Butterfly Technique Checklist

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Armstroke
Entry
- Arms enter the water with hands about shoulder width apart and slice into the water creating minimal drag. Hands should be at their narrowest position upon entry and not push towards each other once submerged. Pushing towards each other will greatly increase drag and decrease forward velocity by up to 50%. The detrimental action is evident by a large splash directed horizontally.
- Hands should be 45° to the surface with the thumbs contacting first. This places the shoulders in a position of full abduction and medial rotation. The scapula is elevated as much as possible to increase the range of motion of the shoulders and allow for a greater amount of time to pull the water.
- During a non-breath stroke the head remains down allowing for a greater range of motion at the shoulders.
- Elbows should be slightly flexed to allow a smooth transition from entry to outsweep.
- The entry occurs at the beginning of the downbeat of the first and larger kick.
- The body position should be as close to horizontal as possible as the hands enter the water.

Outsweep
- Hands begin to move outwards as the elbow flexes and shoulder adducts. They continue to move outwards until they are just past shoulder width.
- The fingertips lead this motion as it is performed with a slightly cupped hand position.
- This is a relatively short phase and can be described as stretching of the muscles in preparation for the catch and the beginning of the propulsive phases.
- If timed properly it is a reaction to the down beat of the main dolphin kick that causes your hips to rise and your shoulders to fall. This in turn pushes your hands outward slightly.
- You should not turn your hands inward until the downbeat of the kick is completed. Improper timing will result in decreased propulsion gained from the downsweep and insweep.

**Catch**
- This coincides with the completion of the downbeat of the dolphin kick.
- Your hands change position from an outward and back pitch to a position of outward and **downward** and back. This action is done through a minimal amount of elbow flexion and shoulder medial rotation and adduction.
- Body position should include a shoulder angle of 150 degrees hyperflexion as well as 150 degrees of flexion at the hip. Knees should be fully extended as the downbeat of the first dolphin kick has just been completed.

![Figure 2. Hips are flexed around 150-degrees, along with 150-degrees of shoulder hyperextension. Knees are in full extension.](image)

**Downsweep**
- After the catch your hands sweep down and out in a circular path as the shoulders continue to adduct and the elbows continue to flex. This phase ends as your hands reach their deepest point.
- It is important that this phase is executed with a hand that is pitched out and back. Pushing straight down will create a large drag force that will propel your head and trunk upwards while generating little forward velocity. Instead, the swimmer should maintain an outward pitch of the hands and sweep them outwards throughout this phase.
- A sign of an improper downsweep is the early dropping of the elbows. **High elbows are critical in this part of the armstroke!!!**
- Excessive undulation of the body will result in the downward motion of the hands in order to bring the head back to the surface. This climbing action both wastes
energy and decreases aerodynamics and should therefore be avoided. *(Note: some elite swimmers display large amounts of undulation. This is only beneficial if the added force of the larger stroke is enough to off set the decreased aerodynamics of the poor body position)*

Figure 3. The Downsweep. Elbows must remain close to parallel to water surface. Hands are pitched out and back.

**Insweep**

- The insweep occurs from the time your hands pass under your elbows till they are below the middle of your trunk. This is associated with flexion of the elbows and extension and adduction of the shoulders. This action results in a hand path that is inwards, upwards and backwards.
- This is a high force movement and critical to the overall propulsion of the arm stroke. Consequently you should focus on accelerating your arms from the beginning to end of this phase.
- Some elite swimmers bring their hands in close to each other along the midline and some keep them almost shoulder width apart. Both techniques are seen at world class levels and neither has been found to be superior.
- The head and shoulders are exiting the water at this time.
- A common mistake during the insweep is pitching the hands inward too early. If they are pitched inward before they pass under the elbows some propulsive force is lost prior to the last portion of the sweep.
Figure 4. The Insweep. Hands get shoulder width apart, or closer. Shoulders are well flexed and adducted during propulsion.

Upsweep
- The beginning of the upsweep overlaps with the end of the insweep. The direction of your hands changes from inward, upward and backward to backward, upward and outward.
- The hands should be at an angle of 60-70 degrees to allow for a great amount of water to be moved. This is perhaps the most forceful phase of the stroke and backward hand motion is at its maximum. Hand speed should be at its maximum as well.
- The hands approach the anterior of the upper thigh. At this point you should relax the wrists so the force of the water pressure places your wrists into an extended position. Palms should be turned into the body to decrease the amount of energy required to slice out of the water leading into the recovery.
- A common mistake is pushing the water more upwards than backwards in this phase. This will result in lowering the hips and contributing little to forward propulsion.

Recovery
- The recovery is the action of the arms above the surface of the water.
- This occurs immediately following the downbeat of the second kick.
- Your elbows should break the surface while your hands are still completing the upsweep. As your arms leave the water, your elbows should not be completely extended but only extend in mid recovery. From there they flex again slightly prior to entry.
- Your shoulders should be fully out of the water to allow for a lower recovery angle of the arms. If the shoulders remain down, they must horizontally adduct to a greater degree (and use more energy) to prevent the arms from contacting the water. However, shoulders that come too high out of the water will cause an increase in form drag and should therefore be avoided. *It is not effective to bring the shoulders out of the water if they travel up faster then your body is moving forward.*
- The wrists remain relaxed throughout the recovery.
- During the middle of the recovery (as the arms are coming around) the body goes through a slight glide phase. Towards the end of the recovery the knees and hips start to flex in preparation for the main kick.
- There is no advantage in recovering your arms too high out of the water. As long as the elbows and hands don’t drag the water the recovery angle is large enough.
Figure 5. Shoulders are out of the water to allow arms to stay out of water during recovery. This allows less resistance through recovery.

**Breathing**

Most butterfly swimmers breath on every other stroke, so the head remains submerged on every other stroke. However, some top butterfly swimmers, such as Michael Phelps, breathe on every stroke.

**Dolphin Kick**

**Timing**

There are usually two dolphin kicks performed for each arm cycle. There is usually a stronger kick and a weaker kick. The stronger kick occurs when the arms are in front of him, and the other one occurs when his hands are at the level of his hips.

**Upbeat**

- The upbeat begins as the knees reach full extension of the previous kick.
- The hips extend causing both the legs and trunk to become parallel to the surface. The trunk continues to rotate up as the thighs drop down in a wavelike motion. It is at this point when maximum knee flexion should occur. This also corresponds to the head rising above the surface.
- Too much undulation however will decrease the hydrodynamics of the swimmer and should be avoided.
- The ankles should remain relaxed throughout both the upbeat and downbeat.
- The feet should just barely break the surface of the water on the upbeat minimizing the drag forces associated with disruption of laminar flow.
Figure 6. Upbeat of kick. Hips and knees are fully extended, leaving them parallel to the water surface. Feet reach surface level, but not much above.

Downbeat
- The downbeat begins with the flexion of the hips as the feet pass above the level of the body.
- The maximum angle of hip flexion should be between 150-160 degrees for the first kick and 160 to 175 degrees for the second kick. It is at this point that the knees start to extend. Angles of a lesser degree will cause the feet to drop too far down into the water thus creating extra drag forces.
- Most elite swimmers spread their knees slightly at the beginning of the downbeat and then bring them together again through the sweep. This is done through abduction and lateral rotation of the hips. The purpose is to maintain a good inward pitch of the ankles through out the kick. A common error in the kick is improper pitch of the feet. They should be pitched down (dorsiflexed) on the upbeat and up (plantar flexed) on the downbeat.
- The downbeat of the first kick occurs during the outsweep (just after the hands break the surface of the water).
- The downbeat of the second kick coincides with the upsweep of the arm stroke.

Figure 7. Downbeat. Hips are flexed between 150 and 160-degrees. The athlete wants to avoid letting the legs drop, increasing drag.