WORLD RUGBY *Putting players first*

Heat Guideline

Introduction

Exercising in extreme environments is known to be associated with medical complications. The American College of Sports Medicine has developed guidelines for exercising in a hot environment. These guidelines were developed to provide advice during endurance events, in particular, distance foot races. The ACSM recommended using, an on-site Wet Bulb Globe Temperature (WBGT) reading and recommended that consideration should be given to cancelling events when the WBGT was above 28.

Rugby is a team sport played by athletes of varying stature where the game is of an intermittent nature and limited to two 40 minute halves. The intermittent nature of the sport probably allows for greater access to fluid intake during competition when compared with endurance events.

Considering the significant differences between endurance foot racing and Rugby, a review of other sports Heat Guidelines, more closely aligned to Rugby was undertaken. This investigation revealed that the National Rugby League (NRL) in Australia had developed Heat Guidelines during 2000 following research undertaken by Dr John Brotherhood.

The outcome of this research revealed that "relying on the WBGT was limited as it only took into account ambient temperature, globe temperature (radiant heat) and humidity and 70% of this reading was dependent on humidity". In addition it was identified that "the WBGT was not recorded by weather bureaus and a figure had to be estimated from the Wet Bulb Temperature".

Dr. Brotherhood placed more weight on the Belding Hatch Stress Index (BHSI) than the WBGT. BHSI is calculated by dividing the Evaporative requirement of the player by the Maximum Evaporative capacity of the environment x 100. A figure of 100 represents an equilibrium between heat loss and heat gain.

In 2001 the NRL adopted guidelines based on the Heat Stress Index measured using a Whirling Hygrometer to assess environmental conditions. Since the introduction of these guidelines there has not been a reported incidence of heat illness during a competition game.

The recommended guidelines are based on utilizing the Heat Stress Index as measured by the Whirling Hygrometer at the site of the game.

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Background information

Heat illness can range from heat exhaustion to heat stroke, with heat stroke being a **potentially fatal illness**. Heat stroke develops when the rate of heat production by the body exceeds the rate of heat loss and total body temperature rises to a level that leads to organ dysfunction and collapse.

Many factors influence the onset of heat illness and their significance should be recognised when exercise is undertaken in a hot environment. It should however be recognised that it is very difficult to identify with certainty that an individual will suffer heat stroke.

A core body temperature above 38 degrees Celsius is present when an individual experiences a heat illness. Major factors known to influence the core body temperature of an athlete are listed below.

External Factors

(a) ambient temperature
(b) radiant heat – direct sunlight
(c) humidity
(d) wind
(e) exposure time
(f) clothing eg dark clothing, headgear, shoulder pads.
(g) medication – stimulants such as pseudoephedrine & caffeine have a negative effect

Internal (Player) Factors

(a) player with past history of heat intolerance
(b) body structure – heavier athletes
(c) aerobic fitness
(d) acclimatisation
(e) hydration levels – pre exercise and during exercise
(f) illness – viral illness eg upper respiratory tract or gastroenteritis.

Important heat stress information

- The capacity of each player to cope with heat is variable and dependent on their ability on that day to produce enough sweat, to evaporate sweat, and to adequately replace fluid losses.
- It has been reported that in 80 minutes of football in hot humid conditions a player is required to dissipate the heat produced in the body by evaporating between 2 – 3.5 litres of sweat to prevent a dangerous increase in core temperature.
- Close monitoring of players, if exercising in a hot environment, is recommended. This should be on the basis of individual assessment. Any player demonstrating signs or symptoms of heat stress should be removed **immediately** from training or playing.
- The following combination of factors is often reported in cases of heat stroke.
    (a) Lack of acclimatization. Acclimatization is a gradual exposure to increasing heat loads and work volumes and is an important factor in reducing a potential heat stroke incident.

(b) Impaired individual temperature regulation on that day eg viral illness, commencing activity dehydrated, use of "adverse" medication eg stimulants.
(c) Extra effort on that day eg to make the team, impress the coach or achieve a goal.

Research has not identified a specific temperature and / or humidity when exercise is not recommended.

Recommended strategies to reduce heat stress

Critical steps

The following are the critical steps in minimizing heat illness during competition and training

1. Education
2. Appropriate scheduling of training and playing
3. Acclimatization
4. Assessment of extreme conditions
5. Implementing Interventions.
6. Crises Management.

Education

Players should be advised to

(a) Report to medical staff previous episodes of heat illness.
(b) Report to coaching and medical staff, any current viral infection especially if associated with a temperature – this should be re-emphasized to players regularly.
(c) Avoid using stimulants eg pseudoephedrine or caffeine prior to training
(d) Always start a training session well hydrated
(e) Always drink fluids during a training and playing session
(f) Report early the signs of heat stress - cramps, headaches, nausea, vomiting – this should be re-emphasized to players regularly.

Coaching, management and medical staff should

(a) Be aware of the early signs of heat stress – cramps, headaches, nausea, vomiting, reduced performance, poor coordination, "abnormal" behaviour.
(b) Implement processes that encourage the reporting of current viral infections.
(c) Implement strategies that encourage all players to commence a playing and/or training session fully hydrated eg pre and post exercise weigh in, pre-exercise urine specific gravity assessments.
(d) Recognise and accept the potential seriousness of a severe heat illness, that is, heat stroke.

Scheduling training and playing

If practical, training and playing should be scheduled when ambient temperatures, radiant heat (direct sunlight) and humidity are expected to be at acceptable levels. Utilising the Heat Stress Index, a guide to acceptable levels would be:

a) temperature ≤ 30 degrees Celsius
b) humidity ≤ 60%

There is no evidence to suggest training or playing at higher temperature and humidity levels will result in a heat illness.

Historical data should be obtained from the local Bureau of Meteorology to identify times throughout a day and month when these conditions are most likely to prevail. This information can then assist with scheduling training to minimize risk.

Acclimatisation

Allowing athletes to acclimatize should also be a component of managing potential heat illness. Activity in hot humid conditions should be introduced gradually to allow athletes to acclimatize to these difficult conditions.

Acclimatisation is reported to occur following 7 – 10 days of exposure to the appropriate environment.

Assessment of extreme conditions

In extreme weather conditions an objective assessment of the environment may be required to assist in determining the safety of the prevailing conditions.

Research and experience has confirmed that the "Heat Stress Index" measured using a "Whirling Hygrometer" is both practical and reliable and it is recommended that each Rugby Ground have access to a Whirling Hygrometer to measure the weather conditions. This Index (see attached chart) takes into account Air Temperatures at various Relative Humidity. Prior studies have confirmed that if the Heat Stress Index % is below 150, the risk to players should be minimal. Experience suggests that players are able to cope with an Index as high as 250 but it is recommended that all of the Heat Illness Prevention Interventions listed below are applied if the Index is above 150.

From a practical perspective, the hygrometer needs to be whirled for 20 seconds to obtain readings. Three measurements should be undertaken and averaged.

The Whirling Hygrometer (≈ $A 175) can be obtained from Arthur Bailey Surgico Pty Ltd 55 Lilyfield Road Rozelle 2039 NSW. Ph – (02) 9555 1588.
www.abailey.com.au

Heat illness prevention interventions

Whilst the Heat Stress Index has been successfully utilized in Australian Rugby League World Rugby recognizes that Rugby players are potentially at a higher risk of a heat illness than Rugby League players. The reasons for this opinion are listed below and have been taken into account when formulating the World Rugby Prevention Interventions:

1. Rugby athletes are generally bigger athletes
2. League players are able to access interchange during their games
3. Aerobic fitness of League players is higher.
4. Less "hugging" in League
5. Rugby athletes from Northern Hemisphere less acclimatized.

The following Game Day Interventions should be implemented when the Heat Stress Index is above 150:

Game day interventions

1. Provision of dressing room fans if air conditioning not available
2. Provision of side line shade if game played during the day when radiant heat (direct sunlight) is a contributing factor.
3. Strategic positioning of towels immersed in ICE water around the ground – behind goal posts and at junction of each quarter line and side line.
4. 2 minute break at the 20 minute mark of each half. The focus of this break should be threefold, a medical assessment of each athlete for signs of heat stress, cooling of athletes and re-hydration. It is suggested that cooling would be best achieved by immediately removing jersey and shoulder pads, application of ICE water to head ± body. Utilising sideline fans and shade (if game during day) would also be ideal. It should be noted that a 2 minute break has been recommended (as opposed to a 1 minute break) because the focus during this break is primarily medical assessment and cooling.

It should be noted that increasing access of water carriers to the field has not been recommended as it is felt that there is adequate breaks in the course of a game to allow water carrier access and player re-hydration.

Training guidelines

The recommendations re education, scheduling and acclimatization should also apply to training sessions.

Training sessions are more easily manipulated and the following is recommended during periods of significant heat stress (Index > 150):

(a) Plan training at the most appropriate time of the day – check Bureau of Meteorology statistics.
(b) Plan training to allow players to acclimatize – gradually increase exposure times and training volumes and intensity.
(c) Identify players who may have a viral infection or are volume depleted.
(d) Be aware of the early signs of heat stress
(e) Schedule fluid breaks every 10 – 15 minutes.
(f) Each 40 minute session should be followed by a 15 minute rest period where players are rested, **cooled**, re-hydrated and protected from radiant heat (direct sunlight).

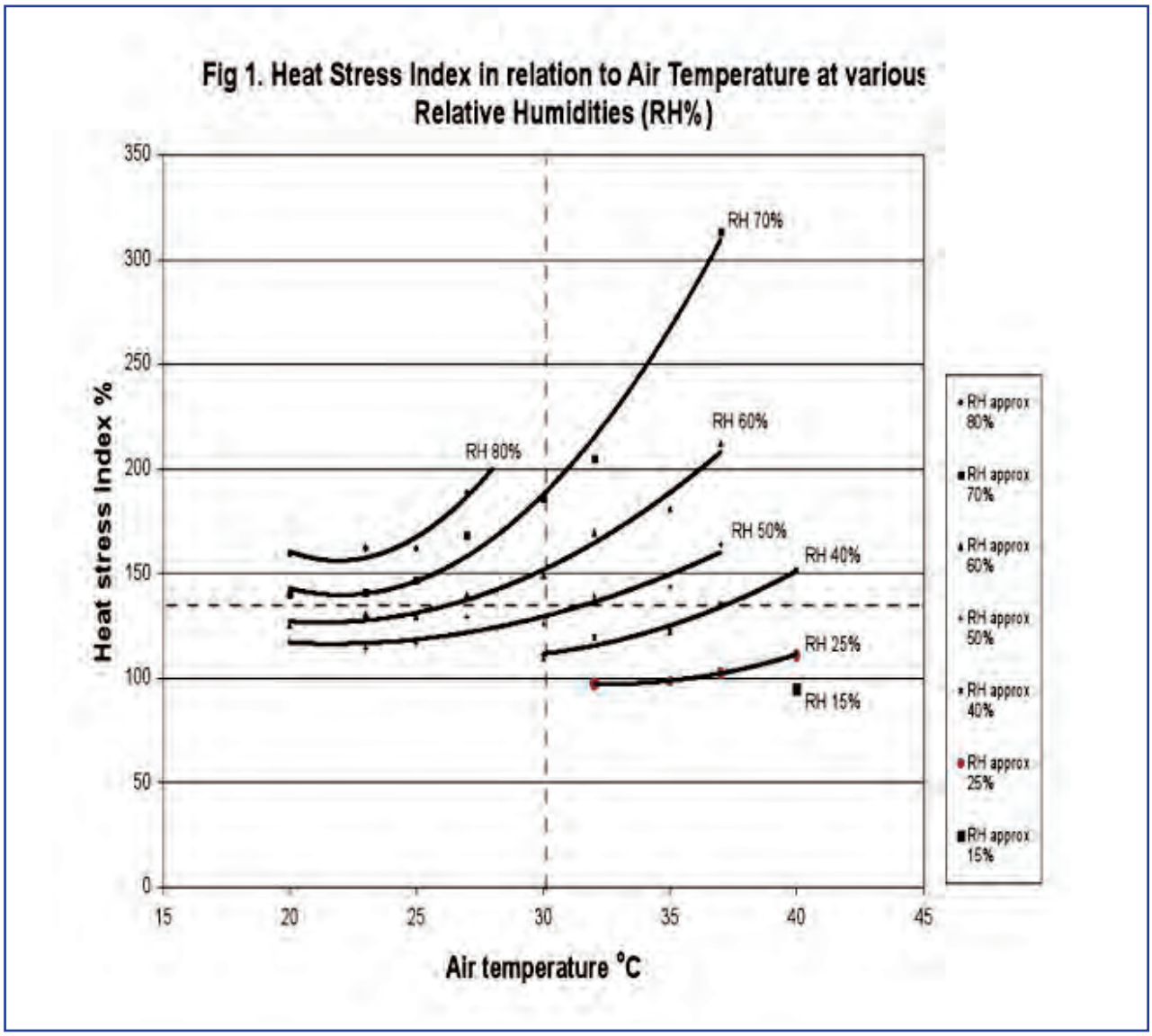
In addition the following are also recommended:

(a) training apparel should be light weight, loose fitting and allow evaporation of sweat
(b) adequate quantities of ICE should always be available
(c) drinks should be provided at a temperature which are known to assist with rapid absorption - less than 15 degrees Celsius (ICE fluids)
(d) shade should be utilized during any break in training

Crisis management

Each training and playing venue should have in place a crises management plan. This plan should reflect that prompt recognition and immediate total body cooling will resolve or mitigate the problems of hyperthermia.

Figure 1: Heat Stress Index in relation to air temperature at various relative humidities (RH%)



Conclusion

These Heat Guidelines are intended to minimize the risk of the onset of heat illness and provide a framework for each team and venue to operate safely during periods of climatic extreme.