EXTREME HEAT POLICY

CHARVIL, UK

PREVENTING HEAT ILLNESS IN TENNIS

The object of this document is to prevent injury, and possible death, from heat illness in sport and activity by assisting officials, coaches and participants to recognise and manage potentially dangerous heat situations.

CCTC British outdoors tennis sports recognises the dangers of extreme weather and the need to ensure that there are appropriate policies and procedures in place to mitigate risks to players, coaching staff and guests should an extreme weather event occur. Extreme Heat Policy must always place the health, safety and welfare of players, coaching staff and guests ahead of the coaching, irrespective of the inconvenience, cost or other considerations.

The purpose and objective of the Extreme Heat Policy (Policy) is to:
• protect the health, safety and well-being of persons who participate in tennis activities at CCTC venue;
• ensure CCTC venue is a safe place to play, coach and spectate so far as is reasonably practicable;
• provide a defined process to any coaching or club event, organisers on managing extreme weather conditions.
• appoint a nominated club role to monitor regularly weather forecasts when players are likely to be exposed to their highest risk of heat injury in the months of June, July and August, the lead up to, and during the period of use for the coaching using the Met Office, the United Kingdom's national weather service. Website (https://www.metoffice.gov.uk); and
• comply with the specific Extreme Weather Procedures prescribed in Sections 1 - 5 above in this Policy.

1 Another defining feature of United Kingdom however is a changing hotter climate. Notably, 2018 was the hottest year on record in the UK and the risk of experiencing extreme heatwaves in summer has increased.

2 While heat-related injury in tennis is mercifully rare, cases of heat-related illness during sport and physical activity have been documented.

3 Recent examples include risks of heat exhaustion in children’s summer sports.

4 Moreover, the incidence rate of heat-related health problems at sporting events is likely underreported due to confounding coding and diagnostic issues, especially in the hospital setting.

In view of these concerns, CCTC British outdoors tennis sports has generated an Extreme Heat Policy that stratify the risk of heat illness based on environmental conditions and recommend procedures for cooling participants. Below CCTC is highlighting five area recommendations for improvement through future research;

1. HOT WEATHER POLICY FOR THE GENERAL POPULATION

DISCUSSION

The risk of heat illness from vigorous exercise or high intensity sport is significant. It can range from cramps, through heat exhaustion to heat stroke, coma, and death (Mitchell 1994).

During competition, competitors may produce 15 - 20 times the heat they produce at rest. Dissipation of this excess heat is primarily achieved through sweating. If the body's ability to dissipate heat is compromised, core temperature in an average size individual may rise by one degree Celsius for every five minutes of exercise if no temperature regulating mechanisms are activated (Nadel 1977). If an individual's core temperature is above 40 degrees Celsius (normal 37 degrees) the risk of heat injury is significant. Rectal temperature higher than 41 degrees Celsius is dangerous. Factors which impair the body's ability to dissipate heat are:

1. high ambient temperature (T);
2. solar radiation;
3. humidity (which compromises the efficacy of sweating) (RH); and
4. dehydration.

These factors significantly increase the risk of heat illness occurring.

Tennis outdoors sports heat illness can occur with high intensity exercise in cool conditions and with well-hydrated participants.

2. TENNIS SPORTS MEDICINE HEAT POLICY

The current extreme heat policy, established in 2005 and outlined in Table 1 /1.1/2, is one of the most influential extreme heat policies. For example, four out of the most representative outdoors sport heat policies listed in Table 2 refer to the extreme heat policy to either set environmental thresholds for activity or provide recommendations surrounding the prevention of heat illness. The guidelines were one of the first forms of heat protection for exercise and the strength of the policy is the ease of access and interpretation for the wider community, especially within the scope of technology at the time of conception.

TEMPERATURE

The tables below provide approximate guides to weather conditions and appropriate individual and organisational responses. Although temperature ranges are given, there are not clear demarcations in risk between ranges.

Table 1 - Extreme heat policy environmental threshold guidelines.

Easily understood, most useful on hot, dry days (Guidelines based on ambient temperature and relative humidity)

Ambient temperature	Relative humidity	Risk of heat illness	Recommended management for sports activities outdoors with no shade access
15–20 °C		Low	Heat illness can occur in running
			Caution over-motivation
21–25 °C	Exceeds 70%	Low-moderate	Increase vigilance
			Caution over-motivation
26–30 °C	Exceeds 60%	Moderate-high	Moderate early pre-season training
			Reduce intensity and duration of play/training
			Take more breaks
31–32 °C	Exceeds 50%	High-very high	Uncomfortable for most people
			Limit intensity, take more breaks
			Limit duration to less than 60 min
≥33 °C	Exceeds 30%	Extreme	Very stressful for most people
			Postpone to cooler conditions (or cooler part of the day) or cancel

The WBGT TABLE 1 is particularly useful for hot, humid days.

Table 1.1 - Extreme heat policy environmental threshold guidelines.		
Guidelines based on wet bulb globe temperature (WBGT)		
WBGT	**Risk of heat illness**	**Recommended management for sports activities**
<20 °C	Low	Heat illness can occur in distance running
		Caution over-motivation
21–25 °C	Moderate-high	Increase vigilance
		Caution over-motivation
		Moderate early pre-season training
		Take more breaks
26–29 °C	High-very high	Limit intensity, take more breaks
		Limit duration to less than 60 min per session
≥30 °C	Extreme	Consider postponement to a cooler part of the day or cancellation (allow swimming)

WBGT TABLE 1.1 Further guidance might be gained from the Wet Bulb Globe Temperature (WBGT) index.

Table 2 Representative sample of extreme heat policy for community-based sporting competitions in the tennis club sports in United Kingdom.					
Sport	**Organisation**	**Adult threshold**	**Children threshold**	**Activity change**	**Activity modification notes**
Tennis	British outdoors tennis	32 °C WBGT	32 °C WBGT	Cancelled	
		30 °C WBGT	28 °C WBGT	Game modifications	-Reduced scoring format
					-Extra break between 2nd and 3rd sets
		33 °C T_a	30 °C T_a	Cancelled	

Tennis: British outdoors tennis; *TSM*: Tennis Sports Medicine; T_a: ambient temperature; *RH*: relative humidity; *n/a*: not available. Slightly modified version of TSM guidelines.

A primary opportunity for improvement of the policy is the current disparity between a linear stepwise risk stratification approach and the physiological strain typically elicited by prevailing environmental conditions. For example, according to the International Organisation for Standardisation (ISO) heat stress standard for occupational environments, conditions constituting

the upper boundary of the 'moderate' risk category in the TSM guidelines (30 °C ambient temperature [Ta] and 60% relative humidity (RH)) are similarly stressful as those determined as 'extreme' (≥36 °C Ta and >30%RH).

3. HEAT POLICIES OF THE OUTDOORS RACQUET CLUB SPORTS IN THE UK

The Lawn Tennis Association is the leading club sport in Great Britain by combined adult and children participation. Ambient temperature and Wet Bulb Globe Temperature (WBGT) remain the two most common environmental measures for defining risk stratification among the extreme heat policies issued to community participants within this sport (Table 2). The argument for using Ta presumably relates to the ease at which it can be understood and accessed by the wider community. However, using only Ta in isolation neglects several critical environmental factors that contribute towards human heat stress; i.e. ambient humidity, solar radiation, and wind. Alternatively, WBGT, which when properly implemented also utilises direct measures of humidity and thermal radiation as well as indirect measures of wind speed, has been a popular indicator of environmental heat stress at the professional sports level and often in occupational environments. However, in order to perform at set of measures in situ to derive a valid WBGT assessment, a specific high-quality device is required and can potentially cost >GBP£500, which likely deters many community-based clubs. Estimated WBGT is freely available based on air temperature (measured in the shade) and ambient humidity reports by the Met Office, the United Kingdom's national weather service. However, it is important to recognise that this is not a true outdoor WBGT value and is calculated based on an assumed moderate sun exposure and light winds.13 Limitations of the WBGT index, even when measured completely in the sun, include an underestimation of the true environmental strain during times of high humidity or low air movement.

Charvil Community Tennis Club presently recommends that outdoors sports extreme heat policies for clubs, schools, member associations, affiliated organisations, member affiliated organisations, regional associations and affiliated clubs urgently to be formulated through consultation nationwide.

Given that the thermal and cardiovascular strain of a given participant exercising at a fixed metabolic rate and wearing the same clothing would be markedly different between at 37 °C with 10% compared to 50% RH, the inclusion of humidity in future heat stress risk evaluations for outdoors sports would be advisable. Tennis Sports Medicine's nationwide recommendations for adults (≥17 years) set cancellation thresholds using both WBGT (30 °C) or Ta (33 °C). Tennis organisations that do not have the potential to measure WBGT must rely on the guidelines for Ta, which do not consider prevailing relative humidity.

4. STRATEGIES FOR REDUCING THE RISK OF HEAT ILLNESS (General Population)

The following strategies are intended for the general population that does not fall into any of the listed 'At Risk' categories. 'At Risk' participants should consult the recommendations for their population sector.

1. Timing of games

Games and sporting activities involving moderate to high intensity exercise should be scheduled to avoid conditions where ambient temperature exceeds or is likely to exceed 32 degrees Celsius or where WBGT exceeds 30 degrees Celsius.

In most parts of United Kingdom players are likely to be exposed to their highest risk of heat injury in the months of June, July and August, although in some regions this level of risk extends into September. This is in part due to high ambient temperatures that are prevalent during this period, and lack of match fitness of players participating in traditional summer sports such as British outdoors tennis.

Where possible, especially in July and August, coaching should be scheduled to start before 9 am. or after 6 pm. Early morning or night coaching minimise the risk of encountering unacceptable conditions at these times of year.

2. Acclimatisation

If play or coaching activities are to be conducted after long periods of cooler conditions, participants should strive to be fully acclimatised prior to participation.

Physiological adaptations to exercising in the heat are rapid and can occur after 3-5 days in a hot environment. Full acclimatisation can take 10-14 days or longer. The initial response is an expansion of the plasma volume; then, over several days, this returns to normal and the sweat rate increases with sweating starting earlier and a more dilute sweat being produced.

There is evidence that exercising in sweat clothing to the point where heat strain is induced can give some degree of acclimatisation (Dawson et al). The training must induce heat strain over several days, and care must be taken that adequate hydration occurs during these training sessions.

Doing some form of submaximal exercise in a heat chamber will also give some degree of acclimatisation; but its practicality in a team sport, except possibly in individual cases, is limited.

Some level of acclimatisation will occur in players coming out of summer. This, however, is usually countered by the lack of match fitness in athletes at this time of year.

What can be done easily is to educate athletes to train themselves to play and train with copious fluids already on-board. Further it must be emphasised to the players that they

MUST consume fluids containing 6%-8% carbohydrate - in warm/hot conditions, muscle glycogen utilisation is much higher. (Febbraio 1992). The consumption of carbohydrate containing fluids has been proven to improve performance in the heat and, more importantly, delay the onset of exercise-induced heat exhaustion (Febbraio 1992, Davies et al 1988) and, hence, probably help prevent heat stroke.

3. Hydration

The more athletes sweat, the more fluid they must consume to avoid dehydration. High levels of dehydration may increase the risk of heat stress. To diminish the risk of heat stress fluid should be consumed before, during and after activity.

It is recommended participants drink at least 7-8 ml of fluid per kg of body mass (average is about 2 cups) no more than 2 hours before exercising to promote adequate hydration and allow time for excretion of excess water.

During exercise it is recommended that participants should drink fluid at regular intervals to replace water lost through sweating. Participants should aim to drink at least 3 ml per kg of body mass (about 250 ml for the average athlete of around 70 kilograms every 15 to 20 minutes or 2–3 cups every hour). However, this may vary dependent on the rate of sweating. Fluid taken should be cooler than the ambient temperature.

Water is considered an adequate fluid option for activities lasting up to one hour… Participants in events or activities exceeding one hour are recommended to use carbohydrate-based sports drinks as a means of replacing fluids, carbohydrates and electrolytes lost during prolonged activity.

In high risk conditions players should be encouraged to drink fluids at scheduled drinks breaks and should be provided convenient access to fluids during activity without unnecessary interruption to the game or event.

Officials and event organisers should also consider including additional drinks breaks for players in conditions of high risk.

Regarding post-event rehydration, it needs to be remembered that this can take 24 hours or more.

4. Player rest and rotation

In conditions of high-risk participants should be provided opportunities to rest using player interchange or substitution. The period of rest should be determined by the ambient temperature and WBGT at the time of the event or activity. For ambient temperatures greater than 26 and less than 30 degrees Celsius and for WBGT temperatures greater than 21 degrees Celsius and less than 25 degrees Celsius, all players should be rested for at least 10% of the period they would normally participate.

For example, if the activity normally runs for 60 minutes, the rest period for the player should comprise at least 6 minutes during the period.

For situations where the ambient temperature is greater than 31 degrees and less than 35 degrees Celsius and the WBGT is greater than 26 degrees Celsius and less than 29 degrees Celsius, all players should be rested for at least 25% of the period in which they would normally participate.

This may be achieved by rotation of players through an interchange bench or via the reduction in the regular playing time for all players.

For events played in high risk conditions that do not have a specified playing time, players should be permitted to take rest breaks from activity equivalent to 3 minutes for every 30 minutes of activity.

The positive effects of rest breaks should also be maximised by employing the following strategies:
• allowing players to rest in naturally shaded areas or providing portable structures that create shade where and when required;
• providing fans and ice packs; and
• providing additional fluids to allow participants to spray or douse themselves to assist cooling.

5. Pre-cooling

Pre-cooling by cool water immersion or the wearing of ice vests has been demonstrated to increase athletic performance in endurance sports. This practice could be of benefit to many athletes. However, it must be noted that the effects of a pre-cooling manoeuvre are reduced rapidly by a warm up. Therefore, any pre-cooling strategy must be undertaken in concert with a vastly reduced warm-up if it is to be effective.

6. Clothing Light coloured, loose fitting clothes, of natural fibres or composite fabrics, with high wicking (absorption) properties that provide for adequate ventilation are recommended as the most appropriate clothing in the heat. This clothing should further complement the existing practices in Australia that protect the skin against permanent damage from the sun.

5. CHILDREN AND HEAT (MOST IMORTANT)

The physiological and structural difference between children and adults' places children at a greater risk of suffering from heat illness. These differences impact on a child's ability to respond to environmental heat and acclimatise to heat. These differences include:

• a larger surface area/body mass ratio which affects their ability to dissipate heat when environmental temperature is greater than skin temperature (Falk 1998). This can be an advantage when heat loss is necessary, but is a disadvantage when radiant or convective heat gain occurs;

• immature sweating mechanisms which require a greater increase in body temperature before the onset of sweating (Araki et al 1979); and

• fewer and smaller sweat glands which limit the production of sweat (Araki et al 1979, Falk 1998, Wagner et al 1974).

HOT WEATHER POLICY FOR CHILDREN

"At ambient temperature greater than or equal to 30 degrees Celsius, children have greater difficulty getting rid of heat than adults."

STRATEGIES FOR REDUCING THE RISK OF HEAT ILLNESS (Children)

The following strategies should be considered for sport and physical activities involving children. The strategies should be considered in conjunction with strategies for reducing the risk of heat illness for the general population and the hot weather policy for children.

1. Shade and drinks

Organisers of activities that are conducted in hot conditions must provide enough shade and regular drinking opportunities. This is particularly critical where the fitness and state of acclimatisation of the young participants are uncertain.

It is recommended that water or fluids be provided whenever children are being active. More fluid, however, appears to be consumed by young people when the drinks offered are perceived as palatable to them. Therefore, for children and adolescents having trouble drinking adequate tap water, flavoured drinks may need to be considered. Conversely, the high energy content of some flavoured drinks may be unnecessary during exercise in athletes who have a genuine rather than an aesthetic need to lower body fat levels.

It is recommended that young athletes begin regular drinking routines using water or fluids during training and competition. Regular and effective drinking practices should become habitual to young athletes before, during and after activity. Individuals should monitor weight changes before and after workouts and know the amount of fluid that they are likely to require.

2. Acclimatisation and overweight children

In addition to the risks associated with activity in the heat for unfit and unacclimated young people, coaches/supervisors of overweight children and adolescents should take extra precautions to lessen the potential for heat gain. It is recommended that, whenever activity in hot conditions is

unavoidable with these children, coaches/supervisors decrease the volume and duration of physical activity and increase opportunities for drinking, rest and shade as a matter of priority.

At the onset of hot weather, the young athlete may take longer to acclimatise. It is therefore recommended that training volumes (duration and intensity) decrease during the first few weeks of hot weather. Increased times for rest, using access to shade more frequently and increasing the number of mandatory drinking breaks are recommended for the young athlete when the weather becomes noticeably hotter.

3. Clothing

In addition to the clothing recommendations made for the general population, it is recommended that summer-based sporting organisations select uniforms that minimise heat gain and that coaches, teachers and parents encourage children and adolescents to wear appropriate clothing in layers that can be easily removed during activity.

4. Heat illness register

To improve the understanding of activity in the heat by children and adolescents, it is recommended that a register of heat-related illness be established. This may comprise a system within which all aspects of heat-related illness incidents are recorded. Items of note may include the individuals afflicted and their symptoms, the time of the incident, the environmental conditions, the physical activity undertaken, the immediate treatment and subsequent action taken.

The system is recommended to help identify individuals who have previously experienced some form of heat illness and therefore may require additional attention to ensure that they adopt prevention strategies.

Schools Awareness Campaign

Wrap, Splat, Hat is an exciting sun awareness education programme for 3-11 year olds, brought to you by Garnier Ambre Solaire in association with the British Skin Foundation.
https://nationalschoolspartnership.com/initiatives/wrap-splat-hat