

It often appears that there is much literature in the swimming world about how to go about increasing your stroke length in the pool (i.e. reducing number of strokes per length), though very little attention is seemingly placed upon how a swimmer or triathlete could stand to improve their times by increasing arm turn-over / stroke *rate*. Admittedly, most swimmers will stand to make the biggest improvements by working to eliminate drag and lengthen their stroke, but does there come a point when one reaches a “plateau” or optimal stroke count, whereby we must then consider lifting stroke rate, but making an effort to maintain that refined stroke length? Do certain body types or genders suit a certain stroke rate / stroke length ratio over others? Do certain swim conditions favour a higher stroke rate and shorter stroke length, or should we be endlessly pursuing that “theoretical” picture of perfection with a long, smooth stroke?

This article has been written to look at these areas, not to cast a shadow of doubt over one way over the other, but to address the way some of the world’s elite swim and triathlon programs are currently thinking and whether or not this would be an appropriate consideration for us “mere mortals”.

Firstly, if you think back to your days at school and in particular during your Physics and Maths classes, your "grumpy-old professors" (mine were anyway!) would have talked to you about POWER, and more importantly the equation for this:

$$\text{POWER} = \text{FORCE} \times \text{VELOCITY (simply put)}$$

...now if you think of the FORCE element as your STROKE LENGTH, i.e. increasing the amount of force you apply to the water (so long as it is directed in the right direction), will increase your stroke length which is manifested as fewer strokes per length. Simple. Most people will at one time or another have counted how many strokes they take per length and aimed to try and reduce the number of strokes by focusing on such elements as catch & pull through and body rotation. This is an excellent way (as already discussed) to improve your economy and efficiency through the water and most people will see improvements in performance with this method if their stroke is rather inefficient to begin with.

Now, lets consider the other side of the equation, VELOCITY. Velocity in this scenario we can take to mean STROKE RATE, and is represented as the number of strokes you take per minute as opposed to the number of strokes per length. I would normally recommend asking a friend or coach to help you assess this, and ask them to count the number of strokes you take in 15 seconds (for a 25m pool) or 30 seconds (for a 50m pool) and multiply the result by 4 or 2 respectively. This should be done preferably during a continuous swim of maybe 400m and you will notice (just like stroke length, that the rate will be slightly variable during the set distance - it shouldn't be if you're economical, but it will tend to be initially and we'll come back to how to correct that in just a moment). Just like cadence on the bike and stride rate on the run, we should really count this as the number of complete arm cycles (i.e. number of times the right arm completes a full stroke). However, as the

numbers we are typically dealing with are much lower for swimming than cycling and running, for ease and accuracy (especially when the length of the pool requires you to restrict your assessment time to 15 seconds due to turning), I would recommend you count left-arm as 1, right-arm as 2, left-arm as 3 etc. Once you have ascertained a base rate, we know where we can move from and to.

Many people make the comment that in response to stroke length increasing (i.e. FORCE), stroke rate will typically drop off (sometimes considerably); and vice versa - for someone working on developing their stroke rate (VELOCITY), their stroke length will typically drop off (leading to the feeling that you are losing your stroke and feel for the water). Obviously the ideal scenario would be for one of these factors to stay constant whilst the other increases. But which should we work on...?

The biggest single difference between the biomechanics of an elite pool swimmer and an elite open water swimmer is in the balance between their stroke rate and stroke length. A typical age-group triathlete may have a stroke count (length) of about 38 - 52 strokes per 50m and a stroke rate of 54 - 64spm (strokes per minute). Compare this to your stereo-typical picture of elite distance swimming perfection Ian Thorpe who would typically swim with a stroke count of 27 - 32 strokes per 50m and a stroke rate of 72 to 76spm, and its easy to see how a swimmer like this moves faster through the water than you or I. However, whilst we all probably know that his stroke length is much greater than ours, his stroke rate may seem quite high for someone who seems so relaxed. The biggest difference therefore is when we look to the elite open water swimmer. During the London Triathlon this year, I was analysing the stroke rates of the elite men (particularly the swim leader Richard Stannard) and you may be surprised to see that these guys were comfortably sat at around 85 spm for 1500m, which is huge. If you put that into context these guys are really flying through the water and whilst they might not appear as smooth as your Ian Thorpe in the pool and certainly not holding a stroke length of nearly 2.0m per stroke like Thorpey would do, the thing is that this is the specific adaptation that these guys are able to make to their strokes for open water swimming. Plus, they do a lot of training at these higher stroke rates.

I have been very lucky to have met and discussed open water swimming technique in Australia with a lady by the name of Shelley Taylor-Smith, and for those of you who don't know her, she has won the World Marathon Swimming Championships 7 times in a row and was even ranked world number one for women AND men at the same time. A truly amazing open water swimmer whose stroke was versatile and adaptable to the conditions she was facing, she is renowned for completing the 70km Sydney - Wollongong Open Water swim (inside a huge shark cage it has to be added!) with an average stroke rate of 88spm. Thats nearly 20 hours of continuous swimming at a hugely high stroke rate. To get to these levels, and more importantly be able to sustain them, takes a lot of training and adaptation.

So, what should we as triathletes take away from this? Should we do away with Stroke Length training altogether in favour of Stroke Rate training, and if so how should we work accurately on this elevated stroke rate. My advice would be that between now and say April you continue to work on the efficiency of your stroke and work to develop that stroke length, minimizing the number of strokes you take per length. Then, just as you would do with cycling and running, you would develop the specificity of your training closer towards the season to develop a higher stroke rate WHILST trying to maintain your stroke length as much as possible. With a good 5-6 months of base behind you at this point that should be achievable and most swimmers should be able to lift their stroke rate 5-6spm over the course of a season without their form slipping, and if it does, then you go back to developing stroke length and thus forth. Its all about balance and progression, so rather than solely having one measure or indicator of performance to work with (i.e. Stroke Length), we can now also discuss Stroke Rate as another valid factor. Also we shouldn't be looking at this as solely on a seasonal basis as well, the conscientious swimmer should consider how just like any other aspect of a good periodized program, this "balance of ratios" can, and should be, developed over a period of years, not just months.

Typically speaking, females of shorter than average height and good musculature will invariably suit a shorter, faster stroke than say a taller than average lean male. However, for both these groups I would always strongly recommend that the bulk of their training is done trying to reduce drag, increase efficiency and develop that longer, smoother stroke in the first instance. If you are new to the sport of swimming or triathlon, almost without exception I would recommend that the first two years or so of your swimming development are spent addressing this side of the "equation". If however, you've been into the sport for a while, are technically speaking a reasonably smooth and efficient swimmer, but feel like you lack some "oomph", then I would be recommending that you at least consider stroke rate training, particularly towards the season as a valid method of improvement. This is specifically for rough open water conditions where it is deemed to be much more suited.

Two swimming product companies, Wetronome (www.wetronome.com) and Finis (www.finisinc.com) have each developed a stroke rate pacing tool to help you work effectively and efficiently with your stroke rate and rhythm. Both products are designed to beep at you underneath your swimming cap (or your run cap for stride rate training) to help you control your stroke rate. They are so simple to use and set to your pace that it is a wonder everyone isn't using them.

We are all individuals, so you should work within your own parameters and progress steadily without thinking "right I need to get up to 85spm just like Richard Stannard" as I guarantee your stroke will fall apart if you do this. For those already with a short "scrappy" stroke, you could set the stroke pacer to beep 5-6spm SLOWER than normal to encourage you to LENGTHEN out your stroke. They are also great for anyone who feels that they are already thinking about too many aspects of their stroke as you are able to really zone-

in on the beep and everything else takes care of itself; ideal for rhythm establishment. What's more, most of the Australian swim team use them in some capacity, which should say something of their benefits.

To summarise, work to develop your stroke length up until about April with catch & pull through drills and body rotation exercises, and then come April aim to be more specific with your approach and look to see how lifting your stroke rate in a controlled manner may help you lift your swimming performance above that guy or girl you've been trying to beat out of the water all last season!

We have much more information available on other aspects of your stroke and types of drills you can do at www.swimsmooth.com , where you'll also find details of our Clinics and one-2-one sessions.

Thanks

Paul