



*The following research activity has been reviewed via QUT arrangements for the conduct of research involving human participation. If you choose to participate, you will be provided with more detailed participant information, including who you can contact if you have any concerns.*

### The effects of cycling in a hot environment on gastrointestinal permeability, plasma endotoxin concentration and neuromuscular performance.

#### Research team contacts

<b>Principal Researcher:</b>	John Osborne	PhD student
<b>Associate Researchers:</b>	Dr Geoffrey Minett	Senior Lecturer and Principal Supervisor
	Dr Ian Stewart	Associate Professor and Associate Supervisor
<b>School of Exercise and Nutrition Sciences, Faculty of Health Queensland University of Technology (QUT)</b>		

#### What is the purpose of the research?

The purpose of this research is to investigate why exercise performance is reduced in a hot environment. More specifically, we are investigating the link between cycling performance (neuromuscular force), gastrointestinal function (permeability) and inflammation (endotoxin release) in a hot environment.

#### Are you looking for people like me?

The research team is looking for moderate- to well-trained **male** athletes who **cycle at least twice a week**, are aged **between 18 to 35** and are **free of any injury or illness**.

#### What will you ask me to do?

Your participation will involve attending the exercise physiology research laboratory (QUT Kelvin Grove campus) on three separate occasions: an **initial data collection and familiarisation session** (1 hour) and **two separate experimental trials** (3 hours each).

The initial session will involve the completion of pre-exercise screening questionnaires (to verify that you are healthy), undertaking an exercise test on a stationary bike to determine your fitness level ( $VO_{2max}$ ) and familiarising yourself with the equipment and testing procedures used in the subsequent experimental sessions.

The two experimental trials will involve cycling for 60 minutes at an alternating intensity between 50% and 70% of your maximal effort every 3 minutes (i.e., 3 mins at 50%, 3 mins at 70%, 3 mins at 50% etc.). Both experimental trials will be conducted in a temperature-controlled room, with one in hot conditions (35°C and 50% relative humidity), while the other trial will be completed at a neutral temperature (20°C, 50% relative humidity).

Neuromuscular testing will also be completed at three time points during the two experimental trials: pre-exercise, immediately following exercise, and one hour after exercise. These tests will measure muscle strength, recruitment and activation using a maximum voluntary contraction (MVC) protocol with electrical stimulation of the femoral nerve at the inguinal fold. This procedure will require you to maximally contract your quadriceps muscle against a fixed resistance (i.e., a static contraction of knee extensor muscles), to which a short (<0.3 s) electrical stimulus will be applied at peak force during the contraction. This electrical stimulation is harmless and will only produce a mild, momentary discomfort.

Blood collection will also be undertaken at the same time points as the neuromuscular testing during each of the two experimental trials (pre-, post- and 1 hour following exercise). This will involve a small amount of blood (~12 ml) being taken from a vein in your arm at these three time points, which will be analysed for markers of gastrointestinal permeability and inflammation.

Therefore, over the course of the study, you will submit to six neuromuscular tests and blood draws; three during the neutral temperature experimental trial and three during the hot experimental trial.

To monitor core temperature, you will be asked insert a small, flexible and disposable rectal thermistor before each of the two experimental trials. This thin rectal thermistor is completely harmless and is regularly used in military, research, medical and sports science applications to monitor core temperature. You will be instructed on how to correctly insert the thermistor before you undertake this entirely painless procedure in complete privacy. Four small skin thermometers will be stuck at different places on the body to record skin temperature (back of hand, shoulder

blade, shin and neck).

A small amount of urine (~20mL) will be collected at the start of each of the two experimental trials to confirm you are properly hydrated. Multiple measures will be collected during the two experimental sessions to see how the human body reacts to exercise in different environmental temperatures (hot vs neutral). For example, you will be asked to wear a heart rate strap in order to monitor your heart rate and every five minutes during the cycling task you will also be asked to rate how difficult the exercise seems (perceived exertion) and how hot you feel (thermal sensation).

#### ***Are there any risks for me in taking part?***

The research team has identified the following possible risks in relation to participating in this study:

- Muscles soreness and minimal risk of soft tissue injury due to the cycling task and neuromuscular testing.
- Additional discomfort during the exercise task in the hot environment.
- Brief discomfort when electrical stimulation is applied to the thigh during neuromuscular testing.
- Minor discomfort and possible bruising around puncture site from blood collection.
- The sticky adhesive on the gel electrodes could potentially produce a skin rash.

It should be noted that if you do agree to participate you can withdraw from participation at any time during the project without comment or penalty.

#### ***Are there any benefits for me in taking part?***

It is expected that this project will benefit you directly by providing you with measures of your aerobic capacity ( $VO_{2max}$ ) which is of interest to many amateur athletes but is expensive and difficult to test for outside of a research environment. This measurement can be used to develop an individualised training program specific to your particular exercise goals.

While the main outcomes from this project may not directly benefit you, the information gathered from your participation will provide insight into factors which may affect exercise performance in the heat. The evidence from this study will also assist with the development of protective intervention strategies which could be used by athletes, the military and certain civilian occupations to improve athletic capacity in a hot environment.

#### ***Will I be compensated for my time?***

No, but we would very much appreciate your participation in this research.

#### ***I am interested – what should I do next?***

If you would like to participate in this study, please contact one of the researchers listed below.

<b>John Osborne</b>	<b>3138 6093</b>	<a href="mailto:john.osborne@hdr.qut.edu.au">john.osborne@hdr.qut.edu.au</a>
<b>Geoffrey Minett</b>	<b>3138 0336</b>	<a href="mailto:geoffrey.minett@qut.edu.au">geoffrey.minett@qut.edu.au</a>

You will be provided with further information to ensure that your decision and consent to participate is fully informed.

***Thank You!***

**QUT Ethics Approval Number: 1600000724**