

# BACKSTROKE

## TECHNIQUE

In his fifth technical article, Nick addresses body position (movement), legs, arms, breathing, timing (coordination) and stroke rate (tempo) for backstroke.



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### THE 'BODY POSITION' (MOVEMENT)

The principles of physics are always with us irrespective of the stroke. However, backstroke is the second most efficient stroke in the water falling behind the mechanics and standards of freestyle. When swimming backstroke, the body position is horizontal to the water surface and the movement pattern is rotational through the long axis of the spinal line. The body cuts and carves from one side to the other

and this is called axis rotation where the shoulders, core and hips are connected with the body moving as a single unit. The focus here is to rotate the shoulders and hips together. Torso rotation is best synchronised with hand entry and is optimised with a deep catch some 50cm below the water surface, with swimmers pushing the hip upward as the hand presses into catch so that shoulder and hip alignment

occurs through the body. Focus on a strong mid-region with tension through the core. Avoid relaxing through the centre of the body as swimmers easily sit in the water which restricts optimal body movement. Consider the body position that minimises resistance, the "streamline" position, a 'core aquatic skill'. Minimising resistance and maximising propulsion is always the goal.



## LEGS

Having a constant, fluid kicking action is seen to support and stabilise efficient body movement. The backstroke leg kick is not a typical upside down freestyle kick. Having completed a vast amount of stroke technique analysis over the last ten years through video playback, it is highly noticeable that when viewing a swimmer doing backstroke underwater we see that the kick action is not just 'up and down' as per the front-crawl kick (when not breathing). The kick comprises of a number of components i.e. up, down, outwards, crossover (right side), up, down, outwards, crossover (left side). Ankle mobility and flexibility is one of the real focus areas of the swimming body. For some, ankle mobility and flexibility comes easy while, for others, it is more work and a systematic approach is often needed. Simplicity, always drive the kick from the hip (hip flexors) not the knee.

## ARMS

Focus on a high sweeping hand driven through strong shoulder rotation. A strong fast arm and hand driven vertically through the air can make for an easy strong pull throughout the underwater phase of the 'pull push' action (easy speed). Focus on early wrist rotation where the thumb exits the water with the wrist rotating to allow the little finger to lead by the time the hand enters the middle third of the recovery phase of the pull. Once the hand is in the water, the arm will be moving downward accelerating into catch before quickly changing direction. At the deepest point of hand entry prior to the catch, the shoulder and hip alignment will be as much as 180 degrees on the left hand side by way of example.

Whilst hand entry in shoulder line is just one element of the backstroke pull, an incorrect hand entry can lead to a poor catch resulting in many common faults thereafter.



Finding your hold on the water is simply called the 'catch' phase. Find this as quickly as possible once the hand is in the water to create a powerful pull.

When viewing the swimmer moving forward underwater in a head on position, sport science analysis and coaching application has shown that the most effective position to achieve an efficient catch or anchor set position, as it can be called, is to have the shoulders and elbow aligned. The hand and arm moves immediately to the side (outwards) and pulls perpendicular to the body. However, to allow for understandable and positive execution following the catch phase, ask swimmers to pull / drive the hand and forearm (with a strong connected wrist) in toward the bodyline and then immediately push / drive the hand and forearm down the leg toward the feet. This will allow for efficient positioning of the elbow and create appropriate leverage and high pressure against the water as the hand and forearm drive past the hip where rotation occurs to achieve peak velocity.





## BREATHING

A regular breathing pattern is required for backstroke where inhalation is taken on one single arm stroke and exhalation on the opposite arm stroke. Ideally, the breath is taken in when the hand enters the water and breathing out occurs when the opposite hand enters the water. The rate of breathing should increase with any increase in tempo (stroke rate). Breathing out through the mouth rather than through the nose allows for quicker exhalation and can, therefore, more easily be coordinated with hand entry. Academic research has shown that lung function is greatly reduced when in the water due to being in the prone or supine position; research compared to rowing and cycling shows a reduction of lung function at 30%, therefore, swimmers have to focus on engaging the breathing muscles and develop deeper diaphragmatic breathing, which can simply be referred to as tummy breathing. When not in training or competition, diaphragmatic breathing is both refreshing and restful and can create a sense of wellbeing as it calms the nervous system, helps prevent panic episodes and, of course, centres attention. Because we are always breathing, breath awareness is a 'self-management' tool and swimmers should tune themselves into this. Indeed, it has taken until the first decade of the 21st century for breathing muscles to be considered an integral part of the conditioning process and now very much part of elite sport.



## TIMING (COORDINATION)

The timing and coordination of backstroke is seen as an alternating stroke technique with constant propulsion created from the whole of the body not just the arms and legs. As one arm is pulling underwater the opposite arm is recovering through the air and just as the pulling arm exits the water the other arm commences its pull. No dead-spot in backstroke should be evident as there should always be high pressure through a constant pulling pattern as well as a constant kicking pattern.

The timing and coordination of backstroke can also be seen as an alternating six-beat kick action, where there are six singular kicks to one full stroke to cycle; this helps stabilise the body as well as offer propulsion. When first beginning to work on technique with young swimmers, maintaining the legs in position behind the torso should be a real focus irrespective of the kicking tempo.



## STROKE RATE (TEMPO)

Stroke rates can be taken in 'real time' but can also be taken in 'strokes per minute' on a stopwatch. Stroke rates are taken on a stopwatch in 'stroke mode' which measures the rate after the third full stroke cycle to give an average across six singular arm strokes. Technology software can give stroke rates for individual full stroke cycles as pictured in the data-table, where a good example of a successful national standard age group swimmer is shown. Although the stroke rate is somewhat low in this particular data-table, this represents a controlled performance. Note the strong final quarter (25m) of 16.49 seconds compared to 16.71 in the 2nd quarter and the tight split differential of only 0.90 seconds between the first and second 50 metres. It's important to maintain full stroke length when trying to increase or achieve an appropriate stroke rate for the differing race distances. Simply chopping the stroke short to increase stroke rate will not equate to a more effective performance or increase in speed.

### Complexities

The head weighs between 4.5kg and 5.5kg and can cause issue with body movement as excessive head motion distorts the body position. The head position should remain fixed with no lateral or up and down motion. Direct upward vision with an open chin position away from where the clavicle meets the sternum is required to help support the body. Lack of mobility in joints and muscles makes for added complexities and often restricts optimal movement, resulting in greater drag such as 'tail drag' where the body is angled head to feet rather than horizontal.

Check out the head position first but also note if the kick is too deep or weak. Tight or weak hip flexors can also create issues. Focusing on

Reaction (s)	Entry		Breakout			15m (s)
	Distance (m)	Time (s)	Distance (m)	Time (s)	Velocity (m/s)	
0.58	2.20	0.69	15.00	7.27	2.06	7.27

Length	Stroke			Velocity (m/s)	Turn Time	Breakout		Distance	Time
	Count	Avg Dist	Rate			Time	Dist		
1	17.0	2.06	44.25	1.65		7.27	15.00	50m	30.32
2	17.5	2.01	45.05	1.60	8.91	7.91	14.8	100m	31.22

Length	25m		50m		100m		Cumulative Time
	Time	Diff	Time	Diff	Time	Diff	
1	13.61		30.32				13.61
	16.71	3.10					30.32
2	14.73	-1.98	31.22	0.90	61.54		45.05
	16.49	1.76					61.54

one cue or one coaching point at a time by seeing or feeling something specific after a clear explanation and demonstration is a proven way to expedite the learning process. Technique changes require a swimmer to process a great deal of information derived from the principles of physics, specifically, biomechanics and hydrodynamics and it will require tens of thousands of repetitions of each skill to develop autonomy.

### Common faults

Slowing of hand speed can result in a shallow catch and therefore slipping or skimming through the surface of the water reducing strength of pull and restricting body movement with a square or flat looking technique. At an 'age group level', sitting low in the water and lateral deviation (snaking of the body) is also a common fault. Younger swimmers often have ineffective timing of arm synchronisation, like catch-up where the hand pauses at the leg. Watch out, too, for any irregular kicking action and for those swimmers who hold their breath on occasion as the rhythm of breathing can support

coordination. At an 'elite level' of performance, we can see swimmers 'rolling out of catch' whereby the hips fall square before the hand drives past the hip, thus reducing power and swim velocity. In this instance, science has shown how power is reduced due to lack of engagement through the core. Swimmers must constantly talk to themselves using cues to allow an action to be more deliberate and to therefore optimise technique.

### Good practice summary

We should aim to coordinate (time) and execute the stroke efficiently. We need to move from basic to effective to efficient strokes and it may take years as swimmers progress through the Athlete Development Support Pathway (ADSP). We should strive for a smooth constant flow, swimming with the whole of the body not just the arms and the legs. Swimmers need to feel a cutting and carving motion through the water with constant rotation, balance and fluid movement. **ST**

**In his next article, Nick addresses the full technicalities of butterfly.**