

Failing to Adapt to Training

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"If you are tired, you are not in shape; if you are not tired, you have not been working hard enough." Anonymous

Introduction

Successful adaptation to training is necessary to ensure better competitive performances. This adaptation is based on the athlete's physiological and psychological responses to four important training factors: type, frequency, duration and intensity of exercise and, unless these factors are managed carefully, they can lead to failing adaptation or overtraining syndrome. The coach must offer a special blend of these factors at critical periods during the training process in order to achieve improved training and competitive performances. This blend is especially difficult to manage for crews, as the boat is only as strong as its weakest link. So, in the process of training, one of your athletes may tolerate the work very well while another falters under the load.

Failing to adapt to training has some major physiological and psychological consequences, all of which lead to increasingly poorer training and competitive performances. It is difficult to design optimal training programs for everyone in the crew and, although some coaches employ a sound scientific approach in developing training programs, many still base their training programs on intuitive and empirical judgements with "more" and "harder" being the most important descriptive criteria. It is difficult to assess the relative impact of training on the athlete and there seem to be no specific preliminary symptoms to warn the athletes that they are failing to adapt. By the time failing adaptation has been recognized, it is usually too late to effectively reverse the condition and the athlete's only option is weeks or months of reduced training or complete rest; this could mean the end of high level competition for that year.

A critical aspect of failing adaptation is that it is often your most highly skilled and motivated athlete who is susceptible to failing adaptation. Athletes who are excessively aggressive, always trying to perform at their best, are more critical of themselves than others, have set extremely high standards, want to win at all costs, genuinely believe they are physically indestructible, and can't seem to get enough work, must be observed carefully by the coach and perhaps more strictly controlled.

Failing adaptation is difficult to define and even more difficult to measure and prevent. The following discussion will likely ask more questions about this controversial topic than provide answers.

Symptoms

Symptoms of failing to adapt to training vary among individuals but the most common general feeling is one of heaviness in the muscles. This is usually accompanied by a gradual deterioration in training and competitive performances.

It is difficult to distinguish between failing to adapt to training and chronic fatigue resulting from training. The day to day variations in the sensations of fatigue should not be confused with failing adaptation. Chronic fatigue can result from consecutive days or bouts of hard training or intense competition but can be relieved with a few days of easy training, no competition and a carbohydrate-rich diet. At present there are no clear signs or body alarm systems that indicate a failure to adapt to training, especially no early warning signals and as a result the process is often too far along to be reversed. Most symptoms are subjective and identifiable only after athletes have overextended themselves. Many rowers also attempt to conceal failing to adapt from the coach in fear of losing their seat in the boat although they may be aware that they are gradually seeing an erosion of their performance. This erosion may be difficult for the coach to evaluate since other crew members may unknowingly "cover up" for their poorly adapting teammate. A coach should also be especially aware of any athlete who suddenly begins to produce extraordinary training performances, as they may be most susceptible to a failure to adapt. Because of their excitement about these performances they often overextend by training at a greater than normal intensity and duration.

With the onset of failing adaptation, the athlete usually experiences a vicious cycle of trying to overcome the poor training and competitive performances by training harder or changing technique. These responses more often lead to even greater physical and physiological deterioration and psychological frustration. The athlete, at this point, is uncertain about his/her skill and, in many cases, loses confidence. In addition, increasing training effort or changing technique can lead to serious injuries that may prevent the athletes from ever competing up to their potential.

Specific Symptoms

Specific symptoms include the following:

Physical and Physiological

1. Excessive and unusual weight loss
2. Change in body composition; decrease in body fat
3. Decreased appetite
4. Local muscular tiredness and heaviness
5. Sleep disturbances
6. Elevated heart rate, blood pressure, and core temperature
7. Decrease in immune protection
8. Decrease in male and female sex hormones
9. Overworking

Psychological

1. Frustration
2. Loss of confidence
3. Wide mood swings
4. Uncertainty
5. Tentative
6. Irritable
7. Uncommunicative and quiet
8. Self pity
9. Tardiness and missing work-outs
10. Looking for excuses
11. Depression
12. Anxiety
13. Trying too hard
14. Inability to relax

Causes

Physiologists agree that there is no greater physical stress that a human must tolerate than exercise. A muscle fiber is unparalleled among living cells in its ability to increase its metabolism, by 1000 times if necessary. A normal response to a continued exercise stress is an improvement in the muscle fiber's response and all of its support systems, thus adapting to exercise and the desired result is better performance. A normal stimulus-response relationship would be:

1. Increase in Training
2. Increase in Physiological factors
3. Increase in Performance
4. Increase in Confidence (positive re-enforcement)

The process of training and its effects on performance can be compared with a theory of adaptation proposed by Selye in the 1950s. Selye proposed a General Adaptation Syndrome (GAS) for the purpose of attempting to explain the ability or inability to cope with a stress. He divided his GAS into three stages: Alarm Reaction (AR), Stage of Resistance (SR), and Stage of Exhaustion (SE). Selye's AR can be compared with the introduction of high intensity training (stress stimulus) and positive early physiological changes (good response to stress). As the training stimulus is continuously and increasingly applied and the body responds by improving performance then this successful response is analogous to Selye's SR. However, if the response to the training stimulus is failing adaptation then this failure represents SE and if this stage is reached then the problem is difficult or impossible to correct. In fact, the extreme of Selye's SE is death of the organism or structure. This abnormal response can be represented as follows:

1. Increased Training
2. Decreased Physiological factors
3. Decreased Performance
4. Decreased Confidence (negative re-enforcement)

Although the causes for deterioration in performance are not clear, it appears that the intensity of training can be a greater negative stress than either the duration or

frequency of training. There is also evidence to show that problems unrelated to training may be partially or wholly to blame for failing adaptation, among them, job and or school related, social, economic, or personal.

Several possible physiological and physical causes of failing adaptation have been suggested and among them are:

1. Rapid increase in training intensity and/or volume; it is suggested that less than one percent increase per week for intensity and 3-5 percent per week for volume be used.
2. Chronic damage to muscle cells; death of cells
3. Overload of immune system
4. Abnormal endocrine responses
5. Disruption of connective tissue; tendon and ligament destruction
6. Nutrient deficiency; vitamin, mineral, etc.
7. Depletion of energy sources; glycogen, fats
8. Red blood cell damage and destruction
9. Chronic dehydration; decrease in blood volume
10. Anorexia nervosa
11. Abnormal cardiac rhythms
12. Decreased liver function
13. Chronic elevation of core temperature

Possible psychological causes, like the physiological and physical causes listed above, are linked closely to the many symptoms listed previously. The continued erosion of confidence, overworking in response to ever-decreasing training and competitive performances, and constant frustration are among a few of the important psychological causes of failing adaptation.

Measurement for Failing Adaptation

Although several attempts have been made to measure failing adaptation, especially attempts at early diagnosis, thus far no accurate means are available to either predict its onset or even detect if it has already occurred. It is often difficult to differentiate between what may be abnormal physiological responses related to a failure to adapt or simply normal responses to heavy training. Scientific studies describing failing adaptation are sparse because of the difficulty in isolating and measuring specific factors associated with this phenomenon. It is extremely difficult to control and manage such studies. However, based on the limited research and the many observations by coaches and athletes over the years, the following seem the most promising of possible measurements:

Measurements used previously:

1. Resting heart rate and chronic increases in blood pressure
2. Cardiac arrhythmias (changes in heart rhythm)
3. Increase in white blood cells; increase in eosinophil levels
4. Increase in cortisol levels
5. Chronic hypoglycemia
6. Decrease in muscular power and VO₂ Max
7. Decrease in muscle glycogen
8. Decreases in testosterone (male) and estradiol (female) or disturbances in free testosterone and bound testosterone; decrease in Tf/C

9. Increased lactic acid for standard submaximal exercise

Measurements that may have potential worth:

1. Body composition; abnormal decreases in body fat and lean body mass (LBM) and change in fat/LBM ratio
2. Chronic elevation in core temperature
3. Abnormal liver function tests; increases in SGOT and SGPT
4. Changes in endorphin levels
5. Decreases in hemoglobin; chronic anemia ("athlete's anemia"); disturbances in erythropoietin
6. Volume of Rapid Eye Movement sleep
7. Chronic decrease in blood volume
8. Chronic elevation of skeletal muscle enzymes

The most attractive factors for possible investigation are blood volume, body composition, muscle enzymes, core temperature, and red blood cell status, most of which are closely linked physiologically.

I am convinced that periodic submaximal ergometer testing may prove beneficial. Athletes should be tested frequently during the periods of high intensity or high volume training using rowing ergometry and power outputs ranging from 60 to 80 percent of maximum. Measurements of submaximal heart rate, VO_2 , lactic acid, O_2 deficit, and O_2 debt, and along with some of the other specific measurements listed previously, may prove to be useful in predicting and detecting failing adaptation. We have developed a test based on three consecutive submaximal efforts on a rowing ergometer that provides useful data concerning an athlete's specific physiological responses to training periodicity. In addition to measuring heart rate and lactate responses during and following 60, 70 and 80 percent of a mean maximal power output of the group, other physiological factors described in this measurement section could also be evaluated. It is also important to conduct most of these measurements during resting or recovery conditions without the immediate effects of exercise as examination of possible failing adaptation factors could be masked by the acute effects of a training session.

Prevention and Treatment of Failing Adaptation

Since it is difficult to identify any clear preliminary or early warning signs of failing adaptation, it is equally difficult to prevent it. Any coach and athlete would, of course, prefer not to see conditions develop where, no matter what the training strategy may be, performance continues to decrease. Some coaches suggest that there is no such phenomenon as failing to adapt to training but instead it is simply the fault of the athlete. In other words, it may be an inherent quality or qualities of the athlete that prevent adaptation and thus those failing athletes do not have the physiological and psychological capacities to adapt and thrive on a prescribed systematic training and racing program. The coach and athlete must also give careful attention to recovery or rest periods; they often forget that the length of these periods is equally as important as the intensity of the specific workout or series of workouts in the determination of overall training intensity. The length of recovery and rest periods are often overlooked and it may be that the insertion of a longer than planned rest or recovery period at a critical time in the high duration or intensity portion of training may help eliminate failing adaptation. It may also be

necessary to modify training sessions when athletes appear not to respond well to the duration and/or intensity of work.

Although some of the measurements discussed earlier may aid in helping to predict or reveal failing adaptation, the most effective measure is the coach's knowledge of athletes and the self-awareness of the athletes themselves. Not only should coaches and athletes record such daily entries in training diaries as distances, stroke rates, times, total volume, number of hard strokes, heart rates, lactates, etc., but more importantly both coach and athlete should carefully and immediately after each training session record their subjective feelings about the work-out; this procedure should also be used for the major training phases or periods. I would suggest that these observations of coaches and athletes be constantly compared so that a continuous line of communication be maintained between coach and athlete comparing how the coach views the responses of the athletes and how the athletes themselves feel; a simple rate of perceived exertion scale could be used.

I would strongly recommend that the coach and scientist combine their efforts to seek ways of predicting failing adaptation. I believe the most promising areas of physiological research are local muscle changes, "athlete's anemia" and chronic dehydration, increased core temperature, and lowered blood volume, the latter factor being the most important. However, the scientist cannot be with the athlete at every training session and thus it will ultimately be the coach who must find better methods of predicting and detecting failing adaptation.

Although the causes of failing adaptation are not clear and this problem more likely results from a combination of some or all of the factors discussed in this presentation, it is probable that the intensity, speed or rate, of training is a more important stress than volume of training. Diminishing the prospects of failing adaptation results from a significant reduction in training intensity or complete rest. Many coaches believe that failing adaptation symptoms can be reduced or eliminated by a few days of light training when it would be best for the athlete to rest completely for 2 to 3 days, followed by 3 to 4 days of some form of easy cross training. It may be recommended that the athlete seek some form of counseling especially if the problem is non-sport related such as poor nutrition, or an academic, economic or social problem.

Prevention is obviously preferable to having to cure failing adaptation. It is no secret that in order to minimize the risk of failing adaptation it is best to use a periodic training program where easy, moderate, and hard training periods are alternated. As a rule, one or two days of intense training should be followed by an equal number or more of easy training days. This should also apply to weekly planning and 1 to 2 weeks of hard training should be followed by a week of easy work.

In summary, I believe there is only a subtle difference between what are normal responses to heavy training and the abnormal responses associated with failing adaptation, in fact, so finite that it may not be possible to accurately measure, detect, and prevent. However, this is such a major problem that the coach and scientist must continue to work closely together to discover possible early warning signs and thus still have time to reverse this debilitating condition.

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