
Australian Cricket

HEAT POLICY

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The CRICKET AUSTRALIA CHIEF MEDICAL OFFICER,
SPORTS SCIENCE & SPORTS MEDICINE MANAGER, &
LEAD SPORTS DIETITIAN are responsible for this document.

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DOCUMENT CONTROL

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REVISIONS

Date	By
8 TH March 2019	Dr Ollie Jay, Dr John Orchard, Michelle Cort, Alex Kountouris, Eliza Freney

1. PURPOSE

- 1.1 Australian Cricket (AC) considers it important to pursue best practice in prevention and management of heat related illness whilst participating in Cricket Australia (CA) sanctioned competitions and training sessions.
- 1.2 The aims of the AC Heat Policy are to:
- ensure that there is a protocol that can to be implemented when extreme (heat-related) weather conditions are expected;
 - introduce and implement an evidence-based Heat Stress Risk Index (HSRI) (Appendix B) that provides an objective measure to indicate when heat stress management strategies and interventions should be implemented during CA sanctioned training sessions and matches; and
 - outline and reinforce guidelines for heat management strategies to reduce the risk of heat illness incidents to participants (Appendix A).

2. SCOPE

- 2.1 The AC Heat Policy (the Policy) applies to all Players, Player Support Personnel and Match Officials (collectively known as **Participants**) involved in any CA sanctioned competitions, including matches or training for such competitions (collectively known as **Elite Cricket**).
- 2.2 In relation to players representing Australia in international cricket competitions or matches, CA will follow this Policy but it is accepted that some of the recommendations

will not apply to international level matches governed by International Cricket Council (ICC) Playing Conditions.

3. RELATED DOCUMENTS

- 3.1 Cricket Australia Extreme Heat Guidelines (2014). This document included the 'Heat Guidelines in Australian Cricket' as an appendix which addressed risk, and recommended **guidelines for playing cricket in the heat**.

4. HEAT STRESS RISK INDEX

The cricket-specific HSRI has been developed specifically for CA to be used to calculate the combined heat stress risk associated with hyperthermia and dehydration to Participants engaged in Elite Cricket.

It is designed to determine what additional heat management strategies (other than the usual strategies outlined in Appendix A) are required during Elite Cricket Sessions when weather conditions are expected to increase the risk of heat illness of Participants and to avoid heat stress illness to Participants.

4.1 Calculation of the HSRI

- (a) Appendix B details the evidence-based information used to derive the HSRI and how to use the HSRI.
- (b) The following key values are needed to calculate the HSRI:
- ambient air temperature in the shade (°C);
 - wind speed (in km/h);
 - relative humidity (%);
 - black globe temperature (°C), indicative of warmth of direct sunshine
- Note: black globe temperature is not measured by any of these weather data sources, and is therefore estimated by the HSRI calculator.

Hourly values for air temperature, wind speed and relative humidity should be obtained from a credible weather data source. The recommended weather data source is the *Bureau of Meteorology* (BOM) website (<http://www.bom.gov.au>). Weather data from the closest possible BOM location to the match or training venue should be obtained. If localised BOM data is not available, for example the ground is more than 10 km from the nearest BOM weather station, then an alternate reputable weather site is acceptable.

An example of alternative weather data source that can be used if BOM data is not available is UBIMET <https://weathercockpit.com.au>

A list of weather stations from the BOM and their proximity to grounds are outlined in Appendix D.

5. HEAT STRESS PROTOCOL

5.1 Match days

- a) Pre-Match Medical Meeting
- i. A real-time HSRI measure should be taken just prior to the Pre-Match Medical Meeting to determine the baseline measure for the match day; and
 - ii. Forecasted HSRI measures for each hour of the match day should also be taken.

The Match Event Manager or the **Medical Officials** (Match-Day Medical Officer or physiotherapist) present at the match should communicate the real-time and forecasted HSRI measures at the Pre-Match Medical Meeting. If either, forecasted or real-time, HSRI for the match day is greater than 3 (see section 5.4) then weather conditions must be monitored regularly throughout the match day (hourly) to determine if the Heat Stress Management Interventions outlined in section 5.4 should apply.

b) Hourly (real-time) HSRI measures

If at any time during the day the real-time HSRI is greater than 3, refer to section 5.4 for the relevant Heat Stress Management Interventions.

- c) If the forecasted and the real-time HSRI is 3 or less, no further Heat Stress Management Interventions are required (other than the usual strategies outlined in Appendix A) for the remainder of the match; unless there is a change in weather conditions or concern is raised by the **Match Officials** (umpires or match referees) or Medical Officials at the match or by Cricket Australia. In this instance, further measures of the HSRI must be observed and the Heat Stress Management Interventions implemented if the HSRI is greater than 3.

5.2 Training Sessions

- a) Hourly forecasted weather data for the training sessions should be entered into the HSRI just prior to the commencement of to any outdoor training Session;
- b) If the forecasted HSRI for any time point during the training Session is greater than 3, then hourly HSRI measures must be continually made (in real-time) throughout the duration of the training session;
- c) If the real-time HSRI is greater than 3 during the training session, the Heat Stress Management Interventions, like those outlined in section 5.4, should be considered. It is acknowledged that the Heat Stress Management Interventions are intended to be applied in respect of a match, and therefore a common-sense approach should be taken in implementing similar strategies at training sessions (e.g. more regular drink breaks when the HSRI is greater than 3, suspend training if the HSRI is greater than 10 etc.);
- d) If both the forecasted and the real-time HSRI is 3 or less, then no further HSRI measures are required to be undertaken and recorded for the remainder of the training session; unless there is a change in weather conditions and concern is raised by the Medical Officials at the training session, or by Cricket Australia. In this instance, further measures of the HSRI must be observed and the Heat Stress Management Interventions implemented if the HSRI is greater than 3.

5.3 Responsibility for Measuring and Implementing the HSRI

- a) Matches
- i. The highest qualified Medical Official in attendance at match and the Match Event Manager are responsible for calculating the HSRI,
 - ii. The highest qualified Medical Official in attendance at Match and the Match Event Manager is responsible for collating and entering the data into the HSRI (on AMS) and making recommendations to the Match Referee and Match Officials (at Pre-Match Medical Meeting or in real-

time during the match) based on the Heat Stress Management Interventions in 5.4.

b) Training Sessions

- i. The highest qualified Medical Official in attendance at the training session and Event Manager (if present or other event staff) is responsible for collating the data from BOM and entering the data into the HSRI on AMS;
- ii. The highest qualified Medical Official in attendance at the match and the Event Manager (if present, or other event staff) at the training session is responsible for determining if any Heat Stress Management Interventions are required based on the HSRI as outlined in sections 5.2 and 5.4 (e.g. whether the training session should continue, require more regular than usual drinks break or delayed to a later time in the day);

5.4 Heat Stress Risk Index Management Interventions

The HSRI rating outlines the Heat Stress Management Interventions to be considered for different heat-related weather conditions. In the instance that:

- (a) **HSRI rating is between 0 to 3 (inclusive):** no change to usual heat management strategies (Appendix A);
- (b) **HSRI rating is between 4 to 7 (inclusive):** heat management strategies (see Appendix A) and consider extra drinks breaks, in accordance with clause 5.5 (e.g. every 50 minutes in first-class matches instead of every 60 minutes). Medical Officials (and anyone else involved in the match or training) should be extra vigilant in monitoring Participants that exhibit signs of heat stress illness such as excessive muscle cramping, dizziness, excessive fatigue etc.);
- (c) **HSRI rating is between 8 to 10 (inclusive):** extra drinks breaks in accordance with item 5.4 a) and b) above should be considered; and with potential that each drink's break should be extended in accordance with clause 5.5 (e.g. 10-15 minutes instead of 5 minutes) to allow Players and Match Officials to leave the field of play to cool down if required;
- (d) **HSRI rating is above 10:** all Heat Stress Management Interventions in accordance with items 5.4a) to c) applied and / or consideration to suspend the match in accordance with clause 5.6 until the HSRI is 10 or below. A meeting between Medical Officer (or highest qualified Medical Official) if present, the Match Event Manager (if present) and Match Referee (or highest-ranking Match Official) to consider how Participants and Match Officials are responding to the Heat Stress Management Interventions and if the match should be suspended until conditions improve. The Match Referee and the Medical Officials are responsible for making any decision to suspend the match. If no agreement can be made the opinion of the CA SSSM Manager and/or the CA Head of Cricket Operations should be sought.
- (e) If suspension has been agreed on, the Match Referee (or highest-ranking Match Official) responsible for the match confirms with the umpires that the match is at the suspension stage. The Match Referee is to contact CA (CA SSSM Manager, CA Head of Operations, or in their absence the CA Match Officials Manager) to inform them that the match has been suspended. Should all parties still agree, the umpires call a suspension.

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- 5.5 If any additional and/or extended drinks break/s impact on the time allocated to the fielding team to complete their overs, the Match Referee (or highest-ranking Match Official) will determine if time lost can be added later in the day / match in accordance with the relevant Cricket Australia Playing Conditions.
- 5.6 If a determination is made to suspend a match, the Medical Officials and Match Event Manager are responsible for monitoring the HSRI at regular intervals in real-time (such as when a match is suspended due to rain). Play should only resume when the Medical Officials, Match Event Manager and Match Referee (or highest-ranking Match Official) have unanimously determined that the HSRI indicates it is safe to resume the game (HSRI 10 or below) and the risk to Participants has been mitigated. The Match Referee (or highest-ranking Match Official) will determine when the match can resume or if time lost can be added later in the day or match in accordance with the relevant Cricket Australia Playing Conditions.

Note: Implementation of the Heat Stress Management Interventions must take a common-sense approach. In situations when Medical Officials, at Elite Cricket become concerned for Participants welfare due to heat they should consider implementing the strategies outlined in section 5.4 regardless of the HSRI. Conversely, in circumstances where Participants are responding to the Heat Stress Management Interventions, Medical Officials and Match Officials may decide to adjust the Heat Stress Management Interventions (e.g. not suspend play if Players and Match Officials are responding well to additional and/or extended drinks breaks).

- 5.7 If no data is available to calculate the HSRI, the Medical Official at the match must decide if players are likely to be at risk of heat stress illness and if the Heat Stress Management Interventions (outlined in 5.4 b, c and d) apply. The Medical Official should then communicate with the Match Referee (or highest-ranking Match Official) the recommendations. The Match Referee (or highest-ranking Match Official) and the Medical Officials are responsible for making any decision to suspend the match.

6. EDUCATION

- 6.1 All AC SSSM staff, Match Event Managers and Match Officials, should be educated about;
- (a) Heat Stress illness (Appendix C);
 - (b) and Heat Stress Management Interventions;
 - (c) the AC Heat Policy; and
 - (d) the use (including where to record data) and interpretation of the HSRI.
- 6.2 Players and Match Officials should have a basic understanding of the HSRI and the AC Heat Policy.
- 6.3 The AC Heat Policy will be stored on the AMS.

7. RECORDING

- 7.1 A record of:
- (a) the weather data;
 - (b) time that weather data was obtained;
 - (c) the HSRI; and

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- (d) Heat Stress Management Interventions (including details of additional and/or extended drinks breaks or suspensions of play).
must be recorded into the AMS by the Medical Officials or Event Staff.

7.2 The Medical Officials or Event Staff must immediately notify the CA SSSM Manager and CA Chief Medical Officer of all Heat Stress Management Interventions and record these on the AMS.

8. REVIEW OF HEAT POLICY

8.1 This AC Heat Policy will be reviewed annually.

8.2 A retrospective review of the calculated HSRI at matches (and training sessions) across the season, including changes to match schedule as a direct result of the AC Heat Policy and incidence of heat stress in Participants will be undertaken and may be used to assess the efficacy of the AC Heat Policy.

8.3 These reviews will be conducted by:

- (a) the CA Chief Medical Officer;
- (b) the CA SSSM Manager;
- (c) the CA Lead Sports Performance Dietitian; and
- (d) an external industry expert such as the Director of Thermal Ergonomics Laboratory, The University of Sydney (or equivalent if not available).

APPENDIX A - HEAT STRESS MANAGEMENT STRATEGIES

The Heat Stress Management Strategies guidelines outlined in this appendix are designed to negate the effects of heat stress that can result from training and playing cricket in the heat. Cricket is a summer sport so it is expected that some Heat Stress Management Strategies will need to be applied even when the heat related weather conditions are not extreme. These strategies become even more important in extreme heat related conditions.

The following Heat Stress Management Strategies are recommended to be implemented in part or full in matches (and training Sessions).

1. HYDRATION

1.1 Pre-Match or Training Sessions

- (a) Ensure Participants are well hydrated at the start of the match or session.
- (b) Urine Specific Gravity (USG) testing is the most accurate method of monitoring players hydration status with an on-waking sample. A value below 1.020 is considered to be acceptable hydration status.

1.2 During Match or Training Session

- (a) Participants should have access to palatable cool fluids throughout their day / session and breaks in play / training.
- (b) Participants should aim to replace their fluid and sodium losses to maintain adequate hydration.
- (c) Participants drinks should be individualised to suit their needs.

1.3 Post-Match or Session Rehydration

- (a) An accurate method to determine fluid loss and rehydration volume required is to calculate Participant's body weight difference over a session (i.e.: player weigh-in and weigh-out of sessions).
- (b) 150% of the volume difference between pre- and post-session weight should be replaced (re-hydration).
- (c) All Participants should drink the required volume slowly (over hours) to minimise diuresis, and choose electrolyte containing fluids (or consume fluid with a meal) to aid retention.

2. COOLING

A combination of external and internal cooling methods is recommended.

2.1 Cold water immersion techniques should be considered, including;

- (a) Whole body or torso (neck to knee) cooling.
- (b) 30 mins at 22-30°C or 5 mins at 15°C

2.2 Ice ingestion (slushies, icy poles)

- (a) The product needs to be swallowed as ice.

2.3 Cold wet towels

- (a) Crushed ice (approximately 3 kilograms), wrapped in wet towels and taped at the ends and middle.
- (b) Placed on the extremities of the body (neck and face during play and drink breaks).
- (c) Rotation of the towels to different areas of the body is preferable.
- (d) Ideally, this should be used in conjunction with an evaporative fan to maximise cooling effect.

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- 2.4 Air-conditioned change rooms
- (a) Where available, change rooms air-conditioning should be set at 18-20°C.
- 2.5 Evaporation
- (a) Participants should avoid wearing compression undergarments during training and matches, particularly in extreme heat related weather.
 - (b) Industrial type fans in viewing areas to encourage evaporation are a good cooling method. This should be used in conjunction with skin wetting to maximise the cooling effect.

APPENDIX B – HEAT STRESS RISK INDEX (HSRI)

Collectively, there are four environmental parameters and two personal parameters that determined the prevailing thermoregulatory strain during exercise in the heat.

The Environmental parameters are:

- Air temperature (in the shade)
- Humidity
- Wind speed
- Radiant temperature (from the sun)

And, the Personal parameters are:

- Clothing properties (insulation and evaporative resistance)
- Activity (metabolic heat production)

A simple cut-off temperature therefore cannot be used as decision-making tool for preventing heat stress risk during cricket competition. Instead, the Heat Stress Risk Index (HSRI) combines all six of these factors to provide a “risk” rating from 0 to 10.

Of the two personal parameters, both are estimated and already built into the HSRI model. Average activity levels for the most active cricket positions are estimated to be 4 “Metabolic Equivalents” (METs) (Jette et al. J Clin Cardiol; 1990). Clothing properties have been measured for a standard cricket uniform (legs pads, trousers, short sleeve shirt, gloves, shoes) provided by Cricket Australia using a 34-zone sweating thermal manikin. Evaporative resistance was measured as 0.023 m²·kPa·W⁻¹ and dry heat transfer resistance was determined to be 1.03 clo (0.160 m²·°C·W⁻¹).

For the 2018-19 season, location-specific hourly weather data will be extracted from the Bureau of Meteorology (BOM) website (<http://www.bom.gov.au>) for air temperature (in °C), relative humidity (in %), and wind speed (in km·h⁻¹). *Note: These hourly data and not peak data must be extracted as the highest relative humidity will not coincide with the high air temperature in a given day. Radiant temperature (additional thermal effect of direct heat from the sun) is not measured by BOM, but will be estimated using the date, time, and location.

ENTER meteorological conditions		
Air Temp °C	Relative Humidity %	Wind km·h ⁻¹
32.0	62	10.0
RISK		
7		
0-3: Play proceed as normal		
4-7: Extra breaks recommended		
8-10: Extended extra breaks recommended		
>10: Consider suspension of play		

Air temperature, humidity, and wind speed are HSRI platform inputs in Excel (Fig.1). The accompanying output provides a “risk” rating from 0-10 with associated interpretation bands (green [0-4]; orange [5-7]; red [8-10]; black [>10]). Each band has a recommended action (see Clause 5.4).

The HSRI rating is based on the combined heat stress risk associated with the development of overheating (hyperthermia) and dehydration throughout the course of a full-day cricket match.

The risk of hyperthermia is determined estimating the physiological “compensability” of the player in the ambient environment. Humans predominantly keep cool during exercise in the heat via the evaporation of sweat. However, sweat evaporation is slowed down by low wind speeds and high humidity. The amount of evaporation required to stop overheating (E_{req}), which becomes greater when air temperature is high with clear skies, is compared to the maximum amount of evaporation possible (E_{max}). If E_{req} is more than 100% of E_{max}, the body gets continually hotter. However fit trained people are known to be able to tolerate conditions when E_{req} is up to 150% of E_{max}. But as this percentage becomes progressively greater, the risk of overheating gets worse. The HSRI “risk” value therefore increases by +1.0 for every 10% E_{req} is above 150% of E_{max}.

Because the amount of sweating needed for a given amount of evaporation is known (2.427

$\text{kJ}\cdot\text{g}^{-1}$ of sweat⁻¹), the rate of dehydration through sweating can be estimated. It is known that a 4% reduction in total body weight (TBW) through sweat losses can be detrimental to a person's health, therefore the risk associated with exceeding this threshold (for 80 kg male) throughout the course of a 3 x 2-h exposure is calculated using the HSRI. It is assumed that through the provision of fluids during breaks, the average player will replace ~50% of their sweat losses. So, a sweat rate of $1 \text{ L}\cdot\text{h}^{-1}$ is considered the threshold for increased risk of dehydration, and the HSRI "risk" value increases by +1.0 for every $0.1 \text{ L}\cdot\text{h}^{-1}$ the estimated sweat rate is above $1 \text{ L}\cdot\text{h}^{-1}$.

The risk scores for hyperthermia and dehydration are then combined to give a final overall HSRI "risk" value (Fig.1).

APPENDIX C- HEAT STRESS ILLNESS ACTION PLAN

Should a player demonstrate signs of heat illness the following should be implemented:

- (a) Remove from the ground to a cooler, shaded (or indoor) environment
- (b) Remove excess clothing and equipment
- (c) If able, measure and monitor body temperature
- (d) On-site cold-water immersion is recommended
- (e) If cold water immersion is not possible, cool the player with fans and / or ice towels
- (f) Provide with cool fluids to consume

APPENDIX D - LIST OF GROUNDS AND NEAREST BOM WEATHER STATIONS

Ground	Weather station	Number	Distance	Available data
MCG	Melb Olympic Park	86338	1km	<=30 min THW
Junction Oval	Melb Olympic Park	86338	3km	<=30 min THW
Marvel (Docklands)	Melb Olympic Park	86338	2km	<=30 min THW
Geelong (Skilled)	Breakwater	87184	2km	<=30 min THW
Gabba	Brisbane Regional	40214	2km	<=30 min THW
Border Field (NCC)	Brisbane Regional	40214	5km	<=30 min THW
Cairns (Cazaly's)	Cairns Post Office	31010	2km	<=30 min THW
Townsville (Riverway)	Ross River	32084	7km	<=30 min THW
Mackay (Harrup)	Mackay Post Office	33046	2km	<=30 min THW
Mettricon, Gold Coast	Southport	40190	5km	<=30 min THW
Adelaide Oval/Rolton	Adelaide (West Terrace)	23000	2km	<=30 min THW
Glenelg	Adelaide Airport	23109	3km	<=30 min THW
Optus (Perth)	Perth Regional	9034	3km	<=30 min THW
WACA	Perth Regional	9034	2km	<=30 min THW
Blundstone, Bellerive	Hobart (Ellerslie)	94029	4km	<=30 min THW
TCA, Hobart	Hobart (Ellerslie)	94029	3km	<=30 min THW
Launceston	Launceston	91049	2km	<=30 min THW
Alice Springs (Traeger)	Alice Springs PO	15540	2km	<=30 min THW
Darwin (Marrara)	Darwin Airport	14015	3km	<=30 min THW
SCG	Sydney (Obs Hill)	66062	5km	<=30 min THW
Spotless/ANZ Homebush	Sydney Olympic Park	66212	<1km	<=30 min THW
Blacktown ISP	Horsley Park	67119	9km	<=30 min THW
Hurstville	Sydney Airport	66037	6km	<=30 min THW
North Sydney Oval	Sydney (Obs Hill)	66062	4km	<=30 min THW
Drummoyne Oval	Sydney (Obs Hill)	66062	5km	<=30 min THW
Bankstown Oval	Bankstown Airport	66137	4km	<=30 min THW
Penrith	Penrith Lakes	67113	3km	<=30 min THW
Manly	Manly (Nth Head)	66197	3km	<=30 min THW
Sydney University	Sydney (Obs Hill)	66062	4km	<=30 min THW
Waverley	Sydney (Obs Hill)	66062	7km	<=30 min THW
McGrath, Sutherland	Kurnell	66043	9.5km	<=30 min THW
Joe McAleer, Blacktown	Horsley Park	67119	9km	<=30 min THW
North Dalton, Wollongong	W'gong Uni	68188	2km	<=30 min THW
Wagga	Wagga (Kooringal)	72151	2km	<=30 min THW
Coffs Harbour	Coffs Airport	59151	2km	<=30 min THW
Manuka, ACT	Canberra Airport	70351	5km	<=30 min THW
Chisolm, ACT	Tuggeranong	70359	3km	<=30 min THW
Phillip, ACT	Tuggeranong	70359	8km	<=30 min THW
Lismore	Lismore	58037	2km	<=30 min THW
Newcastle	Newcastle (Nobby's)	61055	2km	<=30min THW