WHY SWIMMERS NEED TO TRAIN YEAR ROUND

By Genadijus Sokolovas, Ph.D.
USA Swimming

For the purposes of this paper, "year round swimming" is defined as participating in training activities for forty-eight to fifty weeks during a calendar year

Introduction

Typical questions from coaches that we frequently answer regarding swimming include: Do swimmers need to train year round? How many years do swimmers need to train until they are able to achieve an elite level? What workload volume do swimmers need to do in order to reach an elite level? In answering these questions we endeavor to base our discussion on current scientific evidence about the process of athlete training and detraining.

Humans are born on land and become very accustomed to those land activities that surround daily life. Swimming however isn't specific to our nature and humans have had to go to great lengths to achieve similar adaptations with regard to the aquarian environment. Although athletes complete a number of activities on land to improve their water potential, in order to truly achieve peak water potential athletes must go through many years of consistent water training to realize their dreams. To fully develop an athlete's potential, many of these years need to be set up sequentially, are dependent on a stacking effect and occur after the physical maturation of the athlete.

Long-Term Training in Swimming

Based on the following facts, in order to reach Olympic Trials level, females need about 9 to 10 years of year round training, while males need 10 to 11 years.

Many studies indicate that swimmers can reach an elite level after 8 to 12 years of training (Counsilman, J.E., 1968; 1988; Madsen, O., & Wilke, K., 1983; Sokolovas, G., & Gordon, S.M., 1986; Maglischo, E.W., 1994; Sokolovas, G., 2001, etc.). According to our study on Olympic Trials Qualifiers (Tuffey, S. et al., 2001), all swimmers participated in year round training. The average age swimmers started year round swimming is similar for both genders – 9.0 ± 2.9 years for females and 9.4 ± 3.9 years for males. The average age of Olympic Trials Qualifiers in this study was 18.5 ± 2.6 for females and 20.2 ± 2.3 for males.

Every one of our investigated Olympic Trials Qualifiers swam year round, did high workload volumes, and swam on average 19 hours a week. (This didn't take into account the land requirements to achieve this level of success.)

Studies have revealed that elite swimmers swim high workload volumes. Depending on his/her event, a swimmer's yearly workload volume is between 2,500,000 and 3,500,000 yards. It is impossible to swim such high volumes without year round training. Our study shows that the average weekly workload volume is 60,906 ± 16,763 yards for females and 61,811 ± 16,409 yards for males. Distance swimmers swim even higher workload volumes – 76,850 ± 9,369 yards and 73,916 ± 12,228 yards, respectively. Hours spent swimming per week are similar for females and males, 18.8 ± 4.8 and 19.6 ± 4.1 respectively.

An increase in the incidence of injury in athletes

There is anecdotal evidence to suggest that those athletes who take extended breaks from training have suffered unnecessary illnesses or injury when forced to adapt to increased workload volumes at rates that pushed them beyond their limits.

Adaptation of Athletes to the Workload

Athletes doing workload volumes lower than "Adaptation Threshold" will fail to stimulate improvement in performance and result in stagnation.

Adaptation of a body to the workload volume is directly related to the overload stresses applied during training. The progressive overload principle is the main training principle (Bompa, T.O., 1985; 1994; 1999; Wilmore, J.H., & Costill, D.L., 1994; 1999; Zatciorsky, V.M., 1995; Shephard, R.J., & Astrand, P.O., 2000; Neumann, G., et al., 2000; Kurz, T., 2001 etc.). Overload principle refers to the load greater than that to which the body is adjusted. This principle is incorporated in all training programs for elite level athletes. In order to improve performance, athletes need a new stimulus, which should be higher than their so-called "Adaptation Threshold". The new stimulus may be a higher workload volume, intensity, and/or new training method.

Swimmers need to gradually increase workload volumes during the season until the taper. It is impossible to improve and to reach high performance doing the same workload volume every day or week.

This is also true regarding to the long-term stimulus during the training season. Since a swimmer's condition/performance capacity improves during the season, then the workload should show a corresponding increase as well. However, if athletes maintain or hold the same workload volume during the major part of season, then after several weeks of training, the reaction to this kind of stimulus will be lower than their "Adaptation Threshold" and the swimmers would not progress (Platonov, V.N., & Vaicechovskij, S.M., 1985; Costill, D.L. et al., 1991; Wilmore, J.H., & Costill, D.L., 1999 etc.).

Many studies indicate that only systematic training induces long-term stable adaptation, which makes possible increased functional capacities

During the adaptation to the gradual increase of workload, the body undergoes various functional and constitutional changes. These include: maximum oxygen consumption, heart stroke volume and blood circulation, delivery of nutrients to the muscles, removal of waste products of biochemical reactions from the muscles, tolerance to the lactic acid, and many others (Saltin, B., 1986; Weltman, A., 1995; Viru, A.A., 1995; Brooks, G.A., 1996; Shephard, R.J., 1997; Sharp, R., 2001 etc.).

Detraining Effect on the Athletes

Typically after cessation of training, swimming performance declines within several weeks or even days.

The maintenance or improvement of training condition is possible only if an adequate training stimulus is used. As soon as the training stimulus is discontinued, detraining of athletes occurs in a few weeks (Israel, S., 1972; Appell, H.J., 1990; Bompa, T.O., 1999 etc.). Detraining might occur when athletes have long breaks between seasons or when they are injured. Investigations also show that the higher the level of performances the greater the losses during detraining (Costill, D.L. et al., 1985; Coyle, E.F. et al., 1986; Houmard, J.A. et al., 1990; Madsen, K. et al., 1993 etc.).

We can expect that the swimming specific sense of "the feeling of the water" will decrease faster than general strength or endurance.

Different physical qualities decrease at different rates after cessation of training. Some investigations show that specific qualities decrease faster than general qualities (Houston, M.E. et al., 1979; Hickson, R.C. et al., 1985; Viru, A.A., 1995; Wilmore, J.H., & Costill, D.L., 1999 etc.).

Strength

In general, strength might be lost after five weeks once athletes stop training. Considering that in order to achieve Peak Performance, most athletes reduce strength training two to three weeks prior to performance, this effect begins to occur two to three weeks post competition.

Muscular strength decreases significantly after several weeks of cessation in training. Some studies found relatively small strength losses during the first 4 weeks (Houston, M.E. et al., 1979; 1983; Costill, D.L. et al., 1991; Hortobagyi, T. et al., 1993; Costill, D.L., 1998 etc.). However, a longer break in training, typically, leads to the decrease in strength. Strength training increases the cross-sectional area of muscle fibers and uses protein to build the tissues. When the muscles are in a state of disuse, proteins are no longer needed and they begin to break down (Edgerton, R.V., 1976; Appell, H.J., 1990; Houmard, J.A. et al., 1991 etc.). Even reduced strength training programs affect strength maintenance in athletes (Neufer, P.D. et al., 1987; Groves, J.E. et al., 1988; Viru, A.A., 1995 etc.). A decrease of strength is related to the many changes in muscle fibers, enzymes and hormonal activities (Coyle, E.F. et al., 1985; Larsson, N., & Ansved, T., 1985; Hakkinen, K., & Allen, M., 1986; Kjar, M. et al., 1992; Amigo, N. et al., 1998 etc.).

Endurance/Cardiovascular fitness

Studies show that endurance is more sensitive to the cessation in training than strength. Athletes may loose all gains of endurance training in just a few weeks.

Studies revealed that endurance might decrease in one week if it is not maintained (Friman, G., 1979; Fox, E.R. et al., 1989 etc.). Endurance decrease coincides with decline in many physiological parameters such as maximal oxygen consumption (VO2 max), cardiovascular function (heart stroke volume, cardiac output, blood volume, blood flow at high intensity, delivery of oxygen to the muscles, oxygen debt, muscle glycogen levels etc.), activity of enzymes and hormones etc. (Houston, M.E. et al., 1979; Klausen, K. et al., 1981; Thompson, P.D. et al., 1984; Coyle, E.F. et al. 1986; Bangsbo, J., & Mizuno, M., 1987; Neufer, P.D. et al., 1989; Viru, A.A., 1995 etc.). Insufficient training stimulus also leads to the decrease of anaerobic threshold and oxygen enzymes activities (Penny, G.D., & Wells, M.R., 1979; Chi M.M.-Y. et al., 1983; Coyle, E.F. et al. 1985; Allen, G.D., 1989; Amigo, N. et al., 1998; Mujika, I., & Padilla, S., 2000 etc.)

Performance

Specific strength may be lost faster than general strength. Therefore it is important to maintain specific strength training in the water, especially at the end of season.

Performance in swimming and other sports is closely related to strength and endurance. Investigation shows that strength-related performance may be maintained up to 4 weeks (Hortobagyi, T. et al., 1993; Mujika, I., & Padilla, S., 2000 etc.). It has been shown that swimmers can maintain strength during 4 weeks of inactivity, however utilization of force in the water was significantly lower (Neufer, P.D. et al., 1987.)

Performance/Competition Endurance

Endurance performance has been shown to decrease in one to two weeks of inactivity or a markedly reduced workload volume.

Endurance performance decreases rapidly after cessation of training. Absence of a training stimulus or too low of a training stimulus leads to the lower performances in conjunction with many physiological changes (Coyle, E.F. et al., 1986; Claude, A.B., & Sharp, R.L., 1991; Houmard, J.A. et al., 1992; Mujika, I. et al., 1995 etc.). It appears that swimming performances over short and/or long distances decline at different rates during detraining. (Sokolovas, G., & Gordon, S., 1987; Popov, O.I., 1988; Sokolovas, G., 1994 etc.)

Conclusion

A cessation of only a few weeks in training may lead to the many physiological, biochemical, and hormonal changes, which would affect swimming performance. These findings apply to athletes at both the elite and non-elite level. Based on current scientific knowledge, we can conclude that only year round training allows an athlete to improve and maintain specific qualities for swimming, such as "feel of water," utilization of strength and muscular endurance. Failure to maintain a year round profile with regard to training stimulus will lead to the athlete being unable to achieve the performance parameters required to perform up to his/her potential and lead to a serious decline in performance.