Swimming Starts and Turns

Introduction

Starts and turns are fundamental aspects of competitive swimming that significantly influence overall race performance. These techniques allow swimmers to maximize propulsion, minimize time loss at the walls, and maintain momentum across strokes like freestyle, backstroke, breaststroke, and butterfly.

Effective starts and turns can account for up to 10-20% of total race time in shorter events, making them critical for elite and developmental athletes alike. Mastering them enhances hydrodynamic efficiency and reduces drag during entry and exit phases. For adolescent swimmers, early training in these skills supports technique refinement and injury prevention.

There are two primary starts: the grab start, where both feet are positioned on the block edge for a balanced push, and the track start, with one foot forward on a raised pedal for greater explosive power. The grab start enables rapid activation, while the track start optimizes forward drive, particularly in sprint events. Swimmers may fully submerge up to 15 meters post-start, fully extending the body underwater.

Turns fall into hand-touch (open) turns for breaststroke and backstroke, and tumble turns (culbutes) for freestyle and butterfly, which involve a forward somersault for faster wall contact and push-off. Transitional turns in medley relays combine elements for stroke changes. Proper execution prioritizes a tight streamline position off the wall to glide efficiently.

4.1 Starts

The International Swimming Rules determine the style or method that the swimmer must follow. Article 4 of the rules confirms that in the starts for freestyle, breaststroke, butterfly, individual medley, and freestyle relay, swimmers must dive from the starting block upon hearing the starting signal.

When swimmers hear the long whistle from the referee, they must all step onto the starting blocks and remain there until they hear the command from the starter (“Take your marks”). At this moment, swimmers must assume the starting position by placing one foot on the front edge of the starting block or both feet together, and the starter gives the starting signal after ensuring that all swimmers are motionless in their positions. (World Aquatics. Rules, 2023-2025).

4.1.1 Phases of the Start from the Starting Block

4.1.1.1 Two-Foot Start (Conventional Start – Grab Start)

Figure. 01: Grab Start (Two-Foot Start)

4.1.1.1.1 Ready Position Phase

This is the most commonly used method among swimmers. The swimmer stands with both feet on the front edge of the starting block, with the toes gripping the edge from the outside. The distance between the feet is preferably shoulder-width, although this varies among swimmers due to differences in body characteristics.

The hands grip the front edge of the block and may be placed either outside or between the feet. The knees are flexed at an angle between 30 and 40 degrees, the head is lowered between the arms, the gaze is directed toward the water below the block, and the swimmer concentrates on hearing the starting signal.

This technique allows for a longer flight distance in the air and a nearly vertical water entry, with the hands entering first, followed by the head, trunk, and legs, forming as small a circle as possible. This reduces resistance caused by water impact and contributes to a deeper entry and smoother underwater glide. However, this method is slower in leaving the starting block compared to the track start.

4.1.1.1.2 Pull Phase

Upon hearing the starting signal, the swimmer pulls the hips upward, allowing the center of mass to move forward and downward beyond the front edge of the block. At this moment, the swimmer feels as if they are about to fall into the water.

The swimmer then extends the legs at the hip and knee joints, which further enhances the forward fall toward the water. This position forces the swimmer to begin leaving the starting block.

4.1.1.1.3 Push-Off Phase

This phase begins when the swimmer leaves the starting block, immediately after the body moves forward and downward due to the sensation of falling. At this moment, the knee extension angle reaches approximately 80 degrees, and the legs are extended.

The force generated by extending the hip and knee joints directly contributes to the propulsive force of the feet and ankles against the starting block. After the hands release the block edge, the arms extend rapidly forward in a nearly semicircular path until they reach beneath the chin. The head moves in coordination with the arms until the toes leave the block, at which point the swimmer looks downward.

The swimmer leaves the block forming an angle between the extended legs and the surface of the starting block ranging between 40 and 50 degrees, depending on the swimmer's characteristics, pushing ability, and swimming stroke.

4.1.1.1.4 Flight Phase

After leaving the starting block, the swimmer's body is fully extended in the air. When the swimmer's midsection (waist) reaches its highest point, the swimmer begins to snap the legs upward while the head moves downward between the arms, preparing for water entry in as small a circle as possible.

4.1.1.1.5 Entry Phase

The swimmer must enter the water through the opening created by the hands, following a streamlined line as much as possible, with the arms fully extended together above the upper part of the head. Entry begins with the fingertips, followed by the arms, head, trunk, legs, and finally the feet, with the toes fully extended backward.

The entry angle ranges between 30 and 40 degrees relative to the water surface. This angle varies depending on the stroke: breaststroke swimmers prefer a deeper entry to allow for a longer pull, while freestyle swimmers prefer a quicker return to the surface. Therefore, freestyle swimmers perform fast downward dolphin kicks to help surface more quickly.

4.1.1.1.6 Glide Phase

After entering the water, the swimmer should glide in a streamlined position for a short duration, especially in short-distance events. The body must remain straight, avoiding excessive arching at the waist, which delays speed.

The swimmer should not wait until speed decreases, as this requires additional effort to reaccelerate. Therefore, the swimmer must determine when to begin leg kicks to support the glide in freestyle and butterfly, and when to initiate the arm pull in breaststroke.

4.1.1.1.7 Pull-Out Phase (Surfacing)

Freestyle and butterfly swimmers prefer to begin dolphin kicks at the start of the glide, performing 2 to 4 kicks, depending on individual technique, as the allowed underwater distance is up to 15 meters. These kicks are sufficient to bring the swimmer to the surface, provided they are performed while maintaining streamlining.
For freestyle swimmers, the first arm pull helps bring the swimmer to the surface. Alternating leg kicks should begin with the arm pull and continue until the swimmer surfaces. Breathing should be avoided upon surfacing; instead, it is recommended to delay breathing until one or more full arm cycles are completed.

Butterfly swimmers should continue dolphin kicks even when initiating the arm pull with both arms and should avoid breathing upon surfacing.

Breaststroke swimmers, after completing the first arm pull and beginning the second, should raise the head before the pull is completed. Breaststroke swimmers are allowed to inhale during head emergence and then continue swimming.

4.1.1.2 Alternating Foot Start (Track Start)

Figure. 02: Track Start

4.1.1.2.1 Ready Position Phase

This modern technique is widely used and resembles the sprint start in athletics. The swimmer places one foot at the front edge of the block and the other foot behind, similar to a track athlete's starting position. Both hands grip the front edge of the block.

The swimmer trains to position the center of mass over the rear leg. This technique is well suited for explosive starts.

It allows for a faster takeoff due to quicker forward transfer of the center of mass and shorter time to water entry, though with a shorter flight distance. Propulsion occurs sequentially—first from

the rear leg, then from the front leg. However, this method may cause slight time loss due to a sharper entry angle, increasing impact resistance with the water.

4.1.1.2.2 Pull Phase

At the starting signal, the swimmer pulls the hands forward and downward, causing the body to lean forward and downward. The rear leg extends first, immediately followed by the front leg. Simultaneously, the arms move forward and upward in a semicircular path until reaching the optimal entry position.

4.1.1.2.3 Push-Off Phase

The swimmer pushes first with the rear leg, followed by the front leg, focusing on transferring the center of mass forward. The arms snap forward and upward beneath the chin while the front foot continues pushing against the front edge of the block until the leg is almost fully extended.

4.1.1.2.4 Flight Phase

After leaving the block, the swimmer travels through the air in a nearly straight line. This does not require a high jump or excessive arching, but rather an angle that allows linear flight. When the waist reaches its highest point, the swimmer snaps the legs upward and moves the arms and head downward between the arms.

4.1.1.2.5 Entry Phase

Water entry is similar to the two-foot start. The swimmer should enter the water at nearly one point, with the hands overlapping, followed by the forearms, head, trunk, legs, and fully extended feet. The entry angle is smaller than in the conventional start, which helps freestyle sprinters avoid deep entry.

4.1.1.2.6 Glide Phase

After entry, the swimmer decides when to begin dolphin kicks in freestyle and butterfly to maintain streamlining. In freestyle, after one dolphin kick (depending on technique), the swimmer may perform 2 to 4 alternating leg kicks before surfacing.

4.1.1.2.7 Pull-Out Phase

Before reaching the surface, the swimmer initiates the pull with the dominant (leading) arm while maintaining a straight trajectory. After completing the pull, the head breaks the surface. Breathing should be avoided during at least the first full arm cycle after surfacing.

4.1.2 Start from the Water (Backstroke Start)

According to international swimming rules, backstroke and medley relay events begin from the water. Swimmers enter the pool at the first long whistle. At the second whistle, swimmers move to the wall beneath the starting block. After swimmers take their positions, the starter gives the

command “Take your marks,” and once all swimmers are motionless with toes on the wall, the starting signal is given.

4.1.2.1 Ready Position Phase

The swimmer faces the wall, gripping the starting handles beneath the block with both hands. The feet are placed on or below the water surface against the wall, with toes touching the wall and heels away from it. The legs and hips are inclined in the water.

At the command “Take your marks,” the swimmer bends the elbows and pulls the trunk upward into a crouched position. The head is lowered between the arms, with the chin touching the upper chest. The hips, legs, and heels are brought closer together. Some swimmers use one-leg support, others both legs; research has not shown significant performance differences.

4.1.2.2 Push-Off Phase

At the starting signal, the swimmer throws the head upward and backward, eyes facing the wall. The trunk is pushed upward and backward by pulling on the handles, followed by rapid release of the hands and snapping them overhead. Simultaneously, the legs extend at the knees and ankles, pushing forcefully against the wall with the toes, generating backward propulsion.

4.1.2.3 Flight Phase

The swimmer’s body travels through the air in an arched trajectory. The arms are extended overhead, and the head is positioned backward beneath the arms. Although foot entry causes resistance, a higher takeoff angle and good back arch reduce this resistance.

4.1.2.4 Entry Phase

The swimmer enters the water in a straight line: hands first, followed by arms, head between the arms, trunk, and extended legs. The swimmer attempts to create a narrow opening in the water with the hands and head. Because the trunk is close to the surface during flight, the hips usually enter smoothly behind the head. Maintaining leg extension reduces impact resistance.

4.1.2.5 Glide and Leg Kicks Phase

Upon water entry, the swimmer snaps both legs downward to align the body for underwater glide. Dolphin kicks are then performed to approach race speed, up to 15 meters. Typically, 3 to 6 dolphin kicks are recommended. If the swimmer is weak in underwater dolphin kicking, alternating kicks (2–4) may be used instead.

4.1.2.6 Pull-Out Phase

The swimmer initiates the arm pull at the appropriate time to surface smoothly. After completing the pull, the swimmer establishes the backstroke rhythm while maintaining a streamlined body position near the surface.

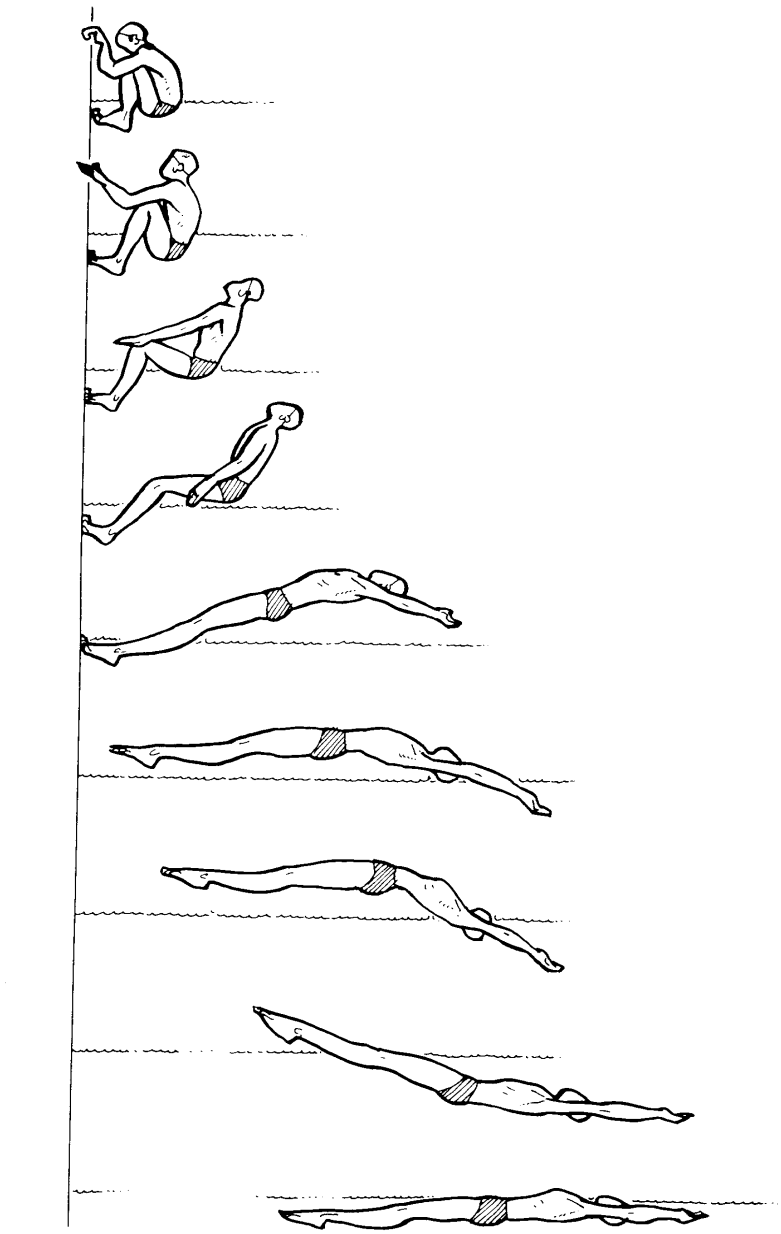

Figure. 03: Backstroke Start

4.2. Turns in the Four Swimming Strokes

4.2.1. Turn in Freestyle Swimming

The freestyle turn can be divided into the following phases:

4.2.1.1. Approach Phase

This phase begins approximately 5 meters before the pool wall, a distance indicated by the red lane markers on both sides of the pool. During this phase, the swimmer must maintain forward speed without deceleration, as higher speed allows for a faster and more efficient turn.

The final arm stroke is usually performed at a distance of approximately 1.7 to 2.0 meters from the wall, depending on the swimmer's anthropometric characteristics, technical proficiency, and race distance.

4.2.1.2. Rotation Phase (Flip Turn)

This phase begins when the first arm completes its pull toward the hip. The swimmer tucks the chin toward the upper chest while the opposite arm finishes its push phase. At this moment, the swimmer pulls the knees toward the abdomen, preparing for the somersault rotation.

During the rotation, both arms remain close to the body, with the hands positioned near the hips. At the end of the rotation, the palms face downward, and the swimmer presses the hands downward to assist in lifting the head toward the water surface. The head remains positioned between the arms while the feet search for and contact the wall.

At the end of this phase, the swimmer rotates around the longitudinal axis until reaching a lateral body position. The speed of rotation should be as high as possible.

4.2.1.3. Push-Off Phase

This phase begins when the swimmer's feet make contact with the wall at a depth of approximately 30 to 40 cm below the water surface. The swimmer then extends the legs and pushes explosively against the wall.

The push-off is executed while the body is in a lateral position, with the arms extending forward. The body then returns to a horizontal position, marking the beginning of the glide phase. A powerful push-off is essential to achieve a streamlined position and an effective glide.

4.2.1.4. Glide Phase

This phase begins immediately after the push-off. The swimmer's body is horizontal, streamlined, and fully extended underwater, with the arms stretched forward above the head, the legs extended backward, and the toes pointed. The hands are placed one on top of the other, preferably with the pulling arm's hand underneath.

The glide continues until the swimmer approaches optimal forward speed. Depending on race distance and technique, underwater dolphin kicks may be used to maintain momentum.

4.2.1.5. Pull-Out and Surfacing Phase

This phase begins when the swimmer feels close to the appropriate forward speed and approaches the water surface. Alternating leg kicks are used to assist in surfacing. The swimmer initiates the pull with the stronger arm, followed by the second arm.

Breathing should be avoided during the first complete arm cycle upon surfacing to minimize hydrodynamic resistance and maintain a horizontal body position.

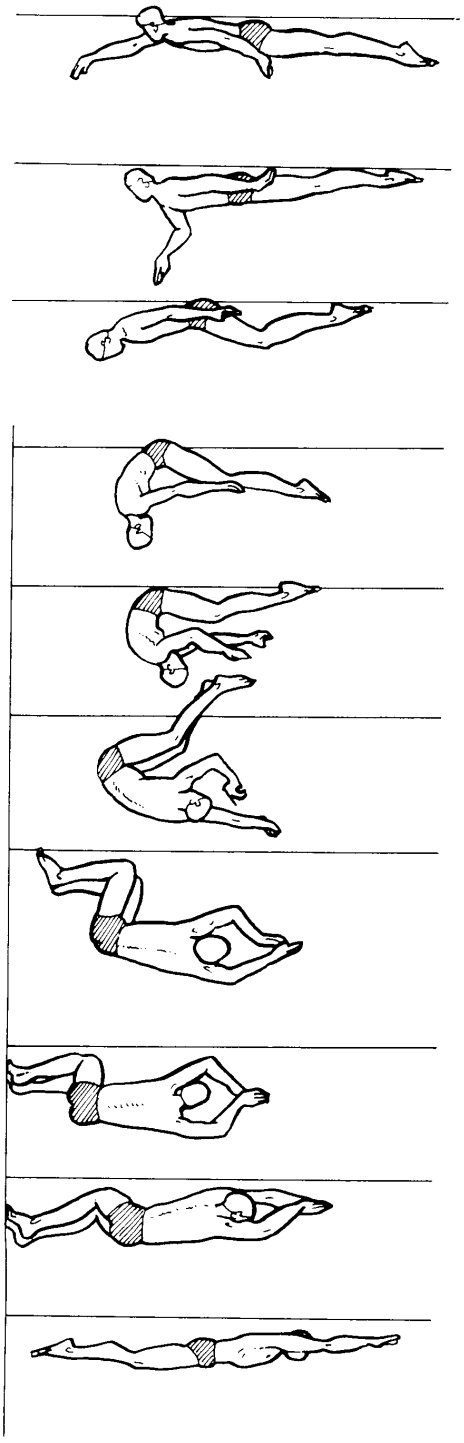

Figure. 04: Freestyle Turn

4.2.2. Turn in Backstroke Swimming

Recent updates to international swimming regulations allow backstroke swimmers to perform underwater dolphin kicks up to 15 meters after the turn. Swimmers are also permitted to rotate from a back position to a breast position before initiating the turn, provided that no arm or leg movements occur except those directly related to the flip turn. The swimmer must return to a back position before leaving the wall.

To assist swimmers in judging the distance to the wall, flags are placed 5 meters from the wall across the width of the pool.

4.2.2.1. Approach Phase

This phase begins approximately 5 meters from the wall. In modern backstroke turns, the swimmer uses the final two arm strokes to prepare for the turn. When the first of these strokes enters the water, the swimmer rotates the body around the longitudinal axis from a back position toward a breast position.

During this transition, the first arm continues its pull while the opposite arm completes its recovery above the water. No leg kicks are permitted during the transition phase.

4.2.2.2. Rotation Phase

When the second hand enters the water, the swimmer initiates the forward somersault. The chin is tucked toward the chest, resulting in spinal flexion. At this moment, leg movement becomes permitted, and a dolphin kick is recommended to raise the hips and accelerate rotation.

4.2.2.3. Push-Off Phase

At the completion of the rotation, the hands are positioned above the head, and the feet are placed firmly against the wall. The swimmer then extends the legs explosively to push off the wall.

The arms are extended forward with one hand placed over the other, and the swimmer must return to a back position before leaving the wall. The push-off angle should be slightly downward to facilitate an effective glide.

4.2.2.4. Glide Phase

After leaving the wall, the swimmer maintains a horizontal, streamlined back position underwater. Dolphin kicks may be used during this phase, provided that the distance does not exceed 15 meters. Toward the end of the glide, the body angle gradually directs the swimmer toward the water surface.

4.2.2.5. Undulation, Pull, and Surfacing Phase

As the swimmer approaches optimal forward speed near the surface, alternating leg kicks are used to assist in surfacing. The swimmer initiates the pull with the stronger arm, followed by the second arm.

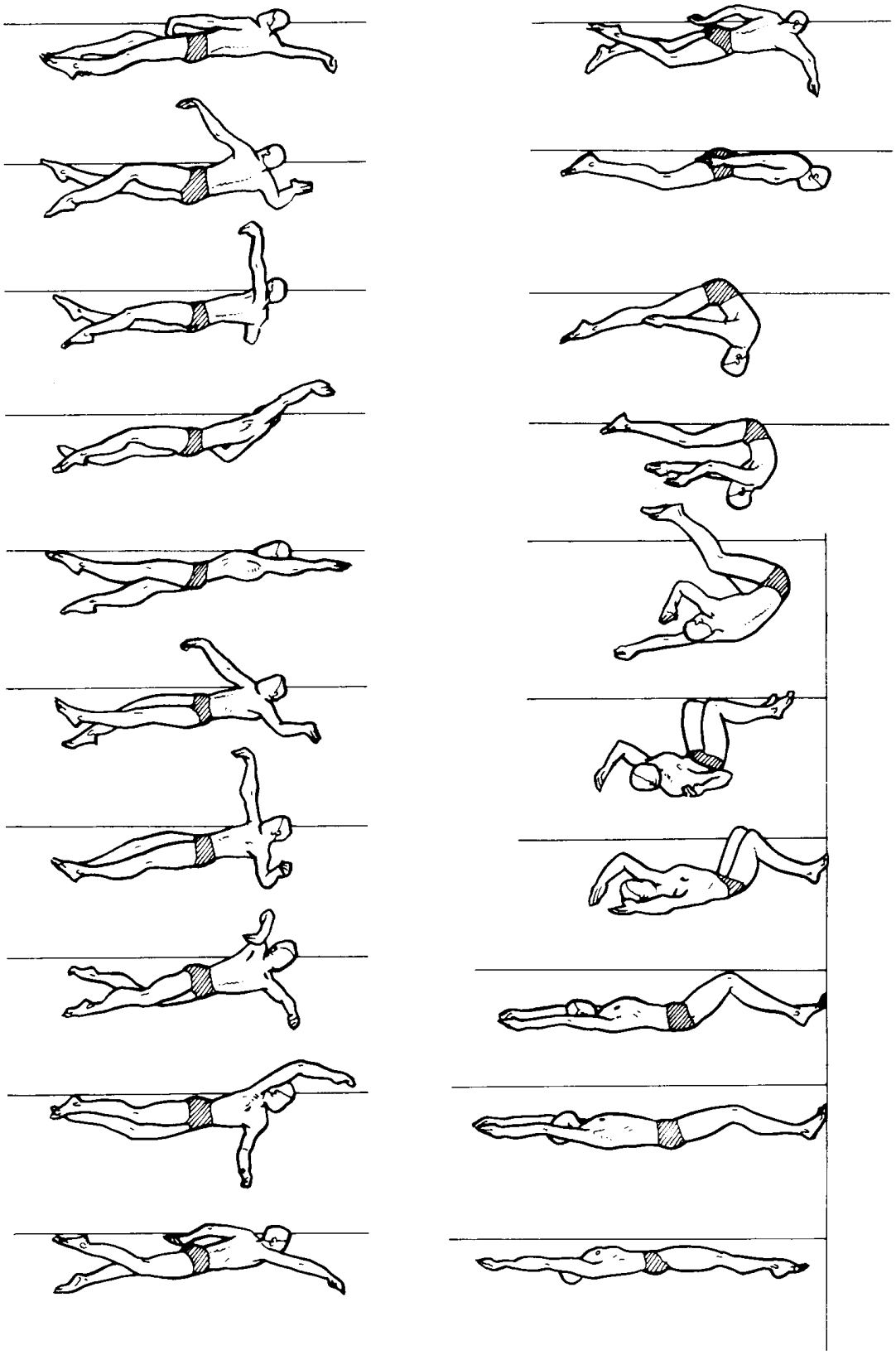

Figure. 05: Backstroke Turn

4.2.3. Turn in Breaststroke and Butterfly Swimming

The turns in breaststroke and butterfly follow a similar sequence from approach to glide.

4.2.3.1. Approach Phase

This phase begins during the final 5 meters before the wall, identified by red lane markers. The swimmer must maintain speed and accurately judge the number of arm strokes required to reach the wall.

The swimmer must touch the wall with both hands simultaneously, either above or below the water surface, with the shoulders level and parallel to the water surface.

4.2.3.2. Rotation Phase

This phase begins after the two-hand touch. The swimmer immediately releases one hand and directs it downward and backward underwater while extending the elbow. Simultaneously, the knees are drawn toward the abdomen, and the feet search for the wall.

4.2.3.3. Push-Off Phase

At the beginning of this phase, the body is positioned nearly sideways, with the feet planted on the wall and the knees flexed. The hands come together, the head is positioned between the arms, and the swimmer pushes explosively off the wall.

The push-off angle differs between strokes: breaststroke swimmers push off at a downward angle, whereas butterfly swimmers aim for a more horizontal angle. The swimmer must achieve a fully streamlined position at the end of the push-off.

4.2.3.4. Glide and Surfacing Phase

The swimmer glides in a streamlined position until approaching optimal forward speed. Butterfly swimmers initiate underwater dolphin kicks while respecting the 15-meter limit and continue kicking during the first arm pull. Breathing should be delayed upon surfacing.

In butterfly events:

- **50 m and 100 m**: breathing is recommended after two or more arm cycles.
- **200 m**: breathing may occur after one complete arm cycle.

Breaststroke swimmers perform a full underwater arm pull followed by one complete leg kick. During the second arm pull, the head emerges before the completion of the pull, allowing inhalation before continuing surface swimming.

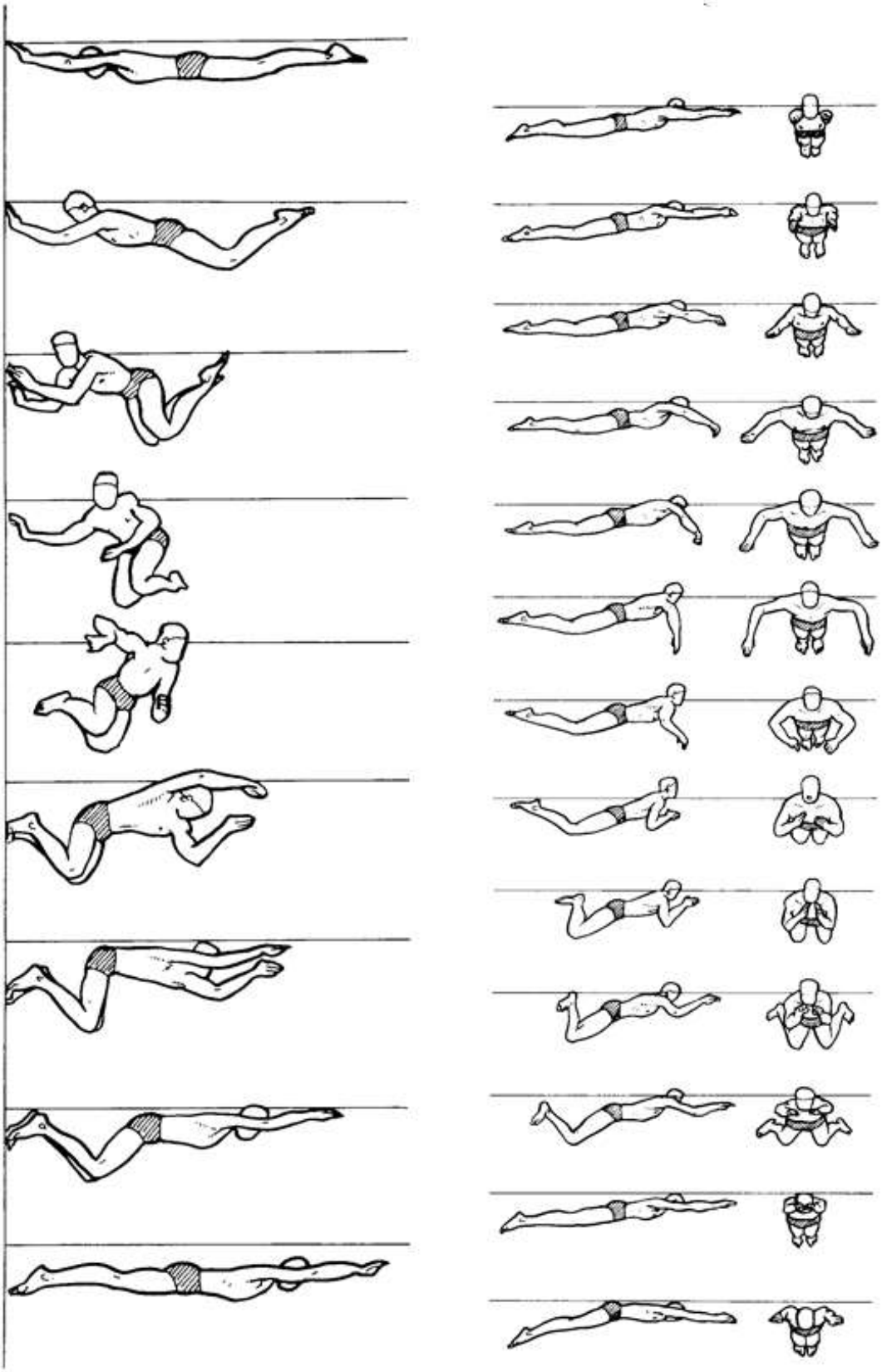

Figure. 06: Breaststroke and Butterfly Turn