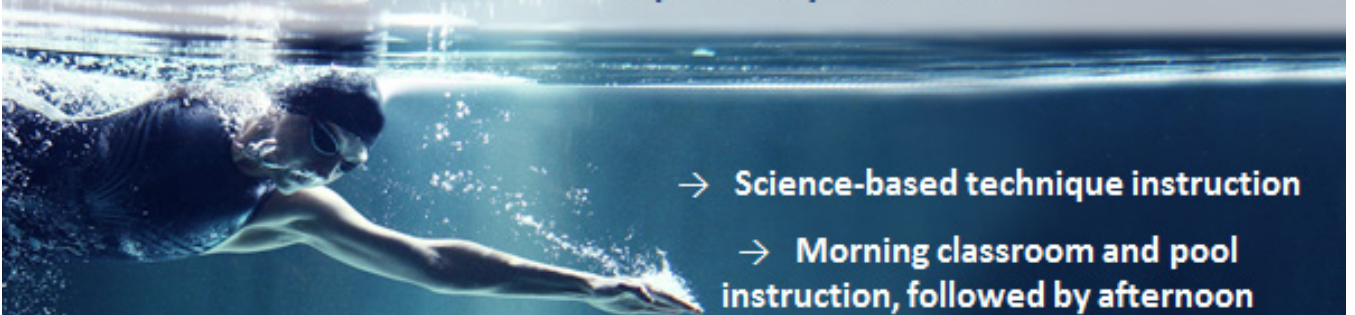


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TRAINING
SERIES**

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SWIMMING TECHNIQUE EDITORIAL GUIDELINES

Swimming Technique is a multi-disciplinary, quarterly journal focused on the training, education and development of swimming coaches who are coaching swimmers for high performance, i.e., national- and international-level swimming competition.

The magazine is organized in seven sections:

- Technical (e.g., swimming stroke technique, swimming skills)
- Training (e.g., physical training, physiology, strength training, recovery practices)
- Strategy and Tactics (e.g., pacing, prelims to finals, race tactics)
- Mental (e.g., emotion management, confidence, mindfulness, mental toughness)
- Environment (e.g., culture, team dynamics, leadership)
- Nutrition (e.g., hydration, supplements, peak performance diet and nutrition management plans)
- Science and Innovation (e.g., current scientific research, literature reviews)

All contributions are welcome. However, we ask that all contributors observe the following editorial guidelines:

1) All contributions should be between 500 and 1,500 words in length. They should be submitted as Word documents or in an email. Contributions should fall within one of the aforementioned section categories.

2) All contributions should be submitted along with the contributor's

personal details and a short bio of no more than 100 words. For example:

Name:

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Article Title: "Mindfulness and its Role in Enhancing the Performance of National-level Swimmers"

Swimming Technique Section: Mental

Short Bio: (Name) has worked in the field of exercise science for the past 15 years. He is also a dedicated swimming coach and coaches at the New York Marlins Swim Team. He holds a bachelor's degree in exercise science from Columbia and a master's in sports physiology from UCLA.

3) Contributors are encouraged to integrate current, peer-reviewed research with practical applications and implications for coaches. The magazine aims to help coaches to access the latest ideas, innovations and concepts in sports science and sports medicine, and apply them to the development of swimmers preparing for national- and international-level competitions.

4) All contributions should include a minimum of two independent references— i.e., not the author's own work. All references and citations should be listed at the end of the contribution, using the Harvard referencing method.

5) Where appropriate, contributions may be independently reviewed and assessed for their appropriateness for publication.

6) Contributors may promote products and services within their contributions, but must declare their association with any product or service mentioned or promoted in the contribution.

7) The editorial staff may choose to invite appropriately qualified and experienced professionals—e.g., sports scientists, researchers and coaches—to comment on contributions, particularly where their input may help readers apply the information to their coaching programs.

8) All contributions remain the intellectual property of the author. *Swimming Technique* will use the contribution solely for publication in the *Swimming Technique* magazine and will not re-use the contribution in any other format or for any other purpose without the expressed written consent of the contributor. ♦

Wayne Goldsmith

Managing Editor of Swimming Technique Magazine

email: wayne@moregold.com.au

BACKSTROKE

REACH FOR THE SKY!

DEMONSTRATED BY DANIELLE GALYER
PHOTO BY PETER H. BICK

> THE ARM RECOVERY SETS THE TEMPO AND TURNOVER RATE OF A BACKSTROKER.

> RECOVER BY LIFTING THE THUMB OUT OF THE WATER FIRST AS IF YOU WERE SHAKING SOMEONE'S HAND. THIS WILL RECRUIT MORE MUSCLES, INCLUDING THE BICEP DURING THE ARM LIFT.

> AVOID LEADING WITH THE BACK OF YOUR WRIST OUT OF THE WATER SINCE THIS PUTS UNNECESSARY STRESS ON THE SHOULDER AND WILL CARRY UNNECESSARY WATER AND WEIGHT INTO THE AIR.

> HALFWAY THROUGH THE RECOVERY, QUICKLY ROTATE YOUR HAND IN A SNAPPING MOTION SO THAT THE PALM IS FACING OUTWARD.

> SLICE YOUR HAND INTO THE WATER, LEADING WITH THE PINKY.

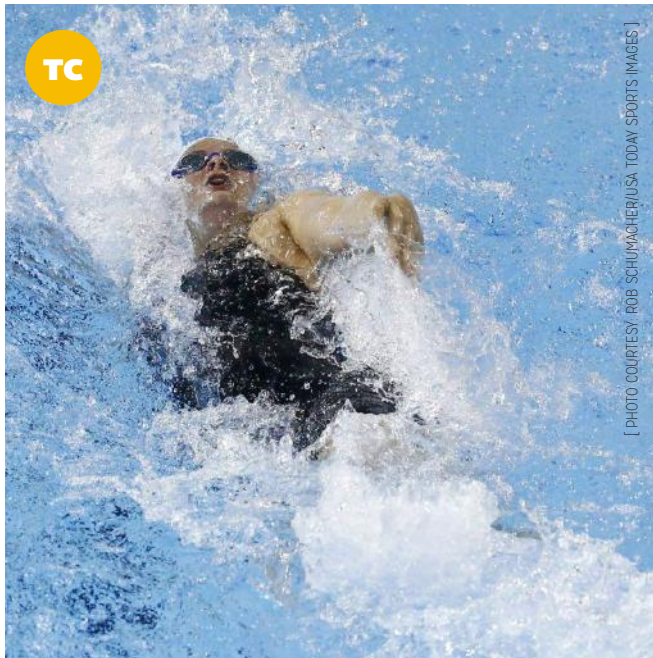
> THE SNAPPING ROTATION OF THE HAND SHOULD BE TIMED WITH THE BODY ROLL TO GENERATE FORWARD MOMENTUM.



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[PHOTO COURTESY: ROB SCHUMACHER/USA TODAY SPORTS IMAGES]

THE STRAIGHTNESS BACKSTROKE KICK MAKES FAST SPEED AND INCREASED LACTATE ACID

by Takahisa Ide, William F. Johnson, Yutaka Yoshimura, Noriko Inada and Sadafumi Takise

degrees knee-bending increases from 12.5 percent to 67.4 percent, and knee angle average 151.15 degree to 171.06 degree, distance per cycle (DPC) improved from 2.12±9M/C to 1.93±12M/C, in the race distance per cycle 2.04M/C to 2.17M/C, Wilcoxon/Mann-Whitney.: 4.766278, $p \leq 0.01$ (see Fig. 3). The elbow angles of >170 degrees elbow-bending from 25.3 percent to 60.3 percent, Wilcoxon/Mann-Whitney.: 4.776403, $p \leq 0.01$ (see Fig.4), but the straightness knee backstroke kick increased lactate acid 6.1mmol/l compared to the bending knee backstroke kick 4.3mmol/l.

The following article analyzes the effect a straight knee kick has on the production of lactate acid during elite-level backstroke competitions (see Fig. 1). Using results from Lactate Pro™, we concluded that with proper technique, the straight-knee butterfly kick can increase speed, and proper training will be able to mitigate the excess production of lactate acid.

METHODS

We collected stroke and lactate data from several elite-level swimmers during practice and competition. Kick speed is analyzed by Kinovea (0.8.15, 1GHz, 256Mo), the butterfly kick s with a 1/500sec frequency and underwater high-speed HD camera (Panasonic HDM:1080i 720p 480pHX-WA30). The lactate test after a 50-second wall kick with a tempo of 1.10sec/stroke measured by a FINIS tempo machine. The subjects' lactate data was generated by the Lactate Pro™ LT-1710 (Arkray, 5µl, Kyoto, Japan) meter for on-farm determination of the blood lactate. Blood lactate was below detection limits of the meter (< 0.8 mM), and confirmed by laboratory assay as 0.459 ± 0.037 mM (mean ± SEM, n = 34).

The data for the straightness knee backstroke kick speed and the lactate test are collected during a 60-second wall kick, where tempo is 1.10-1.20sec/stroke, measured by the FINIS tempo machine. The one-stroke velocity, distance per stroke and max speed data are collected from two 25-meter backstroke swims after a race start. The first 15 meters were completed underwater, using the dolphin kick, and the final 10 meters are completed at maximum effort.

RESULTS

When measuring the effects of straight-knee backstroke kick (see Fig. 2), we find the proportion of kicks greater than 170



Figure 1. Bending Backstroke Kick

CONCLUSION

Backstroke performance seems to be associated to the straight elbow and straight knee in elite world-class swimmers. Butterfly performance improved through possible reasons are less resistance equal to increase the distance per cycle in the championship meet races. The results of this article reveal that with proper training and technique, the straight knee backstroke kick can result in much faster 100 meter backstroke times for swimmers able to mitigate the increase in lactic acid production during competition. ♦

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