Introduction

In some form or another, all athletes have experienced some type of stress. An athlete may potentially encounter stressful situations during competition and/or training sessions, media coverage, financial issues and any other experience that may cause tension within the sporting world or personal life. This paper focuses on the stress that often occurs when an athlete, is overtraining, physically and mentally pushing themselves past their personal limit. This paper suggests that it is possible to manage the stress of overtraining through yoga and the disciplines of relaxation and meditation. Very little research has been conducted to explore the possible uses of yoga with overtrained athletes; however, in this paper I am attempting to assess some of the possible benefits of incorporating yoga into an athlete's training program.

Stress: A General Overview

In order to understand the effects of stress due to overtraining, we must first define what is meant by stress. Cotton (1990) indicates that there is no definition of the term "stress" that is universally accepted. Therefore, this paper will use Hans Selye's expanded definition of stress: "stress is the inability to cope with a perceived or real threat to one's mental, physical, emotional, and spiritual well-being which results in a series of physiological responses and adaptations"(Seaward, 1999, p.5). This definition can be divided into the stressor, the perceived or real threat that causes stress, and the resulting physiological effects. Cotton (1990) states that a stressor can be a situation, circumstance or any stimulus that is perceived to be a threat. Following the stress are the stress responses, which are the physiological changes in the body.

The physiology behind stress is summarized in Hans Selye's process of General Adaptation Syndrome. It consists of four stages: alarm, resistance, exhaustion and termination (Nuernberger, 1981). The four stages represent the process that the body uses to battle perceived stress. During this process, the focus is on the peripheral nervous systems (PNS) and more specifically on the sympathetic nervous system response. Once a stressor is perceived as a threat, the body signals the PNS with a dominant sympathetic response (alarm). Meanwhile, the parasympathetic nervous system is suppressed from its role in the body. Next, the endocrine system is activated and causes the adrenals to help in the control of the sympathetic response. The adrenal medulla then releases the hormone epinephrine and norepinephrine (resistance). Seaward (1999) summarizes the effect of these hormones as:

> the acceleration of heart rate, the increase in the force of myocardial contraction, vasodilatation of arteries throughout working muscles, vasoconstriction of arteries to non-working muscles, dilation of pupils and bronchils, increase ventilation, reduction of digestive activity, release glucose from the liver and several other functions that prepare the body to fight or flee. (p. 9)

The body must now deal with the stress-induced physiological responses that are brought on by the release of epinephrine and norepinephrine.

If the stress is prolonged the body requires the help of the hypothalamus. The hypothalamus directly influences the pituitary gland (Seaward, 1999) and thus, causes it to release adrenocorticotrophic hormone (ACTH) and thyroid-stimulating hormone (TSH). The ACTH circulates in the bloodstream and stimulates the adrenal cortex to

create and release cortisone (cortisol) (Nuernberger, 1981, p.65). Free fatty acids and glucose that are within the body are delved into with the stimulation of cortisol. This energy is taken from the body to deal with the stress response (exhaustion). Nuernberger (1981) suggests that "continued activation of sympathetic arousal can be destructive" in that the body loses essential energy by dealing with the stress and this could cause failure of vital organs (termination). (p.65) Generally, these physiological processes occur in a bodily environment of stress.

The Overtraining Syndrome

The term "overtraining" is used widely throughout the sporting community, magazines, books and television. However, the term is often misused in many of the cases, because there are actually three different stages of overtraining. The three stages are overstraining, overreaching and overtraining syndrome. It is important to clarify what each of the type of overtraining entails. Overstraining occurs when there is an acute tissue damage induced by intensive training that exceeds the stress tolerance of the muscles. Whereas, overreaching is the intentional or unintentional induction of short term overtraining (i.e. an imbalance between physical work and rest). The final stage is the overtraining syndrome, and is the state of chronically depressed performance accompanied by one or more medical, physiological and mental symptoms (Fry, Morton, & Keast, 1991). The overtraining syndrome is the focus of the paper.

Athletes' training programs have what is called progressive overload, which is an ever-changing stimulus that provides physiological adaptations. Controlling the overload is difficult, as it is a fine line between what is just enough and too much of a stimulus.

The overtraining syndrome is continual stress that is above what an athlete can physically handle. As well, Brooks (1998) comments that the overtraining syndrome is comprised of a combination of stress that is experienced through work, home, social interactions and training loads. This sounds very familiar to what can cause general stress in the average person. Therefore, the overtraining syndrome is not just caused by too much exercise and little rest; it can be caused by other stressful incidents in the athlete's life.

Fry, Morton &Keast (1991) state that they are two types of stress responses to the overtraining syndrome. Sympathetic overtraining is the dominance of the sympathetic nervous system and parasympathetic overtraining is the dominance of the parasympathetic nervous system both being part of the autonomic nervous system. Beginning with the sympathetic overtraining, it is characterized by a "prolonged stress response preceding exhaustion" and most athletes that do experience this type of overtraining are "speed and power athletes" (Fry, Morton & Keast, 1991, p.40). Whereas the parasympathetic overtraining is "a reflection of an advanced state of overtraining closely associated with exhaustion of the neuroendocrine system" and it is most likely to affect "endurance athletes" (Fry, Morton & Keast, 1991, p.40). The nervous system has a large role in the overtraining syndrome as "it is clear that overtraining represents a perturbation of nervous regulation" and that it does "fit nicely into the general adaptation model proposed by Seyle". (Fry, Morton & Keast, 1991, p.40)

The implications of the sympathetic and parasympathetic overtraining can have an impact both physiologically and psychologically. Fry, Morton & Keast (1991) provided an extensive list of symptoms that may or may not be evident to athletes who are

overtraining. The following is a condensed list of possible symptoms an athlete may experience. The physiological symptoms may include: increased resting heart rate, increased sub-maximum heart rate and ventilation, decreased maximum work capacity, increase resting blood pressure, retarded blood pressure and heart rate recovery, increased frequency of respiration, elevated coritsol levels, and decreased performance. The psychological symptoms may include: feelings of depression, decreased esteem, emotional instability, sensitive to environmental and emotional stress, increased irritability, and changes in personality.

Research has currently yielded preventative measures to reduce the risk of overtraining in the form of periodization. The term periodization is "the deliberate strategy of exposing athletes to high-volume and high-intensity training loads that are followed by a lower training load, known as rest." (Weinberg & Gould, 1999, p. 434) Thus, by using a periodized plan for athletes, they will most likely have the appropriate amount of training stimulus and rest time, decreasing the risk of developing the overtraining syndrome. Coaches are able to monitor the athletes closely because he/she will be following a program that is set out for them. Fry, Morton & Keast (1992) comment that "periodization provides a framework for controlling the stress and regeneration that is essential for training improvements, assists in achieving regularity in the training process and lifestyle, and decreases the danger of monotony and mental saturation through variation in spite of high training frequency." (p. 243) However, periodization deals with the athletes physical stress yet does not recognize the mental stress that may cause the overtraining syndrome. The practice of yoga and its disciplines

may provide supplement to the athletes' workout that would help avoid or control the overtraining syndrome.

Yoga: For Prevention or Regulation of Overtraining Syndrome

Yoga means many things to many different people, as it is a practice that is intensely personal. Schiffmann (1996) defines yoga as "a way of moving into stillness in order to experience the truth of who you are…[and] also a way of learning to be centred in action so that you always have the clearest perspective on what's happening and are therefore able to respond most appropriately". (p. 4) Looking at yoga in this way, it can be seen how it can be an important aspect to athletes' training programs. The athlete is provided the opportunity to become focused on how he/she feels and thus, able to recognize if there is a problem (i.e. overtraining syndrome). With prevention and or regulation of the overtraining syndrome as a goal, the yoga will be used to emphasis the diaphramatic breathing (yoga breathing), yoga asanas, relaxation and mediation. Cotton (1990) affirms that yoga asanas and meditation are physiologically oriented and meant to serve the function of diffusing the effects of stress such as the overtraining syndrome. As well, they will increase the resistance of the body to future stress or a relapse of the overtraining syndrome.

Diaphramatic Breathing

An athlete's focus on breathing is concerned with getting enough oxygen to the working muscles during vigorous physical activity. Generally, breath control is not a

skill that is practiced, yet it should be. In the article, “In the Zone”, author Dimity McDowell (2000) writes, “if you can control the breath, you can control the mind”. (p. 63) If athletes are to control their own performance and training, breathing properly will benefit them greatly. Breathing has a direct link to the central nervous system and helps in its functioning (Singh & Soin, 1996). Therefore, an emphasis on breathing has a direct impact on neural activity. Nuernberger (1981) suggests that “inhalation directly but subtly reflects and stimulates sympathetic discharge, while exhalation directly but subtly reflects and stimulates parasympathetic discharge.” (p. 180) Consequently, using breathing can control the effects that stress may play on the body.

Concentrating on breathing will enable athletes to focus more on the present moment and relieve stress that could be stimulated in their lives. Diaphramatic breathing maintains a relaxed state that is not aroused where as thoracic breathing stimulates stress by the right vagus nerve that aggravates the parasympathetic nerve tissue causing a stress reaction (Nuernberger, 1981). Therefore, it is important to use diaphramatic breath in all aspects of training, as it will help eliminate the stress caused by the overtraining syndrome. Diaphramatic breath will then be able to target the sympathetic overtraining as well as the parasympathetic overtraining by centering on what the breath is doing. The control of inhalation will aid in the sympathetic overtraining, while the control of exhalation will aid in the parasympathetic overtraining. The use of diaphramatic breathing is also important in the practice of the yoga asanas.

Yoga Asanas

After learning how to breathe properly, athletes can continue to do yoga poses or yoga asanas. These exercises are able to exercise the autonomic nervous system through a conscious control. The autonomic nervous system is energized by the asanas through a process of involution from the organs under its control by adding pressure and massage through the voluntary muscles (Rele, 1958). Because of the muscle toning there will be "a better functioning of the organs it controls." (Rele, 1958, p.70) The practice of asanas allows the body to relax through this physiological mechanism. Also, Nuernberger (1981) discusses that asanas do have documented physiological benefits in that they lower stress levels, reduce blood pressure and assist in the restoration of the homeostasis of the body. Hence, the use of asanas will assist in restoring the body back to normal levels if an athlete is experiencing the overtraining syndrome. A basic selection of yoga asanas could be used initially for athletes, and then they could progress into more difficult moves to relieve stress on the autonomic nervous system.

Relaxation

Overtrained athletes may also reap benefits from doing relaxation techniques. As a part of the yoga practice, relaxation goes hand in hand with both the diaphramatic breath and the yoga asanas. Relaxation is defined as the "lessening of stress or tension. Overcoming stress through rest or diversion of interest and activity." (Singh & Soin, 1996 p. 132). They continue to say, "relaxation is generally taken to primarily mean lessening of mental tension…lessening of mental tension or stress often helps to overcome physical tension because of the interplay between the mind and the body". (Singh & Soin, 1996 p. 132). The physiology concerning relaxation is that when relaxation is induced, the brain

and spinal cord activity lower and this results in the lessening of nerve impulses arising in muscles and other sense endings in tendons and joint structures (Humphrey, Yow, & Bowden 2000). Thereby, allowing the mind to rest, overtrained athletes will consequently rest their physical bodies. Hopefully, by doing this, athletes will be able to combat the overtraining syndrome by calming the mind and the body.

Mediation

The final stage of yoga that an overtrained athlete could use is that of mediation. Meditation is the only part of yoga that has had any extensive research done on it. Humphrey, Yow, & Bowden (2000) suggest that meditation can give the mind a rest as it allows us to have a temporary shut down of the processes in the brain that operate the production of stress. Again, the mind-body connection will help control the stress levels of an overtrained athlete.

Solberg et al. (2000) states that "meditation is probably the most commonly used relaxation technique for stress management and personal growth." (p. 268) The Solberg et al. (2000) research study studied the effect of mediation on participants who were avid runners. As a result, they found that those runners who meditated were more likely to reduce stress reactivity as measured by lactate response after an exercise bout. The proposed physiological reasoning behind these findings was that "the lower blood lactate observed after mediation may be due to reduced norepinephrine, reduction of anxiety caused by relaxation training, or the redistribution of blood flow to a more aerobic skeletal muscle metabolism." (Solberg et al. 2000, p. 271) The evidence suggests that the mediation does lower the hormone, norepinephrine that is partially responsible for stress

to occur. Therefore, the practice of meditation would be a positive influence in preventing or reducing the stress of the overtraining syndrome. The study concludes by stating that "further scientific focusing on stress management techniques used in sport is proposed with the ultimate aim of preventing overtraining." (Solberg et al. 2000, p. 272)

Does it work?

The argument presented is that yoga practices will enable an athlete that is at risk of the overtraining syndrome or who has the overtraining syndrome deal with the stress that it involves. Yoga practice could reduce mental stress on an athlete as well as physical stress that is placed on the athlete's body. The mind-body relationship must play a role, as it is important for athletes to better understand their condition of their bodies and thus be able to perform their sport to the best of their abilities. By controlling the mind through the practice of yoga, athletes will be able to have an effect on the physiological symptoms of the overtraining syndrome through autonomic nervous control. (See overtraining section for specific symptoms).

Conclusion

Stress management is a factor that athletes must include in their training as it affects them just as much as their equipment or physical abilities. To recognize that overtraining is an issue that is present in the sporting world, athletes must also be able to identify it in its beginning stages (overstraining) and try to avoid the most difficult and detrimental stage, the overtraining syndrome. A way to avoid or control the overtraining syndrome is by using a periodized method of training. However, this deals with the physical practices and allotted rest periods. Yoga would be an excellent supplement to

the periodization plan. It would work on the mind-body connection through diaphramatic breathing, yoga asanas, relaxation and meditation. These aspects of yoga would allow the mind to control the body and reduce the severity or the risk of the overtraining syndrome.

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