

# Swimming

Completion of this chapter should enable the reader to:

- Be familiar with the evolution of swimming and the various strokes
- Orient a group of students to being in water
- Instruct novice swimmers in basic swimming skills, such as floating, gliding, and beginning propulsion
- Teach beginning and advanced swimming strokes
- Recognize the proper progressions for teaching beginning, intermediate, and advanced swimmers

## HISTORY

Early humans probably learned swimming by observing animals that used a running motion to move about, on, or in the water. Water is an unnatural medium for humans because it interferes with the breathing mechanism; animals are usually better equipped anatomically for swimming. Humans cannot easily keep the nose above water while horizontal.

Carvings showing people swimming have been found dating as early as 9000 B.C. In the Middle Ages, accounts in the Greek, Roman, Anglo-Saxon, and Scandinavian classics dealt often with great feats of swimming of the heroes of the day.

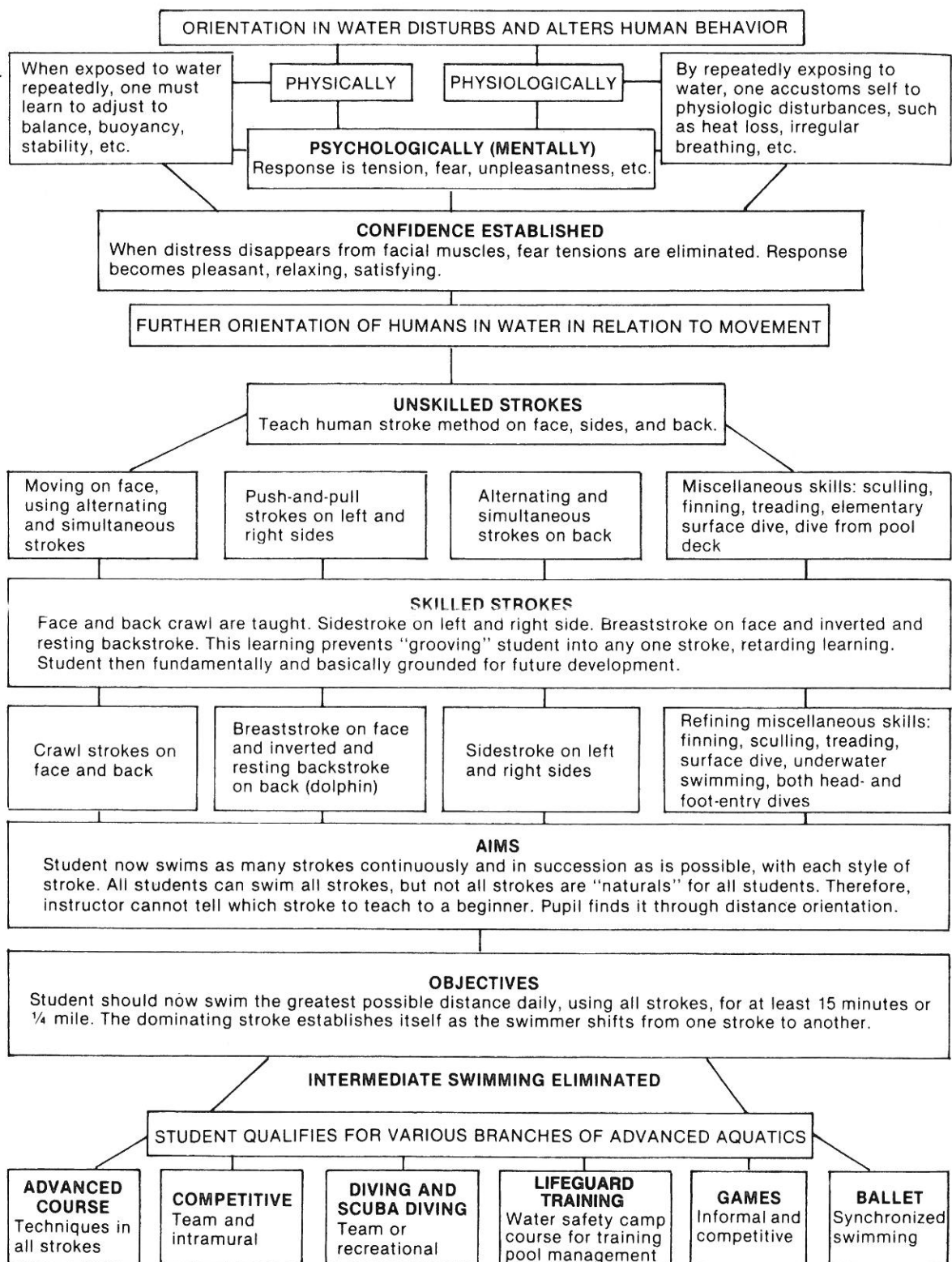
In 1538 Nicolaus Wynman, a German professor of languages, wrote the first book on swimming. In 1696 a Frenchman named Thevenot wrote a more scientific treatise.

The strokes listed here are still fundamental and seaworthy for utility purposes, but have been considerably refined for competitive swimming.

These strokes evolved in the following order:

1. The "doggy" or human paddling strokes.
2. The breaststroke (sailor stroke), the first scientific stroke taught.
3. The underarm sidestroke. This stroke was still too slow for speed because both arms recovered under the water as they did in the breaststroke. The kick was scissorslike.

4. The side, or English, overarm stroke. This stroke was faster than either the breaststroke or the side underarm stroke because the uppermost arm recovered above the surface and thereby reduced undesirable resistance.
5. The trudgen stroke, discovered in South America in 1860 by an Englishman, John Trudgen. This stroke employed the method of recovering both arms above the water hand-over-hand and further reduced resistance to water and created greater speed. It was similar to the side overarm stroke except that the body turned over to the uppermost side to also permit the under arm to lift out of the water for recovery. In this stroke the scissors kick was used.
6. The Australian crawl, introduced to England by Richard Cavell of Australia in the 1902 championships. This was the first true hand-over-hand stroke with vertical thrash of the legs. Cavell explained the stroke as "crawling through the water." The scissors kick was eliminated for speed swimming because recovering the legs caused great resistance.
7. The American six-beat leg-kick crawl. The Australian stroke was scientifically refined by American coaches. This style broke all existing freestyle records in speed swimming and became known as the fastest human stroke in water.



**Fig. 32-1.** The all-stroke method—a progressive learning procedure chart for swimming.

8. The inverted breaststroke. This is the breaststroke executed upside down while swimming on the back.
9. The back crawl. About 1910 the crawl was turned upside down and was much faster in competition than the inverted breaststroke. There was no recovery of arms or legs underwater as in the inverted breaststroke. It also minimized resistance and created faster speed on the back.
10. The butterfly breaststroke. This stroke began to make its appearance in competition about 1934. The kick remained the same as in the breaststroke, but the arms recovered above the water simultaneously. They lifted out of the water at the hips and were swung laterally forward to the entry, resembling a butterfly in flight, thus the name.
11. The dolphin fishtail breaststroke. The newest of all the swimming strokes was created by D. A. Armbruster through the ability and skill of Jack Sieg. The purpose of this stroke is to obtain greater speed with the breaststroke by eliminating the recovery underwater of the legs in the kick. This is accomplished by beating the legs up and down in unison. This kick actually creates greater speed when used without arms than does the alternating crawl flutter kick. It synchronized beautifully with the butterfly arm stroke and created greater speed.

Not only have all of these strokes been developed and refined, but they have been put to practical use by the average swimmer and are expressed in many different categories of water activities, usually called aquatics. Some of the categories of aquatics are:

1. Recreation
2. Lifesaving
3. Competition
4. Synchronized swimming or ballet
5. Springboard diving
6. Water games—polo, basketball, baseball, and the like
7. Water safety
8. Survival
9. Skin diving and scuba diving

Most of these skill activities in water have as a basic background the fundamental skill strokes.

It is strongly recommended that the beginner be taught all of the basic strokes to gain an assurance of self-preservation, an at-home feeling, and the joy and relaxation in recreational swimming. To accomplish this, the beginner must know the fundamental skill strokes. This method of learning is the "all-stroke method for beginners" (Fig. 32-1).

## UNITED STATES OLYMPIC SWIMMING HISTORY

### Men

In 1896 at Athens, there were only two swimming events, held in a lake, and competitors could use any stroke. Over

the years competitions have become increasingly organized in terms of distances, strokes, and facilities. By 1912 there were six men's swimming events and two women's swimming events. In addition there were two men's and one women's diving events.

Early outstanding U.S. swimmers were Charles Daniels, who won four golds in 1904, 1906, and 1908, and Duke Kahanamoku, who won the 100 m freestyle in 1912 and again in 1920. His new style of kicking (the flutter kick) was later adopted by most freestyle swimmers. In 1924 Johnny Weissmuller, the next dominant U.S. swimmer, emerged. He was the first person to swim the 100 m freestyle in under a minute, and he won a total of five gold medals at two Olympiads.

In 1932 the Japanese men swimmers won five of six events, and they won three of six events in 1936. Following these games the Australian men became the swimming power until 1964.

Don Schollander of the United States matched Johnny Weissmuller's feat of five gold medals by winning four in 1964 and one in 1968. Schollander's gold medal in 1968 was in the 4 × 200 m relay. Mark Spitz, a team member on that relay team, was destined to win seven gold medals in 1972. It is still the most gold medals ever won at a single Olympic Games in any sport, and each medal involved a world record (four were individual events and three were relays).

One of the most dominating team performances occurred at the 1976 Olympics when the U.S. men's team won 12 of 13 possible golds and 10 silvers in the 11 individual events. In 1980, when the United States boycotted the Olympics, the Soviet men's team dominated by winning seven of the 13 gold medals. In 1984, when the Soviets boycotted, the U.S. men returned to dominance by winning gold medals in 8 of 13 swimming events, plus both gold medals in diving.

In 1988 a record 21 different nations earned medals in swimming (both men's and women's), but the men's events were once again dominated by a U.S. swimmer. Matt Biondi gathered five golds, one silver, and a bronze, for a performance eclipsed only by Mark Spitz.

The Unified team (formerly the Soviet Union) and the Hungarian team were surprisingly strong at the 1992 Olympics in Barcelona, but the U.S. men's team brought home seven gold medals and six silver or bronze medals.

### Women

The first Olympic women's swimming events were held in 1912, and the next several Olympics were dominated by swimmers from Australia, Great Britain, and the United States.

In 1920 Ethelda Bleibtrey of the United States won the 100 m freestyle, the 300 m freestyle, and anchored the 4 × 100 m freestyle relay to sweep all three events at

the Antwerp Olympics. In 1932 the U.S. women's swim team, led by Helene Madison, won six of the seven swimming and diving events, but it won only three bronze medals in 1936.

After World War II (1948–1960) the U.S. women's teams won 14 gold medals in four Olympic Games. The women's team from Australia emerged as a power at this same time, winning 10 golds including five in 1956 and four in 1960. The U.S. women began to reemerge as a swimming power in 1968 when Debra Meyer won three gold medals. In 1972, when Mark Spitz was winning seven golds, the dominant woman swimmer was Shane Gould of Australia with four golds, one silver, and one bronze. However, Melissa Belote of the United States also won three golds in two individual events and a relay.

In 1972, when the U.S. men had the great team performance, the U.S. and Australian dominance in the women's events continued, but it came to an end in 1976 as the East German women won 11 of the 13 golds. Shirley Babashoff of the United States did manage a gold and three silvers, giving her eight Olympic medals in her career and establishing her as one of the United States' great female swimmers.

When the United States boycotted the Olympics in 1980, the East German women repeated their feat of garnering 11 of the 13 gold medals. In 1984, when the East Germans boycotted, the U.S. women swimmers returned to power with 11 of the 14 golds.

In the 1988 Olympics the stars of the women's swimming competition were Kristin Otto of East Germany and Janet Evans of the United States. Otto's six gold medals broke the record for most golds won by a woman in any sport at one Olympics. Seventeen-year-old Janet Evans won the 400 m individual medley, the 800 m freestyle, and the 400 m freestyle in a world record time of 4:03:85.

The U.S. women's team remained a world swimming powerhouse with 14 medals, although the Chinese women's team was surprisingly strong at the 1992 Barcelona Olympics. Janet Evans again won the 800 m freestyle and took the silver in the 400 m freestyle.

## SWIMMING SAFETY RULES

### Indoor swimming pools

1. No person should ever enter the water or swim alone, for any reason, regardless of swimming ability.
2. Do not enter the pool or swim unless a lifeguard or qualified instructor is present.
3. No running is allowed on the pool deck.
4. No horseplay is allowed in the pool or pool area.
5. Eating, smoking, and glass bottles are not allowed in the pool area.
6. All swimmers must wear bathing suits. T-shirts, cut-offs, or other clothing will not be allowed.

7. People with communicable diseases or infectious conditions such as open sores, eye infections, etc., will not be allowed in the pool.
8. Only one person at a time is allowed on diving boards.
9. Before using diving boards, be familiar with the depth of the pool and configuration of the bottom of the pool.
10. Diving boards are to be used only for what they were designed for. All "splash dives" are prohibited.
11. Never swim near the diving area when diving boards are being used.
12. Diving into the pool while standing anywhere on the deck is prohibited.
13. All people with long hair should wear a bathing cap.

### Open swimming areas

14. Never remain in the water during an electrical storm.
15. Before participating in any aquatic activities—such as canoeing, boating, sailing, skin diving, scuba diving, and water skiing—be certain all safety rules and procedures are understood.
16. Do not expect air-filled flotation devices to compensate for lack of swimming skills.
17. Never dive into water of unknown depth or into water that has not been checked for floating or partially submerged foreign objects.
18. Always be aware of the temperature of the water. Do not remain in cold water for excessive periods of time. Do not enter the water if you are chilled.

## THE ALL-STROKE METHOD FOR TEACHING BEGINNERS

The all-stroke method begins by adjusting students to water; then several skill and some low-skill techniques are learned. When the student is comfortably adjusted to water and basically "stanced," the basic skill strokes can be learned quite rapidly.

Beginners can learn the strokes and make reasonable progress; however, not everyone can swim all strokes equally well. Therefore, by teaching all of the students all of the strokes, everyone will naturally find the stroke most comfortable and suitable through a distance orientation program after the stroke skills are learned. People differ anatomically. If students are taught all strokes in the distance orientation program, the stroke that takes the least effort will naturally be selected most often. Each student will find the stroke that gives the most self-satisfaction, even though basically "grounded" in every stroke. The students are not first "grooved" in one or two strokes, but are basically grounded for advanced swimming, lifesaving, or any other form of aquatic interest. The idea, too, is to do away with the intermediate level of swimming.

The secret of this method is to really work the legs by drilling them in different kick skills. Ordinarily legs are clumsy, being composed of big muscles that in everyday living are used only to walk, run, jump, and perhaps dance. To get legs to relax in water and become skilled, and to get the feel of the unnatural environment of water, the swimmer must train and "overlearn."

Correct breathing habits are the next essential skill to teach. One must breathe to swim, but water interferes with a human's breathing mechanism. Humans have to learn to exhale under the surface and inhale above the surface.

Instructors should emphasize skill learning by constant drill and action. Action creates interest and results in interested students who will work hard if they know they are learning. Swimming taught progressively and intensively accomplishes that. If students become fatigued (not exhausted) from constant exercise, they will naturally take it easy, and when they take it easy, the response is relaxation. Relaxation is learned through constant repetitions.

## OBJECTIVES

1. To orient students to water, a medium that disturbs a person physically, physiologically, and mentally and brings about the following:
  - a. Unstableness
  - b. Apparent loss of body weight
  - c. Loss of sense of balance
  - d. Change in body position for locomotion
  - e. Change in heat-regulatory mechanism
  - f. Change in respiration
  - g. Change in normal muscle tonus
2. To give confidence, using drills that have the following goals:
  - a. To eliminate mental hazards
  - b. To teach the proper techniques of inhalation and exhalation
  - c. To bring about relaxation in the water
  - d. To encourage enjoyment of swimming
3. To teach self-reliance for self-preservation
4. To teach an appreciation of distance over water no matter how short or long
5. To teach respect for water while swimming
6. To impart confidence in skill and ability to accomplish techniques
7. To teach strokes in such a way as to motivate the student to persistent practice
8. To encourage swimming as a source of lifelong pleasure and fitness
9. To teach distribution of effort and conservation of strength
10. To teach how to delay fatigue
11. To teach how to dive into water

## BASIC SKILLS AND TECHNIQUES

### Adjustment to water

1. Examine the pool markings to know its depth at all locations before entering the water
2. Wade waist deep into the pool and submerge repeatedly to chin level, rinsing up and down and washing the face.
3. Hold onto the splash gutter and allow water to lift the legs and body to the surface. Stay relaxed.

### Breath control

Depending on the level and maturity of swimmers, the following activities can be performed while holding onto the pool gutter, holding onto a partner, or without support:

1. Standing in waist-deep water with the body inclined forward, practice breath holding: Inhale through the mouth, close the mouth, shut the eyes, and submerge the face flat beneath the water; hold for 3 seconds and recover. Repeat several times, lengthening the time of holding the breath underwater.
2. Inhale through the mouth, submerge the face with the eyes closed, exhale through the nose, and recover. Repeat several times.
3. Inhale through the mouth, submerge the face with the eyes closed, and exhale through the nose, mouth, or both, steadily but as slowly as possible. Recover and repeat several times.

### Use of eyes underwater

Inhale, close the eyes, submerge, open the eyes, count the number of fingers visible on a partner's hand, and recover. Repeat.

### Balance and control of the body

The following activities are designed to aid the student in developing confidence in the water. To ensure that confidence is generated and fear is not reinforced, it is important to discuss and practice (with partners) the procedures of returning to a stable position before assuming the various floating and gliding positions.

**Jellyfish float.** This float may be performed in either the pike or tuck position. Take a deep breath, submerge the face, raise the knees to the chest or extend the legs, and hold with the arms for 3 seconds. Release the hold, elevate the back and head, allow the legs to extend to the bottom of the pool, let the arms float up a little, and then push them down and toward the hips while at the same time raising the head. The instructor should pay close attention to the swimmer in these initial floats as individual differences, especially in amount of leanness and fat, will result in large differences in ability to float (Fig. 32-2). Repeat.

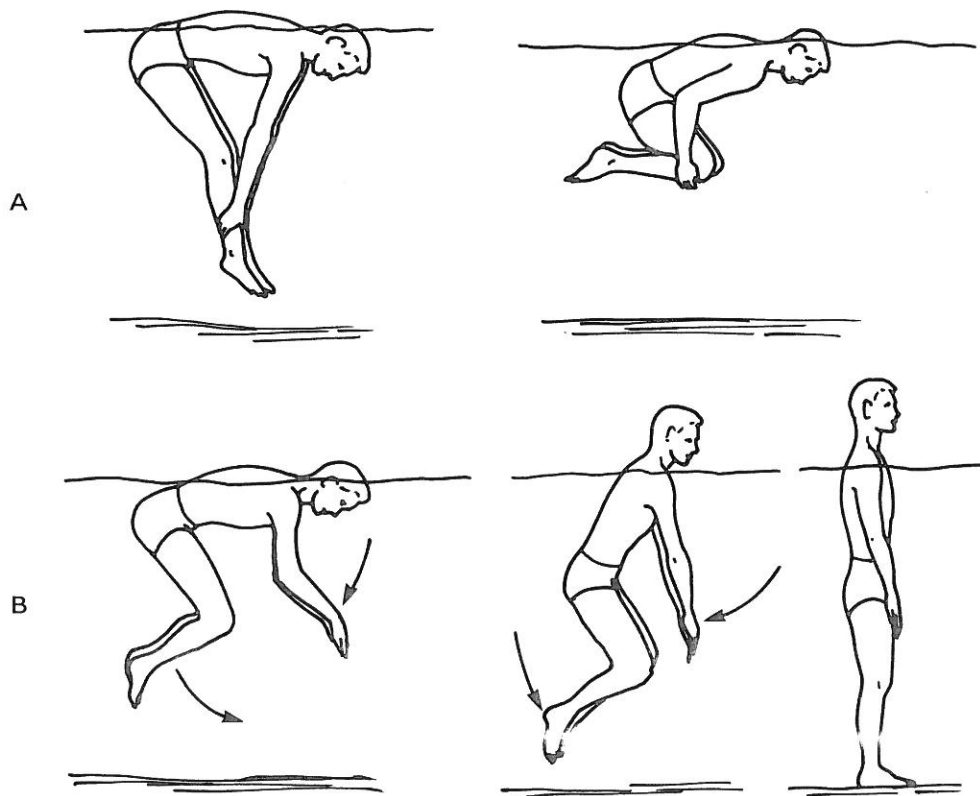


Fig. 32-2. A, Jellyfish float, pike, and tuck positions. B, Recovery from jellyfish float.

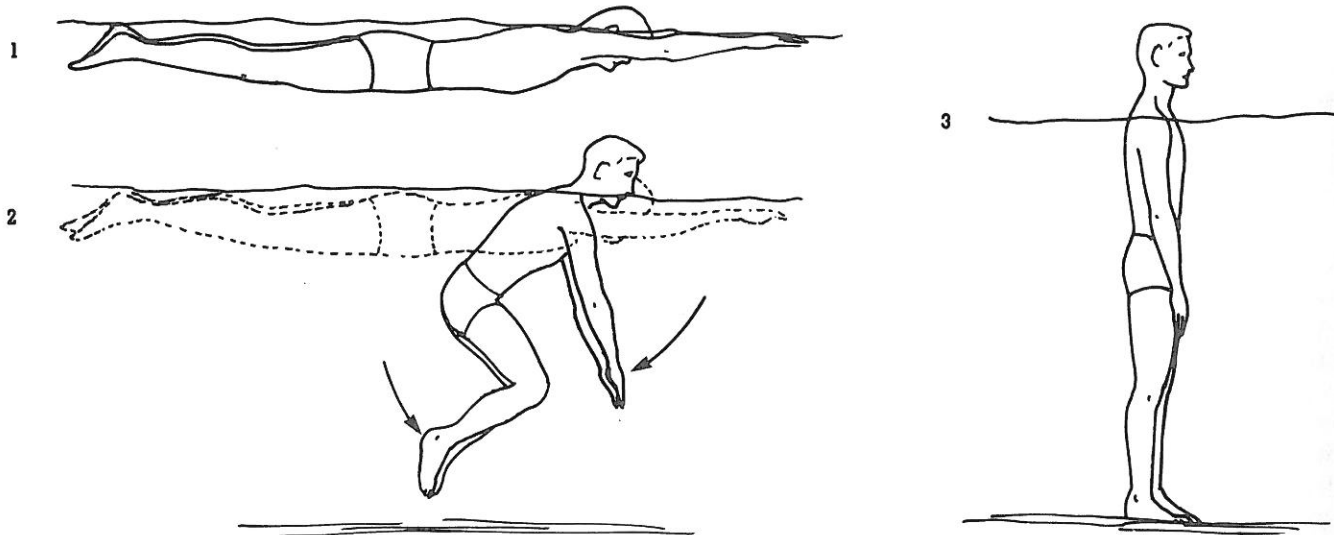


Fig. 32-3. Prone float and recovery.

**Prone (on stomach) floating position.** The prone floating position is taken by lifting and extending the arms forward beyond the head beneath the surface, with the head held low in the water, and extending the legs (Fig. 32-3). (This is the only difference between the prone float and the

jellyfish float.) To recover to the standing position, pull the knees to the chest, round the back, then simultaneously press firmly downward with the extended arms, extend the legs to the bottom of the pool, and lift the face from the water. With the legs extended downward, the feet will

settle on the pool floor. (Water must be at least waist deep.) Keep the eyes open. After recovery, exhale through the nose, open the mouth, inhale, and flutter the eyes open.

**Prone glide and stand.** For the prone glide, bend forward at the waist, with the arms extended forward. Lay the upper body and arms in the water, just under the surface. Take a deep breath at the side, bend the knees, and roll the face under the surface. Straighten the knees, push the feet off the bottom, and slide into a prone position and glide. At the end of the glide, draw the knees into the chest and recover, as in the prone float.

**Back floating position.** With a partner standing directly behind, assume a back floating position by submerging to the chin and, with the partner supporting the back of the neck with one hand and the small of the back with the other, lift the hips and extend the arms sideward. The ears will be under water. The partner gradually removes support, first from the small of the back and then from the neck. The body will not necessarily stay horizontal in the water. Some swimmer's legs have a tendency to sink. The important elements are to relax, keep the arms extended, and hold the neck back to keep the face above water. The partner should help you recover the first few times. To gain recovery from the back float, move the arms downward and forward in the water, round the back, bring the knees to the chin, and lift the head slowly forward. When the body moves to a vertical position, extend the legs to the bottom and stand (Fig. 32-4).

**Back glide and stand.** For the back glide, crouch until the shoulders are submerged, lie back until the ears are submerged, push off with the feet, and glide until forward motion stops. Recovery takes place when the glide ends. To recover, bring both knees up toward the chest and the head forward. At the same time bring both arms forward. During the glide, keep the arms at the side and the legs straight and together.

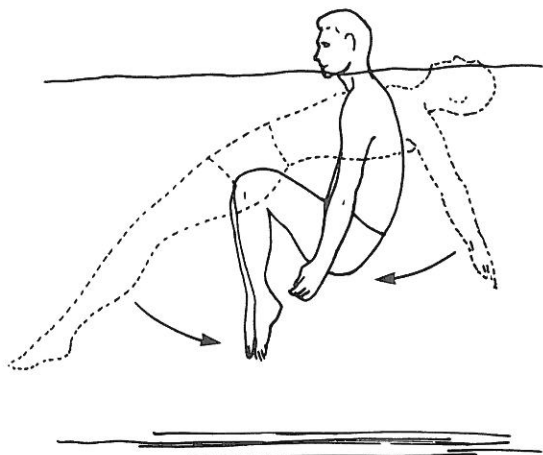


Fig. 32-4. Back float and recovery.

### Simple leg movements to keep body horizontal and to aid propulsion

**Kick glide, prone position.** For the kick glide, prone position, start in the same manner as in the prone glide, but as the body straightens out on the surface, move the legs in an alternate up-and-down maneuver, delivered with the knees and ankles fairly loose; continue to the limit of breath-holding ability. (For additional practice, hold onto the splash gutter or a kickboard and kick the legs as above.)

**Kick glide, back position.** In the kick glide, back position, assume a back floating position but with the back flat, the chin tucked well into the throat, and the arms kept by the sides. Move the legs in a slightly bent-kneed flutter kick. Snap each knee into extension when finishing the kick. (For additional practice, hold onto the splash gutter and execute the flutter kick.)

### Simple arm movements for support, propulsion, and balancing of body

**Arm stroke on the front.** For the arm stroke on the front (dog paddle or human stroke), assume the prone position in the water and extend the arms alternately forward and downward, following with a press backward under the body. Cup the hands slightly on the pull backward. In the recovery forward of each arm, straighten the hand, draw it up under the chin, and extend it to a forward position; cup the hand and repeat the stroke.

**Arm stroke on the back.** The arm stroke on the back (finning) is a paired movement of the hands and arms in a back position. The arms are first extended by the sides and then drawn up about 1 foot (30 cm), extended outward so the hands are perpendicular to the body, then push water backward toward the feet using a fishtail flip of the hands and wrists.

### Coordination of breathing with leg and arm movements

**Combined stroke on the front.** The combined stroke on the front is composed of up-and-down alternating beats of the legs and the dog paddle with the arms, with breathing done entirely above the surface or alternately inhaling above and exhaling below the water. Two or more beats of the legs should accompany each cycle of arm strokes.

Inhalation should be done with the head turned to the side. If the head is turned to the left to get air, inhale when the right arm is extended forward. Rotate the head into the water on this cycle, and when the left arm is extended, exhale underwater through the mouth. To inhale to the right side, the left arm should be extended, and on this cycle, as the right arm is extended, rotate the face into the water and exhale.

**Combined stroke on the back.** The combined stroke on the back consists of finning with the hands and flutter

kicking with the legs. Assume the back floating position with the back flat and the chin tucked well into the throat. First, the leg beat is started using greater speed and more flexibility than is used in the front kick. The thrust of the hands (finning) is put into the stroke at regular intervals. Breathe naturally.

**Turning, right and left.** Begin the front stroke (human stroke), maintaining the body nearly horizontal, and execute a right turn and then a left turn in the middle of the pool. Try executing a complete turn. Extend the hands and pull in the opposite direction of the turn.

**Change positions.** In changing position or turning over from the front to the back, start swimming, keep the body nearly horizontal, and at the point of changing positions, roll the body either right or left to a back floating position. Keep the shoulders and head low in the water. The head, arms, hips, and legs will aid in rolling the body. In changing from a back float to the front, roll in a similar manner to a front position and resume the stroke.

## SKILLED STROKE TECHNIQUES

### Resting backstroke

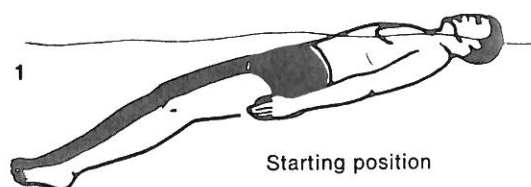
The resting backstroke (Fig. 32-5) should be the first stroke taught to beginners. It requires little coordination and gives the student a sense of motivation. This is principally a resting stroke for an emergency or for easy swimming while resting, and it lays a sound foundation for the breaststroke and elementary backstroke as well as for treading water. The face is never underwater, and thus breathing is not a disturbing factor.

### Whip kick (inverted breaststroke kick)

The recovery is executed by spreading the knees to about approximately hip-width while holding the heels together. Keep the heels down as they are drawn toward the buttocks so that the knees do not lift out of the water, and at the same time lift the hips to prevent the drop. Separate the heels and cock the feet outward toward the knees. Start the drive by sweeping the legs out and together, and engage the water with the soles of the feet, extending the feet as they kick. During this kick, when the knees are not quite straightened, squeeze the thighs together forcefully with the knees relaxed to give a whiplike motion to the foreleg and feet, resulting in increased propulsion. This stroke can also be introduced using a flutter kick first, because the whip kick can be difficult for some students to master.

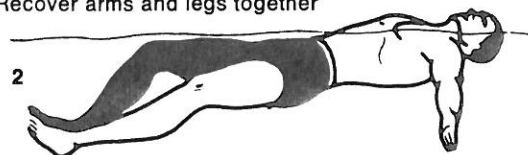
### Arm stroke

The arm recovery starts from the sides of the thighs by turning the palms downward and slightly at an angle in the direction of recovery, the little-finger side of the hand leading and knifing through the water. The arms are held straight. The arms move outward away from the thighs to a point just above the shoulders.

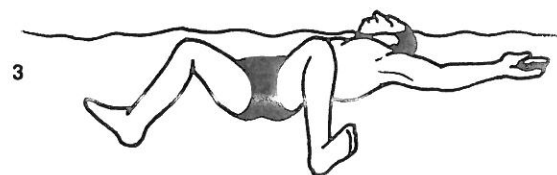


Starting position

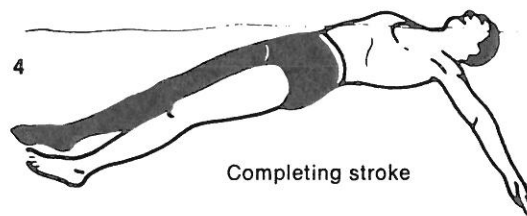
Recover arms and legs together



Palms facing down  
Arms straight



Kick and pull together



Completing stroke



Glide until momentum subsides

**Fig. 32-5.** Progressive steps in the resting backstroke—the first skill stroke to learn.

The pull is executed by turning the palms to the rear and slightly downward and moving the straight arms forcefully to the sides of the thighs.

At no time during either the recovery or the pull of the hands or arms should they be above the surface.

**Whole stroke**

This stroke is easy to execute because the arms and legs work in unison. The arms and legs recover at the same moment and kick and pull at the same moment. When the stroke is closed, stretch out straight and pause until momentum from the previous stroke is spent. Repeat.

**Elementary backstroke**

This stroke (Fig. 32-6) should be taught after the resting backstroke has been mastered. This style affords a little more speed than does the resting backstroke, but is still restful and easy to learn. However, more coordination is required to execute it because the arms are partly recovered before the legs recover.

**Whip kick**

The whip kick is executed exactly the same as in the resting backstroke kick.

**Arm stroke**

The arm recovery in the elementary backstroke differs from that in the resting backstroke. The arm recovery is executed by bending the elbows downward and sliding the hands from the sides of the thighs up along the sides of the body toward the shoulders. Then the hands, palms facing up, reach out diagonally from the armpit under the water until the arms are straight. Turn the palm facing backward and pull, straight-armed, to the sides of the thighs. Pause until the momentum from the pull subsides.

**Whole stroke**

In the recovery phase, hold the legs straight while the arms recover to about armpit level; then start the leg recovery at the same slow speed as the arms recover. When the arms have reached the pulling position, the legs have recovered to the kick position; that is, the knees and heels are apart, feet pointed outward. In the propulsive phase the arms and legs start at the same time, although the legs will usually finish before the arms because of a shorter range of motion. Stretch the body and legs straight, though relaxed, and pause for the momentum to spend itself. Breathe regularly.

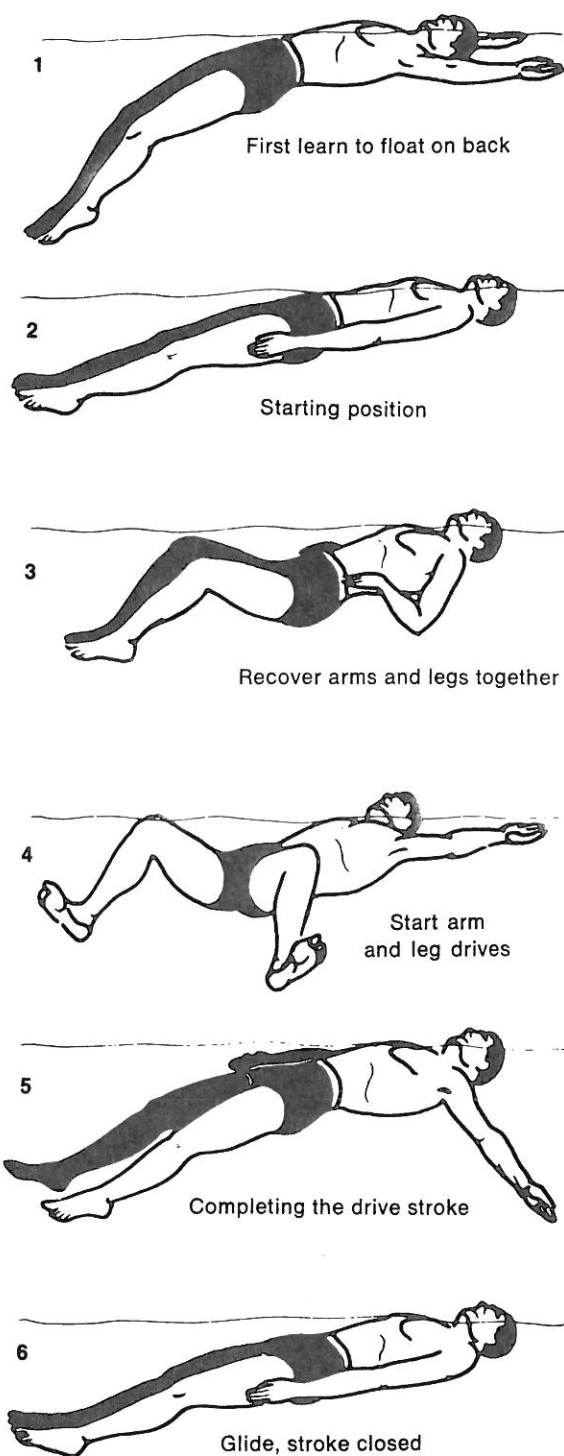
**Underarm sidestroke**

The underarm sidestroke (Fig. 32-7) is easy to learn. It is the foundation stroke for lifesaving. Breathing is not difficult because the nose and mouth are turned to the rear and water passes by the side of the face. This is not one of the modern competitive strokes.

**Scissors kick**

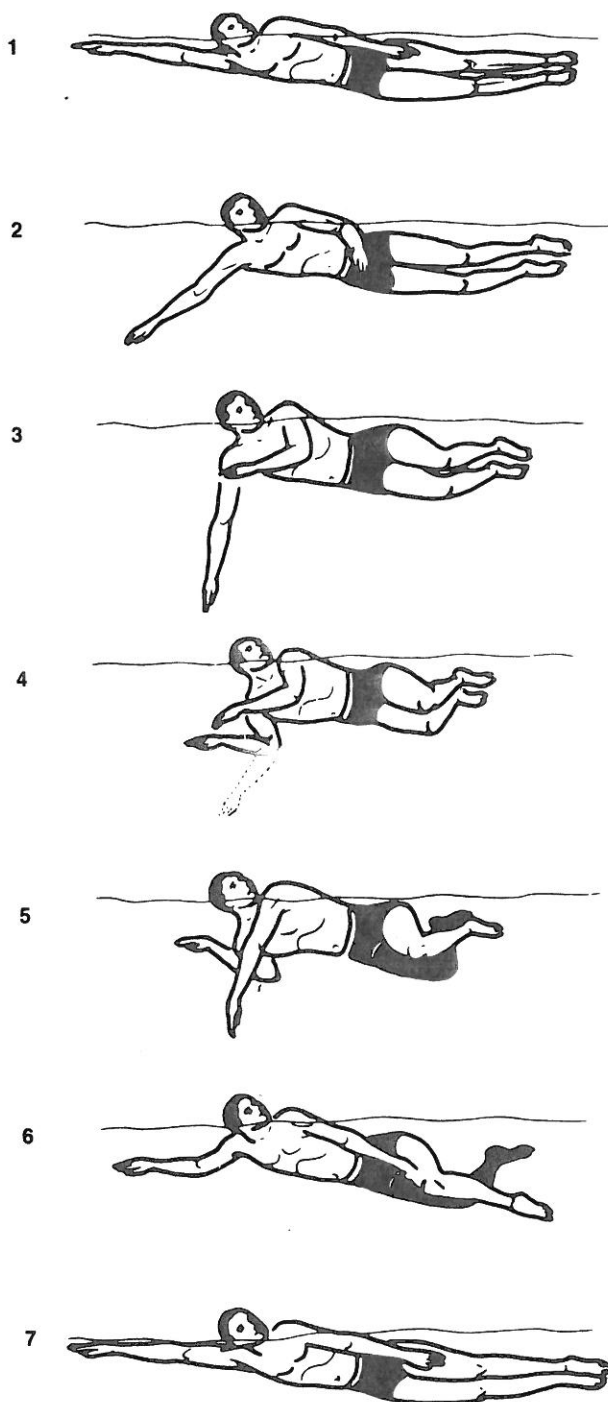
The scissors kick is perhaps the most powerful of all kicks in the water, which is why it is used so much in lifesaving.

First the kick is learned on both sides by holding onto the side of the pool. The body is held straight on its side,



**Fig. 32-6.** Progressive steps in swimming the elementary backstroke.

legs straight, feet extended, and one leg on top of the other. The legs remain parallel with the surface of the water throughout. To start the recovery movement, flex at the knees and slowly draw the heels backward. Both legs are held together and move simultaneously. This drawing



**Fig. 32-7.** Progressive steps in swimming the underarm sidestroke.

of the heels backward gives just the proper amount of flexion at the hip joint. In this position, if an imaginary line were passed through the midpoint of the shoulder and hip joints, it would project out over the legs at a midpoint between the knees and ankles when the legs are in a full recovery position. The scissors is now opened by

moving the under leg back and the top leg forward, still maintaining the fully flexed knees. The foot of the top leg cocks itself, or flexes toward the knee. The under foot remains extended. From this position the legs start the drive, sweeping outward and together by extension of the knees and the foot of the top leg. The under leg hooks the water and acts in the same manner as kicking a ball, whereas the top leg has a whip motion similar to a horse's pawing. With a powerful yet smooth movement, the legs come together stretched straight and relaxed and pause long enough for momentum to be spent in the glide.

#### **Arm stroke**

While the body is on its left side, with the shoulder girdle in a true vertical plane, the under (left) arm is extended forward directly under the head, with the palm facing down and the hand just under the surface. The upper (right) arm pulls back, hugging closely along the upper front part of the body with the palm of the hand resting on the front side of the upper leg—never on the top of the leg.

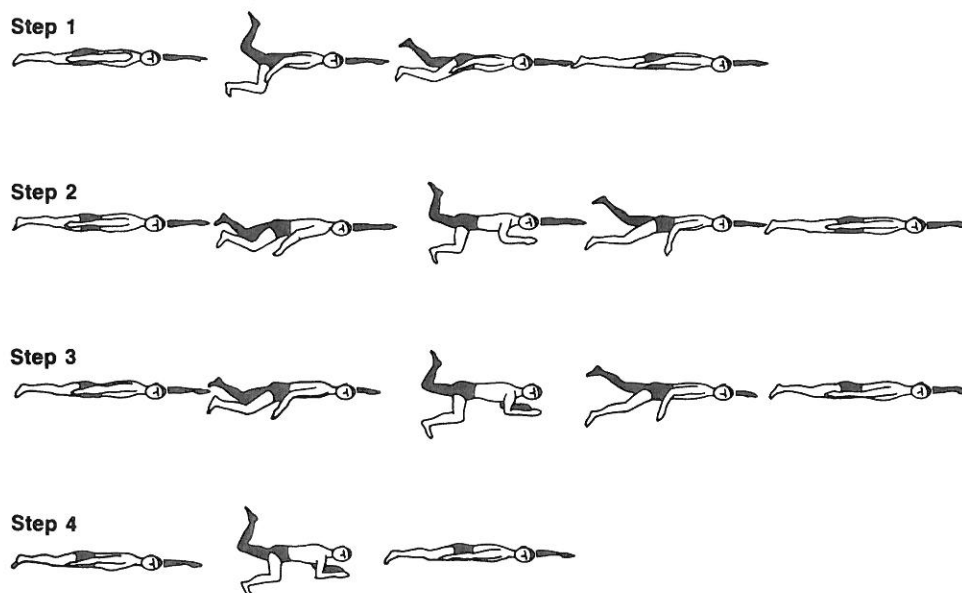
The learner should first get a clear mental picture of the arm stroke from the starting position—that is, both arms moving simultaneously along the longitudinal plane of the body. They meet just under the head, change direction, and simultaneously extend again to their starting position. The under arm moves forward; the upper arm moves backward. The student can singsong, "Everything drawn in, everything thrust out." Actually, as the upper arm slides forward to recover to meet the under arm, the under arm should pull diagonally downward and backward to a line under the head. Here it changes direction and starts the recovery movement, with the hand and fingers pointing forward to its starting position. Even though the hands move in and out together, the under arm is always pulling on the "in" movement, while on the "out" movement the upper arm is pulling, or vice versa.

#### **Whole stroke coordinated in four steps**

It is recommended that each of the four steps be learned thoroughly before advancing to the next step (Fig. 32-8).

**Step 1: scissors kick only.** Take a deep breath and lie on the left side floating position with the body straight and the left under arm extended in a line with the body. Turn your face into the water on top of the under arm and hold your breath. The upper right arm is in front of the upper thigh. Take at least four kicks in succession and pause between each stroke for the glide. The upper hand is in front of the upper thigh and remains on it during these kick exercises. This trains the upper arm to work in unison with the kick, as it must do in the whole stroke.

**Step 2: the kick and upper arm.** The body is still on its extended left side, with the face under water as in step 1. To execute step 2, the upper hand and arm recover at the



**Step 1**  
The kick only

**Step 2**  
The kick and upper arm; must be timed to work together

**Step 3**  
The kick, upper arm, and under arm; timed to start the stroke simultaneously and to kick simultaneously

**Step 4**  
Whole stroke

**Fig. 32-8.** The four steps of learning the sidestroke.

same time as the legs. The hand planes forward beyond the face, with the elbow and hand submerged to a point beyond the face. The arm pull starts at the same time as the kick. Here again, as in the resting backstroke, the upper arm and legs recover at the same time and the kick and pull occur at the same time.

**Step 3: the kick, upper arm, and underarm.** The body and face are still in the same position as in step 1. To execute step 3, press—do not pull—the under arm diagonally down and backward to a point under the face. At the same instant that the under arm starts its press, the legs and upper arm are recovered. The hands meet, cross over, and repass as the under-arm hand recovers and thrusts forward to guide the glide. At the same time the under arm recovers, the upper arm and legs start the kick and pull. Pause and glide. Repeat the singsong, “Everything in, everything out,” as in the under-arm sidestroke. Glide. This makes it easy for the arms and legs to coordinate into the whole stroke. Repeat at least four strokes before stopping for air.

**Step 4: breathing.** Take one or two strokes in the step 3 position and then turn your face out of the water and face to the rear, with the chin in line with the upper shoulder. Breathe in at the same time that the arms and legs come in; breathe out at the same time that the arms and legs go out. Remember, “Everything in, everything out.” Once four or five strokes are correctly timed and coordinated, you have learned the skill of coordinating the whole stroke. Now repeat the same four-step procedure on the right side. The water level should remain constant at your face, leveling at the corner of the lower eye and lower corner of the mouth.

*Note:* These four-step procedures can also be performed with flotation devices, such as kickboards.

### Breaststroke

The breaststroke was the first competitive stroke and is still used in competitive events. However, it is also an excellent utility stroke and is used in many lifesaving skills.

**Kick**

There have been many modifications of the breaststroke kick in order to increase the speed of the entire stroke. In general, the main characteristic of these modifications has been to reduce unwanted resistance by narrowing the knee spread and increasing the desired resistance by adding a slightly downward thrust in the propulsive phase of the kick. However, for the beginner the traditional kick is probably easiest to learn initially.

The breaststroke kick (whip) is almost the same as used in the inverted or the resting backstroke. The body is prone, arms extended, face under. The recovery begins with the heels close together and then drawn toward the buttocks just under the surface. This results in the knees being brought forward and separating to approximately hip-width apart; however, the angle of the thighs to the upper body should be slightly greater than 90 degrees. In other words, the knees should not be drawn up quite so far as to be directly below the pelvis (Fig. 32-9, 4). When the heels are fully drawn up to the buttocks, they are "cocked" (dorsi flexed) in preparation for the drive. The drive is made forcefully but smoothly by pressing the feet

first outward then backward and inward until they are together, with the toes pointed. Glide with the legs fully extended until momentum from the kick is spent. During the propulsive phase of the kick, you should feel as though water is being pushed backward by the soles of the feet. Also attempt to get a whiplash to the legs during the kick phase. This is accomplished by driving the thighs in toward each other before the knees have fully extended. This movement gives the powerful whiplash kick.

**Arm stroke**

In the starting position, the arms are extended forward, hands close together, palms facing away from each other. The arms press outward and downward simultaneously until the hands are slightly wider than the shoulders. The elbows then bend and the hands press downward so the palms face the feet. The hands then press inward together until they are under the chin, at which point they release the water and immediately begin to recover. Pulling too wide removes the support from under the shoulders and head, causing them to drop and sink, which disturbs the body balance. As the arm pull is being completed, the face

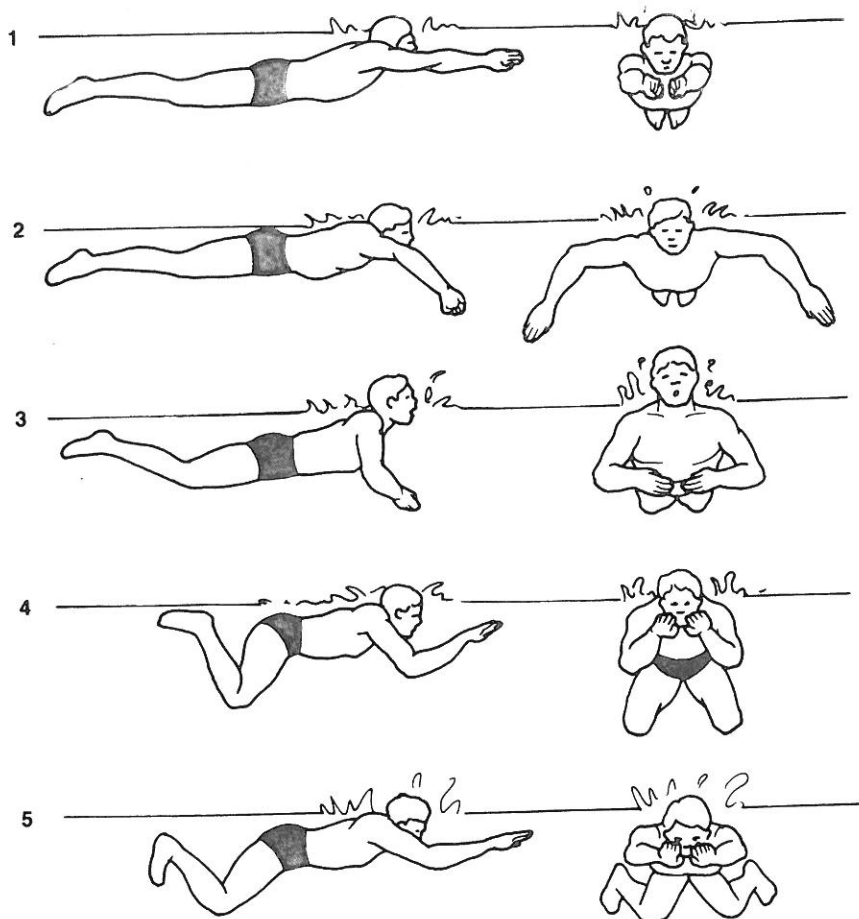


Fig. 32-9. Progressive steps in swimming the breaststroke.

is lifted to breathe and the knees begin their flexion for the kick recovery. The recovery of the arms begins under the chin as the hands join each other and are thrust forward to the starting position. At this point pause to allow for a glide. The entire arm stroke is a continuous, uninterrupted movement. Practice walking across the pool and coordinating the breathing with arm action technique.

### Whole stroke

Push off from the side of the pool with the body prone on the surface, fully extended, the face underwater. The arms pull as just described to a point under the chin, at which time the breath is taken and the legs are recovered with the feet spread and cocked for the drive. By this time the arms are already thrusting forward. When the arms are almost fully extended, the legs start the drive. The arms

pause for the glide when they have reached full extension. The legs also pause for the glide when they have closed at the end of the drive. The body is now fully extended. Exhale slowly during the glide. Repeat several strokes to time the movements smoothly and continuously from the start of the stroke to the end of the leg drive (Fig. 32-9). The breaststroke can easily be executed with the face out of the water, as may be required in some lifesaving situations. To accomplish this, the glide is shortened and the stroke requires more effort than normal.

### Crawl stroke

The crawl stroke (Fig. 32-10) is the fastest of all swimming strokes. It has been studied over the years, and engineering and mechanical principles applied to this activity have made it one of the most refined and specialized of all sports skills.

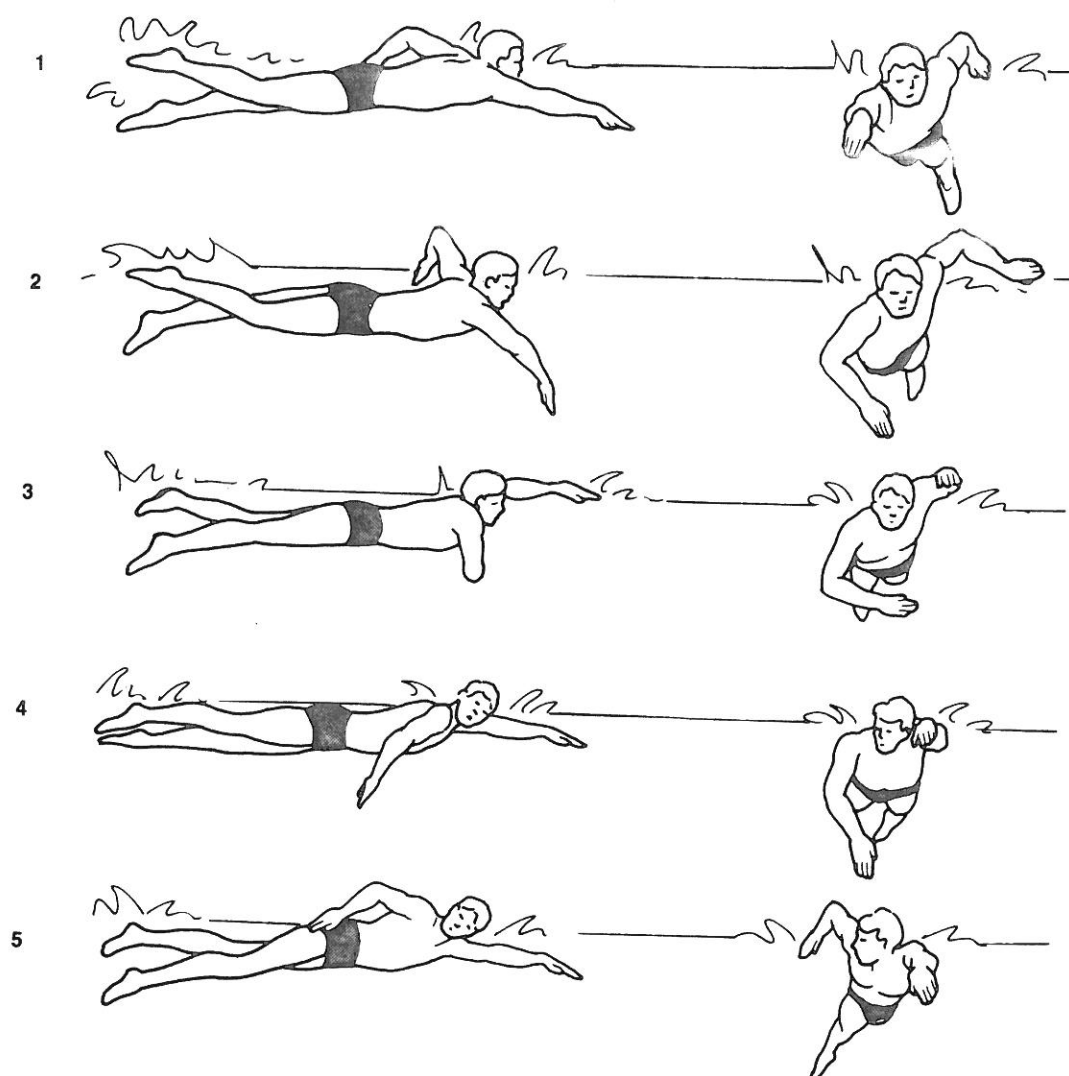


Fig. 32-10. Timing the arms and legs with breathing in the crawl stroke.

**Flutter kick**

The body is prone, with arms and legs fully extended, face under, and ankles stretched and close together. From this position the flutter kick is executed by alternately oscillating the legs vertically from the hips, forcefully and regularly. On each downward beat the foot turns inward (pigeon-toed). This occurs naturally if the ankles and feet are held loosely. This increases the surface area of the foot. In the upward beat the foot is extended, not pigeon-toed. Beginners should first attempt this kick while learning to hold the legs straight yet not rigid. This originates the movements from the hips. When this is learned and the thighs move up and down, the knee action can be learned. For example, look at the action of one leg only. In some ways it is similar to pedaling a bicycle. As the leg drives up, the sole of the foot pushes upward and remains there until the knee is almost straight on the downward beat. (See action of right leg in Fig. 32-10, 1 through 3.) This movement results in a quick down-up whiplash of the foreleg and foot at the end of the downbeat, the same principle used in the breaststroke kick. This skill can be learned by daily drills with the aid of a kickboard.

**Arm stroke (alternating)**

This stroke is executed by alternately reaching hand-over-hand forward into the water and pulling the body forward over the surface. The arm stroke has seven components: (1) entry, (2) support, (3) catch, (4) pull, (5) push, (6) release, and (7) recovery.

For the entry, place the hand in the water at a natural arm's length, directly in front of the shoulder. The fingers should enter the water before the elbow or shoulder. A comfortable reach should be made; never overreach. (See Fig. 32-10, 1 through 3.)

In modern speed swimming, as well as in teaching the crawl stroke to beginners, an opposition-rhythm type of stroke is prevalent. This means that the arms are nearly opposite each other at all times. However, if speed is desired, the fundamental mechanics of the stroke become quite complex and highly technical in obtaining the ease and balance necessary for good performance as well as speed. These technical essentials can be obtained once the fundamentals of the stroke have been mastered.

The beginner should not be concerned with speed in learning, but should merely be able to execute the arm stroke with reasonably good opposition timing.

The catch (the position the hand assumes when it is in the optimal position to begin propulsion) and pull should start first in the hand and then by bending the elbow slightly for good leverage (Fig. 32-10, 2). The pull shifts into a push as the arm passes under the chest toward the opposite hip. Then the push continues the drive to the release with the forearm and hand. (The release of one hand coincides with the catch of the other hand.) At this

point the shoulder begins to lift in preparation to recover the arm until the hand clears the surface at the hip.

The arm is then recovered to the entry by lifting the shoulder, bending at the elbow, and turning the hand so that the palm faces to the rear and gradually faces the water at entry. The arm recovery movement is up and outward, away from the hip, and forward to the water. The shoulder is held high while the hand and forearm enter the water. The desired high elbow position on the recovery, entry, and catch is made easier if the shoulders and hips are allowed to roll to both sides during a complete stroke. The rolling action should be symmetric, with the head held in a relatively stable position (Fig. 32-10).

**Whole stroke**

While the arms execute a complete revolution, the legs complete some number of evenly measured beats. In walking, the arms and legs move in a 1:1 ratio, an opposite-arm-and-leg counterbalancing movement. In swimming the crawl, a preferred (though not mandatory) leg-to-arm ratio is 3:1; that is, the legs perform three beats to each arm stroke, or six beats to each complete cycle of both arms. This ratio gives the stroke a counterbalancing movement like that in walking or running.

**Breathing**

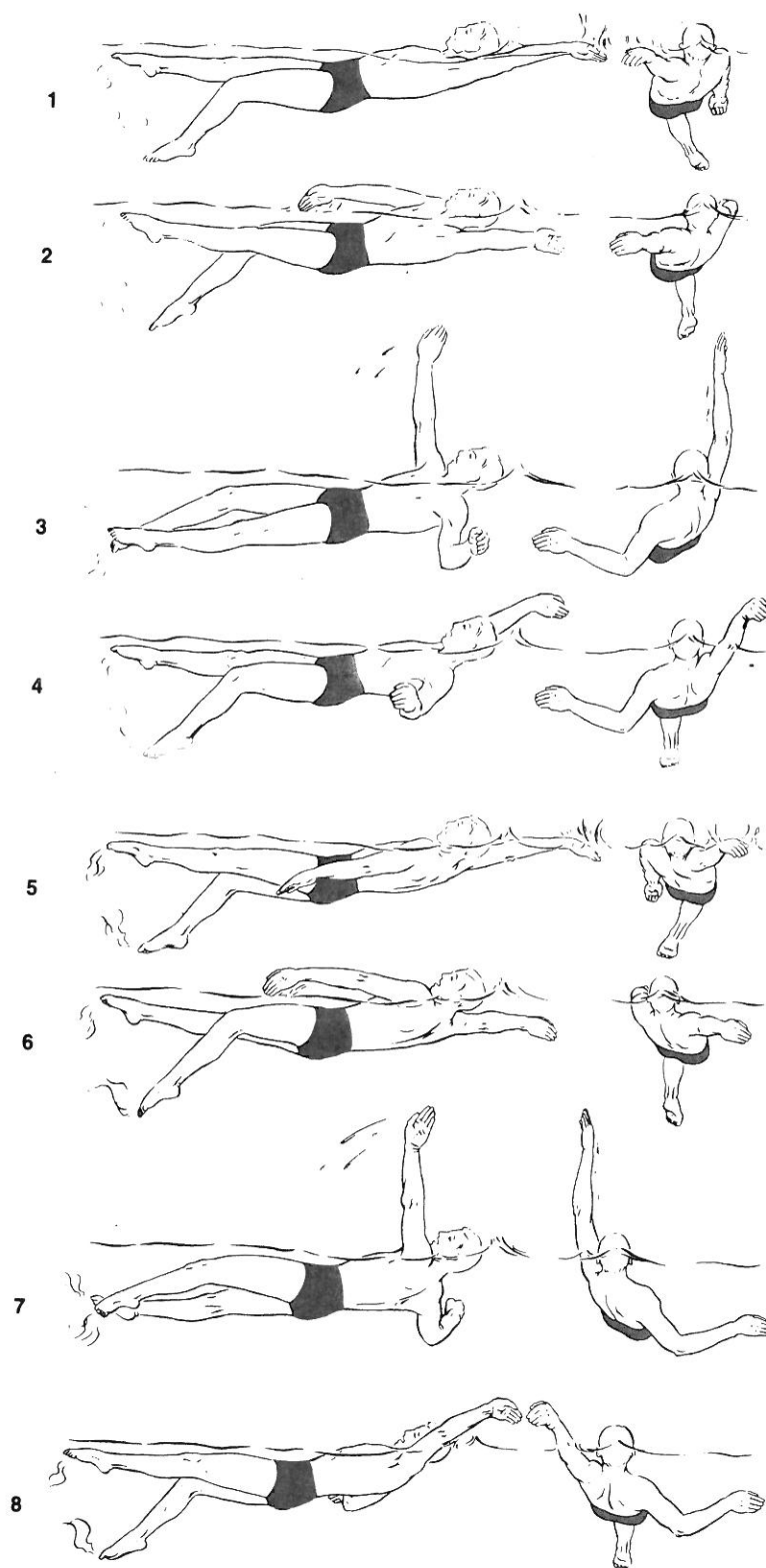
Breathing in the crawl stroke is executed as follows: just as the arm opposite the breathing side has entered the water and is stretching for the catch and the arm on the breathing side has completed two thirds of the pull, the head is turned to inhale and then immediately returned in line with the body. When turning the head for air, keep the chin in close to the throat and look to see if the mouth is inside the trough of the bow wave formed by the head. Take a quick breath as the mouth is opening; do not pause after opening the mouth. Curl the lips out away from the teeth when opening the mouth (Fig. 32-10, 4 and 5).

**Back crawl stroke**

The back crawl stroke (Fig. 32-11) is the fastest stroke done on the back. It differs from the crawl in that the face is not under the water during the stroke, so that breathing is simplified.

**Inverted flutter kick**

Essentially the kick is the same as the flutter kick in the crawl stroke. The body is extended on its back, legs held closely together, ankles and toes pointed, chin low on the throat, and the water level at the lower earlobes and around, not over, the chest. The legs move alternately up and down with action originating from the hips. On the upward beat the toes turn in, and on the downward beat they are extended. At the end of the upward beat the



**Fig. 32-11.** Progressive steps in swimming the back crawl showing the six leg beats and one revolution of the arm cycle.

kneecap should not break through the surface and the foot should throw some water above the surface without projecting out of the water. To accomplish this skill, the thigh, as in other styles of kicks, forcefully drives down just before the knee has straightened. This action gives the foreleg and foot an effective propulsive up-down whip. The ratio of leg kicks to one complete stroke revolution is 6:1, the same as in the crawl stroke.

### **Arm stroke**

The arms move in opposition to one another as if the swimmer has a broomstick across the back of the neck and shoulders with the arms extending out along the broomstick. The hands exit the water thumb-first and enter the water with the little finger first.

The moment the arm has finished its pull along the side of the thigh, the hand gives a final downward press as the shoulder is lifted out of the water and the hand is turned to face outward. The arm is bent slightly at the elbow at the beginning of the recovery phase, but it is straightened for the entry. The arm recovers to the entry with an upward swing and continues to the entry at a point not more than 6 inches (15 cm) outside the shoulder line. The hand and forearm should not be slowed as they near the point of entry, but should accelerate so that they are in the water before the shoulder can sink under.

The power, or pull, phase of the stroke can be done with either a bent or straight arm. The bent-arm stroke is used by high-level competitive swimmers and is more difficult to learn than the straight-arm pull, which is generally recommended when learning the backstroke. In the initial part of the straight-arm pull, the arm is shallow, about 2 to 6 inches (5 to 15 cm) underwater. As the arm reaches a point directly out from the shoulder, the depth should be about 6 to 10 inches (15 to 25 cm). From here, the arm continues until it reaches the leg and begins the recovery phase (Fig. 32-11). The bent-arm pull is initiated with the hand entering the water, little finger first, palm out, facing away and slightly backward, with the arm straight. Body roll is crucial to perform the bent-arm backstroke. At the point of entry, the body rolls onto the side of the arm entering the water. The hand enters the water and presses outward and downward until it catches the water. The catch with one hand and release with the other hand should coincide. The catch is made 12 to 18 inches (30 to 45 cm) below the surface. As the pulling hand presses downward, outward, and backward, the elbow bends. Next the hand presses upward, backward, and inward toward the hip and surface. The arm will have a maximum bend of about 90 degrees at this point and will be about 6 inches (15 cm) below the surface. The hand now increases its pulling speed and presses downward and outward. The final push downward is probably the most propulsive part of the stroke. In both types of

pulls the arm stroke should be smooth and relaxed throughout. A slight hip roll and a more pronounced shoulder roll permit an easier recovery and catch, as well as more efficient action of the opposite arm.

### **Breathing and head position**

Breathing should be continuous and rhythmic. Hold your head with the chin always lined up on dead center, never moving from side to side. The ears should be below the water surface. The head should be propped up as if it were on a pillow. The swimmer should be able to see his or her toes. Try to keep the body stretched to prevent sagging at the hips (Fig. 32-11).

### **Dolphin butterfly stroke**

The dolphin butterfly stroke was created in 1935 by David A. Armbruster, swimming coach at the University of Iowa, with the aid of one of his swimmers, Jack Sieg. The legs in this stroke move in unison in an up-and-down wavelike action that resembles the tail of a dolphin while swimming. The arms also move in unison in both the propulsive and the recovery phases. The arms recover bilaterally, low above the surface; are held nearly straight; and resemble the wings of a butterfly in flight.

The stroke is definitely dominated by the kick. This wavelike kick by the legs has become the fastest means of kicking through water. It is even faster than the alternating flutter kick used in the crawl and back crawl strokes, yet the basic characteristics of the dolphin kick are the same as those of the alternating flutter crawl kicks.

The dolphin butterfly stroke is very exhausting to the untrained individual. Except for use as a competitive swimming stroke, it has little, if any, value to humans. It is certainly not a survival stroke due to the high energy demands it requires of the swimmer. However, the stroke is included here because many students desire to learn it, if for no other reason than for its rugged, challenging action and for the satisfaction of being able to perform it.

### **Kick**

It is essential that before learning the dolphin kick the beginner thoroughly master the crawl flutter kick because the basic characteristics of the two are the same. When the flutter kick is learned and performed with ease, the student is well conditioned to attempt the dolphin kick. In daily training drills the practice of this kick works in well with the other stroke kicks in the all-stroke practice method.

As practice progresses, the student should lie face down on the surface of the water, kicking only, with the hands finning at the sides of the hips. As a final step of conditioning and training, and before the whole stroke is attempted, the student should submerge and practice the kick underwater during breath-holding intervals. The

hands should be finning at the sides of the hips rather than extended in front of the head. By practicing the kick underwater, the student is able to determine that progress is truly forward and not down or up. If either occurs, adjustment should be made to equalize the up-and-down beat in relation to the forward plane of progress. It is also essential while performing underwater to stress relaxing the entire spine from the shoulders through all the joints to the end of the toes. To help beginners become familiar with this movement, it is often practiced with the aid of swim fins. When the true shortened up-and-down beat of the kick and the up-and-down action of the hips have been mastered, the student has been properly trained and conditioned for learning the arm action.

**Downbeat.** Both legs sweep downward simultaneously. The hips flex, the knees flex, and the thighs move downward at the beginning of the downbeat. At the end of the downbeat the legs are fully extended, with the toes pointed and the hips flexed. At the completion of the downbeat, the feet are pressing downward with the most velocity and force in the entire kick. Loose ankles provide the whipping action necessary to be propulsive.

**Upbeat.** Hip extension moves the legs toward the surface while the legs are still straight. Gradually the knees start to flex as the legs move toward the surface.

### Arm stroke

The student should first practice the arm stroke by walking across the swimming pool, bent at the hips, chin at water level, stroking with the arms. The stroke can also be practiced while stationary, in the same position.

During the arm stroke the hands trace the shape of an hourglass underwater. The arms start the stroke from the point of entry, just outside the shoulders, pressing downward into a short lateral spread. The hands and forearms continue the pull backward with a quick inward action, with the hands coming very close together, elbows bent until they reach a point just under and ahead of the shoulders. From this point the power drive is completed backward and outward past the hips until the arms and hands have cleared the surface of the water. This final emphasis is delivered by straightening the elbows until shoulders, arms, and hands have cleared the surface of the water. From this action the arms also derive the impetus to swing laterally forward through the recovery phase to again reach the correct point of entry. During the recovery the arms are held nearly straight, palms facing the surface. The recovery should be executed without hesitation at the end of the power drive. The arms should enter the water with a soft plunge, the wrists slightly flexed toward the surface as they enter. Actually, the hands and forearms should enter the water slightly ahead of the upper arms and shoulders. At this point, without hesitation, the catch of the next stroke is started.

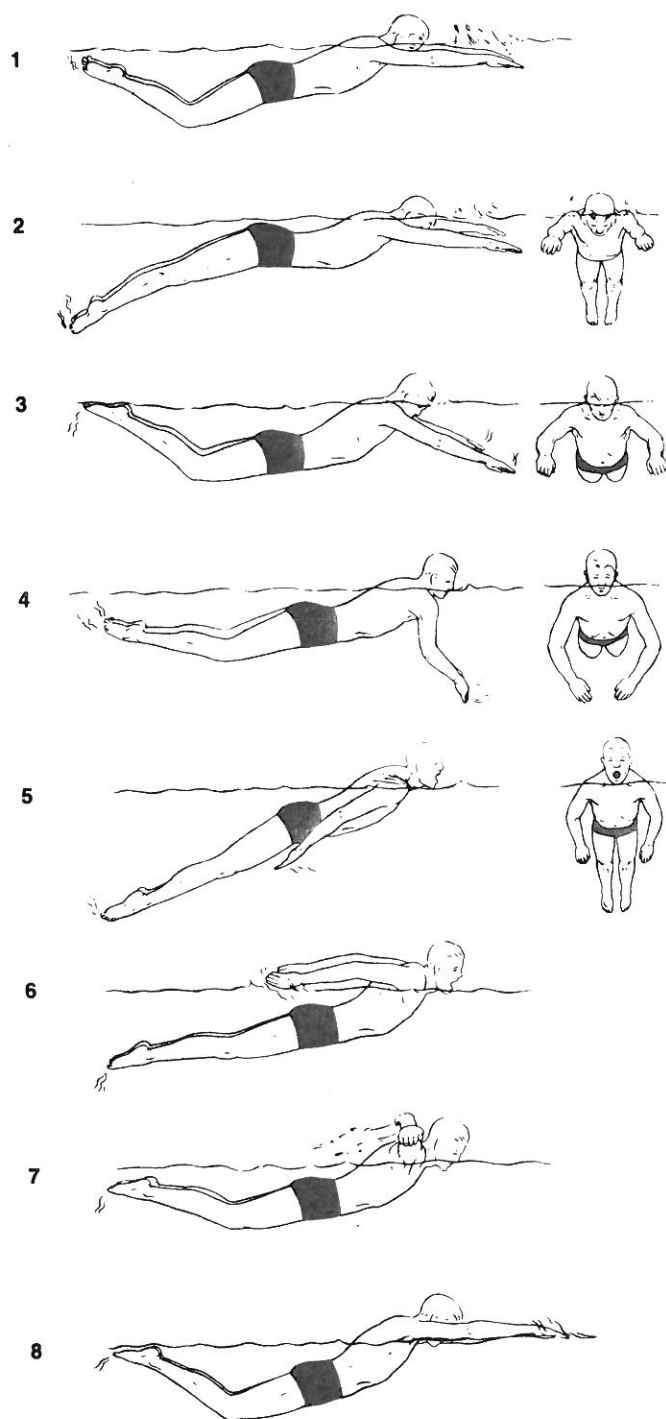
When walking or swimming across the pool practicing the arm stroke, the student should imagine the body moving toward the face of a large clock; the left arm should enter the water pointing to 11 o'clock and the right arm should point to 1 o'clock.

There is no pause in the entire stroke turnover. This is what is known in swimming terms as a *fast turnover stroke*; that is, the moment the arms complete the power drive, they go into the recovery to start the next stroke. Not only must the arms recover quickly, but the power drive of the arms must also be rapidly executed. It is this fast turnover cadence that makes the stroke so strenuous for the beginner, especially if the beginner is poorly conditioned. However, most students skilled in other strokes have an urge to learn the challenging, complex skills involved in performing this stroke.

### Whole stroke

The stroke is started by moving the arms forward laterally to the point of entry. The hands enter the water just outside the shoulders simultaneously, pointing to the 11 and 1 o'clock positions, respectively. As the hands execute the catch, with a slight spread and downward press, the first downward beat of the kick takes place (Fig. 32-12, 1 and 2). This downbeat of the kick is a natural counteraction caused by the powerful downward catch and pull of the forearms, similar to the counterswing of the arms and legs in walking or running. While the hands and arms execute the inward drive or pull to a point just ahead of the under the shoulders, the first upbeat of the kick has taken place (Fig. 32-12, 3 and 4). From this point the arms continue to complete the final power drive as the second downbeat of the kick takes place (Fig. 32-12, 4 and 5). This action is again a natural counterbalancing movement of legs and arms. As the arms drive out of the water at the hips and move into the recovery phase, the legs execute the second upbeat (Fig. 32-12, 6 through 8). Note that during the entire arm recovery phase there is only one beat of the legs, which is up, and none supporting the body. For this reason it is essential that the swimmer move the arms quickly from the end of the drive to the entry. This quickened movement will prevent the body from sinking below swimming level. The most troublesome part in learning the stroke is this latter phase. If the arms move too slowly or hesitate at any point between the final drive and the entry, rhythm and timing are lost.

In executing the entry, the arms plunge lightly into the water and immediately go into the catch to start the next stroke. The stroke should first be practiced without breathing until reasonably satisfactory timing is attained. Beginners often make the mistake of starting the recovery of the arms prematurely, before the arms and hands have cleared the surface of the water well back of the hips and straightened elbows (Fig. 32-12, 5 and 6).



**Fig. 32-12.** Progressive steps in swimming the dolphin butterfly stroke.

### **Breathing**

Correct breathing in the dolphin butterfly stroke is not too difficult, providing the beginner does not develop a tendency to climb too high to get a breath. In learning this skill, the student should again walk the arm stroke across

the swimming pool with the face submerged while executing the breathing and correct timing action of the head in the arm stroke cadence. Taking a breath every stroke should be practiced. Correct breathing habits in this stroke are essential to obtain ease of performance of the entire stroke.

To inhale, the swimmer should lift the head just far enough for the mouth to clear the surface of the water. This action takes place just as the arms have passed backward from under the shoulders and are completing their drive. Air is actually taken just as the arms clear the water and move into the recovery phase (Fig. 32-12, 4 through 6). Note how the finishing "kick" of the arm stroke gives the head the necessary lift to inhale. Emphasis is placed on dropping the head quickly (but not too deeply) into the water after air has been taken in and before the arm recovery has reached the point of entry (Fig. 32-12, 7 and 8). It should now be easy for the beginner to visualize why it is essential to quickly recover both the head and the arms to give support to the body during this phase of the stroke. Both the head and the arms are above the surface of the water during the second upward beat of the kick. If this phase of the stroke is not well timed and executed, the beginner will tend to sink too deep in the water and then have to climb too high to get air. With practice, proficiency is acquired and the tiring, unnecessary movements are minimized.

### **LEARNING PROGRESSION FOR BEGINNERS**

1. Review swimming pool landmarks regarding pool depths, any unique features of the natatorium, and personal safety rules
2. Orientation and adjustment to water in order to overcome loss of body weight, loss of balance, and loss of body heat, all of which disturb the beginner psychologically, physiologically, and physically
  - a. Submerging the face, opening the eyes, and holding the breath
  - b. Shipping water with the mouth
  - c. Breathing with bobbing exercises
  - d. Floating, tucked and body straight, on both the face and back
3. Adjustment of the hands and feet to paddling in shallow water
  - a. Sculling with and without the feet
  - b. Finning with and without the feet
  - c. Treading water with and without the feet
4. Unskilled strokes on the face, sides, and back
5. Skilled strokes (basic strokes)
  - a. Kicks
    - (1) Flutter
    - (2) Scissors (both sides)
    - (3) Whip

- b. Arms strokes (basic strokes)
  - (1) Alternating stroke with breathing
  - (2) Sidestroke with breathing
  - (3) Breaststroke
  - (4) Resting inverted breaststroke
- 6. Synchronizing or timing of arms and legs in all strokes—part-whole method, that is, breaking down each stroke from the whole into its component parts and by progressive stages building it again into the whole stroke
- 7. Orientation in distance swimming

### LEARNING PROGRESSION FOR INTERMEDIATE SWIMMERS

Instruction in intermediate swimming is given to those who have taken and passed the beginner's course; those who have never had instruction but can pass the beginner's test, although they have no knowledge of stroke technique; or those who can swim in deep water.

1. Study pool sanitation and personal health and hygiene.
2. Review strokes, and review techniques of proper breathing.
3. Practice and drill on the techniques and timing of the leg action in all the stroke kicks.
4. Coordinate and time the technique of the arm action with the leg action and breathing action; review the diving techniques.
5. Start orientation to distance swimming, emphasizing relaxation and natural breathing.
6. Practice fundamental dives from the springboard.
7. Learn and practice safety factors for self and others, such as tired-swimmer's stroke, a simple rescue, simple carries in towing, and resuscitation.
8. Swim distances, stressing ease in breathing, relaxation, and the distribution of effort over distance comfortably.

### LEARNING PROGRESSION FOR ADVANCED SWIMMERS

Instruction in advanced swimming is given to those who have passed the intermediate course or have achieved the ability to swim  $\frac{1}{4}$  mile (0.4 km) and have demonstrated all of the standard strokes.

1. Practice timing the strokes to develop ease of performance with added power and speed, thereby gaining confidence.
2. Swim each stroke 100 yards (91 m) with correct timing.
3. Swim 25 yards (22.9 m) on each side, holding the upper arm out of the water fully extended.
4. Swim 25 yards (22.9 m) on the back, holding both hands out of the water.

5. Swim  $\frac{1}{4}$  mile (0.4 km) mile in 8 minutes or less.
6. Learn a good racing start and good technique in turning at the end of the pool.
7. Be able to do at least three dives from the springboard in good form.
8. Learn safety factors in small craft.
9. Swim safely for 20 minutes.
10. Learn how to wade properly in water of unknown depth.
11. Learn how to swim out of a swift current.
12. Learn how to assist another person temporarily in distress in deep water.
13. Learn how to swim for two people.
14. Swim under water for a distance of 25 yards (22.9 m).
15. Learn how to conserve strength.
16. Learn how to rest while tired in deep water.
17. Learn boatmanship:
  - a. Paddling and rowing.
  - b. What to do when capsized.
  - c. How to land safely when capsized.
18. Be able to teach others how to swim.
19. Learn how and when to make a safe rescue.
20. Be able to demonstrate proper resuscitation.

### TEACHING CONSIDERATIONS

1. Skilled lifeguards should be on duty in the pool for all instructional sessions.
2. Beginning classes should contain fewer students than intermediate or advanced classes. All classes should be ability grouped as specified in the chapter.
3. Include review and practice in all sessions.
4. Basic stroke technique is easier to understand if demonstrations and initial practice take place out of the water.
5. Consider using a "buddy" system for safety and skill feedback.
6. Work first for technique and then use strokes for distance.
7. With intermediate and advanced swimmers, consider why students are taking the course. Competition, endurance, and recreational goals require different teaching orientations.

### SUGGESTED READINGS

- Colwin C: *Swimming into the 21st century*, Champaign, Ill, 1992, Human Kinetics. Presents an overview of every phase of competitive swimming, swimming research, practical coaching advice, and training schedules.
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