

The science behind swimming

As I look back over my coaching career there have been a few periods of time where I have been involved in some very important volunteer group activities and swim meets. When I was the head coach with a club in Oxford, Ohio I had the opportunity to host several major swim competitions from the Ohio Swimming Championship series to what was then, Jr. Nationals East. These meets gave our club the opportunity to view how USA Swimming operated at all levels and to discuss with parents, coaches, and swimming volunteers what was important in swimming for the swimmers at competitions and to some extent practices.

Additionally, I had the fortune of being elected president of the Ohio Coaches Association for almost five years. This volunteer position provided me with the opportunity to share training views with coaches and to discuss what was important in the development of athletes. Then, during the tenure as president, the Central Zone elected me as their coach representative to the National Age Group Swimming Committee. While on this committee I had the chance to hear various views from a national perspective. During this period I learned that what was important in the development of swimmers was not just limited to practicing laps up and down the pool, swimming fast, and training hard, but that there indeed was some science behind swimming.

During a symposium on age group swimming in Colorado Springs, our group had the opportunity to listen to some of the best science minds in sport and how their specialization applied to the sport of swimming. What might be surprising is that swimming fast is not just about practicing and competing, but is indeed about how our child has developed physically, mentally, socially, and technically. These are just a few, but represent the major areas of development in our sport. Maturation plays an equally important role in a child's success in this sport and that improvement mirrors the same curve irregardless of age. These areas of swimming are what this article will discuss.

The physical development of athletes can be characterized by two types of maturation; biological and chronological maturation. The difference between these types of growth can give coaches and parents a clue on the progress we can expect from a child. What is the difference between the two? Chronological age is just like it sounds, the age of your child as we measure it. However, biological age is measured quite differently and can explain why there is such a difference among swimmers in certain age groups.

Biological age is measured through hand-wrist X-rays which can be used to determine each swimmers biological maturity. How this impacts an individual swimmer is if the bones in a child grow, and begin to fuse together we can determine if a child is maturing biologically quicker than chronologically (early maturation), maturing at the same rate (on time maturation), or maturing slower (late maturation). We all have seen obvious examples of the early maturation, like the 10 year old boy or girl who is several inches taller than all other competitors. Conversely, we have seen examples of the late maturation in swimmers.

What this means in swimming is that depending on where you child falls into maturation will determine how fast your child will get during his or her growth. Continued success in the sport of swimming will be determined by the level of maturation a swimmer is experiencing and those who are experience early maturation

will see success sooner in a swimming career versus those who experience late maturation. Those swimmers who experience late maturation can expect to have successful swimming careers later in life. These individuals though need constant encouragement because they may not see the success that individuals who experience early maturation do and for a young swimmer this can often times be discouraging.

Those swimmers who mature on time can expect to experience success at the same time as their peer group. However, just like the swimmer who experiences late maturation, these swimmers at times need to be encouraged so that they will continue in the sport. What does this mean for us as coaches and parents? It means that we should always encourage our swimmers to succeed at their own pace and not some perceived rate of success based on the success of swimmers who experience early maturation. How do we know if we are expecting too much? If you are comparing your 11 year-old child's times to that of a swimmer who is 6 feet tall and your child is only 5 feet tall, then you are probably are expecting too much.

Mental development is also critical in the development of an athlete and as you can tell by the physical development on an athlete's mental well being. Imagine your 8 year old child on the blocks next to a swimmer who looks like they are 12. Wouldn't you be intimidated? I know I would be! So it is important that as parents you encourage your swimmer to do the best he or she can. This has been mentioned in previous articles, but your support of your child and his or her coach is critical. Encourage your child to do the best they can, to continually work on technique, and to listen to the advice that the coaches provide them. Remember to be the parent and be as supportive as you can be. Additionally, keep in mind that just like physical development there are children who will mature sooner than other children, and that there are some children who mentally mature at a slower rate.

Mental maturation typically follows physical maturation. It can be difficult for an athlete to understand at an early age that there are those who grow sooner and more. However, if you explain to your child that this is normal and that each child will develop at their own individual rate, your child will more likely to be successful in any endeavor than the child who doesn't understand this concept. Also remind your child that there are many more facets to achieving aquatic success than how big you are. A couple of examples of this are good technique, and good listening skills. If your child listens to his or her coach and diligently works on good technique then simple physics dictates that at some stage in swimming a swimmer will get better than some of their competitors...notice I did not say all.

Ok, I realize that some of us hate this topic, but physics and math really do come into play in the sport of swimming. Depending on your child's technique and muscular development simple physics and math will to some degree explain success or failure in this sport. For example, your child may be 5 feet tall and their biggest competitor 6 feet tall, but let's say for instance that your child takes 20 strokes in a given length of a race and their competitor who is 6 feet tall takes 20. Obviously your child is mathematically going to stand a better chance of long-term success than their competitor. Why? Well look at it from this perspective. Usually, and not always, a child's arm span is about the same as their height. So if your child who is 5 feet tall and takes 20 strokes a length, then each arm pull is about 3.8 feet long versus the swimmer who is 6 feet tall taking the same stroke length which for a 6 foot individual would be less than 3 feet long. The point here

is that your child has a more efficient competitive stroke than their competitor, and in the long-run stand a much better chance of improving.

This also bring technique back into focus because from the physics standpoint a swimmer who is taking longer arm strokes is more efficient than a swimmer who moves their arms through the water as fast as they can. We have mentioned to our swimmers frequently and have done counting stroke sets to emphasize this point. The draw back here is that a swimmer will often times have to take steps back in time improvement to have long-term improvement. For young children this is a very difficult to achieve. A child's natural tendency is to try and be as competitive as they can be, and will often times sacrifice stroke technique and distance per stroke to move their arms faster. If they only knew that if they maintained the same stroke length and worked toward having faster arms with that stroke that they will get even faster. That takes self-control and confidence. These two skills are very difficult for a young individual to achieve...when was the last time you asked your child to be patient about something and it worked?

Long term development in this sport is not just about swimming laps up and down the pool like I said before. Swimming fast is multi-dimensional and requires that a swimmer master a number of skills. Just like academics in school, a child does not master everything right away. It takes time, and just like the growing mind and body of a child, so does the development of swimming skills. If your child can be patient and works diligently at their technique, listens to their coach, gets through the mental and physical development that they will ultimately go through, then your child will eventually become a good swimmer. How long that takes, like the biology, physics, chemistry, psychology, and sociology of sport indicate, depends on the development of your child in each of these sciences! Sit back and enjoy your child's swimming career and watch science take place in the pool!