

***“Tramadol and sport: Effects on physical and sustained attention performance during cycling exercise.”***

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**PROJECT REVIEW**

Tramadol is an analgesic medication for the treatment of moderate to severe pain. Recently, there have been concerns about the abuse of tramadol causing falls in the pro-cycling peloton. Only few studies have examined the effects of Tramadol on performance and none with athletes or healthy subjects. The impact of Tramadol on cycling performance might be mediated by its effect on sustained attention, which is defined as a capacity to detect of relevant stimuli that are rare and unpredictable.

The aims of this project are: 1) to investigate the impact of Tramadol on physical performance in cycling with a Functional threshold power test (1st year); 2) to investigate the effect of Tramadol on sustained attention at rest (1st year) and during exercise (2nd year) with the Continuous Performance Task; 3) to study whether sustained attention might mediate the effect of Tramadol on cycling performance with an ecologically-valid task (3rd year). All experiments to reach the objectives will be performed using a placebo-controlled, double blind, randomized counterbalance methodology. Tramadol (a single dose of 100 mg of orally administered will be used) or Placebo will be administered to participants 120 min before starting each test. We will recruit 30 subjects for each experiment (15 males and 15 females). Together with objective measures of physical and cognitive performance, we will obtain measures of subjective performance such as perceived effort and mental fatigue.

This research project will be the first to test the effects of Tramadol on sustained attention during cycling. This is particularly relevant since Tramadol has been placed on WADA's Monitoring Program from 2012 to 2015 (Narcotics: in competition only) in order to detect potential patterns of abuse. Our findings would certainly help the WADA to decide whether to include Tramadol into the Prohibited List or not.

**Results and Conclusions:**

The use of tramadol, an analgesic medication, in professional cycling is generating particular interest and concern. Tramadol might enhance cycling performance at the cost of reducing the ability to stay focused. The aim of the present study was to test the hypothesis that acute oral administration of tramadol improves exercise performance during a 20-min cycling Time-Trial (TT) (Experiment 1) in a group of cyclists and whether sustained attention would be impaired during exercise (Experiment 2).

This study is a clinical trial (EudraCT number: 2015-005056-96) using a placebo-controlled, double blind, within-participants, counterbalanced methodology. We administered a single oral dose of Tramadol (100 mg), or placebo 120min before starting the TT. Electroencephalography measures (EEG) were recorded throughout the cycling exercise and at rest. In *Experiment 2*, the methods were the same as in *Experiment 1* except that participants performed an Oddball (cognitive) sustained attention task during exercise.

We recruited 56 cyclists in total. In *Experiment 1*, overall power output was higher in the tramadol condition than in the placebo condition. This result was partially replicated in *Experiment 2*, as the power output during the second half of the TT was higher under tramadol, while no differences were observed in the first part of the TT. No effects of condition were shown either in the PVT or the oddball task. Tonic EEG analysis at baseline revealed opposite results when comparing Experiments 1 and 2. However, EEG data showed a significant effect at the neural-related activity related to stimulus processing during exercise.

Futures studies should include a pre-fatigue protocol at a fixed load before the TT to address this issue, and in addition a more ecological task.