

## THE ENDURANCE COACH.COM

You only need to taste success.. you don't actually have to swallow it! A fascinating study which further questions the theories of fatigue and the impact of energy drinks within sport. Taken from:

A. Pottier, J. Bouckaert, W. Gilis, T. Roels, W. Derave (2010). **Mouth rinse but not ingestion of a carbohydrate solution improves 1-h cycle time trial performance.** Scand J Med Sci Sports 20: 105–111.

Carbohydrate drinks are known to enhance performance in longer distance endurance events. The body has a limited store of glycogen (stored carbohydrate) and this gradually reduces during prolonged exercise leading to a loss of performance. It is thought that during events of an hour or less, carbohydrate drinks may not be of benefit due to the fact that the body has enough glycogen to last for an hour of exercise and performance is therefore not affected.

The 'central governed' theory of fatigue has gained much support in recent years. Central governance suggests that fatigue is 'centrally' controlled (by the brain) rather than 'peripherally' controlled (by the muscles).

The question to ask is whether a lack of glycogen in the muscles directly stops them working (simple lack of fuel) or whether the brain is monitoring the glycogen levels and as they decrease, the brain then reduces nerve signals and stops the muscle working. Consider the following scenario:

*When your car runs out of petrol, it stops.. it's a simple issue of having no fuel and you need to put more into the tank. Imagine your car had a computer which monitored the fuel levels and as the fuel levels drop, the computer actually started to 'limit' the engine. Despite you 'putting your foot to the floor' and trying to drive at full speed, the computer just doesn't let it happen.. your speed is being centrally controlled as the computer is trying to conserve fuel.. is the brain doing that when you exercise?*

### The study

A recent study at a Ghent university showed that cycling performance can be improved by simply 'swilling' carbohydrate in your mouth for 5 seconds rather than actually ingesting the drink.

Riders completed 2 separate time trials, riding for 1 hour in each. In the first time trial riders rinsed out their mouths at regular intervals with a sports drink containing carbohydrates and electrolytes. They did not swallow the sports drink, they simply rinsed for 5 seconds before spitting the drink out. In the second trial the riders repeated this but used a 'placebo' which was a sweetened drink with no actual carbohydrate content. The drinks were 'taste tested' beforehand to ensure that riders could not tell the difference between either drink.

### The results

Swilling with the carbohydrate drink increased power output by 3.7%, which equated to a 2.37 minute improvement compared to swilling with the placebo drink. In addition to power output being higher, lactate levels and heart rate were also higher which indicated in simple terms that the riders were able to ride harder.. more power, more lactate and higher heart rate.

In contrast, the riders 'perceived exertion' (how hard does it feel) did not change between the 2 time trials, they both felt the same..

## What does this mean?

Going back to our earlier scenario of 'central control', if the brain is monitoring your fuel levels and is concerned that they are dropping too low, it needs to find a way to slow you down and limit your engine. This is possible by shifting your perception and making you think that things are harder than they actually are. Consider the following scenario:

*You climb into your car and head off to work and you are late.. you decide to drive at 80mph along the motorway to make up time but the 'central computer in your car is concerned.. the fuel tank is only half full and driving at 80mph uses a lot of fuel! To combat this problem the computer makes you believe that you are driving at 80mph but it's a trick.. you're actually driving at 60mph..*

*You climb onto your bike and prepare for a cycle time trial event.. you know how it feels to ride at 25mph and that's your intention for this event. Unfortunately you're not very well fuelled and your brain is worried so it changes your perception. To you, it feels as though you are trying hard enough to ride at 25mph, at the finish, your average is only 23.5mph.. you're confused, it certainly felt hard enough! It was a trick, your brain made you believe you were riding hard enough to achieve 25mph.. In actual terms you were only riding hard enough to achieve 23.5mph..*

*So the big question is what actually made you slower? Was it a direct consequence of the lack of fuel in your legs (peripheral) or was it the altered perception.. the trick of the brain.. (central).*

## Back to the study..

The researchers believe that swilling the mouth with carbohydrate 'fooled' the brain into thinking that the riders had taken fuel on board. When the carbohydrates were detected in the mouth, the brain removed the limitations on the muscles, returned the rider's perceptions back to normal and stopped playing tricks!

One of the key things to consider is that the carbohydrate drink was never actually ingested, the riders did not swallow the fluid and the carbohydrates therefore never actually reached the exercising muscles. If the riders had swallowed the drink, we would have made the simple conclusion that the riders went faster when they took the carbohydrate drink because they supplied fuel to their muscles.. that assumption would have been wrong.

Research continues regarding central governance theories and it has its limitations. As yet scientists have not been able to find a means by which the brain can actually monitor the glycogen levels in the muscles and until a method is identified, the theory cannot be fully supported. Despite this, it's fair to say that some of the research does make fascinating reading!

On a final note.. don't start spitting you energy drinks out just yet, especially when close to other athletes!

Marc Laithwaite  
Marc@TheEnduranceCoach.com