Some Ideas on Teaching the Strokes

Over the history of the sport of swimming, one constant has been the change in the manner in which strokes are swum. Constant innovations have marked our sport from the beginning, and these continue, perhaps even at an accelerated rate today.

It is beyond the scope of this chapter to turn you into an expert in biomechanics or the teaching of strokes. We do want to offer some initial ideas to you. On the following pages are some basic stroke "Construction and Correction Ideas." These are from the American Swimming Coaches Association Level 2 STROKE SCHOOL, the state of the art biomechanics course required for ASCA Coaching Certification. They are not the "final word" on stroke technique by any means, since the sport is in a constant state of change.

We urge you to seek out and study from a variety of texts to enhance your knowledge of biomechanics, and the teaching of swimming skills. For your reference a listing of some of the best materials follows:

REFERENCES:

- ***ASCA Level 2 Stroke School*** – ASCA, 2101 North Andrews Ave., Fort Lauderdale, FL 33311 – (1-800-356-2722)

- ***Coaching Swimming Successfully*** – Dick Hannula – Human Kinetics, PO Box 5076, Champaign, IL 61825

- ***Swimming Even Faster*** – Ernest W Maglischo – Mayfield Publishing Co., Mountain View, CA

- ***Competitive Swimming Techniques for Champions*** – Mark Schubert – Sports Illustrated Book, Winners Circle Book, NY

- ***Competitive Swimming Manual for Coaches and Swimmers*** – James (Doc) Counsilman – Counsilman Company, Bloomington, IN

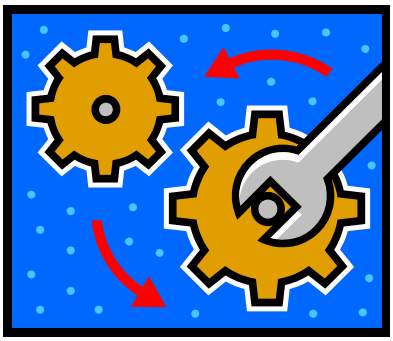
- ***Science of Coaching Swimming*** – John Leonard - Leisure Press, Champaign, IL

- ***Swimming Into the 21st Century*** – Cecil Colwin – Leisure Press, Champaign, IL

- ***WORLD CLINIC YEARBOOKS*** – The Series, 1970 – Present, ASCA (1-800-356-2722)

Articles on Stroke Technique also appear regularly in the ***NISCA JOURNAL, Swimming Technique Magazine, Swimming World Magazine***, and ***American Swimming Magazine*** (ASCA)

Stroke Construction and Correction



For each of the four strokes (freestyle, backstroke, breaststroke, and butterfly) in this section, we will follow this pattern:

1. Establish a verbal description of the stroke
2. The three dimensional analysis of the stoke
3. Alignment and balance of the body in the stroke
4. Stroke trends we are seeing around the world
5. Common faults and how to correct them.
6. A test on that part of the section.

FREESTYLE

1. **Verbal Description**

a. ***Head Position:*** The head should be relatively low in the water, with the water level slightly above the hairline. The head should be held still during the stroke, except when breathing.

b. ***Body Position:*** The body should ride high in the water, assisted by the kick. Freestyle should be swum predominantely on the side, with very little time spent in the "flat" position in the water. The body roll to each side should be 45º. Attention should be paid to the alignment of the body, both in the horizontal and vertical plane.

c. ***Arm Action:*** The hand enters the water on a line directly in front of the shoulder joint, the palm pitch slightly outward, and the little finger entering the water first. The hand extends out in front of the face and deep (6" – 14" - depending on the size of the swimmer).
The elbow bends as the hand sweeps up with thumb towards the chest as the pull accelerates. The elbow points toward the sidewall of the pool.
The hand pushes through under the swimmer as the body rotates onto the side. The hand brushes against the thigh to finish the pull and exits the water with the little finger first. The pull should accelerate throughout the stroke.
The recovery has the elbow high with the hand swinging forward under the elbow with the fingers relaxed and close to the water. The hand reenters the water in a controlled manner (finger, wrist, and elbow),

d. ***Leg Action***: The kick is generated from the large muscles of the buttocks and thigh. The toes are pointed and relaxed with the ankles also relaxed and loose. The kick should be steady and continuous.

e. ***Breathing***: The breath is taken as the hand finishes the stroke, looking under the "window" formed by the arm and the water. The head should return to the frontal position as the hand passes the head. The air is expelled underwater in either a continuous or explosive manner, so the swimmer can inhale during the first half of the arm recovery. (Many beginning swimmers will hold their breath while the face is in the water and try to exhale and inhale when the mouth is out of the water.) Air is inhaled while the mouth is in the trough that follows the bow wave generated by the head, hence the head does not have to be lifted.

f. ***Timing***: In order to fully utilize the core body power available, it is critical that the hand entry be coordinated with hip roll. When the right hand enters the water, the left hip should be tipped upward stretching the right side. As the right hand catches the water and begins its pull, the right hip quickly rotates upward. This cross body stretch creates the additional hand speed that accelerates the body forward. This has the effect of "opening the hips" in advance of the hand and arm. This will accelerate their inward and upward sweep.

2. 3 Dimensional Analysis

The hand enters relatively wide of the midline, then extends out in front (change in width) and deep (change in depth). When the hand sweeps upward, the depth changes again and tremendous lift is generated by the leading edge (thumb side) of the hand sweeping upward. As the hand pushes through, there is substantial drag force in effect along with some lift from a change in both depth (shallow-deep-shallow) and some width change.

Some swimmers have the hand enter the water much closer to the midline and do a slight rounding out motion as the hand moves deeper. This is common in older, stronger swimmers and can add a further width and depth dimension that increases the lift force available, but at a considerable cost in terms of physiological force needed.

3. Body Alignment and Balance

Freestyle is a long axis stroke, with rotation around a line that extends through the body from the head to the feet, like a barbeque skewer. Substantial body rotation depends on maintaining balance around the axis. When the hand is at its deepest point in the stroke, it acts as a pivot point around which the hips can rotate quickly.

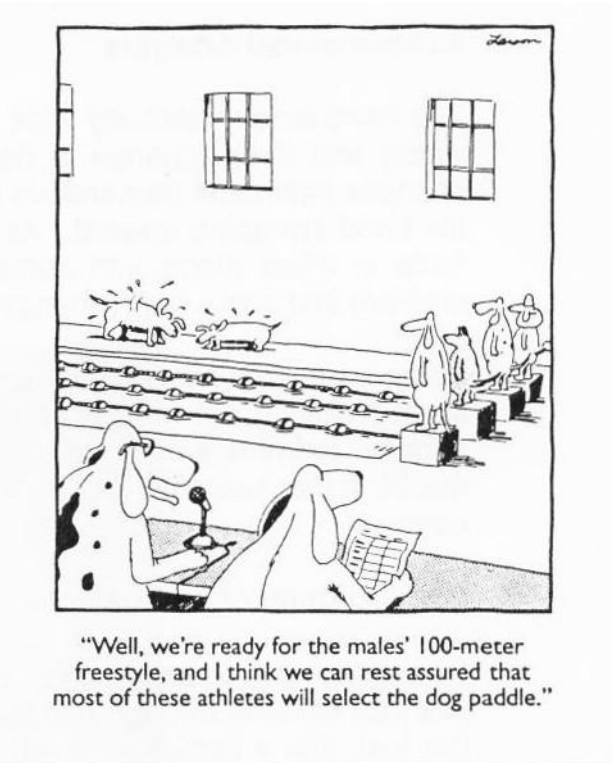
The head is a very important part of this balance – the further the head deviates from the line formed by the upper spine, the more difficult it is to attain a balanced body position. As the head drops with the chin toward the chest, the higher in the water the hips will move and the less the legs will have to kick to provide a horizontal body position. With the head too high the hips will drop. The challenge is to find the optimum head position for each swimmer: one that will give them a high body position with the smallest possible vertical exposure of the body profile to the oncoming water.

By keeping the stroke balance out front, the kick helps propel the body forward, not just support the legs upward. Also, the body is far more streamlined on its side, so we want to spend the maximum amount of time on the two sides and the least possible time in the chest down position. In effect, we want to "skate" from side to side quickly.

For most swimmers, their shoulders are the widest part of the body and therefore the exposure of both shoulders to oncoming water is a highly resistant position. By swimming from side to side, one shoulder is constantly out of the water, presenting a much smaller vessel to the oncoming water. Note that this means the overwhelming majority of kicking will be done on the side and not on the chest, so coaches should be aware kick drills on the kickboard are not going to be useful as stroke drills. Kicking should be done on the side, one arm extended, and one arm at the side; so much for "social kicking" unless you choose to allow that time.

4. Freestyle Trends

Depth Dimension - Several excellent international swimmers, Alexander Popov of Russia among them, are clearly using a greater depth dimension of the stroke, with their sculling action being very strong in the vertical plane. This may be effective because the deeper the water, the less turbulent and "in motion" it is likely to be. In reaching for the deep water, he may be getting more effective deflection of the water. His stroke count is extremely low and his kick is very strong, with extensive usage of hip rotation to create more power in each stroke.



"Well, we're ready for the males' 100-meter freestyle, and I think we can rest assured that most of these athletes will select the dog paddle."

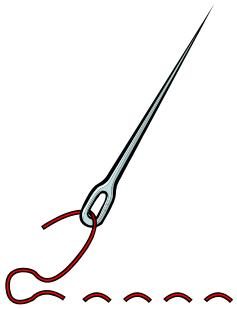
Stroke Precision – This seems to be a common thread among Popov and Sadoyvi of Russia, and Kieran Perkins of Australia. Each spends a great deal of time training longer swims of sub-threshold intensity, concentrating on the timing and precision of hand-hip coordination. Both Sadoyvi and Popov have much greater than the normal 45° body rotation and a very high elbow recovery with the hand close to the body and barely above the water. Perkins has a pronounced hip roll, but his upper body does not rotate as markedly as Sadoyvi and Popov.

Kicking Patterns – Studying kick patterns of international swimmers shows that the six-beat pattern is being universally used among sprinters at this time. Even the distance swimmers are cultivating the ability to use a strong six beat kick off the turns and in their final sprint. The implication would seem to be to teach new swimmers a good six beat kick and try to retain that ability during their training years.

5. Frequent Faults and Corrections

Many of the common problems seen in freestyle relate to body position. If the head swings from side to side, the hips and legs will follow in a "wagging" motion. Some swimmers "bob" up and down as their hands enter the water. This is another problem caused by the head moving up and down. Both of these problems can be corrected by holding the head still in a horizontal plane.

Lack of an adequate body roll will make the body highly resistant, like pushing a boulder through the water. Teach the swimmers to rotate onto each side as they swim and the body can move through the water like a needle.



The arm action can have multiple faults, the most common of which is eliminating one or more dimensions in the stroke. The most common error is a lack of depth in the stroke, or a lack of width. In more experienced swimmers, a tendency to rush the recovery by not extending all the way to the hips with the hand and the length of dimension can suffer. Correction is best accomplished by lots of one arm drills and one on one correction by the coach, offering constant feedback as to the execution. This is labor intensive work, but vital to good swimming.

The most common problem with the kick is stiffness, or a rigid action of the legs. The swimmer can only correct this by working on a relaxed, loose action. Instruction to structure the kick within a small box can help contain a wild kick. All individual kicks should be of the same relative dimension, not one deep kick followed by several smaller kicks. A two beat rhythm is a natural motion for some swimmers. You should encourage swimmers to be skilled in the more versatile 6 beat kick, but some will only be comfortable using a two beat kick, and should not necessarily be considered a stroke fault.

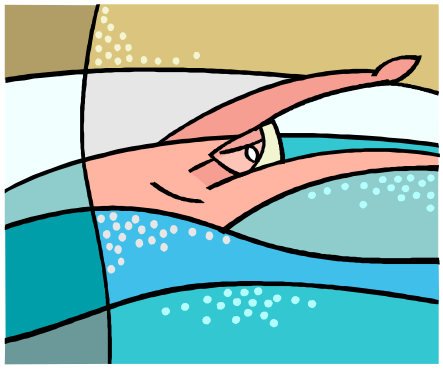
Breathing problems can occur in the timing of the breath or in failing to exhale completely underwater. These are individual corrections that can only be fixed by one on one attention by the coach. It is valuable to periodically check the breathing mechanism of even the best swimmers to make sure there is adequate ventilation underwater before turning the head for inhalation.

Coach Nort Thornton of Cal-Berkley has taught the concept of hip rotation as a key element in adding power. The idea of "opening the hips" is generic to all sports that have a "striking implement" and a ball. (Examples – tennis, golf, baseball, etc.) In the case of swimming, we have an "implement" in the hand. We have no ball, but we add power to the motion of the hand through the water by opening the hips prior to the inward sweep of the hand. The torso is "twisted" open in the direction of the inward scull, adding the power of the major abdominal muscles to the sweep.

The skilled coach will learn to recognize stroke problems that are actually occurring underwater, by the reaction of the body and the head above the water. It is important to sometimes take a look under water either through an underwater window, with a mask and snorkel, or an underwater video camera to see what the swimmers are doing with the arm stroke. Video is a great tool for this purpose and commercial products such as Scope Coach or Power Cam (www.swimtpi.com) are tremendously useful to the coach on deck, who cannot conduct a workout and be in the water with a mask and snorkel at the same time.

BACKSTROKE

1. Verbal Description



a. ***Head Position:*** The head in backstroke is held high and still. The water should be touching the ears. The eyes and head remain extremely still. If there is significant head movement, the rest of the arm stroke action will be flawed.

b. ***Body Position:*** The body rolls from side to side. Try to have the swimmer spend as much time as possible on the side and as little total time as possible on the "flat" position on the back. The same principle of resistance to the water applies to the backstroke and freestyle.

c. ***Arm Action:*** The hand should enter the water on a line just outside the shoulder of the body (11:00 and 1:00 on a clock). The little finger enters first and drives down deep into the water. The elbow then rotates towards the bottom of the pool and the hand is positioned wide of the body and deep in the water, this is the catch phase. The fingers are pointing to the side wall as the hand sweeps up and nearly breaks the surface at the hips before once again going deep at the completion of the pull. During this motion, the thumb edge of the hand leads and the palm of the hand faces the feet. The hand exits the water at a high speed as it is lifted up, out, and over the water to exit the water past the hip. This is one of the most propulsive part of the stroke and is accomplished with great acceleration.

d. ***The Recovery:*** As the hand exits the water, the thumb leads. The arm continues in a straight line over the shoulder and as the arm passes vertical, it is rotated so the little finger is now leading for re-entry into the next arm cycle. The arm is stretched upward, with the shoulder joint rolled up and out of the water, as the body "rolls" into the opposite arm stroke. The head should remain totally still during the action of the body roll and recovery.

e. ***Leg Action:*** The kick is a flutter kick, positioned slightly deeper than the freestyle kick. The knees should never break the surface. Remember that almost all of the actual kicking action is done with the body rolled towards the side. This is important when using and designing stroke drills.

f. ***Breathing:*** In backstroke a rhythmic breathing pattern needs to be established. Exhaling when one arm enters the water is easy for the swimmer to understand. This is important for buoyancy and the obvious physiological need.

2. 3 - Dimensional Analysis

The hand enters the water and immediately changes both width and depth dimension as it is positioned for the "catch." It is now wide from the centerline and deep. In the next action, perfect (though short) lift is achieved as the hand goes "up and over" in the flip. This changes both depth and length. The final action includes the longest application of lift possible in the sport, as the arm at full extension changes all three dimensions at once as the hand moves from wide and deep to shallow and narrow as the pull finishes the length dimension of the stroke. This action is tremendously propulsive.

This final action is a major change from the old action which described a finish "down, past the hip, then a recover." World class backstrokers since 1980 have been using a final inward and upward sweep to generate a great lift force and an accelerated recovery.

When teaching the stroke to young swimmers, our recommendation at the present time is to teach a deep catch and entry, then teach an "up and over" motion and an exit sweep from a deep position, wide of the body.

3. Body Alignment and Balance

Backstroke balance is a critical part of the stroke. Again, this is a long axis stroke and we must understand and appreciate the role that rotation around the spine can provide in generating propulsion. Body alignment here is very different for different purposes. High school coaches will recognize that the head and body position to swim the 50 backstroke on the medley relay is substantially higher (and therefore puts the legs and feet deeper) than in the 100 back. This higher position allows for A) a deeper and more power generating kick, and B) a shorter, more powerful, and higher turnover arm stroke.

Many high school coaches advise the 50 backstrokers to "put the chin on the chest, round the shoulders, and get up and out of the water." This obviously produces a body alignment that presents a very resistant profile to oncoming water. It is a trade-off for the short term generation of increased power. In the 100 backstroke, coaches generally get the athlete to "lay the head back," using the head weight to counter balance the hips and raise the hips and legs higher in the water.

This position is a much more streamlined position. Further, as the swimmer rolls from side to side in the water, the vessel get more narrow and slips more easily through the water. It is no coincidence that so many of the best backstrokers are tall and thin with narrow bodies and long arms and legs. This shape is a great natural alignment and profile. As the arms recover, the hips are rolling "ahead" of the upper torso, creating the core power that aids in propulsion.

Theoretically, a low turnover with high power will produce the fastest backstroke, as it avoids the blunt profile of the swimmer flat on their back. The more strokes a swimmer takes in a 100 yard backstroke, the more times he rotates through the resistant flat on the back position and the more total resistance he creates. The trade-off for turnover versus resistance is an individual choice that coaches and swimmers will make by trial and error. (What stroke rate produces the maximum sustainable speed, and will this speed be able to carry for the full 100 before physiological fatigue overwhelms?)

4. Backstroke Trends

There are more variations in backstroke than in any other stroke. There are successful swimmers at the international level that use every recognized technique. Most American world-class backstrokers use a traditional deep catch and then finish with the 2nd powerful ending upsweep; and a very fast recovery. The rules now limit the use of underwater swimming with a dolphin kick to 15 meters from the start and each turn. This position is very fast for those who have a good dolphin kick and should be practiced extensively to aid the overall speed of the swim. Most coaches recommend shifting from dolphin to flutter kick just before the breakout arm stroke in order to get into the proper swimming rhythm.

5. Frequent Faults and Corrections

With young swimmers, holding the head still is the most common problem we see. If the head is not still, the perception from the center of the eye to the recovering arm is incorrect and the swimmer has a hand entry that is badly out of position. This then "skews" the remainder of the arm stroke. Constant drilling with the head still is vital. Various techniques, like placing a quarter or small flat rock on the forehead while the swimmer practices, can be useful in getting the swimmer who is learning, to concentrate on the maintenance of the correct head position. Holding a full length door mirror up on the starting block and tilting it forward will allow the swimmer to watch their stroke while they are swimming.

Teaching the stroke initially may be best accomplished by teaching a straight arm technique while establishing the body and head position and roll, then gradually the bending of the elbow and eventually incorporating the powerful "rip the hand out" technique. There is no established technique for teaching this skill. Keep trying until the swimmer finally "gets it."

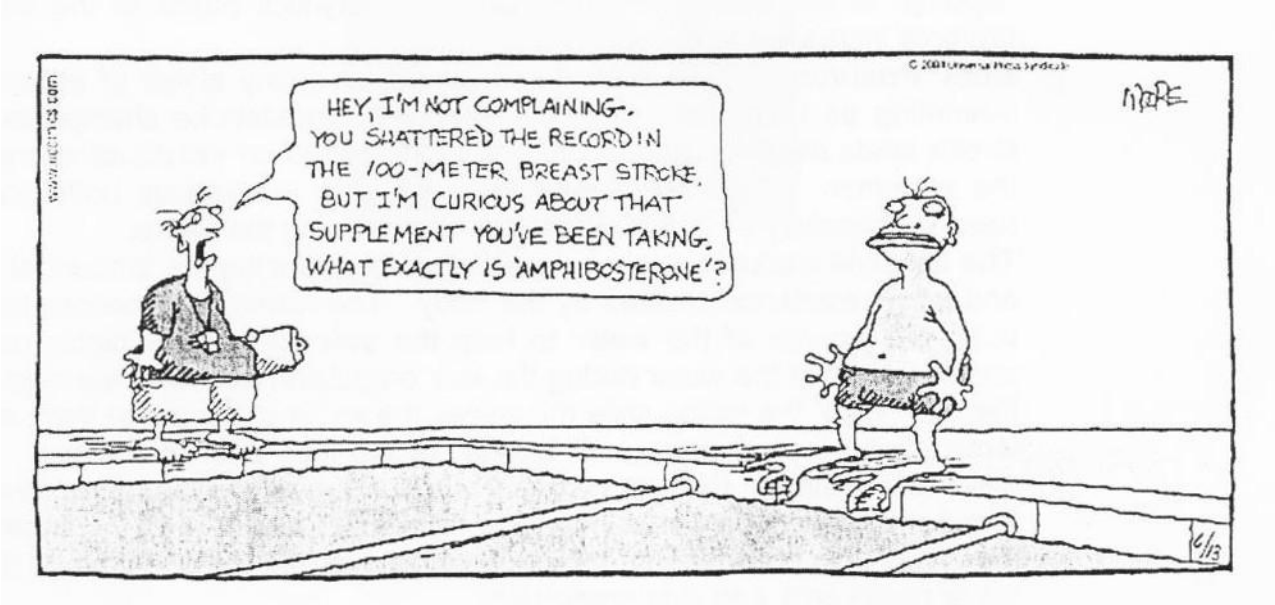
Using one arm drills may be valuable to increase the concentration on body roll and eliminate the flat body position. This also allows for increased concentration on the arm pattern and hand pitch during the pull. The hand pitch should be the same as the direction of the arm and hand movement. The swimmer should try to make the hand an extension of the arm.

Many coaches favor the use of small paddles to encourage and exaggerate a smooth little finger hand entry and eliminate the “slapping” action when the back of the hand enters first.

Keeping the turnover rate low reduces total resistance, but many swimmers have difficulty producing enough force to swim fast with a lower turnover, so there is a trade-off process between resistance and speed in relation to turnover. A “spin” drill can encourage better hand and arm speed if you need to increase turnover. It can also help create a smoother, more flowing arm action.

Backstroke, like pitching a softball, can be done a great deal without any significant joint stress if done correctly. Most good backstrokers have swum a large amount of backstroke in training to encourage comfort with the stroke. Many positive technique habits can be developed in young swimmers simply by swimming a greatly increased amount of backstroke in practice.

The recovery in the backstroke should be taught in a controlled, slow fashion first. Later, most swimmers will develop a much faster recovery action as they begin using a propulsive second upsweep and exit action of the stroke.



BREASTSTROKE

There are at least three major breaststroke styles being swum successfully around the world at this time. They are:

1.) The traditional “flat” body position. Typical of males, a powerful and arm oriented breaststroker, such as Steve Lundquist of the mid “80’s”.

2.) The body roll breaststroke, introduced by Tracy Caulkins and many other long, slender swimmers. This style has fewer proponents today, but it is still seen. With the proper body type, it can be effective.

3.) The “wave action” breaststroke, typical of Mike Barrowman, is the chosen style for most of the world class swimmers today.

Many athletes use a mixture of styles, further complicating the present day picture of the stroke. The one thing that seems common to all who are swimming fast is that they have adapted some style to fit their particular body type and strengths. Not everyone can swim the “Barrowman” style, nor can everyone be expected to swim “flat” breaststroke fast. But everyone can adapt some of the ideas of each to their stroke. FINA has made rule modifications that require the arms to recover in the water, but nearly all of the world’s top breaststrokers are recovering the hands and most of the forearm at the surface of the water.

1. Verbal Description

a. ***Head Position:*** The head rides naturally on the shoulders, with the eyes focused forward and slightly down. In some swimmers, there may be “dipping” of the chin during the hand recovery/kick phase of the stroke to promote increased streamlining.

b. ***Body Position:*** There have been almost as many styles of breaststroke swimming as there have been international breaststroke champions. The stroke lends itself to various interpretations based on individual strengths of the swimmer. These are frequently evident in the various body positions used successfully by different individuals swimming the stroke.

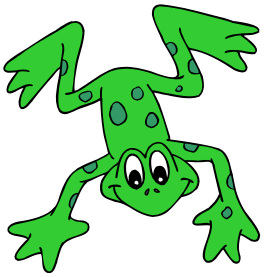
The flat style seeks to minimize resistance by reducing the amount of frontal and eddy resistance created by the body. The rolling style concentrated on using the energy of the water to help the swimmer lift the highly resistant shoulders out of the water during the kick propulsion and raise the hips during the pull. Also, the rolling style minimizes the angle of the upper thigh and the torso during the recovery and “set-up” of the legs prior to the kick. In the wave action stroke, the arm recovery is a surge over the top of the bow wave to put the breast in a position to “ride the wave forward” with the force of the kick. It is also possible that the body surge over the top of the wave deflects water backwards and aids propulsion.

c. ***Arm Action:*** Similar in two styles of the stroke. The hands begin the stroke together, directly out in front of the face, about 6 – 12 inches below the surface. The palms are pitched out at a 45º angle to the vertical plane and the thumbs are down. The elbows are straight and the reach of the arms is extended. The hands press wide and in so doing "pitch up" so that, at the corners of the stroke, the hands are vertical in the water, palms facing outward, and the little finger is almost breaking the water surface. At this point, the hands sweep inward and down, cutting a long arc towards the center line of the body. The elbows are held high during this inward sweep. The forearms are nearly perpendicular to the surface of the water during the in sweep. The palms are pitched back and slightly outward until the hands pass under the elbows, at which point the hand pitch smoothly shifts to a slight inward pitch.

After the hands pass under the elbows, they continue to accelerate together and begin the recovery. There is tremendous lift generated during this movement and careful attention must be paid to the pitch of the hands to make sure this force is not dissipated. The hand pitch should be slightly outwards and backwards until the hand is under the elbow, at which time the pitch is changed to slightly inward and backwards.

In the wave action breaststroke, the stroke differs from the widest point inward. As the hands pitch up and out at the widest point, the arms are swept inward with the hands and elbows moving simultaneously together. This promotes a horizontal "slide" of the forearms across the water, creating Colwin's "bound vortex" around the forearms and allowing a differently created lift force to move the body up and over the bow wave, as the kick drives it forward. During this movement, the hands are positioned facing the bottom of the pool, with the pitch changing from outward to inward during the inward scull. It is important to note that the success of this technique is in the ability to generate tremendous kick forces and "lunge" over the top of the wave.

d. ***The Recovery:*** The hands accelerate from the end of the "in sweep" directly into the recovery. The hands travel forward either one atop the other, or very closely side by side. The elbows, after the hands pass under them on the "in sweep", squeeze together under the chin. This helps lift the width of the shoulders out of the water during the breath and the hand recovery and allows the full power of the kick to be applied to propelling the body forward.
In wave action breaststroke, the recovery speed of the arms is critical. As mentioned earlier, the arms extend quickly forward in a lunging motion from the fingertips through the elbows to the shoulders.



e. ***The Kick:*** The heels start behind the buttocks, as closely as possible. The toes rotate outward and the kick is executed "around, back, and down." Note that all three dimensions are described in the phrase. The width of the kick varies with the individual, but in general, wider will give more propulsion than narrow. The kick finishes with the legs squeezing together and lifting towards the surface, as they begin their recovery to the next beginning kick position. The soles of the feet should be turned towards each other at the completion of the kick to maximize the available lift forces.

f. ***Breathing:*** Exhalation is underwater and inhalation is accomplished at the natural height of the rise of the body, which is generally at the end of the pull, just before the kick pressure is applied. Exhalation can be explosive on the arm "in sweep", or steady.

g. ***Timing:*** Good timing is the key to good breaststroke. The general principle is to have one "end" of the body…either the top or bottom half... in the most streamlined possible position while the other half is supplying propulsion. This can be described as "Kick, Stretch, Pull." Wave Timing: The critical piece in timing the wave style is to have hands out front and forcefully extending the stretch at the point where the kick first applies power. This "leap over the surge of the wave" timing is vital to the success of this style.

2. 3 - Dimensional Analysis

a. ***The Pull:*** The hands begin on the center line and deep. They press outward and upward, then sweep inward and downward with great acceleration. This gives a tremendous lift effect. The mechanism is different in the wave action stroke. The hands have little if any depth change, as the propulsion is developed from the mechanism of the bound vortex around the forearms.

b. ***The Kick:*** The feet start on the center line and shallow, then kick around, back, and down changing all three dimensions at one time.

3. Body Alignment and Balance

It is possible to keep the feeling of swimming downhill by the balance of the body in this short axis stroke. With the head allowed to dip underwater, it is clear that doing so while forcing the chest downward as the hips come to the surface, allows the feel of the stroke to be downhill. In the flat style of the stroke, the issue of alignment is critical, as the angle of the upper thigh with the torso creates a highly resistant posture in the water. Bringing the heels up to the buttocks partly modifies this problem, but it also produces the posture of swimming uphill.

The head and its sixteen pounds of throw-weight also play a major role in the breaststroke. As the head lowers, and the eyes and chin drop toward the chest; the implication is towards swimming downhill. As the head lifts and chin raises, it implies swimming uphill. The choice of head position on the recovery thus determines uphill or downhill swimming. The same is true during the breathing motion, flexing the neck to raise the head results in an uphill posture.

Holding the head still and breathing when the head and shoulders are at their natural high point at the end of the in sweep of the hands, then dropping the chin on the hand recovery, allows for downhill swimming. The use of the head as a throw-weight is a practical means of creating a downhill swimming posture throughout the stroke.

4. Breaststroke Trends

Because the stroke is so customized to the individual it is difficult to pinpoint many clear cut trends, but here are a few common techniques we can note.

a. With the outward arm sweep, all start with the hands pitched out and begin the outward movement by pressing from a deep "setup" position to a position wider than the shoulders and with the hands outside of the elbows. At the "corner of the stroke," the hands are vertical in the water, with the thumbs pointing down towards the bottom of the pool.

b. The kick, while varying in width among the top swimmers, is always finished with the legs almost completely extended and with the thighs squeezing together. In the majority of cases, the finish of the kick is with the soles of the feet facing each other.

c. The head is still and moves with the shoulders as they rise, enabling them to get an inhalation at the high point of the stroke. Then, they use the head as a throw weight to shift the body's center of gravity forward and swim "downhill" during the kick phase and the recovery of the hands.

5. Frequent Faults and Corrections

Getting adequate rotation around the stable, high elbow position during the pull is a frequent problem for the swimmer. If they fail to do this, the lift force generated is applied in a useless vertical direction. The also occurs with experienced swimmers when they get tired during a race. This is a loss of the depth dimension or the stroke. Another common problem is kicking or pulling a narrow path. It takes strength to maintain a full width dimension and as that strength dissipates, so does stroke efficiency.

In the kick, the most common fault found in swimmers is not "finishing" or closing the kick. The legs need to extend and squeeze all the way together before the heels lift towards the surface to initiate the next kick.

Another common fault with the kick is failing to rotate the toes outward fully, prior to initiating the power phase of the kick. If the toes are not turned out, the feet will not be able to for the full "catch" or lift of the feet. The toes need to be pointed to opposite sides of the pool when the kick action starts.

Timing problems are multitudinous and varied. Serious dead spots in the propulsion are developed when the arm pull and leg kick overlap. A slight overlap is common in the world-class breaststrokers, but the average swimmer must constantly work on the "kick-stretch-pull" timing.

Success with the wave action breaststroke seems to be predicated on the concept of a very fast arm action and kick. The speed of each contributes to the "skimming action" the swimmer wants over the surface of the water. The body position in this style is very high in the water, but at the same time very buoyant and "flat" on the surface.

Comment: The coach must use a great deal of judgment when teaching and coaching breaststroke. Individual variations are common and frequently very beneficial. The coach must judge when an unusual action is positive and when it is negative. This is very often a "tough call." Teach sound fundamentals, and then observe what the swimmer does with them over a period of time, and then correct from that point. It is possible to teach good mechanics for the pull and kick, then teach the timing of the "Kick, Stretch, Pull", that can be modified to the body style of the individual swimmer as they mature. Young swimmers frequently want to kick and pull at the same time when learning the stroke, so the separation of the stroke elements is good in the beginning stages. As the swimmer becomes more proficient, an overlap of the kick and pull can be developed to minimize the "dead" time, when no propulsion is provided.

If coaches had been conservative about teaching breaststroke over the history of the sport, very little progress would have been made. Don't be afraid to experiment.

BUTTERFLY

1. Verbal Description

a. ***Head Position:*** The head "leads" the stroke, alternating between a raised position looking slightly down the pool, to a position used during the majority of the stroke with the face looking at the bottom of the pool and the back of the head in line with the spine. As the hands finish the pull, the head stretches forward to breathe, then lowers to the "in-line" position prior the hands reaching the mid-point of the recovery.

b. ***Body Position:*** The body "rolls" through the water. This is vital to swimming a good butterfly. As the hands enter the water in front, the chest is down and the hips are up. As the pull progresses, the upper body rises, and the hips lead the kick deeper in the water. While the chest is deep, the shoulders stay close to the surface. As the body slides forward from the chest-down, hips-up position when the hands enter the water, the body is level as the hands perform the in-sweep that supplies the first impulse of propulsion from the lift to the body.

c. ***Arm Action:*** The pull is similar to the freestyle pull. The hands enter the water in front of the shoulders, with the palms tipped slightly outward, and the thumbs down. The elbows are tipped up on the entry as the hands are slipped into the water. The hands round outward slightly, then sweep inward and down, almost touching under the throat. Then they push back past the waist, and use a cutting action, with the little finger leading, to exit the water near the hips. Older and stronger athletes tend to have the hands enter the water closer together out front. Younger and weaker swimmers should use a wider entry and eliminate the first outward sweep. This will leave them with sufficient muscle power to sweep inward and push through.

d. ***The Recovery:*** The hands exit with the little finger first. The recovery is low and flat, with the hands close to the water. The little finger continues to lead the recovery for as long as possible, with the hand rotating to the entry position during the last part of the recovery.

e. ***The Kick:*** The butterfly kick is done with the legs acting together as a large fin. The kick must begin at the hips, and move backward through the legs in a wave action. The depth of the kick is important, adding amplitude to the body movement, and the kick is propulsive. Relaxed ankles and slight knee bend is helpful in aiding the propulsion.

f. ***Breathing:*** The exhalation is underwater – either continuous or explosive. As the hands pull past the hips, the head stretches forward to breath, keeping the chin very near the surface of the water. After the inhalation is taken, the head immediately returns to the streamline position.

   Side-breathing, while used by a few world-class swimmers, is generally not recommended, because it creates balance and strength problems in the stroke.

g. ***Timing:*** The phrase "hands in – hips up" is a great way to teach swimmers to coordinate the stroke. If the hands can be entering as the hips are at the top of their rise, the timing of the stroke will be perfect.
   Another phrase that works well is, "kick (the hands) in – kick (the hands) out." Outstanding body roll and "hand/hips coordination" are the keys to good timing.

2. 3 Dimensional Analysis

The hands begin at shoulder width, and their initial movement changes width (outward) and depth (deeper). Then the depth continues to move deeper as the hands sweep inward (width changes again). The hands are on the center line under the throat, then push wider and deeper throughout the push phase of the stroke, and the hand acts as a wing flying backward as the little finger leads the hand out of the water (length, depth, and width change.)

3. Body Alignment and Balance

The body in butterfly does not have many problems in the horizontal plane, due to the short axis nature of the stroke. The alignment issues are in the depth plane of the stroke. The question has been the same for quite some time…how much body roll is too much? A certain amount of body roll is helpful in producing propulsion and in timing the stroke. Too deep a roll, with an overemphasis on the amplitude of the stroke, will create too much resistance and an unstable flow around the body. We want the body to roll through a relatively narrow band of water at the surface, not "diving and surfacing." It is easy to get the feeling of swimming downhill by a deep chest press and high hips (concentrate on a deep chest press as the hands enter the water.)

The head position is crucial in creating balance in the stroke, as it drops slightly to help initiate the rolling action, and then flexes slightly during the breath to stretch the chin forward for the inhalation.

4. Butterfly Trends

The stroke has not changed significantly in quite some time. Most world class swimmers have a similar technique. Increasing the rate of turnover by adjusting the pull pattern under the body, the development of a powerful dolphin kick off the water in the streamline position, and reducing water resistance during the breathing portion of the stroke have moved the times for the 100 Butterfly closer and closer to the 100 Freestyle.

Wendy Skylar knew how to intimidate her opponents in the 100-meter butterfly.

5. Frequent Faults and Corrections

Poor timing is the most common problem with the butterfly. This can be fixed if a constant emphasis on “Hands in – Hips up” is maintained. Use one arm fly drills to help develop the proper timing for the stroke.

When initially teaching butterfly, work first on learning the proper body roll, and its relationship to the arm stroke. The kick will be developed from a proper body action. Well-timed kicking is much more important than the vigor of an ill-timed kick. The largest muscles in the body are in the leg, thus tiring the swimmer very quickly if they over-kick.

Another common problem is the breathing. The swimmer needs to get the head back to the streamlined position quickly after inhalation. Raising the head up high out of the water to breathe will cause major problems with the body position. The head should reach forward, keeping the chin in contact with the water Having the swimmers practice the arm pull with an underwater recovery will help them learn the correct timing for the breathing.

With the arm pull, the common problem is keeping the arms too straight, and not sweeping in under the throat. By having them practice vertical fly, you will be able to see the arm pattern and make corrections. The swimmer can also do vertical fly for a long period of time, since they do not have to lift the arms out for the recovery. Vertical fly can be practiced in a water depth of 8-9 feet or greater. The swimmer does a feet first surface dive to the bottom and gets in the streamline position with the knees bent. As the swimmer pushes off the bottom, they take one arm pull on the way to the surface. At the completion of the pull, they should break the surface, take a breath, then do another feet first surface dive to return to the bottom; and repeat the drill. This drill is also one of a very few that can be done with paddles.

During the recovery, swimmers will sometimes try to “turn the hands over,” so the thumb exits first. Emphasize “cutting” the hands out of the water, with the little finger leading.

When teaching the stroke to swimmers who may be lacking in physical strength, have their hands enter the water wider than ideal, and sweep in directly under the chin, eliminating the “round-out” motion. This requires less muscle, and emphasizes good timing in the stroke. As the swimmer gets stronger, you can gradually have them “reach more” and stretch on the entry.

Swimmers will enjoy learning to swim good butterfly when encouraged to use a pronounced body roll, and “feel” the stroke as they flow through the water. The kick is an additional propulsive tool to the arms and body, not the primary propulsion and body position adjustment mechanism. This is a beautiful stroke. Let the swimmers discover this by learning to swim gently and easily.