



PHASE 3: ANAEROBIC- ENDURANCE TRAINING



During cardiorespiratory training, recovery is a very important, yet often overlooked, component of the exercise plan. As trainers work with clients to improve their cardiorespiratory efficiency, and as these clients progress within the ACE Integrated Fitness Training® (ACE IFT®) Model, recovery becomes increasingly important.

If recovery days and times are not used effectively, this can lead to overtraining, which can cause decreased performance, weight and mood issues, and sleep disturbances, among other issues (ACE, 2014). This course covers the signs and symptoms, internal physiological changes, and the psychological response to overtraining. You will also learn how appropriate programming that includes adequate recovery can prevent this phenomenon from plaguing you and your clients.

To safely and effectively program cardiorespiratory training times, intensity, and duration for yourself or your clients, a very narrow window exists within the training plan that is the key to producing optimum training results. Undertraining can produce only small physiological changes and very few, if any, positive changes in performance. Conversely, exercising beyond this training window without proper recovery can cause negative changes in performance as well as many other physiological issues (Kenney, Wilmore, & Costill, 2012). This type of exercise burnout, called overtraining syndrome, is more common among those training in phases 3 and 4 of the ACE IFT Model. However, anyone can be affected by overtraining. ACE (2014) defines overtraining syndrome as “the result of constant intense training that does not provide adequate time for recovery.”

Overtraining can be accompanied by several physiological changes. Many of these problems will present themselves on an individual basis, which may make it difficult for the trainer and client to recognize it as a sign of overtraining. Similarly, it is difficult to identify the overtraining syndrome because not all documented signs and symptoms are seen in all individuals (Kenney, Wilmore, & Costill, 2012). Overtraining is caused by either too much intensity during workouts or an abundant

amount of volume without proper recovery. Intensity-based overtraining is seen in individuals who focus primarily on strength training, where volume-based overtraining is usually linked with endurance training (ACE, 2010). Initially, the most noticeable sign that clients or athletes may experience is a decrease in physical performance. This can be clearly identified by both athlete and coach, but it may not necessarily be attributed to overtraining at its first detection. This is why it is imperative that coaches and trainers understand other signs and symptoms of overtraining that may go unnoticed when overshadowed by an initial decrease in performance.

A preliminary symptom that accompanies overtraining is consistent fatigue after a period or multiple periods of recovery (hours, days, or weeks). This type of lethargy manifests itself because the body was unable to recover in the time allowed by the individual before the next exercise bout. Although fatigue occurs with overtraining, exercisers may also experience disturbed sleep patterns, which may take time to become actualized. This lack of sleep compounds the issue of fatigue, promoting further physiological conflicts. Another symptom that will be more prevalent to the client is increased muscle soreness. Due to the inability of the body to recover between exercise bouts, the muscular system is unable to repair muscle damage caused by previous training sessions (ACE, 2010).

The nervous system is greatly affected during cardiorespiratory endurance training. Generally speaking, cardiorespiratory overtraining leads to issues related to the regulation of the autonomic nervous system, a division of the peripheral nervous system (PNS). The autonomic nervous system is under involuntary control, meaning that the exerciser has no conscious control over how the body responds to stress placed upon it. It is responsible for the increase and decrease of heart rate, which is affected during and after exercise. If overtraining occurs, the ability of the autonomic nervous system to work effectively is altered and the heart rate response to exercise changes. Some research suggests that a high volume of



cardiorespiratory training without proper recovery can lead to regulation issues mainly within the parasympathetic division of the autonomic nervous system. This causes higher heart rates after the exercise bout is concluded, as well as a noticeable decrease in resting heart rate. Conversely, with overtraining caused by resistance training (intensity-related), the sympathetic nervous system is affected, which can elicit a higher resting heart rate and lower heart rates during exercise (Kenney, Wilmore, & Costill, 2012).

Other symptoms of overtraining that may be less noticeable to both the client and trainer include those taking place in the endocrine system. The endocrine system has a slower response rate when compared to the nervous system. Therefore, it may take more time for the signs and symptoms associated with the endocrine system to be noticed. Overtraining significantly affects the hormones known as catecholamines (epinephrine and norepinephrine). These hormones are released from the adrenal glands and are responsible for the changes in blood pressure and heart rate in response to long-term endurance training. When the body is unable to reach a state of rest, due to overtraining, the levels of both epinephrine and norepinephrine have been shown to rise and stay elevated during rest periods. Continuously higher levels of these two hormones may also be responsible for both elevated heart rates and blood pressure when measured during and after exercise (Meeusen et al., 2007).

Another hormone altered by continuous training without adequate rest is cortisol. As many exercise professionals know, cortisol is important when it comes to weight management and is referred to frequently as the “stress hormone.” Along with cortisol being released during times of psychological stress, cortisol blood levels also increase during bouts of extended endurance training. The continued, excessive release of this “stress hormone” may be responsible for weight gain that some individuals see during periods of overtraining (ACE, 2014).

Another hormonal change that can lead to overtraining is related to testosterone. During times of long-term physical stress, testosterone tends to decrease, while cortisol, as previously stated, shows an increase. The measurable difference in these two hormone amounts are what can cause an increase in catabolism, which is a breakdown of tissue. In the case of overtraining, proteins are being utilized for fuel, which can cause muscle tissue breakdown, leading to a decrease in lean mass and, therefore, resting metabolic rate (Kenney, Wilmore, & Costill, 2012). By decreasing the number of calories used during rest as the body’s lean mass decreases, further weight gain in the form of adipose tissue may be seen.

Another physiological effect of overtraining can be seen through changes in immunity. During levels of normal stress, the immune system is responsible for keeping people safe from any dangerous viruses and/or bacteria that may try to invade the body, warding off illness and disease. However, when the stress level increases (both physically and emotionally), the ability of the immune system to function is compromised (Kenney, Wilmore, & Costill, 2012). Professional athletes, as well as recreational competitors, have been known to suffer from illness immediately following or during their competitive events. Research has shown that during bouts of moderate-intensity physical activity, immune function increases, while during overtraining and bouts of exhaustive training, immune function actually shows a decrease in effectiveness. The cause for illness under these circumstances can be traced to reduced levels of lymphocytes and antibodies in the blood. These specialized units are responsible for seeking out and eliminating any foreign pathogen that might be trying to invade the body. Because of the increased and excessive training being performed by the individual during this time, these lowered concentrations of important chemicals do not allow the immune system to function properly, increasing the chance for an illness to infect the exerciser (Kenney, Wilmore, & Costill, 2012).

Although overtraining can occur in any individual who is not getting adequate recovery, many of those who are diagnosed with overtraining syndrome are competitive athletes. Overtraining can happen in these populations due to the pressure of performance goals put on them by their coaches, teams, and probably more likely, themselves. The pressure of an expected performance outcome can cause high levels of emotional stress, which is why many athletes who suffer from overtraining may show signs of



other psychological disorders. As measured outcomes decrease with overtraining, an athlete may become anxious and try to train harder in order to compensate for the decrease in performance. This will further perpetuate the cycle of overtraining, not allowing the body to recover adequately. Because this increased physical effort may not result in measureable gains in performance, feelings of inadequacy, irritability, and loss of motivation may begin to surface. Some research has shown similarities between the psychological signs of overtraining and clinical depression, which includes effects on neurotransmitter levels (Meeusen et al., 2007). Neurotransmitters are chemicals used to communicate between nerves and other cells within the body. During clinical depression, the neurotransmitters dopamine, serotonin, and norepinephrine are subject to change, which is why many anti-depressive drugs are aimed at increasing the amounts of these specific chemicals. Responses to overtraining can include changes in the amounts of these neurotransmitter within the body and are therefore responsible for some of the emotional responses seen by those who suffer from overtraining syndrome (Meeusen et al., 2007).

Clearly, there are many manifestations of the overtraining syndrome. It is important to recognize these signs and symptoms, as well as any other noted changes in your client, in order to properly identify overtraining. To prevent overtraining from affecting your clients or athletes, measures must be taken before any of these issues can be seen. The most important and effective way to prevent the overtraining syndrome is by programming regular rest and recovery days and times for your exercisers (Redmon, 2013). A properly designed training plan is the key to preventing overtraining, improving performance, and aiding in overall health. Using the FITT principle is an effective way to plan and implement periodized training that will reduce the occurrence of overtraining. Frequency of training bouts refers to the number of times per week that this type of training occurs (ACE, 2014). For cardiorespiratory training, up to six or seven days per week may be appropriate, depending on the level of fitness

and goals of the client. Intensity is an important factor related to overtraining, and as the frequency increases, the intensity should decrease to allow for proper recovery. Time refers to the total duration of the exercise bout and, like frequency, is dependent upon the intensity. Programming high-intensity intervals to improve cardiorespiratory efficiency is a great training method. However, these intervals must be accompanied by appropriate rest periods. Lastly, the type of training can be altered to allow for prevention of overtraining. If someone is running consistently to improve his or her heart health or improve performance in a marathon, a cross-training day using a stationary bicycle or swimming might be a great way to alter the physiological demands, yet give the individual a needed rest from the physical and mental strain of the same mode of exercise (ACE, 2014).

The ACE IFT Model offers important guidelines for integrating appropriate rest into an existing training program to prevent overtraining. Due to the increase in intensity, as well as the competitive nature of clients that progress beyond phases 1 and 2 of the cardiorespiratory training component of the ACE IFT Model, phases 3 and 4 are of great importance when understanding how to adequately program appropriate rest to avoid overtraining. Phase 3 (anaerobic-endurance training) is where goals related to competitive events begin to be addressed, and appropriate first ventilatory threshold (VT1) and second ventilatory threshold (VT2) heart rates should be found in order to properly train within this phase. To avoid overtraining and many of the symptoms that accompany this syndrome, phase 3 training zones should be established as follows: 70–80% of training time spent below VT1, 10–20% of training time spent between VT1 and VT2, and <10% of total training time spent above VT2. For those individuals who are working toward highly competitive endurance performance goals, performing two or three interval sessions per week utilizing zones 2 and 3 is appropriate. However, for those athletes who are new to competition or have a lower fitness level, one interval session using zones 2 and 3 would be appropriate per week. In either case, work-to-rest ratios of 1:3 should be incorporated into the interval sessions to allow for appropriate recovery time. This recovery ratio should be applied to each work interval during zones 2 and 3. For example, if a training day consists of two sets of three 60-second sprints in zone 3, each sprint should be followed by three minutes of active rest to allow for



full recovery before the next interval. Applying these principles will keep the client/athlete safe from injury and overtraining while still allowing him or her to progress through the training program to achieve competitive goals (ACE, 2014).

Communication is also key to preventing and recognizing the overtraining syndrome. If the coach or trainer has developed a successful relationship with the client, honest conversations about performance and personal struggles can be initiated. With well-developed rapport, open and honest communication about emotional struggles, motivational issues, illness, or dips in performance measures are easily discussed. Rapport is the basis of the ACE IFT Model and should be the foundation for creating a positive relationship in which sensitive issues can be broached. With rapport comes trust, and with trust clients and athletes who are allowed to feel vulnerable with their trainers can open up about issues facing them during their training. As a coach or personal trainer, it is important to listen to your clients, but unless you are also a licensed mental health professional, you must not counsel them when confronted with issues of depression that may surface. It is important to stay empathetic and motivational and allow the individual to feel supported by you. Referrals can also be a great tool when a client or athlete suffers from overtraining. Although you may have developed a sound system for improved performance and results, a client's drive to overachieve, compete, or simply do more

may lead him or her to overtraining. When emotional issues begin to surface, calling upon an outside mental health professional is always appropriate (ACE, 2014).

Understanding the overtraining syndrome is important when working with individuals who are striving toward self-improvement. Whether physical or mental, the signs and symptoms that accompany overtraining can be serious, yet subtle. Using effective communication to understand each client's physical and emotional reactions to exercise will leave you better prepared to effectively monitor his or her stress levels and prevent the overtraining syndrome. By programming safe and effective training plans using the ACE IFT Model and FITT principles, you empower your clients and put them on the right path toward achieving their goals. ●

References

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