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## Straight Arm Anchor vs. Bent Elbow Anchor in Freestyle

(The observations in this document are the opinion of the author and were formed in conjunction with his own experience, his interactions over many years with Bill Boomer and in discussion with the athlete used as the subject in this quick study)

Kalyn Keller was an up & coming swimmer who made the Pan Am team in 1999 and won the 800 free at the Goodwill Games in 2001. Everything seemed to be headed in the right direction until she hit a small dead spot in her career in 2002. Although she competed at the SCM World Championships in Moscow she struggled to be able to back half some of her races and there was more frustration than joy in her swimming results. In the early summer of 2003 she moved from Phoenix to Los Angeles. The new training environment was described as a shock to her, and in the first few weeks she struggled to make it through a workout let alone try to compete with some of the swimmers in the practice. She changed to a more catch-up oriented style of freestyle to survive and this strategy eventually led to a change in her technique. This change in my opinion paved the way to her 3 national titles in the summer of 2003 and was very instrumental in her making the 2004 Olympic Team. She went from a technique that was basically a straight arm(as viewed from the side) under water pull with a hip rotation emphasis during the finish phase of the stroke, to a high elbow in the catch anchor phase of the stroke, with the body roll occurring during the front quadrant of the stroke. For an in-depth look at this overall subject please see a previous article of mine titled "Has SCY affected freestyle technique"

In this section I have included 5 pictures covering the right arm as we see it from the side view below the surface of the water. In both sequences the right arm was following a breathing stroke on the left side. This might seem confusing since in the 2002 pictures the head is so much higher later in the stroke, but I made sure I chose two situations that were as identical as possible.

### Picture #1

In the '02 frame we note that there is a slight curve in the spine line of the body and that the head has been lifted off the horizontal line to initiate the breath. I have placed a yellow line on the hips to indicate where they are to highlight a lack of rotation as she seeks to establish her anchor position. You'll note in this case that there is only a slight rotation of the hips.

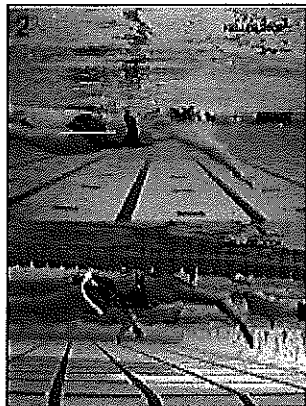
In the '04 frame you'll notice that her spine line is much straighter and that the head is more in line with the horizontal while taking her breath. In this frame the hips are fully rotated and ready to engage the anchor position.



The following table shows the results of the experiment. The first column shows the number of trials, the second column shows the number of correct responses, and the third column shows the percentage of correct responses. The data shows that the number of correct responses increases as the number of trials increases, and that the percentage of correct responses remains relatively constant around 75%.

Number of Trials	Number of Correct Responses	Percentage of Correct Responses
10	7	70%
20	15	75%
30	22	73%
40	30	75%
50	38	76%
60	45	75%
70	52	74%
80	60	75%
90	68	76%
100	75	75%

## Picture #2



In the '02 frame we see that her arm is basically straight and she is swimming with her upper body (shoulders & arms) as being the source of leverage force (2<sup>nd</sup> class lever). There has been no movement whatsoever in her hip roll at this point and because of her breathing action, (head is still out of line) part of the propulsive potential of the right arm has been dedicated to body balance and stability. Because the power source is basically arms and shoulders, the movement places a huge strain on the smaller muscle groups in this region and will more than likely result in a much higher metabolic cost to the athlete.

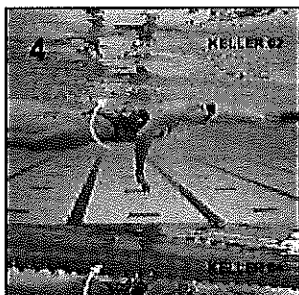
In the '04 frame we see that the high elbow has created a perfect anchor, and the hips are well into rotating to the opposite side. This action in conjunction the recovery motion of the opposite arm creates a source of power that is generated through the body via the body roll and produces all the pressure that she will need to move her body past the right arm anchor point. This is a perfect example of a 1<sup>st</sup> class lever movement and uses the natural movement of the core muscles in the body to generate force. Because of the larger body muscle source and the effect of angular momentum (movement connected to the recovery of opposite arm) the metabolic cost of this power source is very small in comparison to the '02 technique. It should also be noted that her head is in line with the body and all force generation is focused on forward propulsion.

## Picture #3

In the '02 frame we note that the body has just begun the process of rotating and has moved just slightly off the original line that it established during the entry extension. In this case it would seem that the elbow has "dropped or slipped" slightly and the head is just getting back to the point where it is more or less in line with the body. In the '04 frame we note that body has now rotated past the horizontal and she is well into delivering the major impulse on the established anchor position. Her head at this point is in perfect line with the body and the body platform is in a perfect shape to take advantage of the force that was generated by her rotating action.



## Picture #4



In the '02 frame the head is now in line with the body and all pressure applied to the anchor position is propelling the body forward. The body is now rotating past the horizontal as she begins to apply pressure in conjunction with her body roll. This is the first time in the stroke that there seems to be a connection between the body and the anchor position.



In the '04 frame the body roll has delivered the majority of the force impulse and the arm is getting ready to exit the water.

#### Picture #5

In the '02 frame we can see that the body has now rotated past the horizontal and the arm is still engaged in delivering a significant propulsive force. At this point the left arm is already seeking to establish the next anchor point in the stroke, taking little advantage from the impulse being generated on the right side.

In the '04 frame we see that the left arm is extended and still riding the impulse that was generated by the right side. As the body rotates to its maximum to begin the left side anchor, the right arm is releasing the water as it exits into the recovery motion.



One usually finds a contrast in techniques in different athletes, but in this case we find that same contrast in the same athlete over a period of years. This presents an interesting case and is the main reason why I chose this particular subject to illustrate these contrasting techniques. It's my opinion that her '04 technique is far more efficient and effective and although her '02 technique would keep her competitive in most events in a short course competition, it would be very limited in any long course event over 100 meters.

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