# Increased training load in athletes

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| **Ethical review** | Approved WMO |
| **Status** | Recruitment stopped |
| **Health condition type** | Other condition |
| **Study type** | Interventional |

## Summary

### ID

NL-OMON45311

**Source**
ToetsingOnline

**Brief title**
Increased training load

### Condition

- Other condition

**Synonym**
extreme fatigue in athletes, Overtraining

**Health condition**

overtraining

**Research involving**
Human

### Sponsors and support

**Primary sponsor:** Wageningen Universiteit
**Source(s) of monetary or material Support:** Ministerie van OC&W

## Intervention

**Keyword:** overtraining, time trials, training program

## Outcome measures

### Primary outcome

The main study parameters is endurance performance on the (~10km) time trial

tests (in min:sec).

### Secondary outcome

Mood state (answered with POMS and logbooks).

# Study description

### Background summary

Overtraining is a serious problem in the athlete*s world. *Overtraining is an accumulation of training and/or non-training stress resulting in long-term decrement in performance capacity with or without related physiological and psychological signs and symptoms of overtraining in which restoration of performance capacity may take several weeks or months*. (ECSS joint consensus statement on the definition of overtraining Meeusen et al 2013).
Estimating prevalence of overtraining is difficult, but it happens to approximately 30 to 60% of all athletes at one point in his/her athletic career. Sport physicians need to assess a combination of symptoms and exclude a list of diseases to finally diagnose an athlete as being overtrained. Of course, by that time, harm has been done, and the athlete faces a long time of recovery and underperformance. Therefore, early detection of signals of overload that could lead to overtraining, has high priority in sport research.
A solution would be to monitor athletes during their training program to follow certain markers that suggest a risk of overtraining in an early stage. Early *markers* that were studied in the past are heart rate (variability), hormones, psychological symptoms (Profile of mood states (POMS) questionnaire) and C-reactive protein. The results of these studies are divergent and an effective way of monitoring is still lacking.
As inflammatory markers (cytokines), like interleukins, can explain many of the symptoms of overtraining, (see also reference Smith et al 2004 *Tissue trauma: the underlying cause of overtraining syndrome?*) we want to assess, in a future study, whether these cytokines are indeed a good *early marker*.
Research to find these early markers for overtraining is done by assigning

athletes to an increased training load. Training load is extended in a controlled fashion, to cause underperformance. As described in the definition: underperformance is the only central criteria for overtraining.
In past research, various strategies were used to extend the normal training program of an athlete. An effective strategy among runners was used by Lehmann. In this strategy, both training volume and intensity increased in 4 weeks* time from 100% till 200% and from 100% till 130%, respectively.
Lehmann considered endurance runners and runners in this study, while we will consider a different type of sport: cycling, and include triathletes and cyclists. This is for practical reasons, as we don*t have equipment available to measure running performance (we have a bicycle ergometer only). Moreover, cycling is the preferred exercise mode to do experimental research, as it can easier be combined with other measures, e.g. sampling of blood or monitoring oxygen consumption is much more convenient while cycling instead of running. Finally increasing running load could easier result in physical injuries due to high impact of running on low extremities, this risk is much lower in cyclists.
Before we use this training protocol in a more extensive study to monitor changes in cytokine profiles during increased training load, we should test whether this protocol also leads to underperformance in a controlled and safe way in our setting (with triathletes and cyclist instead of runners).
Therefore, the aim of this study is to test whether a 4 week training protocol with a gradual increase in both volume and intensity (from now on we will call this the adapted training protocol) leads to underperformance. Performance will be measured with a simulated time trial on a bicycle ergometer, a well-accepted method to measure performance. When the adapted training protocol leads to underperformance (>2% increase in time), we will use that protocol in a future study in which we will assess changes in specific markers, i.e. cytokines.

## Study objective

The main objective of this study is to test whether the adapted training protocol induces underperformance (>2% increase in time) in trained cyclists and triathletes.

## Study design

A training intervention of 4 weeks, in which training load increases. Time trials are performed directly before and after this training period.
Follow-up/After-care: after the adapted training period, a recovery period (2 weeks) follows, hereafter another time trial is performed.

## Intervention

The intervention consists of a 4 week training period with increased volume and increased intensity (volume increases from 100% to 200% in 4 weeks, intensity increases from 100% to 130% in 4 weeks). Logbooks are filled in during this

period. Training data (heart rate, distance, duration) will be monitored using watches and GPS. Participants will be tested prior to this period and after this period with time trials. These tests are simulated 10km time trials on a bicycle ergometer. Before the time trial they fill out a POMS questionnaire and after the time trial they will grade the exercise intensity on a Borg scale.

**Study burden and risks**

Each participant has to visit the University five times (one time for information, 1 time for screening, and 3 times for a time trial).
At information day questions are answered, and log books are handed out. Participants fill out these log books during their normal training program and during the adapted training program.
At screening day, a VO2max test is performed and one shorter test time trial is performed, this serves as a familiarization with the bike ergometer and to establish inclusion criteria.
Time trials are performed before and after the 4 week training period and after a recovery period. Before the time trial, a POMS questionnaire is filled out and after the time trial a Borg scale is showed to ask for severity of the test.
Risks and discomfort are small. Athletes are used to perform maximal exercise, which makes the VO2max test and time trials an additional average intensive training workout. The adapted training period consists of a higher training volume and intensity then athletes* average training program, this probably leads to fatigue and temporary underperformance. But with sufficient recovery afterwards, this should not cause long-lasting problems.
Because there is a risk (though very small) of overtraining, athletes will be monitored. After every week of training, athletes will be phoned and a few points will be checked: morning heart rate, (quality of) sleep, accomplishment of the training protocol, and POMS questionnaire. If these data suggest that the athlete is at risk for overtraining, he or she will be withdrawn from the study.
We will use the following criteria: increase in morning heart rate (>20%), worse POMS score (at least 2 points decrease in the mood state "Strength" and at least 2 point increased score in mood state "depression","anger","fatigue", ánd "tension"), decrease in sleep quality (>25% decrease on scale 1-10) ánd unable to fulfil 80% of the training program. When an athlete meets all four criteria, he/she will be withdrawn from the study for protection.
When an athlete completes the study or will be withdrawn, he/she will perform 2 weeks of recovery training (50% volume). After this recovery, he/she will perform a final time trial. If the performance of this third time trial is worse than the first time trial (>2% increase in time), we will advise the athlete to take one additional recovery week at 50% volume. We will phone the athlete after this period to check whether he/she is recovered (normal heart rate, normal quality of sleep, normal POMS)
In short: the risks are rather small, but the advantage of this study, is that it could lead to a training protocol which induces underperformance in a safe and controlled manner, which, in future, could lead to the discovery of markers

to diagnose overtraining in an early stage.

## Contacts

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## Trial sites

### Listed location countries

Netherlands

## Eligibility criteria

**Age**
Adults (18-64 years)
Elderly (65 years and older)

### Inclusion criteria

Age: 18 - 45 y
BMI: 18.5 * 25 kg/m2
Minimal of 5 hours of training per week, and a maximum of 13 hours
Regular cycling training
Able to be present and participate at all test days
Willing and able to increase *normal* training program with given %
VO2max between 45 and 65 ml/kg/min (will be estimated at screening visit)

### Exclusion criteria

Chronic illness
Blood donations during study
Working at *Human Nutrition* - Wageningen University
Msc thesis or internship at *Human Nutrition* - Wageningen University
Participating in other scientific research (with the exception of EetMeetWeet)

## Study design

### Design

**Study type:** Interventional

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| Masking: | Open (masking not used) |
| Control: | Uncontrolled |
| Primary purpose: | Prevention |

### Recruitment

NL

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|---|---|
| Recruitment status: | Recruitment stopped |
| Start date (anticipated): | 06-09-2017 |
| Enrollment: | 7 |
| Type: | Actual |

## Ethics review

Approved WMO

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| Date: | 20-04-2017 |
| Application type: | First submission |
| Review commission: | METC Wageningen Universiteit (Wageningen) |

## Study registrations

## Followed up by the following (possibly more current) registration

No registrations found.

## Other (possibly less up-to-date) registrations in this register

No registrations found.

## In other registers

| Register | ID |
| --- | --- |
| CCMO | NL60915.081.17 |