Vol.03,Issue04,June2015

INTERNATIONAL JOURNAL OF RESEARCH PEDAGOGY AND TECHNOLOGY IN EDUCATION AND MOVEMENT SCIENCES (IJEMS) ISSN: 2319-3050

INFLUENCE OF ENVIRONMENTAL HAZARDS TO COACHING EXERCISE IN SPORTS

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ABSTRACT

The Olympic Games have drawn attention to a number of environmental influences on sports performance. During the time of the Summer Olympics it is usually hot and/or humid. On the other hand, the Winter Olympics invariably call for protection against the cold. The 1968 Mexico City Games, sited at 2,350 meters above sea-level, presented the situation of lowered barometric pressure and reduced air density. World records were set in the men's 100, 200, and 400 meter races and the long jump. Distance races were appreciably slower than in previous Games. In Los Angeles in 1984, concern was expressed for athletes possibly experiencing high levels of both heat and air pollution. While some athletes certainly suffered as a result of the climate, British middle-distance runner, Steve Ovett, and Swiss woman marathoner, Gabriela Anderson-Schiess being the most obvious examples, the weather in Los Angeles during the Games was generally comfortable. It is the purpose of this section to describe the physiological responses to a number of environmental conditions and to offer considerations that could be given during the performance of sporting activities.

Key words: *Hyperthermia, Hypothermia, Altitude, Temperature, Heat cramps, Heat syncope, Frostbite*

INTRODUCTION:

There are certain individuals who have a low tolerance to heat and need careful supervision by coaches. Those with heavier builds possess a lower ratio between skin surface area and body mass than those with more linear builds. This is a disadvantage for heat removal. High levels of body fat also encourage heat storage. Fat tissue has a lower specific heat than lean tissue and therefore, absorbs heat more readily. Individuals with a high level of endurance fitness tolerate hot conditions much better than those who are unfit. It has been shown that physical training in cool conditions improves tolerance to hot conditions. However, full adaptation to heat can only be achieved by actually working in hot conditions. The adjustment is very rapid and is achievable in about 7 to 10 days if regular daily exercise for 90 minutes is undertaken. Heat acclimatization expands the blood volume, which supports an increased capacity and precision of sweating. When fluid losses exceed 2 percent of body weight prior to exercising, significant endurance performance deterioration occurs. It is wise to drink (hydrate) before exercising so that no dehydration occurs. However, during some high energy sporting contests, despite experiencing sweat losses of 4-6 kg, it is neither necessary nor advisable to attempt to entirely replace the amount of fluid lost. The body actually produces water during exercise. Most athletes only drink enough fluid to recover between 40 and 50 percent of the sweat lost. Partial fluid replacement has been shown to reduce the risk of overheating.

During an athlete's career numerous things happen which bring changes in his/her environment. There are three environmental conditions which an athlete will have to learn or practice how to acclimatize to, these are altitude, temperature and time change.

ENVIRONMENTAL EFFECTS IN SPORTS TRAINING:

Altitude

It is a place which elevation especially above sea level or above the earth's surface.

At altitude, there is reduced air resistance, suggesting an advantage in activities involving speed, i.e. sprints. The force of gravity is reduced, suggesting an advantage where relative and maximum strength is critical

Some of the immediate effects of exposure to altitude are increased breathing rate, increased heart rate, giddiness, nausea, headache, sleeplessness and decrease in VO2 max. For every 300 meters above 1000 meters VO2max decreases by approximately 2.6%. The total effect of these adjustments is a reduction of work capacity.

The long term effects of continued exposure to altitude include are increased erythrocyte volume, increased hemoglobin volume and concentration, increased blood viscosity, increased capillarisation, continued lower V02max, decreased lactic acid tolerance and reduced stroke volume.

HAZARDS OF ALTITUDE TRAINING:

Due to the reduced oxygen pressure at altitude, athletes are unable to maintain high intensity training and subsequently their aerobic fitness may slowly decrease. This reduction in fitness may offset any positive physiological adaptations from altitude. Athletes can become 'over trained' as it is a common mistake to adopt the same training zone based on heart rates or times, time to perform a certain distance and/or lactate concentration.

Recovery from training is longer and since sleep can also be disturbed, a good way to avoid overtraining is to take an afternoon nap. Nutrition is important as lower oxygen levels mean that the demand for carbohydrate is proportionately higher and a healthy iron status is also desirable for the production of red blood cells. A nutrient-rich diet is also recommended to help counter the possibility of illness and infections due to the suppression of the immune system at altitude.

Symptoms such as headache, vomiting, dizziness, physical and mental fatigue, sleep disturbance and digestive disorders can also occur at altitude and may require the reduction and modification of training, or even a complete cessation of training.

Ultraviolet radiation is significantly higher at altitude and can cause sunburn or snow blindness. Athletes should protect themselves by using ultraviolet sunscreen and sunglasses.

Temperature

The ability to perform vigorous exercise for long periods is limited by hyperthermia (over heating) and loss of water and salt in sweating. Athletes should know the hazards of vigorous exercise in hot, humid conditions and should be able to recognize the early warning symptoms that precede heat injury.

Low levels of dehydration can influence performance and it is claimed that a loss of 2% body weight (1kg for a 50k athlete) can reduce performance by 10 to 20% (a 120 seconds 800 meters reduced to 132 to 144 seconds)

Two factors influencing early fatigue and impaired performance in all types of sports are the depletion of the body's levels of carbohydrate and fluids. Athletes should consider the use of sports drinks to replace these.

1. TRAINING IN HOT ENVIRONMENT

Heat Illness

Heat acclimatization is of interest to physicians as well as athletes, because it reduces the incidence of heat illness and the intensity of symptoms. The most common heat illnesses among athletes are heat cramps, heat syncope, and heat exhaustion.

Heat cramps are usually unheralded and occur in the voluntary muscles of the legs, arms, and abdomen, after several hours of strenuous exercise in individuals who have lost a large volume of sweat, have drunk a large volume of hypotonic fluid, and who have excreted a small volume of urine. Sodium depletion probably causes heat cramps. Heat acclimatization decreases the risk of experiencing heat cramps.

Heat syncope (e.g., fainting) occurs most commonly during the first 3-5 days of heat exposure. This illness is related to the shunting of blood through dilated coetaneous vessels, postural pooling of blood, diminished venous return to the heart, reduction of cardiac output, and cerebral ischemia. Heat syncope typically occurs when the ambient temperature or humidity rises suddenly.

Heat exhaustion is the most commonly diagnosed form of heat illness among athletes. Heat exhaustion is defined as the inability to continue exercise in a hot environment, and involves a diagnosis of exclusion. Heat acclimatization significantly reduces the signs and symptoms of heat exhaustion, after eight days of strenuous, intermittent running.

Heat Acclimatization

It has been shown that physical training in cool conditions improves tolerance to hot conditions. However, full adaptation to heat can only be achieved by actually working in hot conditions. The adjustment is very rapid and is achievable in about 7 to 10 days if regular daily exercise for 90 minutes is undertaken. Heat acclimatization expands the blood volume, which supports an increased capacity and precision of sweating. The acclimatization process is retarded by dehydration. For optimal adaptation to occur, fluid balance should be maintained during the recovery periods between daily bouts of work in the heat.

2. TRAINING IN COLD WEATHER

In cold climates the athlete continually tries to prevent heat loss and a fall in the core body temperature. A cooled state is referred to as `hypothermia' or `exposure'. In a fatigued person its symptoms are poor control of movement, disorientation, and poor judgment and reasoning.

Cold-Weather Risks

Tolerance to cold weather training is much more difficult for the body, compared to hot weather training. Heat is lost more readily via convective heat transfer from the skin and the body has more difficult maintaining its internal temperature in these conditions. Fitter athletes have an easier time maintaining a given exercise intensity and higher rates of metabolic heat production in cold weather then their unfit counterparts, but if heat lose exceeds heat production the overall body heat content decreases and peripheral and core body temperature starts to decline, if the body’s internal temperature drops below 35 c (95 f), hypothermia can develop, which can result in shivering, confusion fatigue and slurred speech. Reduction in internal body temperature can result in abnormal cardiac rhythmic.

The biggest dangers in cold weather include frostbite and hypothermia.

Frostbite is the medical condition where localized damage is caused to skin and other tissues due to freezing. The hands and feet are affected most frequently, although cheeks, nose, ears and even corneas may be involved. Greatest at risk are those over-exposed in cold environments.
Hypothermia is a body temperature significantly less than 98.6°F (37°C). If the environment gets colder, the body may need to generate more heat by shivering (increasing muscle activity that

promotes heat formation). But if heat loss is greater than the body's ability to make more, then the body's core temperature will fall.

Chilblains also known as chilblain, pernio and perniosis are small, itchy swellings on the skin, which are not painful at first, but can become painful. It is a dermatological response to cold and wet conditions. Inflammatory responses, such as warm, swelling skin may result in mild cases, whereas painful blisters develop in more severe cases.

Adaptations to cold weather and considerations

While numerous adaptations to cold weather exercise occur, the main ones include: an increase in non-shivering thermo genesis, improved sleep in cold environments, and improve circulation to the appendages. When the body shivers, it is rapidly depleting its glycogen stores to keep warm. Shivering can also interrupt and perhaps prevent sleeping. Improved circulation is only temporary and often occurs in people who are regularly exposed to cold environments. If one is exercising in the cold weather, especially if they haven't yet adapted to the cold, they may want to consider ingesting additional carbohydrates to compensate for the energy expended via shivering. Special attention should be paid to clothing, specifically with regards to layering. Polyester, wool, silk, or polypropylene are often regarded as ideal first layers as they wick moisture away from the skin to the next layer for subsequent evaporation.

As stated above, one should permit more time to adjust to training or competing in cold climates, especially if the training or competition is to occur at a higher altitude. Athletes should allow themselves more time to warm-up pre-exercise or pre-competition and employ periods of active rest to keep warm. Healthcare and fitness professionals, including athletic training staffs, physicians, and coaches, should be aware of what signs to look for in cold injuries and should thoroughly assess and/or refer someone who is suspected of experiencing a cold-related injury or illness.

Time

When we travel in an easterly or westerly direction, for every 15 degrees of longitude a time change of one hour occurs. The general effect of this time change is an upset to those body functions that are time-linked, e.g. sleeping, waking, eating, bowel and bladder functions. The body will gradually adjust and a minimum of one days stay for a one hours time change is regarded as a necessity. Air travel has an effect on the body. E.g. digestion upset, swelling feet and dehydration.

CONCLUSION:

There is a variety of heat exposure protocols that can achieve heat acclimatization. Coaches need to consider the frequency of exercise, duration, intensity and the environmental conditions that produce heat strain to elevate core body temperature and invoke a sweating response. There should be very effectively carefully and progressively in the different conditions individual expose himself such as hot humid and cold environment.

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