

Preparing Rugby Players for Competition in Hot and Humid Conditions

As the game of Rugby grows and branches out into different countries the range in conditions that matches take place will vary greatly. The fact that some major rugby tournaments 15's and 7's take place in hot and humid environmental conditions makes it imperative that coaches and strength and conditioners appreciate the severity of this challenge and understand how to effectively prepare their players for competition in the heat. It is important to realise that athletes who are used to living and training in cooler climates are placed at a significant disadvantage when they have to compete in hot and humid conditions. Heat acclimatisation strategies have been researched in depth so that athletes can perform at their optimal level in foreign conditions at competitions such as the Olympics, World Championships and World Cups, as many of these events take place every four years in different countries and environmental conditions around the world.

Background

About 75% of the energy turnover during exercise is wasted as heat this inevitably leads to a rise in core body temperature. In cool environments, much of this body heat can be readily transferred to the air, but when the environmental temperature exceeds skin temperature, heat is gained and the core body temperature can rise to dangerous levels (Nadel, 1988). Research states that exercise in the heat results in a higher heart rate and a higher cardiac output compared with the same exercise in a cooler environment. Exercise in the heat is also linked to higher blood lactate concentration and a faster rate of depletion of muscle glycogen (Maughan & Shirreffs 1997). These factors can also decrease the speed of recovery between games and training sessions at tournaments in hotter environments. Finally if a player is dehydrated before exercise the reduction in performance in the heat is greater again.

Implementation

In order to minimise the effects that hot, humid conditions have on an athlete, coaching and conditioning staff have to address the issue of acclimatisation.

Regular exposure to hot, humid conditions causes a number of physiological adaptations that will reduce the adverse affects on performance and also reduce the risk of heat injury. Acclimatisation results in a faster onset of sweating (one of the body's cooling mechanisms), a greater distribution of sweating over the body, and an increase in sweat rate. Most physiological adaptations to heat stress occur

within a 14 day period of regular exercise in a hot environment (Montain 1996), it is not essential to live in a hot climate for a long period of time to gain an advantage in performance. Acclimatisation becomes more important if an athlete needs to compete more than once in a day which is normally the case with 7's competitions with up to 8 games over a two day period.

The two ways of acclimatising for competition in the heat are to live and train in a climate similar to the one in which competition will take place or to remain in your natural living environment but train in an artificially enhanced climate (Maughan & Shirreffs 1997). Because exercise capacity is reduced so much in the heat it is important to reduce the intensity volume of exercise performed over the first few days during an acclimatisation phase. If two training sessions are to be performed during the acclimatisation phase it is generally encouraged that the shorter high intensity session be carried out first and the longer heat acclimatisation session later in the day. The high intensity session should be conducted during the cool outdoor air if done at home or in the early morning cooler temperature if training in the hot weather climate.

Athletes are generally more receptive to the heat acclimatisation training if it is gradually phased in with shorter less intense sessions. These sessions can be 30 to 60 mins depending on intensity. There should not be longer than 2-3 days between sessions in the heat so that adaptation can occur. If the training is being completed at home the heat training sessions can be introduced gradually while still completing normal training sessions.

Disadvantages of staying at home and training in an artificial environment such as a hot room is that the exercise will more than likely be restricted to cycling, rowing, treadmill running, skipping and circuit training, this is generally due to the size and nature of artificial acclimatisation rooms. These exercise options are not rugby specific and do not allow the team unit skills such as lineout and scrum etc. However the type of exercise performed for adaptation does not matter provided that a period of prolonged (60 – 100 minutes) moderately intense exercise is carried out in hot conditions (Maughan & Shirreffs 1997). The goal of the session should be to raise core body temperature and stimulate sweating at a level that is safe for the athlete. Intermittent exercise is likely to be as effective as continuous training in stimulating acclimatisation but it is recommended that 100 minutes in duration is ideal (Maughan & Shirreffs 1997).

If acclimatisation is to be carried out in the form of a camp in a hotter climate it is important to research the areas weather patterns to make the correct training time decisions. It is important to see if the climate has a higher humidity level in the morning as many tropical areas do, compared to the maximum temperature during the middle of the day. If this is the case it makes sense to alter the session so that acclimatisation can take place but still in a safe manner.

Timescale

The timescale for training should allow for 3-4 days of reduced training during the heat of the day, the coach needs to monitor how athletes respond to the heat training and alter the volume of training accordingly, it is also important to note that individual athletes will vary in their response to heat training and alterations for individuals workload may have to be varied (Maughan & Shirreffs 1997). Normal training can continue for a few days while the acclimatisation process continues and before tapering for competition begins. In the week leading up to competition the intensity can be raised significantly for training with enhanced periods of recovery allowed before competition starts. Recovery will also be aided with the use of hydration and ice baths (Maughan & Shirreffs 1997).

The ideal approach for acclimatising athletes to the heat for Rugby Teams may well be a combination of increasing heat exposure at home for 2 weeks prior to travelling with the use of artificial heat rooms or training camps in hot and humid climates generally found in the North of Australia, followed by a one week heat acclimatisation program at the site for competition.

The Table below outlines the acclimatisation strategy developed for the Welsh Academy Netball Side. It outlines a heat acclimatisation strategy using exercise with the use of an environmental heat chamber and also the use of a Sauna. The use of the Sauna was strictly monitored so that the players were not allowed to exercise to reduce any chance of overheating. The use of the sauna therefore was to simply raiser the body temperature and increase sweat rate.

Table 1 Acclimatisation using the Environmental Chamber

Week	Number of Sessions	Length of Session (min)	Work:Rest
1	1	30	*10 min cycling:20 min rest (once)
2	2	40	*20 min cycling:20 min rest (once)
3	3	60	*15 min cycling:15 min rest (twice)

**50-60% of maximal heart rate - determined from previous fitness tests*

Table 2 Acclimatisation using the Sauna

Week	Number of Sessions	Time (min)
1	1	15-20
2	2	30-40
3	3	60

(The Heat is On – Welsh Netball Association Website)

(http://www.welshnetball.co.uk/welsh_netball_association/homefitness.htm#heat)

Modifying Training Sessions and Warm-Up

Training sessions and warm-ups need to be modified for hot weather training. The purpose of the warm-up is to raise core body temperature and increase blood flow to the muscles. In warmer climates there is a risk of hyperthermia and dehydration if the warm-up is too excessive and this will result in decreased performance. It is important to add rest periods that allow for hydration during a shortened warm-up in conjunction with warm-up activities that emphasise unit activities at a moderate intensity. The warm-up should be practiced before competition so that all involved are comfortable with any changes to the regular warm-up that athletes are accustomed to in cooler temperatures. Athletes need to be aware that fluid replacement actually needs to increase as they acclimatise to the heat due to the increased sweating response adaptation (Sawka & Pandolf 1990). If an athlete becomes dehydrated their improved ability to tolerate heat will be diminished as there is no way to adapt to dehydration.

Monitoring Athletes

Regular monitoring of athletes needs to occur during acclimatisation phases. One of the most effective monitoring devices is the measurement of an athlete's body mass as this can give useful information on the athlete's hydration levels (Maughan & Shirreffs 1997). The records of body mass are only useful if they can be compared to measurements made in normal training conditions at home. It is essential that athletes know their optimum body weights for training and competing and how much these vary on a daily basis. If measurement conditions are controlled (completed at the same time of day under the same circumstances) then comparisons can be made to check for any variances that might explain problems associated with heat acclimatisation. If there is a progressive decrease in body mass over a few days there is a likely cause of dehydration. Other contributing factors that can lead to weight loss in hotter climates can be loss of appetite and decreased food intake (Maughan & Shirreffs 1997).

Other monitoring processes used to monitor heat acclimatisation can be the use of a travel diary that records daily body mass, information on urine output i.e. amount and colour. Again this information is only useful if it can be compared with normal patterns that occur over a couple of weeks of training in their cooler home environment (Maughan & Shirreffs 1997).

Pre Cooling

There may be times where there is insufficient time available for any heat acclimatisation practices to occur such as the late call up of a player who was not in the original squad that has undergone a heat acclimatisation phase or the sudden unexpected soaring of temperatures that can happen in Australia and other parts of the world. Pre cooling is a method that helps prevent overheating during exercise by reducing body temperature before competition. The main aim of pre cooling is to reduce the time till the onset of fatigue during competition (Miller 2007). The main methods of pre cooling are through cold water immersion or exposure to cold air. Cold water immersion is more practical as large freezer rooms are not generally close to competition venues where ice baths and cold showers are. It is important to note that if using ice baths the temperature needs to be gradually decrease from around 29 degrees by 2 degrees every 10 mins for 60 minutes (Miller 2007). As well as being easier to access cold water immersion also increases the rate of heat loss from the skin and a greater reduction in core body temperature.

Conclusion

Heat acclimatisation is essential if players and teams are to perform at their optimal level in competitions in hot and humid conditions. Whilst cost can invariably be the deciding factor in being able to complete training camps in the environment that you are about to compete, thought must be given to accessing artificial heat acclimatisation methods that may be able to assist in acclimatising to the conditions that the players and team are about to compete in.

Whilst heat acclimatisation is necessary, there is also a need for monitoring of athletes responses to heat acclimatisation so that the athletes are not being exposed to training that may be detrimental to their health or performance. Careful consideration needs to be given to intensity, volume and types of training used for heat acclimatisation. It is also important to maintain adequate core skill practice and team unit skills practice during training and preparation for competition in hotter environments as execution of these will still be essential in performing at

optimal standards. Teams striving for success in hot and humid conditions will need to prepare for competition with strategies of acclimatisation, hydration and pre cooling. Hydration needs to be maintained throughout the training and heat acclimatisation phase with pre cooling performed two hours before competition if possible. If these strategies are well planned and executed the individuals and team should have an added advantage that can ultimately mean success.

References

Maughan, R.J and S.M Shirreffs (1997). Preparing Athletes for Competition in the Heat: Developing an Effective Acclimatisation Strategy. Sports Science Exchange. Issue 65, Volume 10.

Miller, C (2007). Acclimatisation: Your Pre-Competition Strategy for Staying Cool when the Heat is on.

Montain, S.J, R.J Maughan, and M.N Sawka (1996). Heat Acclimatisation Strategies for the 1996 Summer Olympics. Athletic Therapy Today Volume 1.

Nadel, E.R. (1988). Temperature Regulation and Prolonged Exercise. Perspectives in Exercise and Sports Medicine. Volume 1.

Sawka, M.N, K.B. Pandolf (1990). Effects of Body Water Loss on Physiological Function and Exercise Performance. Perspectives in Exercise Science and Sports Medicine. Vol 3.

Wales Netball Association Website: www.welshnetball.co.uk,

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