



## INFORMATION TO PARTICIPANTS



**Research Title:** Does body composition impact relationship between physiological responses to post-exercise hydrotherapy and performance?

**Principal Researcher:**

Jessica Stephens  
PhD Scholar, AIS Physiology  
P: 02 6214 7881  
M: 0400 411 327  
E: [jess.stephens@ausport.gov.au](mailto:jess.stephens@ausport.gov.au)

**Co-Researchers:**

Dr. Shona Halson (AIS)  
Dr. Jo Vaile (AIS)  
Dr. Chris Askew (USC)  
Dr. Gary Slater (USC)

We would like to invite you to participate in this PhD research project. You should only participate if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you would like to take part, it is important for you to understand why the research is being conducted and what your participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information.

**Aim:**

This study aims to build on previous research to examine the relationships between the physiological processes affected by cold water immersion (ice baths) and the recovery of cycling performance.

**Benefits:**

By participating in this study you will be assisting with the generation of new knowledge to benefit Australia's elite athletes. Participation in this study will also provide you with an individual comprehensive body composition assessment,  $\text{VO}_{2\text{max}}$  and training zones reports in addition to access to experts in the field of sports science to provide you with valuable information on training and recovery.

At the completion of the study you will be provided with all of your individual data as well as information, explanation, and interpretation of the overall results.

**Who we are recruiting?**

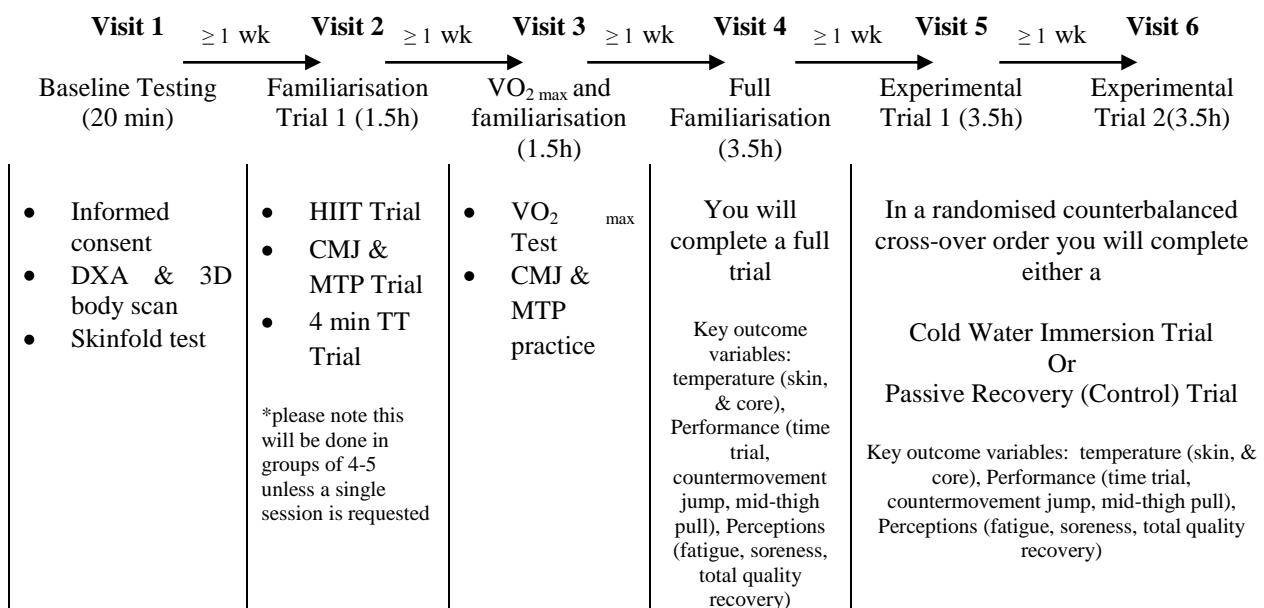
To participate in the study you must:

- Be a healthy male aged 18 - 45 years
- Have no history of cardiovascular events or vascular disease
- Be a non-smoker
- Have no current illness, infection, injury or history of back injury that may limit performance throughout the duration of the study
- Be free from Raynaud's disease or any other medical condition that may impact blood flow
- Be able to complete the full HIIT protocol (see below) and have a cycling peak power output of  $\geq 300$ watts
- Have a body fat percentage (as determined by an initial DXA scan) of  $\leq 12\%$  or  $\geq 18\%$
- Be able to attend all scheduled visits to the Australian Institute of Sport

## What is involved?

You will be asked to attend the AIS on six separate occasions (see figure 1), totalling approximately 14 hours. The first visit will be for baseline testing where you will undergo body composition testing this will take approximately 20 minutes. Next visit we will take you through a familiarisation of the main components of the experimental trials to ensure you are able to complete them, this will take approximately 1.5 hours. Then you will be asked to come in for a VO<sub>2</sub> max test, at this visit you will also be given the opportunity to practice the performance testing component of the trials again, this is to help enable you to perform these safely and to a high standard during the trials, This visit will take approximately 90 minutes. Finally you will be asked to come in once per week for 3 weeks to complete the full 3.5 h trials. These will only differ in the recovery method you perform. During these trials you will be asked to complete the HIIT protocol followed a 60 minute recovery period. During the 60 minute rest period post-exercise you will perform one of two 15 minute interventions recovery (cold water immersion 15°C, or passive recovery/seated rest). Various physiological measures (including core and skin temperature, heart rate), perceptual measures (thermal sensation, rating of perceived exertion, perceived fatigue, perceived soreness and total quality of recovery) and performance measures (4 min cycling time trial performance, countermovement jump and mid-thigh pull) will be assessed immediately before and after exercise as well as 40 minutes post the recovery intervention.

Figure 1: schematic diagram of study design



## Testing Procedures

Body composition will be measured prior to the first testing session via three methods: anthropometry, dual energy x-ray absorptiometry (DXA) scan and a 3D body scan. First, a full anthropometric profile will be conducted taking a maximum of 1 hour.

The anthropometric profile consists of nine skinfold, 13 girth and 16 length and breadth measurements. For this you will be asked to stand in your shorts only while a qualified anthropometrist locates specific bony points of your body and marks them. Then using these marks your skinfolds, girths and breadths will be measured using callipers and tape measures. Skinfolds will be conducted in a private room with only the researcher present to respect your modesty.

Following this, you will complete a DXA scan taking approximately five minutes. During the DXA you will lie on your back in a DXA scanner with minimal movement. With the DXA scan there is a small amount of radiation that you will be exposed to however the total radiation exposure from this study (0.5 µSv per scan) which is well below the radiation one might receive from a chest x-ray (25-60 µSv) or a seven hour aeroplane flight (~50 µSv).

Finally you will complete a 3D body scan (approximately five minutes). The 3D body scan involves standing inside the scanning machine in only tight fitting trunks with minimal movement as the laser and cameras move around you to record the image. Again this will be conducted in a private room with only the researcher present.

Skin temperature will be recorded during each trial via waterproof sensors that sit against the surface of the skin. The sensors will be taped to four locations: chest, forearm, thigh, and calf. The sensation of the sensors and tape might be noticeable at first, but will soon fade and is no different from having a band aid on your skin. Heart rate will be recorded using a heart rate monitor chest strap and watch.

Core body temperature will be measured throughout each trial via a disposable rectal thermometer. The thermometer is self-inserted to a depth of 10 cm. Inserting the temperature probe might be uncomfortable at first but once it is correctly in place it is not noticeable, you will also be provided with some lubricant to make insertion easier. At the end of each trial you will remove the temperature probe and dispose of it.

You will be asked a number of perceptual ratings throughout testing, perceived thermal sensation will be measured using a visual analogue scale whereby you rate your thermal comfort on a scale of zero (unbearably cold) to eight (unbearably hot). Perceived fatigue and soreness will be measured using a visual analogue scale whereby you rate how fatigued and how sore you feel on a scale of zero (nothing at all) to ten (extremely high). Finally you will be asked to rate your total quality recovery (TQR), this is measured on a scale from six (no recovery) to twenty (full recovery).

You will be asked to complete a High Intensity Interval Test (HIIT) on a cycling ergometer, this protocol (see table 1) is comprised of a number of different cycling interval sets designed to challenge different facets of cycling fitness. This protocol takes 71 minutes to complete and has been designed to induce fatigue, but this fatigue and tiredness should not be in excess of anything you have felt during training or competition.

Table 1: outline of HIIT protocol

	Elapsed time	Description
<b>Warm-up</b>	0-10 min	4 min easy (T1) 3 min Moderate (T2) 3 min Threshold (T3)
<b>Set 1 – short sprint</b>	10-16 min	3x6s on, 114 sec recovery Sprint 1 – 80% max (small gear) Sprint 2 – 100% max (small gear) Sprint 3 – 100% max (big gear)
<b>Recovery 1</b>	16-20 min	4 min recovery at 50 watts
<b>Set 2 – long sprint</b>	20-24 min	4x (20s on, 40s recovery)
<b>Recovery 2</b>	24-31 min	7 min recovery at 50 watts
<b>Set 3 – Repeat Sprints</b>	31-37.5 min	13x (20s on, 10s recovery)
<b>Recovery 3</b>	37.5-44.5 min	7 min recovery at 50 watts
<b>Set 4 – Pursuit effort 1</b>	44.5-48.5 min	4x (45s at 250 watts, 15s on)
<b>Recovery 4</b>	48.5-55.5 min	7 min recovery at 50 watts
<b>Set 5 – Pursuit effort 2</b>	55.5-59.5 min	3x (1 min at 250 watts, 20s on)
<b>Recovery 5</b>	59.5-66.5 min	7 min recovery at 50 watts
<b>Passive rest</b>	66.5-67 min	30s passive rest
<b>Set 6 – Time Trial effort</b>	67-71 min	4 min time trial
<b>Cool down</b>	71-73 min	2 min recovery at 50 watts

Performance will be measured with three tests, first you will be asked to complete a countermovement jump test (CMJ). For the CMJ you will be asked to complete two sets of three maximal jumps with a light weight bar on your shoulders and two sets of three maximal jumps with a weighted bar (40% of your body weight) on your shoulders. Next you will be asked to complete a mid-thigh pull test, during this test you will be asked to pull as quickly as possible on an immovable bar and to maintain the maximal effort for five seconds. The mid-thigh pull test is maximal test and will lead to fatigue but you will only be asked to maintain the effort for a very short period and will be given two minutes rest between each of the three efforts to ensure you have fully recovered. The final performance test you will be asked to complete is a 4 minute cycling time trial, you will be asked to complete as much work as possible during this time trial. Again we will be asking you to give a maximal effort for this test which will cause feelings of fatigue or tiredness but this should not be in excess of anything you have felt during training or competition. For all of the aforementioned tests you will be provided information, instruction and feedback.

**Right of Withdrawal**

Participation in this study is completely voluntary. You may choose to withdraw from the study at any time for any reason, without consequence or prejudice. If you choose to do so, there will be no compromise in the relationship between you and the investigators.

**Confidentiality**

All aspects of the study, including the results, will be strictly confidential and only the investigators will have access to information specific to participants, except as required by law. A report of the study will be submitted for publication; however, individual participants will not be identifiable.

**Appreciation**

On Behalf of the University of the Sunshine Coast, the Australian Institute of Sport and the researchers we would like to thank you for all of the time and effort you have put into assisting us with this study. Without committed and enthusiastic participants, research like this would not be possible.

**Enquiries**

Any inquiries regarding requirements and procedures used in this study are encouraged. Please contact the principal researcher - Jess if you have any questions.

Jess Stephens

P: 02 6214 7881

E: [jess.stephens@ausport.gov.au](mailto:jess.stephens@ausport.gov.au)

**This study has been approved by the Australian Institute of Sport and University of the Sunshine Coast ethics committees. If you have any concerns with respect to the conduct of this study, you may contact the AIS Ethics Committee Secretary - Ms Helene Rushby - [helene.rushby@ausport.gov.au](mailto:helene.rushby@ausport.gov.au) Tel 02 6214 1577**