World Rugby Heat & Air Quality Guidelines 2025

WORLD RUGBY

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HEAT GUIDELINES

INTRODUCTION

Heat illnesses during sport can range in severity from mild heat exhaustion through to heat stroke, which is a potentially fatal condition. All heat illnesses develop when the rate of internal heat production by the body, which is upregulated during exercise, exceeds the rate of heat loss from the body to the surrounding environment. Resultant rises in core body temperature, if high enough, can lead to adverse health effects and ultimately organ dysfunction, collapse, and death. While fatal heat injury during sport is relatively rare, cases of heat-related illnesses (e.g. mild-to-severe heat exhaustion) during sport competition/training are far more common and may have a profound impact on players health and future sport participation (Sports Medicine Australia (SMA) Extreme Heat Policy v2.0, 2025). Though rare, death from severe exercise-induced heat illness is one of the two main causes of death in athletes (IOC consensus statement; Racinais et al, BJSM, 2023).

Many factors influence the risk of heat illness, and their significance should be recognised when exercise is undertaken in warm/hot environments. It should however be recognised that it is very difficult to identify with certainty that an individual will suffer heat stroke. Major factors known to influence the core body temperature of an athlete are listed below.

Environmental Factors

- Ambient temperature (measured in the shade)
- Mean radiant temperature (measured with black globe thermometer, accounting from additional thermal radiation from direct sunlight and reflected from surrounding surfaces)
- Humidity
- Wind speed

Personal Factors

- Metabolic heat production (activity level)
- Clothing and protective equipment (coverage and breathability)
- Duration of activity

Individual (Player) Factors

- Recent (last 2 years) history of heat intolerance
- Body weight (metabolic heat production is higher in heavier athletes during weight-bearing activities)
- Aerobic fitness levels
- Heat acclimatisation status

- Hydration status – pre-exercise and during exercise
- Pre-existing illness – viral illnesses, e.g., upper respiratory tract or gastroenteritis
- Use of certain medications (e.g., stimulants such as pseudoephedrine)

IMPORTANT HEAT STRESS RISK 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 (avoiding reductions in total body mass of >1-2%). It has been reported that in 80 minutes of rugby in hot and 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 potentially dangerous increases in core temperature. Close monitoring of heat illness signs in players, if exercising in a high heat stress environment, is recommended. This should be based on an individual assessment. Any player demonstrating signs or reporting symptoms of heat illness should be removed immediately from training or playing and treated accordingly (*see Management of Hyperthermia / Heat Exhaustion / Heat Stroke).*

The following combination of factors is often reported in cases of severe heat illnesses.

- Lack of heat acclimatization. Heat acclimatization is characterised by physiological adaptations that protect players against heat-related illnesses. Acclimatization can be induced by a gradual exposure to increasing (and sustained thereafter) heat loads and work volumes over the course of 1-2 weeks.

- Impaired individual thermoregulation on that day due to factors such as viral illness, commencing activity dehydrated, use of “adverse” medication e.g. stimulants.

- Very high player motivation (e.g. extra effort to make the team, impress the coach or achieve a goal) causing a player to ignore initial heat illness symptoms leading to a progression to a more severe form.

RECOGNISING SIGNS AND SYMPTOMS OF HEAT STRESS RISK

Players are advised to:

- Report to medical staff previous episodes of heat exhaustion or exertional heat stroke.

- Report to coaching and medical staff, any current viral infection especially if associated with a fever (core temperature at rest >38.0°C - this should be re-emphasized to players regularly).

- Avoid using stimulants e.g. pseudoephedrine prior to training or games.

- Always start a training session or game well hydrated. Normal (euhydration) hydration status can be verified by ensuring that pre-exercise nude body mass in within ±0.5 kg of the players typical body weight. If any concerns about a player’s hydration status exist (e.g., because of previous dehydration event, or diuretic illness) a urine specific gravity (USG) measure is recommended from a mid-stream

(preferably first-pass upon waking) urine sample. USG values >1.025 indicate hypohydration, and that a player should drink at least an extra 0.5 L of water before commencing activities.

- Always drink fluids during a training and playing session. Players should never start a game or training session with any sensation of thirst.

- Players should report early any symptoms of heat illnesses - cramps, headaches, nausea, dizziness – this should be reemphasized to players regularly.

Coaching, management and medical staff should be advised to:

- Be aware of the early signs/symptoms of heat illnesses – cramps, headaches, nausea, vomiting, reduced performance, poor coordination, "abnormal" behaviour (**Figure 1**).

- Implement processes that encourage the reporting of current viral infections.

- Implement strategies that encourage all players to fully rehydrate following a playing and/or training session, e.g. pre and post exercise weigh-in to guide fluid replenishment requirements (players should ingest 150% the volume of body water lost).

- Understand the potential seriousness of a severe heat illness, such as heat stroke.

PRE-EVENT PREPARATION FOR HEAT STRESS CONDITIONS

Allowing athletes to physiologically adjust to high heat stress risk conditions is recommended (if feasible) to manage the potential risk of heat illness. Ideally, activity in hot and humid conditions should be introduced gradually to allow athletes to acclimatise. Travel from a cooler to a warmer climate for in-season games can elevate heat stress risk due to a deficit in the physiological heat acclimatisation that occurs if an athlete is repeatedly and regularly exposed to high heat stress conditions. Complete heat acclimatisation is characterised by a lower resting core temperature, a greater blood volume, and a higher maximum sweat rate – all of which are protective against heat-related illness and performance decrements.

Most elite rugby athletes will be partially (~50%) heat acclimatised due to their highly conditioned training status, even if they are primarily training in a cooler climate on account of the regular bouts of hyperthermia that are induced by high-intensity physical activity. Depending on logistical feasibility, teams are encouraged to travel to an event location with a substantially hotter climate than their home base a minimum of 3 days in advance of an event. During this time at least 2-3 training sessions should be completed in the local ambient conditions to help induce some physiological adaptations. The greater the number of days that players can be exposed to, the greater the opportunity for adaptation. As a reference, 7-10 consecutive days of moderate-to-high intensity exercise in a hot climate are required to attain complete acclimatisation.

POST-EVENT RECOVERY FROM HEAT STRESS CONDITIONS

Recovery for players following hyperthermia during competition should focus on post-exercise cooling and the full replenishment of lost body water.

Post-exercise cooling

- Cold showers and cold-water baths are effective ways of conductively cooling the body rapidly after competition.
- Applying water to the skin surface accelerating its evaporation with fans are also effective post-exercise cooling strategies.

Rehydration

- As a guide, players should seek to ingest ~50% more water than what has been lost during exercise heat exposure due to the diuretic effects of post-exercise water ingestion.
- Measuring the differences between pre- and post-game body mass (nude) of each player is the most effective way of prescribing precise individualised fluid replenishment volumes. It is well accepted that thirst is generally a poor indicator of hydration status. Urine specific gravity (USG) measures attained from a first-pass mid-stream urine sample upon waking the morning after a game, tested with a refractometer, will provide a reliable assessment of next day hydration status. USG values >1.025 indicate sustained hypohydration and the necessity to replenish body water further.
- In most cases rehydrating with plain water is sufficient, but if there are concerns about electrolyte losses then water can be supplemented accordingly without compromising recovery.
- Alcohol should be avoided – its potent diuretic effect will potentially eliminate all ingested water within 3-4 h resulting in the same level of dehydration as before.

ASSESSING HEAT STRESS RISK

The risk to player health in high heat stress conditions is determined by:

- Air temperature,
- Humidity,
- Wind speed
- The level of thermal radiation in the environment.

These four factors are combined to define player heat stress risk using a Heat Stress Index (HSI), which is then used to trigger the implementation of protective actions to keep players sufficiently cool and safe.

The HSI is a ratio (expressed as a percentage) of the rate of skin surface evaporation (derived almost exclusively from sweat evaporation) required to offset the rate of internal heat production from metabolism and any dry heat load from the surrounding environments via convection and radiation, relative to the maximum rate of evaporation permitted by the prevailing environmental conditions (determined by humidity and wind).

Once the HSI exceeds 100, this means that the amount of sweat evaporation needed to regulate body temperature is greater than what is possible in the environment the player is in. Consequently, core temperature will continue to climb. The greater the HSI value above 100, the greater the rate of increase in core temperature, and the greater the risk a player will reach a core temperature sufficient to elicit a heat-related illness in a fixed amount of time.

CALCULATING HEAT STRESS RISK

To calculate the HSI for a given training session or match the user must obtain the following information:

A. Air temperature (measured in the shade) (℃)

B. Relative humidity (%)

C. Black globe temperature (℃)

D. Wind speed (m/s)

Environmental data required to assess heat stress risk can be obtained via two methods:

1. Direct measurement using a portable field device – This is the recommended approach for semi-professional and professional settings, as it provides accurate, real-time data from the field of play.

2. Publicly available weather data – This method can be appropriate for community or amateur-level applications where portable monitoring devices are not accessible.

Instructions for both data collection methods are as follows:

Portable monitoring device

- World Rugby recommends the use of an Environmental Measurement Unit (EMU) device to collect real-time and forecast environmental data. This enables automated analysis, reporting and storage of key heat stress information.

- The primary benefit of a portable monitoring device is the ability to capture accurate data specific to the local conditions where training or competition is occurring. This ensures decisions are tailored to the microclimate on the field of play.

- If the World Rugby-recommended provider is not used, environmental data must be collected using a suitable device capable of measuring the required parameters. These values can then be manually entered into the World Rugby Heat Stress Risk Tool to support an informed and appropriate risk assessment.

- World Rugby recommends use of the EMU system. Where this is not possible commercially available devices such as the Kestrel 5400 may offer a viable alternative. More basic consumer-grade devices lack appropriate shielding, calibration and measurement accuracy. This can introduce significant error and may lead to a misclassification of heat stress risk – where unvalidated monitoring tools are used a lower threshold for heat mitigation measures and game suspension should be applied. For that reason, we recommend adherence to the Guideline.

- Device information is available in Appendix 1

Freely available weather station data

- When use of a portable monitoring device is not feasible, World Rugby recommends following the steps below to collect the necessary environmental data for manual entry into the World Rugby Heat Stress Risk Tool.

Step 1: Retrieve air temperature and relative humidity

- Obtain current air temperature and relative humidity values from the closest available weather station to the field of play.

- It is critical that concurrent (same time) values for air temperature and relative humidity are used.

Note: Relative humidity is inversely related to ambient temperature. Maximum humidity typically occurs when temperatures are lowest (e.g. early morning). Using the peak temperature alongside the peak relative humidity from different times of day will significantly overestimate the Heat Stress Index (HSI), potentially leading to unnecessary match interruptions and resource use.

Step 2: Estimate wind speed

- Weather station wind speed data is typically recorded at a height of 10 metres and reported in kilometres per hour (km/h) or miles per hour (mph).

- To ensure accurate input into the Heat Stress Risk Tool, wind speed must reflect the value at 2 metres height and be expressed in metres per second (m/s).

- Apply the following conversion factors as needed:

Adjustment	Formula
Height: 10 m → 2 m	Multiply by 0.7
Units: km/h → m/s	Multiply by 0.278
Units: mph → m/s	Multiply by 0.447

Apply the height correction first, followed by the unit conversion.

Step 3: Estimate globe temperature

- Use **Table 1** to estimate black globe temperature, based on a visual assessment of cloud cover, time of day, and season.
- *Note:* The values provided in **Table 1** assume light wind conditions and do not account for geographical variation (e.g., latitude or longitude). They are intended as a general guide only when direct measurement is not possible.

Step 4: Calculate the HSI using the world rugby heat stress risk tool

- This tool has been designed to help organisers easily enact this policy during both training sessions and competition games.

Note: The process of manually retrieving and entering weather data into the Heat Stress Risk Tool carries a high potential for user error, which may compromise the accuracy of heat stress risk assessments. Additionally, in sport stadium environments, microclimates created by surrounding structures and architectural features can result in substantial discrepancies between the actual environmental conditions experienced by players and those reported by the nearest weather stations. These differences underscore the importance of using on-site environmental monitoring devices whenever possible.

MEASURING HEAT STRESS RISK

The following best-practice procedures to effectively measure heat stress risk during sessions or competition should be employed wherever practicable:

- All variables required to calculate the HSI should be direct and true measures (e.g., a dry bulb thermometer, used to measure air temperature, should be shaded by a structure that eliminates the effects of thermal radiation and is mechanically aspirated with ambient air) with ISO compliant sensors.
- Any device selected must be fit-for-purpose in terms of stability and accuracy.

- The measurement device should be mounted on a tripod and fixed level at a height of 1.2 m, and not hand-held.

- Measurements must be representative of the conditions to which the athletes are exposed. In an outdoor environment, measurements must be conducted in an area without shade (i.e., full sun if a cloudless day) and over the same surface (at the appropriate height) that the activities are taking place (e.g., natural grass, synthetic grass). If a location satisfies these two requirements, measurements can take place beside the field rather than at the centre of it.

- Data should be sampled in real-time and time-averaged appropriately for each individual variable (e.g., 10-min average for black globe temperature compared to 1-min average ambient air temperature), with a 15-min rolling average of the HSI value generated

- Measurements should begin at least 1 hour prior to the commencement of a match or training, with HSI values updated and clearly shown on a display that is accessible to all key stakeholders, e.g., on a phone app accessible by all individuals contributing to medical and operational decisions. Full transparent communication of HSI levels and associated recommendations to all players and staff on accessible displays is also recommended.

- A forecasting function that is integrated with the HSI calculator to provide predicted values is also advantageous for appropriate planning.

HEAT STRESS RISK CATEGORIES

To support a graded and evidence-based approach to managing heat stress risk during World Rugby events, a series of heat stress risk categories have been established based on the calculated Heat Stress Index (HSI) score for the game or training session. These categories, summarised in **Table 2**, each include corresponding intervention strategies designed to reduce the risk of player hyperthermia and safeguard athlete health.

Low Heat Stress Risk (HSI - 0 to 99)

Key Message: Regular playing conditions

Recommendations:

- Follow standard hydration practices.

- Activities may continue uninterrupted.

Moderate Heat Stress Risk (HSI - 100 to 149)

Key Message: Increase fluid intake

Recommendations:

- Emphasise adequate pre-exercise hydration.
- Players should hydrate proactively, before the onset of thirst.
- Where practical, reduce clothing weight to aid cooling.

High Heat Stress Risk (HSI - 150 to 199):

Key Message: Begin active cooling

Recommendations:

- Implement basic cooling strategies, including a 3-minute break mid-way through each half (ideally near the 20-minute mark).
- Make drinks and ice readily available at the sideline.
- Provide iced towels for use on the lap, head, or neck during breaks in play.
- Use sideline fans, with a preference for misting fans in conditions above 40°C. Players are encouraged to apply water to the skin or jersey while using fans.
- Ensure dressing room fans are available to support air-conditioning (AC). If AC is unavailable, skin wetting is strongly advised.
- Do not change wet 'warm-up jerseys' to dry ones, as this increases thermal strain due to the need to re-wet clothing for evaporative cooling.

Very High Heat Stress Risk (HSI - 200 to 249)

Key Message: Extend half-time break

Recommendations:

- Continue all cooling measures from the High Heat Stress Risk category.
- Extend half-time from 12 to 20 minutes to allow additional cooling.

Extreme Heat Stress Risk (HSI > 250)

Key Message*: Consider delaying or suspending play*

Recommendations:

- Under these conditions the Match Day Doctor and team doctors may select to delay or cancel the match.
- In cases of uncertainty, consult the Tournament Medical Director or World Rugby Chief Medical Officer.
- Do not resume play until all of the following conditions are met:
    - HSI has fallen below 230 for at least 45 minutes.
    - Forecast indicates a low risk of HSI rising above 250 over:
        - The next 2 hours (if play has been suspended mid-game), or
        - The next 3 hours (if play has not yet started).
    - The match day doctor confirms it is safe to recommence play

An infographic summarising the HSI categories and interventions has been developed to support this policy (see **Figure 2**).

ROLES OF OFFICIAILS IN DECISION MAKING

While the management system provides a robust framework for heat stress risk mitigation, it is strongly recommended that all decisions are guided by clinical judgment and common sense. This is an independent process run by the MDD (Match Day Doctor) in consultation with both Team Doctors. The decision to implement the Game Day Interventions lies with the MDD and, if no MDD, then the referee.

- If Medical Officials have concerns regarding player welfare, they may choose to implement intervention strategies from a higher heat stress category, even if the current HSI score has not yet crossed the formal action threshold.
- Conversely, if players are responding well to existing interventions—such as cooling breaks or an extended half-time—Medical and Match Officials may determine that further escalation (e.g., match suspension) is not required.
- All decisions involving the extension of breaks, or in extreme cases, the suspension or resumption of play, should be made through collaborative consultation between:
    - Medical Officials
    - Match Officials
    - Head of Match Operations

Consensus should be sought wherever possible. However, if agreement cannot be reached, the most Senior Medical Officer present (e.g., MDD) should make the final decision.

EMERGENCY MANAGEMENT

Necessary Equipment

To effectively manage heat stress risk, Medical Staff must bring and use equipment they are familiar with and that lies within their scope of clinical practice. Accurate core temperature measurement is critical to safe player management. At a minimum, the following equipment should be available at all training and competition venues:

- Rectal thermometer (disposable) – for accurate core temperature measurement
- Cooling apparatus – as detailed in the section below
- Ice supply – minimum of 20 kg for on-site treatment
- Electrolytes and intravenous (IV) access supplies – for fluid and electrolyte management

Management of Hyperthermia / Heat Exhaustion / Heat Stroke

If heat exhaustion or heat stroke is suspected in a player during or after training or competition:

- Immediately measure rectal temperature
- A rectal temperature ≥ 40.5°C, combined with signs of central nervous system (CNS) dysfunction (as summarised in **Figure 1**), is diagnostic of exertional heat stroke (EHS)

Treatment

Heat stroke is a medical emergency. The following steps must be taken immediately and systematically to maximise the chance of full recovery:

1. Remove all equipment and excess clothing
2. Initiate rapid cooling within 30 minutes via:
    a. Whole-body cold-water immersion (optimal: 2–14°C; continuously stirred and topped up with ice)
    b. If immersion is not possible, use rotating cold, wet towels to cover the body in a shaded, cool area
3. Maintain airway, breathing, and circulation
4. Once cooling has begun, activate emergency medical services
5. Continuously monitor:

    a. Rectal temperature

    b. Heart rate, respiratory rate, blood pressure

    c. CNS status

6. Do not use alternative thermometry methods (e.g., oral, tympanic, axillary, forehead) — these are inaccurate in exertional settings
7. Cease cooling once rectal temperature is 38.3–38.9°C
8. Discharge only when player is:

    a. Rectal temperature < 38.0°C

    b. Lucid and ambulant

9. If player remains collapsed, confused, or temperature remains > 38.0°C, initiate urgent hospital transfer
10. Ensure cooling continues during transport

Note: Exertional heat stroke has a 100% survival rate when cooling is initiated within 10 minutes of collapse.

If an athlete is not diagnosed as having heat stroke:

If Heat Stroke is Ruled Out (Symptomatic Heat Illness) Initiate the following symptomatic therapies:

- Move the athlete to a shaded area
- Remove excess clothing
- Apply ice packs to the neck, axillae, and groin (use 6 packs total)
- Use iced towels on the face and fan cooling
- Consider a tepid or iced water bath

Additional supportive measures

- If altered consciousness and low blood sugar, consider IV glucose
- Monitor blood pressure
- Administer oxygen if needed

- Avoid depressants, except when needed to control seizures
- All players with significant hyperthermia should:
    - Have electrolytes and renal function assessed
    - Be monitored in hospital

AIR QUALITY GUIDELINES

While evidence linking poor air quality to adverse outcomes during vigorous exercise remains limited, World Rugby recommends assessing the risk associated with airborne particulate matter, specifically particles 2.5 micrometres in diameter or smaller (PM2.5), using one of the following methods:

1. Direct measurement using a portable field device – This is the preferred approach for semi-professional and professional settings, as it provides accurate, real-time data directly from the field of play.
2. Publicly available air quality data – This method is appropriate for community or amateur-level applications where portable monitoring devices may not be accessible.

Instructions for both data collection methods are as follows:

Portable monitoring device

- In line with World Rugby's recommendations for managing environmental heat stress, an Environmental Measurement Unit (EMU) is advised to collect both real-time and forecasted PM2.5 data. This enables automated analysis, reporting, and storage of key air quality metrics.
- The primary benefit of a portable monitoring device is its ability to capture location-specific data, ensuring that risk assessments reflect the actual microclimate at the training or competition venue.
- If the World Rugby-recommended provider is not used, data should be collected with a device capable of reliably measuring PM2.5 concentrations.

Freely available air quality data

- Where a portable device is not used, World Rugby recommends accessing real-time and forecasted air quality data from IQAir, which provides coverage for most international locations.

- Among the available metrics, PM2.5 (expressed in $\mu g/m^3$) should be used as the primary indicator. Risk should be assessed using the thresholds provided in Table 3.

WORLD RUGBY HEAT STRESS RISK TOOL

A dedicated website has been developed to support the implementation of this policy and hosts a freely accessible heat stress risk assessment tool for use by World Rugby stakeholders during training and competition. This tool is underpinned by the updated World Rugby Heat Guidelines (2025), which expand upon previous frameworks to provide more precise risk classifications and targeted, evidence-based mitigation strategies. Developed by EMU Systems in collaboration with The University of Sydney, these guidelines aim to enhance player safety and reduce the incidence of heat-related illness across all levels of rugby union, from grassroots to elite competition.

EMU Systems World Rugby Heat Stress Calculator

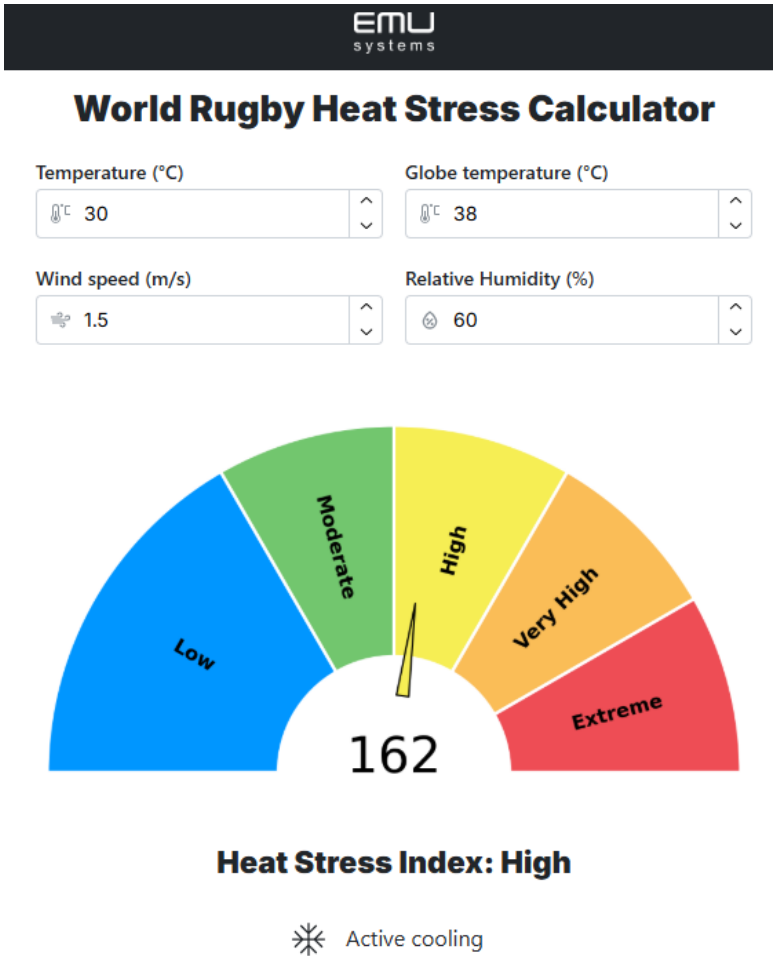

Figure 1. Infographic to support the identification of heat stroke. This visual guide outlines the key signs and symptoms of exertional heat stroke alongside the evidence-based clinical criteria required to make an accurate and timely diagnosis.

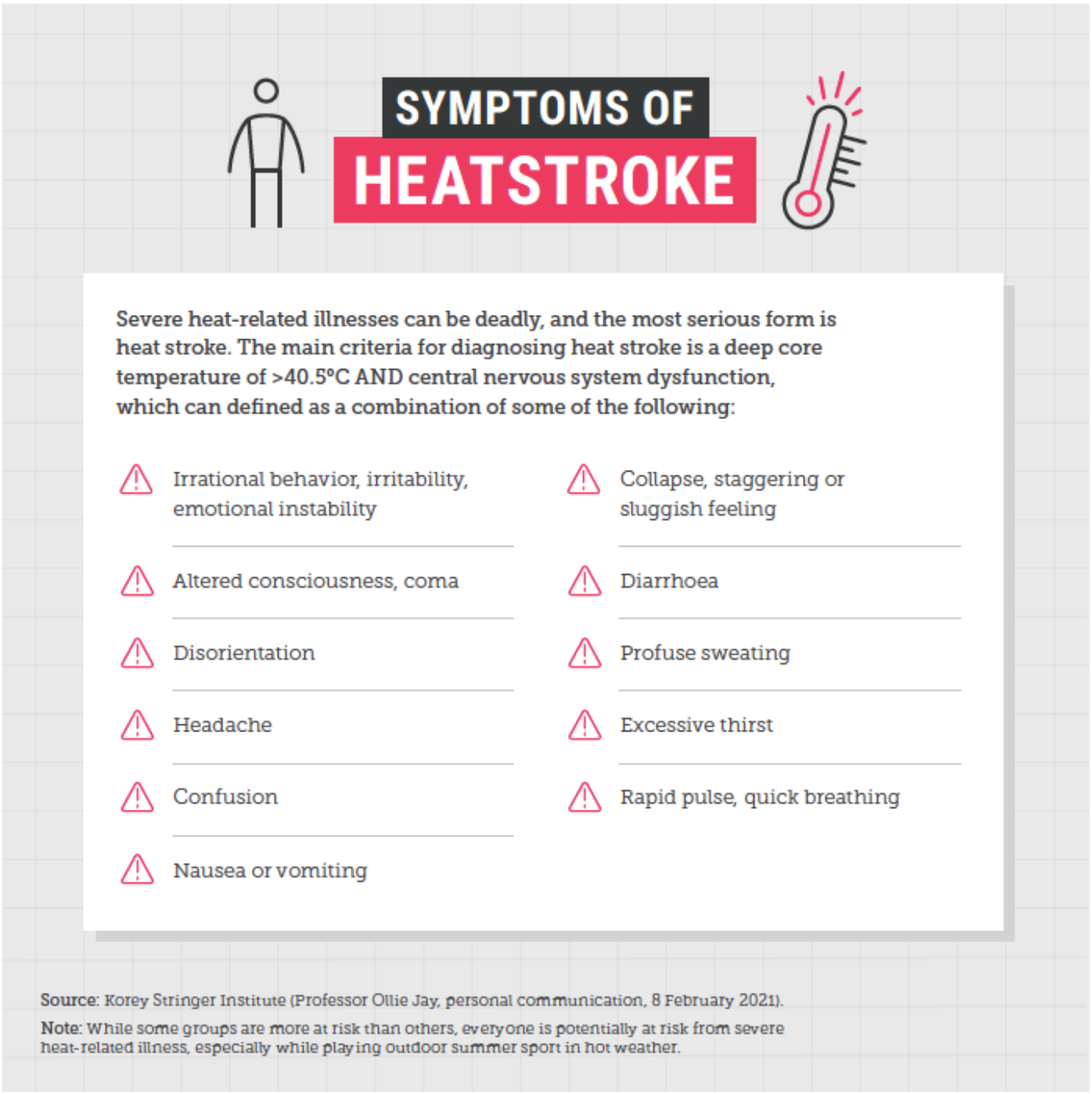

Figure 2. World Rugby Heat Stress Management Plan. A graded intervention framework based on Heat Stress Index (HSI) values. Risk levels range from Low (HSI 0–99) – Regular playing conditions, through to Moderate (100–149) – Increase fluid intake, High (150–199) – Begin active cooling, Very High (200–249) – Extend half-time break, and Extreme (250+) – Consider delaying or suspending play.

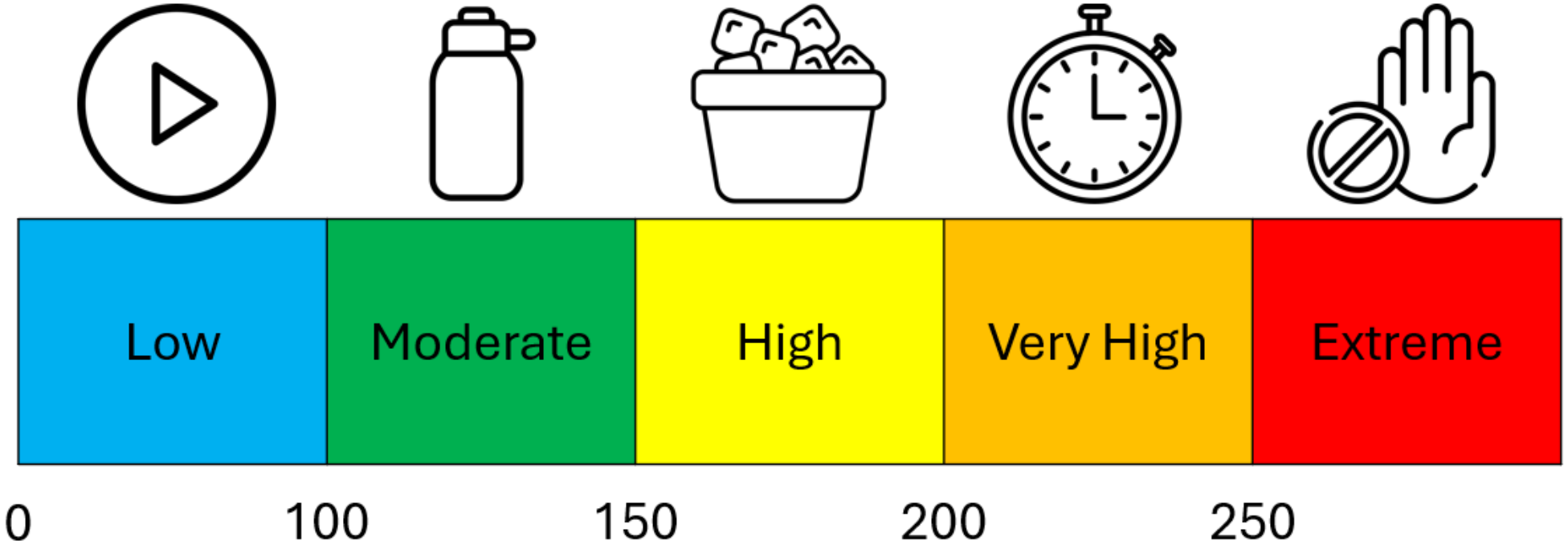

Table 1. Estimated Black Globe Temperature (Tg) values based on time of day, season, and a subjective assessment of cloud conditions, and the prevailing ambient air temperature (Tair). Clear indicates 0-25% cloud cover; Partly Cloudy indicates 25-50% cloud cover; Mostly Cloudy indicated 50-75% cloud cover; Overcast indicates 75-100% cloud cover.

CLEAR	**Spring**	**Summer**	**Autumn**
Before Sunrise	Tg = Tair	Tg = Tair	Tg = Tair
Sunrise – 10am	Tg = Tair + 6	Tg = Tair + 8	Tg = Tair + 6
10am – 5pm	Tg = Tair + 9	Tg = Tair + 12	Tg = Tair + 9
5pm - Sunset	Tg = Tair + 6	Tg = Tair + 8	Tg = Tair + 6
After Sunset	Tg = Tair	Tg = Tair	Tg = Tair

PARTLY CLOUDY	**Spring**	**Summer**	**Autumn**
Before Sunrise	Tg = Tair	Tg = Tair	Tg = Tair
Sunrise – 10am	Tg = Tair + 5	Tg = Tair + 6	Tg = Tair + 5
10am – 5pm	Tg = Tair + 7	Tg = Tair + 9	Tg = Tair + 8
5pm - Sunset	Tg = Tair + 5	Tg = Tair + 6	Tg = Tair + 5
After Sunset	Tg = Tair	Tg = Tair	Tg = Tair

MOSTLY CLOUDY	**Spring**	**Summer**	**Autumn**
Before Sunrise	Tg = Tair	Tg = Tair	Tg = Tair
Sunrise – 10am	Tg = Tair + 4	Tg = Tair + 4	Tg = Tair + 6
10am – 5pm	Tg = Tair + 6	Tg = Tair + 6	Tg = Tair + 9
5pm - Sunset	Tg = Tair + 4	Tg = Tair + 4	Tg = Tair + 6
After Sunset	Tg = Tair	Tg = Tair	Tg = Tair

OVERCAST	**Spring**	**Summer**	**Autumn**
Before Sunrise	Tg = Tair	Tg = Tair	Tg = Tair
Sunrise – 10am	Tg = Tair + 1	Tg = Tair + 2	Tg = Tair + 1
10am – 5pm	Tg = Tair + 2	Tg = Tair + 3	Tg = Tair + 2
5pm - Sunset	Tg = Tair + 1	Tg = Tair + 2	Tg = Tair + 1
After Sunset	Tg = Tair	Tg = Tair	Tg = Tair

Table 2. Graded Heat Stress Categories. This table presents the five heat stress risk levels, their corresponding Heat Stress Index (HSI) ranges, the associated key management message to guide decision-making and the recommended intervention strategies during each risk period.

Risk Category	HSI Value	Key Message	Recommendations
Low	0 – 99	Regular playing conditions	• Follow standard hydration practices. • Activities may continue uninterrupted.
Moderate	100 – 149	Increase fluid intake	• Emphasise adequate pre-exercise hydration. • Players should hydrate proactively, before the onset of thirst. • Where practical, reduce clothing weight to aid cooling.
High	150 – 199	Begin active cooling	• Implement basic cooling strategies, including a 3-minute break mid-way through each half (ideally near the 20-minute mark). • Make drinks and ice readily available at the sideline. • Provide iced towels for use during breaks in play. • Use sideline fans. Players are encouraged to apply water while using fans. • Ensure dressing room fans are available. • Do not change wet 'warm-up jerseys' to dry ones
Very High	200 – 249	Extend halftime break	• Continue all cooling measures from the High Heat Stress Risk category. • Extend half-time from 12 to 20 minutes to allow additional cooling.

Extreme	250 +	Consider delaying or suspending play	• Match Day Doctor and team doctors may select to delay or cancel the match.
			• If uncertain, consult the Tournament Medical Director
			• Do not resume play until all the following conditions are met:
			  ○ HSI has fallen below 230 for at least 45 minutes.
			  ○ Forecast indicates a low risk of HSI rising above 250 over:
			  ▪ The next 2 hours (if play has been suspended mid-game), or
			  ▪ The next 3 hours (if play has not yet started).
			• The match day doctor confirms it is safe to recommence play

Table 3. Air Quality Risk Assessment.

• **Low (< 12 µg/m³)**
• Air quality is satisfactory, posing little or no risk
• Outdoor activities can proceed as planned
• **Fair (12.1 – 25 µg/m³)**
• Air quality is acceptable; however, some pollutants may pose a minor health concern for sensitive individuals
• Activities can proceed with caution for sensitive groups
• **Poor (25.1 – 50 µg/m³)**
• Air quality may affect sensitive groups, who should limit prolonged outdoor exertion
• Consider reducing the intensity and duration of outdoor activities
• **Very Poor (50.1 – 100 µg/m³)**
• Health effects may be felt by everyone; sensitive groups may experience more serious effects
• Reduce or reschedule outdoor activities and provide rest areas
• **Hazardous (100+ µg/m³)**
• Health warnings of emergency conditions; the entire population is at risk
• Consider suspending outdoor activities, more events indoors, and clearly communicate health risks

Appendix 1

Recommended device:

EMU (Environmental Monitoring Unit) System - EMU systems contact: https://emu-systems.com.au/

Alternative device:

Kestrel 5400 Heat stress tracker - https://kestrelinstruments.com/category-heat-stress/heat-stress-monitoring-system