ISRCTN95800060 https://doi.org/10.1186/ISRCTN95800060

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

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

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?
Dr Caroline Sunderland
caroline.sunderland@ntu.ac.uk

Contact information

Type(s)
Scientific

Contact name
Dr Caroline Sunderland

Contact details
Erasmus Darwin Building
Nottingham Trent University
Clifton Lane
Nottingham
United Kingdom
NG11 8NS
+44 115 8486379
caroline.sunderland@ntu.ac.uk

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

Study design
Single-centre randomised cross over trial

Primary study design
Interventional

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 ± 0.1oC, 59 ± 1% rh) in a dehydrated state (achieved through undergoing a period in an chamber (~ 40oC, 75% rh))
Condition 2: Participants complete exercise in heat (33.3 ± 0.1oC, 59 ± 1% rh) in a hydrated state (ingestion of water ad libitum, in a thermally neutral environment (~ 19oC) for ~ 2 hours)
Condition 3: Participants complete exercise in a thermally neutral environment (~ 19oC) in a dehydrated state
Condition 4: Participants complete exercise in a thermally neutral environment (~ 19oC) 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 thirst) 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
Participant information sheet	Participant information sheet	11/11/2025	11/11/2025	No	Yes