

The effects of exercise in the heat and hydration status on cognitive function

Submission date 05/09/2016	Recruitment status No longer recruiting	☐ Prospectively registered ☐ Protocol
Registration date 23/09/2016	Overall study status Completed	☐ Statistical analysis plan ☒ Results
Last Edited 24/10/2019	Condition category Other	☐ Individual participant data

Plain English summary of protocol

Background and study aims

Many major international competitions for field hockey take place in hot environmental conditions (such as in the Rio 2016 Olympics). There is therefore a need to better understand how the body copes with the heat stress associated with high-intensity intermittent (stop-start) exercise and how this impacts upon field-hockey players' physical performance and cognitive function (mental processing). Field hockey not only involves intermittent high speed running and sprinting but decision-making skills. Therefore it is important to understand how field-hockey specific exercise in hot conditions effects cognitive function. In addition, previous research from our lab has demonstrated that field hockey player compete when dehydrated, particularly during tournaments. The aim of this study is to determine whether cognitive function is impaired in hot and moderate conditions and when dehydrated following hockey specific exercise.

Who can participate?

Female elite field hockey players aged 18-40.

What does the study involve?

Participants complete four field hockey simulations in a random order, a minimum of 1 week apart, on a treadmill. Before and after each of the hockey match simulations cognitive function is assessed using laptop based software. The four simulations involve exercise in the heat in a normal hydration state; exercise in the heat when dehydrated; exercise in moderate conditions in a normal hydration state; and exercise in moderate conditions in a dehydrated state. Participants are familiarised with all the techniques and measurements during preliminary laboratory visits. For each simulation, participants have their cognitive function measured before and after each exercise test. In addition, their rectal temperature, how much they felt they are pushing themselves and thirst are measured every 10 minute during exercise.

What are the possible benefits and risks of participating?

Participants benefit from being provided with information about their current fitness levels and a training programme provided should they wish. In addition, information can be provided regarding a participant's responses to exercising in hot conditions. Intermittent exercise in the heat is physically very demanding, and places strain on the body. Therefore, there is a risk that

participants may feel faint or nauseas and/or suffer from heat stroke. All participants will be closely monitored in order to avoid this.

Where is the study run from?
Nottingham Trent University (UK)

When is the study starting and how long is it expected to run?
September 2006 to September 2008

Who is funding the study?
Nottingham Trent University (UK)

Who is the main contact?
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Contact information

Type(s)
Scientific

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Additional identifiers

Protocol serial number
FHITP

Study information

Scientific Title
Effects of heat stress and dehydration on cognitive function in elite female field hockey players

Study objectives
Cognitive function would be impaired when hypohydrated and under heat stress.

Ethics approval required
Old ethics approval format

Ethics approval(s)

Nottingham Trent University School of Science and Technology Human Ethics Committee, 14/11/2006, ref: xxxviii

Primary study design

Interventional

Study design

Single-centre randomised cross over trial

Study type(s)

Other

Health condition(s) or problem(s) studied

Sports performance

Interventions

Participants are randomised to undertake four exercise conditions in a random order. The exercise undertaken consists of 50 minutes of activity, divided into 2 x 25 min blocks of exercise separated by a 10 min intermission designed to replicate half time. This is performed on a motorised treadmill (h/p/cosmos Pulsar 4.0, Nussdorf-Traunstein, Germany) housed in an environmental chamber (WIR52-20HS, Design Environmental Ltd., Gwent, Wales, U.K) and consisted of different exercise intensities observed in match-play. Participants are required to hold a hockey stick for the entire duration of the protocol. The treadmill gradient was set at 1% to reflect the energy cost of outdoor running.

Condition 1: Participants complete exercise in heat ($33.3 \pm 0.1^{\circ}\text{C}$, $59 \pm 1\%$ rh) in a dehydrated state (achieved through undergoing a period in an chamber ($\sim 40^{\circ}\text{C}$, 75% rh))

Condition 2: Participants complete exercise in heat ($33.3 \pm 0.1^{\circ}\text{C}$, $59 \pm 1\%$ rh) in a hydrated state (ingestion of water ad libitum, in a thermally neutral environment ($\sim 19^{\circ}\text{C}$) for ~ 2 hours)

Condition 3: Participants complete exercise in a thermally neutral environment ($\sim 19^{\circ}\text{C}$) in a dehydrated state

Condition 4: Participants complete exercise in a thermally neutral environment ($\sim 19^{\circ}\text{C}$) in a hydrated state

All participants are monitored closely throughout the recovery period on completion of the main trials. Participants are fed, rehydrated and only permitted to leave the laboratory once they were euhydrated, core temperature had returned to normal levels and the participants confirmed they were feeling 'normal'.

Participants undergo computerised cognitive function assessments at baseline and 60- minutes post-exercise in all four trial conditions. Additionally, rectal temperature, perceived exertion (self-reported) and perceived thirst (self-reported) are measured at baseline and every 10 minutes throughout exercise in each condition.

Intervention Type

Other

Primary outcome(s)

Cognitive function is assessed using the Stroop test, visual search (VS) test and Sternberg Working memory test before and 60 minutes after each exercise condition.

Key secondary outcome(s)

1. Rectal temperature recorded at baseline (time point 0) and every 10 minutes throughout exercise and immediately after completion of the final cognitive test battery in each exercise condition
2. Rating of perceived exertion on a scale of 6-20 using the Borg scale recorded at time point 0 and every 10 minutes throughout exercise in each exercise condition
3. Rating of perceived thirst (9 point scale ranging from not thirsty to very, very thirsty) at time point 0 and every 10 minutes throughout exercise in each exercise condition

Completion date

01/09/2008

Eligibility**Key inclusion criteria**

1. 18-40 years old
2. Female elite
3. Elite field hockey players

Participant type(s)

Healthy volunteer

Healthy volunteers allowed

No

Age group

Adult

Lower age limit

18 Years

Upper age limit

40 Years

Sex

Female

Key exclusion criteria

1. Exercise-induced asthmatics
2. History of heart problems
3. Family history of sudden death below the age of 50

Date of first enrolment

01/12/2006

Date of final enrolment

01/09/2007

Locations

Countries of recruitment

United Kingdom

England

Study participating centre

Nottingham Trent University

Department of Sports Science

Clifton Campus

Nottingham

United Kingdom

NG11 8NS

Sponsor information

Organisation

Nottingham Trent University

ROR

<https://ror.org/04xyxjd90>

Funder(s)

Funder type

University/education

Funder Name

Nottingham Trent University

Alternative Name(s)

NTU

Funding Body Type

Private sector organisation

Funding Body Subtype

Universities (academic only)

Location

United Kingdom

Results and Publications

Individual participant data (IPD) sharing plan

IPD sharing plan summary

Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article	results	19/06/2018	24/10/2019	Yes	No