

# The Effect of Stress Management on Non-Training Stress in the Overtraining Syndrome

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## Abstract

Overtraining Syndrome (OS) is a form of Chronic Fatigue Syndrome that affects athletes and avid exercisers. The purpose of this study was to investigate the effect stress management has on eliminating non-training stress, such as mental or emotional stress, in the OS. Subjects included endurance athletes (N=20, mean age=31.4 years) presenting symptoms of the OS (identified by a questionnaire developed from qualifications for Chronic Fatigue Syndrome paired with accepted characteristics of the OS). Group 1, the stress management (SM) group, met once a week with a counselor who worked with the subjects on managing their stress level using a variety of stress management techniques such as progressive relaxation. Group 2 met once a week as a support group; SM techniques were not introduced. All subjects were required to report training, illnesses, progression/regression, and any outside stress. SM group identified the stress management techniques they used in their diaries. The recovery or relapse of the subject over the 2-year period was analyzed. Significant differences were found between the SM and control group at 12 months ( $p<0.01$ ), 18 months ( $p<0.01$ ), and 24 months ( $p<0.001$ ) for training level increase, with the SM group reporting increased rates of recovery. There was no significant difference between groups at 6 months, although the SM group reported fewer stress-related symptoms on the life stress inventory, which was consistent throughout the study. Training load significantly increased in the SM group ( $p<0.01$ ), when compared with the control group. Non-training stress, paired with everyday training stress may contribute to the development of OS. Management of outside stress, using SM techniques, may reduce stress, and lead to recovery from OS, as indicated by training load increasing.

**Keywords:** Chronic fatigue; Overtraining; Adrenal fatigue; Recovery; Stress

## Introduction

Chronic Fatigue Syndrome is characterized by prolonged fatigue and poor recovery after performing tasks that were formerly easy. People with this disorder cannot perform their daily tasks without becoming extremely fatigued. Overtraining Syndrome (OS) is a form of Chronic Fatigue Syndrome that affects athletes, avid exercisers, and people in fitness related professions [1]. It is characterized by extreme decrease in performance and/or training ability. It has been known to last from several months to two years [1]. There have been reported cases of up to 7 years [2]. Athletes have been unable to continue participating in their sport.

Other than the obvious decrease in training capacity or intensity, OS can be distinguished by the following symptoms:

- Muscle pain/Body aches
- Mood changes; easily irritated
- Decreased or disturbed sleep
- Depression
- Decreased self-confidence
- Loss of Competitive Desire
- Loss of enthusiasm for the sport
- Decreased appetite
- Increased incidence of Injury
- Frequent Illness
- Elevated Resting HR
- Headaches

There are many theories as to the development of OS. It is unknown if overtraining is actually the cause of OS. The cumulative

effect of training, any extreme physical stress, and overtraining are all important triggers for the condition. There are many theories that involve immune dysfunction occurring because of extreme physical stress [3,4]. The immune system will then be easily effected by any virus or disease, and will be unable to fight off infection. In almost all cases, a lack of restful sleep is reported [5]. Resting for 3-5 weeks assists underperforming competitors in improving their performance [6].

In the OS, it is common for people to suffer from anxiety and depression [7]. This could be caused by the development of the OS. The OS could also be caused because of the anxiety and depression. The chemical imbalances that occur from anxiety and depression may play a part in OS development.

The occurrence of outside stress in the form of mental or emotional stress, life changes, imagined stress, or conflict has been noted in many OS cases [8]. Prolonged stress on the body in the form of training or non-training stress has become a theory as to the development of OS. The OS has been found to develop in highly motivated individuals, who tend to be perfectionistic and push themselves to their limits [9]. The body cannot deal with excess stress in any form for a prolonged period of time without negative effects occurring [10]. Poor stress management or an inability to deal with stressors, whether physical or not, may be the key to OS development.

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The foremost cause of OS is training stress. Overtraining may or may not occur in every case. It is hard to tell if overtraining has occurred because of individual differences in training tolerance. Overtraining for one person may be optimal training for another. It has been noted that there is an increased risk of developing OS following a training overload (increased intensity or volume) of three weeks or more [11].

Elimination of stress may play a role in prevention of OS. It is apparent that physical training is related to development of the overtraining syndrome, however, the effect non-training stress has not been established. Elimination of non-training stress with stress management techniques may help combat OS. The purpose of this study was to investigate the effect stress management has on eliminating non-training stress in the overtraining syndrome. A focus on management of outside stress to combat OS may serve to help in identifying the role non-training stress plays in OS.

## Methods

This study was delimited to young to middle-aged endurance athletes presenting symptoms of OS. Coping scales were used to determine progress or regression in the sample. This study aimed to determine if stress management directly affects non-training stress and if outside stress is a factor rather than any changes in training.

A stress management group and a control group (that meets as a support group) were used. Progression or regression in training, and elimination or addition of stress over a 2-year period was assessed between the groups, as well as over time.

## Subjects

Subjects included endurance athletes (N=20, mean age=31.4 years) presenting symptoms of the overtraining syndrome. They were identified by a questionnaire developed from qualifications for Chronic Fatigue Syndrome paired with accepted characteristics of the OS. Twenty athletes (N=20) with OS were identified from club teams in Louisiana. They were divided into two groups. Group 1 was the experimental group and received training on how to manage stress. Group 2 was the control group.

Group 1, the stress management (SM) group, met once a week with a counselor who worked with the subjects on managing their stress level. Different methods of stress management were introduced and implemented. Meditation, Deep Breathing, Alter Avoid Accept (AAA), Body Awareness, Assertiveness Training, Progressive Relaxation were techniques that used. Group 2 met once a week as a support group; SM techniques were not introduced. All subjects were required to report training, illnesses, progression/regression, and any outside stress in a journal. SM group identified the stress management techniques they used in their journal. Each subject was followed for a 2-year period. The subjects self-reported progress or regression. The recovery or relapse of the subject over the 2-year period was analyzed.

Both groups were assessed every 6 weeks for 24 months by the researcher. Observations, progress, or setbacks were recorded. Psychological questionnaires were distributed every 6 months for 2 years. These included:

- The Coping Response Inventory [12].
- The Athlete Daily Hassle Scale [13].
- Hazards of Change Stress Scale [14].

The improvement or regression of the athlete was based on the 3 questionnaires, as well as the amount of training increase or

decrease from baseline. The recovery of the subjects was reflected with an increase in training. The amount of training (determining recovery or regression) was based on percentage of normal level for each individual. Training was quantified in percentages of increase or decrease from pre-OS, or peak level. The percentage of training from the baseline was compared between groups and across time. This study can be generalized to the population of endurance athletes (who are training) with OS.

Endurance athletes from the local area were targeted and screened for OS. The sample was identified by a questionnaire that determines if the subject has the characteristics of the overtraining syndrome. Of the people identified as having OS symptoms, a sample was randomly selected. Control variables included the random selection of young to middle-aged endurance athletes with OS symptoms. The subjects were randomized into either the SM or Control group. An attempt to randomize into groups based on sex and age was made.

The internal validity of the study being threatened by any outside participation by subjects in other treatments was considered. Subjects were instructed to undergo usual care. They reported all treatment in a journal, and any influence was noted. Participation in other treatments was noted, but the presence of the control group helped to eliminate any apparent threat. Another threat that was considered was the subjects' motivation to get better and to use the stress management techniques. The subjects had to have a desire to get better and follow the guidelines of the study. This could not be controlled for, but discrepancies were reported.

The meeting of the control group was implemented to control for the fact that the stress management group physically met once a week, which could be considered a threat to both internal and external validity as the group "getting together" could affect the outcome of the study due to socialization received during that meeting. To strengthen the validity, the control group met once a week as a support group, but did not learn to use stress management techniques.

Performance was self-reported by the subject. The researcher did not directly assess the subjects. Guidelines for interviews were in place, subjects took self-evaluations, and the journal kept by the subject was self-reported.

Data was analyzed in the form of percentages of improvements, no change, or setbacks from baseline that occur in each group as determined from training logs. Data was assessed over time and between groups. The data from the control group vs. the stress management group was used to determine if the stress management techniques helped to eliminate non-training stress, and thus the OS.

A repeated measures ANOVA was used to examine data from the 3 questionnaires. There was one within factor (time) and one between factor (being the treatment of the stress management vs. the control group). Dependent measures were assessing the 3 questionnaires.

The analysis of data from the questionnaires between groups helped to determine if the stress management had an impact on reducing stress in the lives of the SM group subjects. Examining the data over time shows how and when the stress was eliminated and if it held constant, was eliminated, or if it was increased in each group.

Data from the training logs was obtained to aid in determining which groups did in fact regress or progress over time, and if one group outperformed the other for any specific reason.

## Results

Descriptive statistics are reported in table 1. Twenty athletes started

the study, and completed the study. Only 16 subjects finished the requirements and meetings for inclusion in the study.

A significant difference was found between the SM and control group at 12 months ( $p < 0.01$ ), 18 months ( $p < 0.01$ ), and 24 months ( $p < 0.001$ ) for training level increase. There was no significant difference between groups at 6 months, although the SM group reported fewer stress-related symptoms on the ADHS inventory, which was consistent throughout the study. Training amount significantly increased in the SM group ( $p < 0.01$ ), when compared with the control group.

## Discussion

Subjects in the experimental group reported both improvement and recovery, while the control group did not show the same improvements. The attention to their disorder, and the fact that they met as a group and were provided social support did not help to the extent the stress management techniques did. It is possible that the athletes who are displaying symptoms of OS have a difficult time with stress management in their lives, and when physical stress (in the form of overtraining or overreaching) is placed on the body, OS is the result. The dedication the subjects had to stress management techniques varied, but compliance was overall good. The subjects reported learning and following the techniques, and were honest about their training habits and symptoms. They wanted to get better, and reported setbacks and progress honestly.

The duration of the study may be a limitation. The study lasted for a period of 2 years. Some cases of OS have been known to last longer, while other cases will resolve quickly, on their own. The presence of the control group helped to eliminate most error produced by duration, but there is a distinct possibility that the subjects with the most severe symptoms will eventually begin to recover, regardless of the group they were in.

Experimental morality did occur. Four subjects did not meet the minimal requirements for inclusion in the study, due to missing scheduled meetings, though they continued to report data.

Subjects continued to visit regular doctors and receive usual care. Outside treatment was reported and error was accounted for, though the presence of the control group helped to eliminate the threat. Subjects were asked to be honest about their participation in other treatments or medication they received, and there were no statistical differences noted, and no evidence that any outside treatment had an effect.

Outside stress has been identified as a probable cause for the OS in many studies, and the current study agrees with this, and is similar to prior studies. Life stress and daily hassles have been found to increase the incidence of illness and athletic injury [15,10]. It stands to reason that stress management techniques could help to reduce stress levels, thus eliminating symptoms, and the current research supports this.

The more stress a person is put under, whether it is training or non-training stress, the more susceptible they are to illnesses and disease. The fact that stress promotes illness may prove to be a factor in the development of disorders such as the OS. Case studies were conducted in other studies showing that outside stress is prevalent in several cases

of OS [16,8]. These studies conclude that the overtraining syndrome may be a response to an accumulation of both training and non-training stress [16,8], and the current study supports prior research.

Social and lifestyle factors may be involved in the development of the chronic fatigue syndrome [7]. The non-training stress that occurs from a person's lifestyle has an impact on development of chronic fatigue syndrome, and thus the OS when combined with training. Non-training stress, in the form of environmental and lifestyle stressors, has also been found to contribute directly to the development of the overtraining syndrome [17]. The current study does not address lifestyle and personality, which should be a target of future research.

Individual differences exist in response to training load. This makes it difficult to determine if a person is overtraining. Optimal training for one athlete may be overtraining for another. In studies conducted to determine what impact individual differences may hold, no changes in training load were found prior to the onset of the disease in many cases [18-20]. These studies also confirmed that non-training stress is a common factor among subjects. Additional non-training stress was found to occur just prior to onset of the OS in several subjects. These studies concluded that non-training stress, together with the stress of training (not overtraining), may lead to the development of the overtraining syndrome [18,19], which is further supported by the current research.

An intolerance to normal training due to an accumulation of stress has been found to be a probable cause of OS [18,21,17]. Case studies of athletes in Meehan's studies revealed that almost all athletes were carrying out the same amount of training as they had done in previous years. They also reported no significant increase in training load in the six months leading up to their symptoms presenting. All athletes were also experiencing some form of non-training stress prior to their symptoms. The accumulation of training and non-training stress that the athletes experienced may have led to the development of an intolerance to their normal training load and thus ultimately to overtraining syndrome itself. Similar reports from subjects in the current study were given. Decrease in ability to exercise, or maintain training load, was reported in each case. It appears the body must choose to try and curtail the physical stress of training while focusing on other life stressors.

Physical fatigue, whether caused by exercise or manual work, is a factor affecting susceptibility to illness [22,23]. Peters examined percentages of runners with upper respiratory tract infections. His results suggested that top competitive athletes and those who engaged in very long or intense exercise (such as ultramarathons) were more susceptible to upper respiratory tract infections than less competitive athletes [23]. The fact that infection will occur more readily when physical fatigue is present, may lead to immune dysfunction in athletes, and the OS. Nieman DC [22] found that physiological and psychological stress of training and competing at the elite level also seems to have a combined effect on susceptibility to illness. Because the athletes are more susceptible to illness, they will constantly be sick. This may lead to OS, or OS may result from the prolonged inability of the body to fight off disease. The physical fatigue of training stress will lead to immune dysfunction if the physical stress is carried out

Group	Wt (kg)	Ht (cm)	Age (yrs)	% PreOS	Pre OS training level (miles/week)	% PreOS level 6 mo	% PreOS level 12 mo	% PreOS level 18 mo	% PreOS level 24 mo
SM	73.1	185	32.6	39.2	58.8	58.4	72.3	78.9	89.6
Control	72.9	175	30.2	41.7	60.2	49.5	63.8	67.6	81.6

Table 1: Descriptive statistics and results.

for a long period without appropriate rest. A repair or recovery debt is accumulated. Paired with additional non-training stressors, the normal stress of training will progress the accumulation of repair debt. This may lead to the development of the overtraining syndrome. The subjects in this study who learned to manage stress began to recover from OS, and its symptoms, and show a statistically significant recovery period and return to baseline training. The addition of stress management, and the prevention as well as the elimination of stress, are important factors in recovery and prevention of OS.

## Conclusions

The development of overtraining syndrome has severe health impacts, as well as effects on athletic performance and quality of life. The individual differences in response to training show that training or overtraining itself are not the chief cause of OS. Athletes involved in recent investigations reported suffering from symptoms of the overtraining syndrome for as long as two years. In such cases, athletes have been unable to continue participating in their sport. This impacts not only competitive athletes or teams, but all people who develop OS. Quality of life for these people is very low. It is important to take measures to prevent, eliminate, or combat this condition. Through this study, we found evidence that stress management will help to manage symptoms of the OS. This adds to evidence that OS can be prevented and treated through further knowledge of its specific cause, with control of non-training stress being a key factor that must be addressed. Consistent findings among the literature are apparent. The fact that training stress leads to the OS is well accepted. It is unknown whether the training stress is in the form of overtraining, if it is paired with non-training stress, or if it is the accumulation of prolonged training. With the evidence from this study, we can definitively say that non-training stress plays a larger role than once considered. Daily stresses, along with physical stress will increase the incidence of illness and athletic injury. If illness and injury are increased due to any kind of stress, they it is safe to assume that OS may result from these factors. Non-training stress, paired with everyday training stress leads to the development of OS. OS can occur without a change in training load. Management of outside stress may lead to recovery from OS.

Because training load differs, it is difficult to determine a precise point where overtraining occurs. This leads to the belief that training stress must be paired with non-training stress for OS to occur. This is thought to result from intolerance to the former level of training, or by the additional outside stress. A person's susceptibility to stress varies; some people can tolerate outside stress better than others. This is where questions of personality type with regards to the development of the OS come into question. Further research is needed on this topic, specifically regarding coping with stress, stress tolerance, and factors that should be considered "outside stress" in susceptible athletes.

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