

**Overloading and overtraining problems during military training :  
South African National Defence Force (sadf)**

Lt-Colonel RGP A. OPPERMAN,  
LtCol J. MOOLMAN (South Africa).

**1. Introduction**

- 1.1. The exercise demands imposed on the musculoskeletal system during military training continue to be of utmost concern in today's more technologically oriented armed forces. This fact is most evident in the conditioning of new recruits, making the sudden transition from civilian to military life, who are subjected to an intensive programme of physical training during their initial months of military service (basic training) (Gordon 1986).
- 1.2. It is extremely difficult to diagnose an overtraining syndrome as a physical and or mental illness in recruits, during military/basic training. On the other hand this syndrome can be more easily diagnosed in top athletes where you have a one to one relationship between athlete and coach. In the military training context we rather refer to an overuse injury, because injuries sustained by recruits under physical training are in most cases the only symptoms indicating overtraining problems. Most of the overuse injuries during basic training are caused by too soon, too much and too fast training. A contributory factor is the intensity of the training programme which doesn't allow the recruit enough recovery time. Recruits are physically overloaded, which leads to overuse injuries.

**2. Aim**

- 2.1. The aim of this paper is to analyze the overtraining syndrome as an illness and discuss recommendations, based on research studies, to reduce overuse injuries by recruits under physical training in the South African National Defence Force (SADF).
- 2.2. The scope of this presentation is as follows:
  - a. Overtraining Syndrome as an illness.
  - b. Overtraining/overuse injuries in the SADF.
    - i. Gordon Research Study 1982.
    - ii. Jordaan Research Study 1990.
  - c. Managing overtraining problems in the SADF.
  - d. Summary.
  - e. Possible solutions/recommendations.
  - f. Future planning.



## Overloading and overtraining syndrome as an illness

### 1. Definition

#### Overloading

Overloading is physical and/or mental activities which can overload an athlete/recruit, if these activities are quantitative in a short time (day or week) without adequate recovery time. Continuous physical and mentally overloading over a long period of time promotes development of the overloading syndrome (too much, too soon, and too fast concept).

#### Overtraining

Overtraining syndrome can be defined as a physical and emotional illness, due to physical and mentally overloading during the training programme. This illness develops over a long period.

### 2. Reasons for overtraining

The following reasons can be furnished for overtraining:

- a. wrong and faulty training methods: (too much, too soon, too fast);
- b. prolonged training sessions;
- c. training intensity is too high;
- d. insufficient rest (recovery) between sessions;
- e. stress (at work or at home);
- f. incorrect eating and sleeping;
- g. various illnesses;
- h. excessive smoking and alcohol/drug intake.

All the above mentioned factors, or some of them over a long period, result in the so-called overtraining syndrome.

### 3. Symptoms of overtraining

Overtraining can either be sympathetic or parasympathetic.

#### Sympathetic

Sympathetic nerve stimulation results in the fight or flight reaction and is easier to diagnose.

#### Parasympathetic

Parasympathetic activation results in slowing down and is more difficult to diagnose, as its main manifestation is disturbances in the normal regulation of energy and protein metabolism. The only noticeable symptom is the decrease in the maximal performance (clumsy movements and poor coordination).



#### **4. Symptoms of sympathetic overtraining**

##### **4.1. The following symptoms have been diagnosed:**

- a. Easy sweating and moist hands;
- b. Fatigue;
- c. Irritability and decreased tolerance of stress;
- d. Lack of appetite;
- e. Sleeplessness;
- f. Weight loss;
- g. Frequent headaches;
- h. Rapid resting pulse rate;
- i. Increased basal metabolism;
- j. Heaviness and chest pain.

##### **4.2. The following clinical illnesses must first be eliminated before sympathetic overtraining symptoms can be diagnosed:**

- a. Any heart disease;
- b. Insulin deflection;
- c. Any other disease and intake of medicine by the athlete/recruit;

#### **5. Emotional and behavioral changes**

The following emotional and behavioral changes can be detected when an athlete/recruit is overtrained:

- a. Loss of enthusiasm and drive (The don't care attitude);
- b. Loss of joy and thirst for competition;
- c. Listlessness and tiredness;
- d. Irritability, depression, ill-humour and inability to relax;
- e. Impaired concentration and academic performance;
- f. Changes in sleeping patterns (waking up tired);
- g. Loss of appetite;
- h. Loss of libido;
- i. Poor coordination;
- j. Excessive thirst.

#### **6. Physiological changes**

The following physiological changes can be detected:

- a. Increased blood eosinophil;
- b. Serial T wave changes on the EEG;
- c. A decrease in  $VO_2$  Max;
- d. Decreased testosterone levels in men;
- e. High corticosteroid level, which cause a catabolic instead of a anabolic effect on muscle cells protein;
- f. Increased blood pressure (systolic increase 20 mm Hg and diastolic increase 75 mm Hg).



### **7. Treatment of overtraining**

- a. Excessive stress in daily life and during training should be eliminated;
- b. Emphasize adequate recovery time and reduce training intensity;
- c. Adequate quality and quantity of nutrition must be given to the athlete/recruit, regardless of any loss of appetite;
- d. Encourage correct sleeping habits;
- e. Break the monotony of training (training environment and or event);

Once the full-blow overtraining syndrome has developed, a complete rest for between 6 - 12 weeks might be needed for complete recovery. The athlete should only start again when he/she has strong desire for training and even then the sessions should be light and progressive.



## Overtraining/overuse Injuries in the South African National Defence Force (SANDF)

### 1. Gordon research study

Dr N.F. Gordon, Brig (Dr) E.P. Hugo and Dr J.F. Cilliers monitored in 1982 a total of 947 recruits during their basic training of a 10 week cycle, in the SA Army in connection with overtraining injuries which were caused by the physical training programme.

He documented the following anatomical sites per number of injuries and divided the injuries in two groups ie

#### *a. Injuries: Group 1*

Injuries sustained at the presence of an obvious sudden precipitating event. From the 74, group 1 injury, 21 involved the ankle, 16 the lower back and 11 the knee. The remaining 26 injuries were sustained at a variety of anatomical sites (Gordon 1986).

#### *b. Injuries: Group 2*

Injuries sustained at the absence of an obvious sudden precipitating event. Figure 1 illustrates the number of group 2 injuries (330) at the various anatomical sites (Gordon 1986)

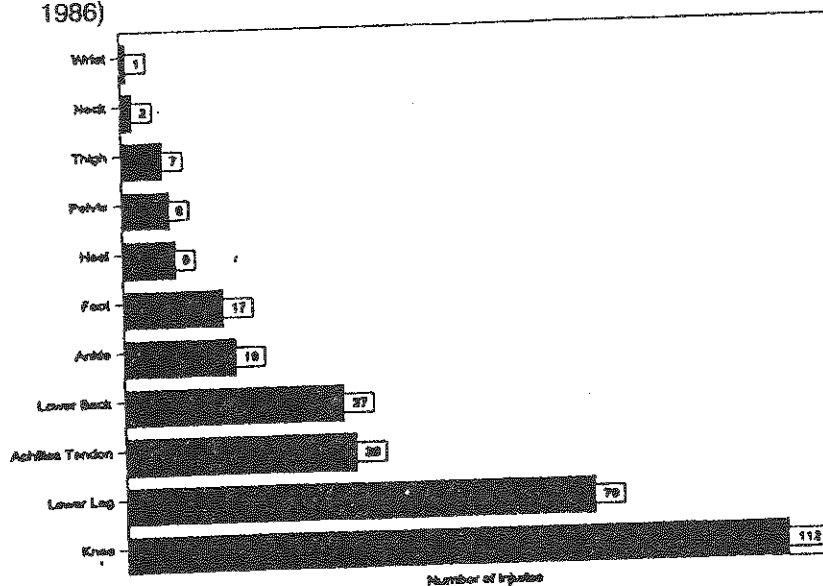
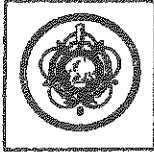


Fig 1 : Number of exertion-related injuries at different anatomical sites without an obvious sudden precipitating event

#### 1.1. Loss of basic training time

The knee (Fig 1) sustained the largest number of injuries, but lower leg injuries caused the greatest loss of training time. A number of 966 recruit-days out of a total of 2711 recruit-days, or 35,6% of the total number of training days, was lost (Gordon et al 1986).



## 1.2. Stress fracture

They found that forty two separate stress fractures were sustained by 39 recruits, an incidence of 4,12% with a loss of 8263 recruit days. From these stress fractures the tibial stress fracture was the most common (a total of 35 of the 39 recruits sustained tibial stress fractures).

## 1.3. Cyclic training concept

Due to the fact that the vast majority of exertion related injuries in the Gordon study, were sustained without a sudden precipitating event, it can for practical purposes be regarded as overtraining (overuse) injuries. He and his team suggested that the principle of a progressive, aggravating physical training programme, for basic training, should be replaced by a *cyclic progressive*, aggravating training programme, because of the high incidence of overtraining injuries during the 10 weeks of the basic training cycle.

The cyclic concept of physical military training implicates that the high risk activities, like run and drill should be replaced by static, free-standing exercises every third week of training (Scully and Besterman 1982).

The SANDF accepted the standard cyclic progressive training programme, and it has been implemented at all training units in the SANDF.

## 1.4. Results

The implementing of the *cyclic progressive*, aggravating training programme showed a decrease in overtraining injuries, especially lower leg stress fractures. Other injuries were relatively constant.

## 1.5. Conclusion

The reason for this high overtraining injuries can be caused by the fact that whit beginning of basic training there is no differentiation between the physical standard of the recruits. The medical check-up for military training doesn't point out the physical fitness ability of the recruit at that stage.

The fit as well as the unfit recruit, follows the same physical training programme, therefore this situation causes that the unfit recruit is more exposed to overtraining injuries.

The ideal situation will be if all recruits undergo a physical fitness test before basic training and according to that be divided into two categories namely:

- a. the well-conditioned physical recruit;
- b. the weak-conditioned physical recruit.

These two groups should follow different physical training programmes, which are planned to develop the two groups to a maximum physique.



### Jordaan research study

Dr G.Jordaan's study in 1990 of 160 recruits during basic training, measured overstrain injuries against injuries per 1000 training hours. He found that the frequency of some overstrained injuries was lower than those of the Gordon Study (Fig 2).

#### FREQUENCY OF OVERSTRAINED INJURIES

Anatomical Area	Jordaan Study	Gordon Study
Lower Back	8	11
Hip/Pelvis	1	2
Upper leg	3	2
Knee	40	34
Lower leg	26	36
Foot/Ankle	15	14
Other	7	1

Fig 2: The anatomical distribution of overstrained injuries in military recruits that are busy with military basic training. A comparison from a previous study have been done in corresponding with population (Gordon et al, 1988). The frequency of injuries are indicated as a percentage (%) of all overstrained injuries

He also found that most of the overuse injuries occurred during the first, second, fifth and ninth week of training (Fig 3).

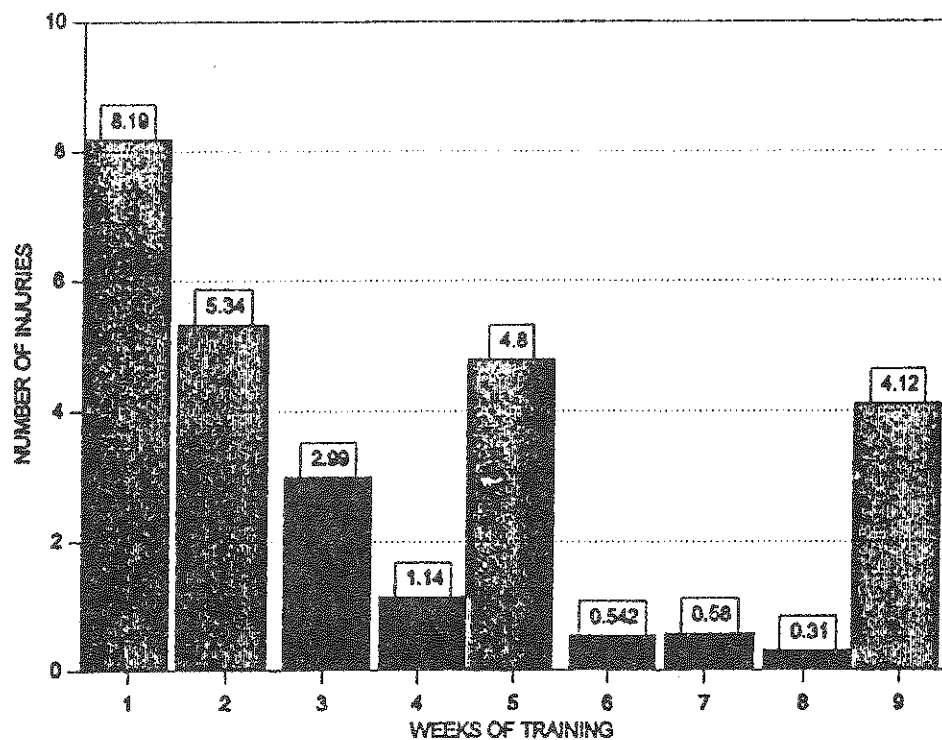
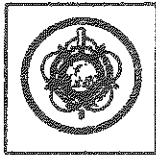


Fig 3: The weekly incidence of overstrained injuries during the nine weeks of basic military training (indicated as injuries per 1000 training hours a week).



He found that the incidence (injuries/1000 hours training) of stress fractures were higher during the second half of basic training, while tibial stress syndrome, especially during the beginning and the last week of basic training, is extremely higher than any other injury. Therefore the tibial stress syndrome is the biggest single overuse injury during basic training (Fig 4).

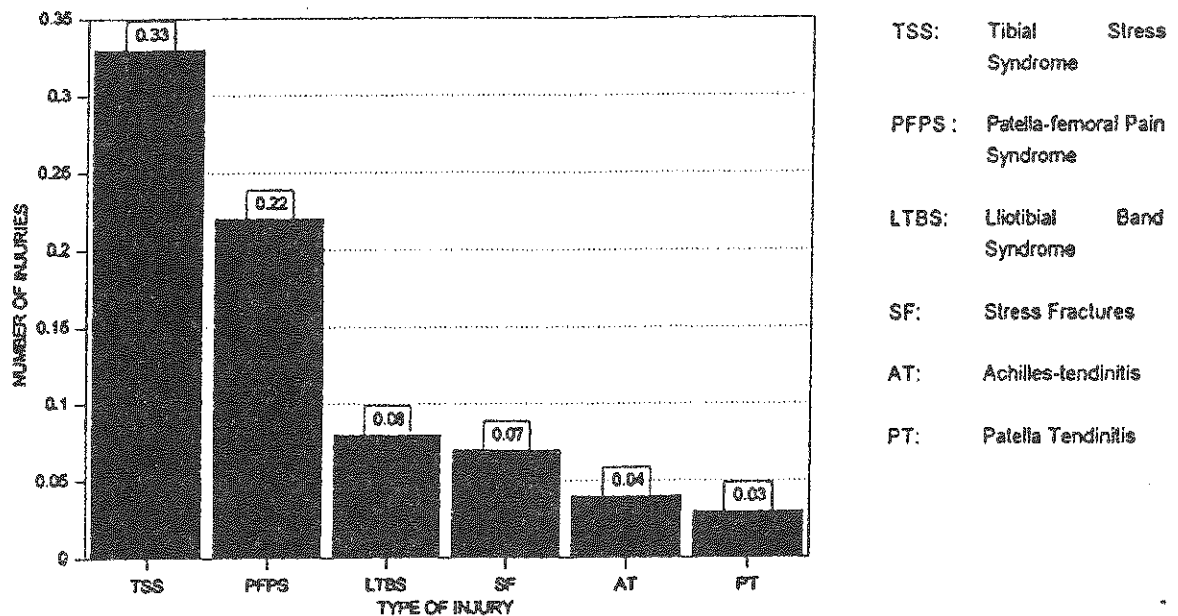


Fig 4 : The incidence of six specific overstrained injuries during military basic training (indicated as injuries per 1000 training hours)

This tendency ascribed the fact that the recruits are not used to their boots as they are still breaking-in stiff new boots during the beginning of basic training. The drilling frequency is also much higher during the last week of training, especially before their passing out parade. Drilling is one of the biggest causes of overuse injuries (Tibial stress fractures).

Jordaan mentioned that the highest overuse injuries (tibial stress fractures) occurred during their formal training and drilling, while the lowest incidence were during field exercises and limited physical training (Fig 5).

When drilling is an important component of the weekly physical training programme, the risk for overuse injuries increases (Fig 5). Field exercises are not associated with a high risk of overuse injuries (Jordaan et al 1993). He came to the conclusion that the military task specific training of the recruits not only train for combat readiness but that the overuse injuries are mostly limited to formal physical training.





## INCIDENCE (% OF INJURED RECRUITS)

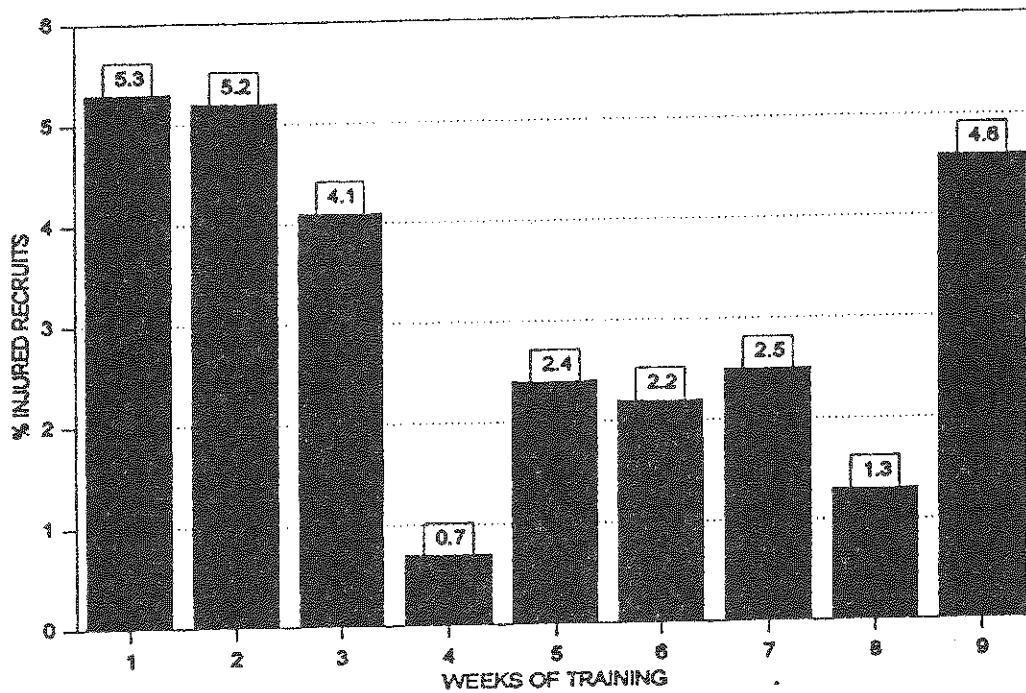


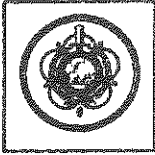
Fig 5 : The weekly incidence of overstained injuries during basic military training (Indicate as a percentage of injured recruits per week)

Jordaan therefore found that certain components of formal physical training are directly related to the high incidence in the number of overused injuries.



### Conclusion

The Jordaan study found that the frequencies over some overused injuries (specially lower leg injuries), were lower than those of the Gordon study. The conclusion can therefore be made that the cyclic progressive training programme had positive results regarding overuse injuries. The results indicated formal drill as the greatest cause concerning overuse injuries (Tibial stress fractures) whilst the breaking-in of stiff boots during the beginning of basic training worsen the frequency of overuse injuries. More emphasis should be placed on task specific training because this doesn't only reduce overuse injuries, but trains recruits for combat readiness.



## **Managing overtraining problems in the sandf**

A recruit can be physically overloaded by an instructor during basic training and specialised force preparation which lead to overuse injuries. Besides overused physical injuries which are easy to detect, it is extremely difficult to detect an overtraining syndrome case, especially where you are working with hundreds of recruits.

### **1. Overuse injuries are managed in the SANDF by:**

- a. The implementation and strict application of a cyclic progressive training programme;
- b. The monitoring of the progress and natural behaviour of recruits, as much as possible during the training process;
- c. The taking of immediate action when it is suspected that a recruit during training might have overtraining syndrome/overuse injury or is progressing towards illness;
- d. The training of the regimental instructor in:
  - i. the mechanics of overtraining syndrome/overuse injuries;
  - ii. the diagnosing of this illness/injuries; and
  - iii. preventative actions which could be taken to avoid it.

### **2. Standard Boot**

A study was done in 1986 on three types of military boots in order to select a new military boot which will reduce overuse injuries (lower leg injuries). The study showed that the standard boot was still the most suitable boot for military use, but it was recommended that sorbothane heel pads be included in the heel area to act as a shock absorber. A softer leather will also be used for the uppers. It is expected that this will result in a lower incidence of injuries during the first few weeks of basic training when recruits are injured as a result of breaking-in stiff new boots and the fact that they are not used to the drilling exercise.

### **3. Running shoes**

The new cyclic training programme has been successful in reducing the number of overuse related injuries. One of the stipulations of the new programme is that recruits are allowed to do all running and PT in their running shoes. Due to the high price of good running shoes, recruits from lower income groups are unable to afford their own running shoes and therefore have to use the PT shoes supplied by the SANDF, which are issued to all recruits.



## Summary

It must be accepted that physical military training lead to overuse injuries, specially bone stress injuries. According to the Jordaan study the composition of the physical training programme is the biggest, single risk factor. Military drilling exercise is the biggest, single physical activity which causes the most overuse injuries (tibial stress fractures) per hour, during formal physical training (Jordaan et al 1993).

Although the new cyclic programme has reduced overuse injuries by SANDF recruits, and the fact that Jordaan's scientific research also excluded biomechanical risks factors, a large number of overuse injuries still occur which are costly in terms of training time lost. Contributive factors like shock absorbed inner soles and new PT shoes can further decrease the incidence of overuse injuries.

The fact that both the physical and weak achiever follow the same physical training programme, expose the physical weak achiever to overuse injuries. This situation results in the fact that the weak achiever seldom reach his/her full physical potential during basic training.

Field exercises showed the lowest incidence of overuse injuries, and train the recruit in his/her specific military task (combat readiness).



## Recommendations

According to the findings of the two studies, the following recommendations are made:

- a. Military drilling is an integral component of military training and it will always be the case. It is thus recommended that formal drill activities be limited as it is the cause of most overuse injuries.
- b. It is recommended that the total military training programme be, to a greater extent, composed of task oriented training, ie field training.
- c. It is recommended that formal and informal sports activities be utilised to enable recruits to acquire physical combat skills and to prepare them for combat utilisation.
- d. It is recommended that boots with shock absorbed inner soles be provided.
- e. It is recommended that all recruits undergo a physical fitness test before basic training, and according to the results, be categorised as physical well-conditioned or weak-conditioned. The recruits in these two categories should then follow different physical training programmes, specially planned for the physical ability at that stage.



### **Future planning**

The research studies by Gordon and Jordaan were done on National Servicemen doing compulsory military training. Most of these young men were in the age group 17 to 18 years, whites, relatively inactive and coming from a "soft" environment. Participation in a sudden intensive programme of physical training led to a large number of overuse injuries.

Members from the former Defence Force, uMkhonto we Sizwe, APLMA and Transkei, Bophuthatswana, Venda and Ciskei countries, are currently integrating to form a new SANDF with changed human resource composition. The profile of these members differs from the profile of National Servicemen, considering the difference in background, age groupings and fitness level to mention a few.

Future studies need to be done to analyze the difference in the composition of former Defence Force and the integrated SANDF to adjust physical training programmes accordingly.