

# **THIS INFORMATION IS NOT INTENDED TO REPLACE THE RECOMMENDATIONS OF YOUR ATHLETIC TRAINERS AND/OR DOCTOR---REMEMBER SAFETY FIRST!!**

## **Heat Stress and Athletic Participation**

Early fall football, cross country, soccer and field hockey practices are conducted in very hot and humid weather in many parts of the United States. Due to the equipment and uniform needed in football, most of the heat problems have been associated with football. During the 1995 through the 2000 football season there have been 17 heat stroke deaths in football. This is not acceptable. There are no excuses for heatstroke deaths if the proper precautions are taken. During hot weather conditions, the athlete is subject to the following:

**Heat Cramps** - Painful cramps involving abdominal muscles and extremities caused by intense, prolonged exercise in the heat and depletion of salt and water due to sweating.

**Heat Syncope** - Weakness, fatigue and fainting due to loss of salt and water in sweat and exercise in the heat. Predisposes to heatstroke.

**Heat Exhaustion (Water Depletion)** - Excessive weight loss, reduced sweating, elevated skin and core body temperature, excessive thirst, weakness, headache and sometimes unconsciousness.

**Heat Exhaustion (Salt Depletion)** - Exhaustion, nausea, vomiting, muscle cramps, and dizziness due to profuse sweating and inadequate replacement of body salts.

**Heatstroke** - An acute medical emergency related to thermoregulatory failure. Associated with nausea, seizures, disorientation, and possible unconsciousness or coma. It may occur suddenly without being preceded by any other clinical signs. The individual is usually unconscious with a high body temperature and a hot dry skin (heatstroke victims, contrary to popular belief, may sweat profusely).

It is believed that the above mentioned heat stress problems can be controlled provided certain precautions are taken. According to the American Academy of Pediatrics Committee on Sports Medicine, heat related illnesses are all preventable. (Sports Medicine: Health Care for Young Athletes, American Academy of Pediatrics, 1991). The following practices and precautions are recommended:

1. Each athlete must have a physical exam with a medical history when first entering a program and an annual health history update. History of previous heat illness and type of training activities before organized practice begins should be included. State high school association's recommendations should be followed.
2. It is clear that top physical performance can only be achieved by an athlete who is in top physical condition. Lack of physical fitness impairs the performance of an athlete who participates in high temperatures. Coaches should know the **physical condition** of their athletes and set practice schedules accordingly.

3. Along with physical conditioning, the factor of acclimatization to heat is important. Acclimatization is the process of becoming adjusted to heat and it is essential to provide for **gradual acclimatization to hot weather**. It is necessary for an athlete to exercise in the heat if he/she is to become acclimatized to it. It is suggested that a graduated physical conditioning program be used and that 80 percent acclimatization can be expected to occur after the first seven to ten days. Final stages of acclimatization to heat are marked by increased sweating and reduced salt concentration in the sweat.
4. The old idea that water should be withheld from athletes during workouts has no scientific foundation. The most important safeguard to the health of the athlete is the replacement of water. Water must be on the field and readily available to the athletes at all times. It is recommended that a minimum of ten minutes be scheduled for a water break every half hour of heavy exercise in the heat. **Water should be available in unlimited quantities**. Check and be sure athletes are drinking the water. Cold water is preferable. Drinking ample water before practice or games has also been found to aid performance in the heat.
5. Salt should be replaced daily. Modest salting of foods after practice or games will accomplish this purpose. Salt tablets are not recommended. **Attention must be directed to replacing water -- fluid replacement is essential**.
6. Know both the **temperature and humidity**. The greater the humidity, the more difficult it is for the body to cool itself. Test the air prior to practice or game using a wet bulb, globe, temperature index (WBGT Index) which is based on the combined effects of air temperature, relative humidity, radiant heat and air movement. The following precautions are recommended when using the WBGT Index (ACSM's Guidelines for the Team Physician, 1991):

Below 64 Unlimited activity

65-72 Moderate risk

74-82 High risk

82 plus Very high risk

7. There is also a weather guide for activities that last 30 minutes or more (Fox and Mathews, 1981) which involves knowing the relative humidity and air temperature:

Air Temp	Danger Zone	Critical Zone
70 F	80 percent RH	100 percent RH
75 F	70 percent RH	100 percent RH
80 F	50 percent RH	80 percent RH
85 F	40 percent RH	68 percent RH
90 F	30 percent RH	55 percent RH
95 F	20 percent RH	40 percent RH
100 F	10 percent RH	30 percent RH

8. RH = Relative Humidity
9. One other method of measuring the relative humidity is the use of a sling psychrometer, which measures wet bulb temperature. The wet bulb temperature should be measured prior to practice and the intensity and duration of practice adjusted accordingly. Recommendations are as follows:

Under 60 F Safe but always observe athletes

61-65 F Observe players carefully

66-70 F Caution

71-75 F Shorter practice sessions and more frequent water and rest breaks

75 plus      Danger level and extreme caution

7. Cooling by evaporation is proportional to the area of skin exposed. In extremely hot and humid weather reduce the amount of clothing covering the body as much as possible. **Never use rubberized clothing.**
8. Athletes should **weigh** each day before and after practice and **weight charts checked**. Generally a three percent weight loss through sweating is considered safe and over a three percent weight loss is in the danger zone. Over a three percent weight loss the athlete should not be allowed to practice in hot and humid conditions. Observe the athletes closely under all conditions. Do not allow athletes to practice until they have adequately replaced their weight.
9. Observe athletes carefully for signs of trouble, particularly athletes who lose significant weight, and the eager athlete who constantly competes at his/her capacity. Some trouble signs are nausea, incoherence, fatigue, weakness, vomiting, cramps, weak rapid pulse, visual disturbance, and unsteadiness.
10. Teams that encounter hot weather during the season through travel or following an unseasonable cool period should be physically fit but will not be environmentally fit. Coaches in this situation should follow the above recommendations and substitute more frequently during games.
11. Know what to do in case of emergency and have your emergency plans written with copies to all your staff. Be familiar with immediate first aid practices and prearranged procedures for obtaining medical care, including ambulance service.
  - **Heat Stroke - This is a medical emergency. DELAY COULD BE FATAL.** Immediately cool body while waiting for transfer to a hospital. Remove clothing and place ice bags on the neck, in the axilla (armpit), and on the groin area. An increasing number of medical personnel are now using a treatment for heat illness that involves applying either alcohol or cool water to the victim's skin and vigorously fanning the body. The fanning causes evaporation and cooling. (Source--The First Aider--September 1987)
  - **Heat Exhaustion - OBTAIN MEDICAL CARE AT ONCE.** Cool body as you would for heat stroke while waiting for transfer to hospital. Give fluids if athlete is able to swallow and is conscious.
  - **Summary** - The main problem associated with exercising in the hot weather is water loss through sweating. Water loss is best replaced by allowing the athlete unrestricted access to water. Water breaks two or three times per hour are better than one break an hour. Probably the best method is to have water available at all times and to allow the athlete to drink water whenever he/she needs it. Never restrict the amount of water an athlete drinks, and be sure the athletes are drinking the water. The small amount of salt lost in sweat is adequately replaced by salting food at meals. Talk to your medical personnel concerning emergency treatment plans.

## Health and Safety

### Recommendations for Hydration

#### WHAT NOT TO DRINK

- Drinks with Carbohydrate (CHO) concentrations of greater than eight percent should be avoided.
- Fruit juices, CHO gels, sodas, and sports drinks that have a CHO greater than six to eight percent are not recommended during exercise as sole beverages.
- Beverages containing caffeine, alcohol, and carbonation are not to be used because of the high risk of dehydration associated with excess urine production, or decreased voluntary fluid intake.

## HYDRATION TIPS AND FLUID GUIDELINES

- Drink according to a schedule based on individual fluid needs.
- Drink before, during and after practices and games.
- Drink 17-20 ounces of water or sports drinks with six to eight percent CHO, two to three hours before exercise.
- Drink another 7-10 ounces of water or sport drink 10 to 20 minutes before exercise.
- Drink early - By the time you're thirsty, you're already dehydrated.
- In general, every 10-20 minutes drink at least 7-10 ounces of water or sports drink to maintain hydration, and remember to drink beyond your thirst.
- Drink fluids based on the amount of sweat and urine loss.
- Within two hours, drink enough to replace any weight loss from exercise.
- Drink approximately 20-24 ounces of sports drink per pound of weight loss.
- Dehydration usually occurs with a weight loss of two percent of body weight or more.

## WHAT TO DRINK DURING EXERCISE

- If exercise lasts more than 45-50 minutes or is intense, a sports drink should be provided during the session.
- The carbohydrate concentration in the ideal fluid replacement solution should be in the range of six to eight percent CHO.
- During events when a high rate of fluid intake is necessary to sustain hydration, sports drinks with less than seven percent CHO should be used to optimize fluid delivery. These sports drinks have a faster gastric emptying rate and thus aid in hydration.
- Sports drinks with a CHO content of 10 percent have a slow gastric emptying rate and contribute to dehydration and should be avoided during exercise.
- Fluids with salt (sodium chloride) are beneficial to increasing thirst and voluntary fluid intake as well as offsetting the amount of fluid lost with sweat.
- Salt should never be added to drinks, and salt tablets should be avoided.
- Cool beverages at temperatures between 50 to 59 degrees Fahrenheit are recommended for best results with fluid replacement.

## Health and Safety

### Head Injury Information

#### Signs and Symptoms of Mild Head Injury

Parents need to be aware of the observable signs and symptoms of a concussion:

Headache	Feeling "foggy" or "not sharp"
Nausea	Change in sleep pattern
Balance problems or dizziness	Concentration or memory problems
Double or fuzzy vision	Irritability
Sensitivity to light or noise	Sadness
Feeling slowed down	Feeling more emotional

**Post-concussion Syndrome** Following a mild head injury, athletes may suffer a number of lingering symptoms for varying lengths of time. If any of the following lists of post-concussive symptoms are noted, the athlete should not be allowed to return to participation and should be referred for physician evaluation if symptoms persist.

Depression	Feeling "in fog"
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Numbness/tingling	Sensitivity to light
Dizziness	Headache
Poor balance	Sensitivity to noise
Drowsiness	Irritability
Poor concentration	Trouble falling asleep
Excess sleep	Memory problems
Ringing in the ears	Vomiting
Fatigue	Nausea
Sadness	Nervousness

**Second-Impact Syndrome** Second-impact syndrome is a rare event, which poses a significant concern for athletes who return too soon after suffering a previous concussion. Second-impact syndrome is characterized by an auto regulatory dysfunction that causes rapid and fatal brain swelling, and can result in death in as little as two to five minutes. It is particularly important to note that virtually all of the second-impact syndrome cases that have been reported have occurred in adolescent athletes. The progressive signs of second-impact syndrome are as follows:

- \* Previous history of concussion
- \* Visual, motor or sensory changes
- \* Difficulty with memory and/or thought process
- \* Collapse into coma
- \* Signs of cranial nerve and brainstem pressure

**Cumulative Effects of Repeated Concussions** At this time, there is little known about the cumulative effect of concussions. However, early research suggests that athletes who have sustained at least one mild head injury (MHI) have a greater risk for repeated MHI and that the severity of subsequent MHI may be increased. Until research can further illuminate the potential cumulative effects of concussion, it is recommended that athletes sustaining more than one concussion should be referred for follow up evaluation and assessment to determine any residual effects that might preclude participation in contact or collision sports.

Reference:

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## **Reducing Head and Neck Injuries in Football**

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Head and neck injuries in football have been dramatically reduced since the late 1960's. Several suggestions for continued reduction are are follow:

1. Preseason physical exams for all participants. Identify during the physical exam those athletes with a history of previous head or neck injuries. If the physician has any questions about the athlete's readiness to participate, the athlete should not be allowed to play.
2. A physician should be present at all games. If it is not possible for a physician to be present at all games and practice sessions, emergency measures must be provided. The total staff should be organized in that each person will know what to do in case of head or neck injury in game or practice. Have a plan ready and hour your staff prepared to implement that plan. Prevention of further injury is the main objective.

3. Athletes must be given proper conditioning exercises which will strengthen their necks so that participants will be able to hold their head firmly erect when making contact. Strong neck muscles may help prevent neck injuries.
4. Coaches should drill the athletes in the proper execution of the fundamentals of football skills, particularly blocking and tackling. **Keep the head out of football.**
5. Coaches and officials should discourage the players from using their heads as battering rams. The rules prohibiting spearing should be enforced in practice and in games. The players should be taught to respect the helmet as a protective device and that the helmet should not be used as a weapon.
6. All coaches, physicians, and trainers should take special care to see that the player's equipment is properly fitted, particularly the helmet.
7. Strict enforcement of the rules of the game by both coaches and officials will help reduce serious injuries.
8. When a player has experienced or shown signs of head trauma (loss of consciousness, visual disturbances, headache, inability to walk correctly, obvious disorientation, memory loss) he should receive immediate medical attention and should not be allowed to return to practice or game without permission from the proper medical authorities.

## Health and Safety

### Concussions

#### **Suggested Guidelines For Management of Head Trauma In Sports**

Head trauma is a common problem in sports that has the potential for serious complications if not managed correctly. Even what appears to be a "minor ding" or "bell ringer" without loss of consciousness, has the risk of catastrophic results in a youngster who is returned to action too soon. The medical literature and lay press are reporting instances of death from "second impact syndrome" even after mild concussions.

At many athletic contests across the country, there is a lack of trained and knowledgeable individuals making the decision to return concussed athletes to the game. Frequently there is undue pressure from various sources (parents, player and coach) to return a valuable athlete to action ASAP. In addition, often there is unwillingness by the athlete who wants to play to report headaches and other symptoms that will prevent his/her return to play.

Outlined below are guidelines that may be helpful in establishing a protocol useful to those responsible for the return to play decision after a head injury, whether they are medically trained or not. These are general guidelines and are not meant to replace the judgment of a physician or certified athletic trainer present on the sideline. **IF THERE IS ANY OBVIOUS ABNORMALITY OR DETERIORATION OF SYMPTOMS, IMMEDIATE MEDICAL CARE SHOULD BE FOUND.** It is the relatively minor head injury with no obvious consequence where this protocol could be most helpful on the sideline.

#### **SIDELINE MANAGEMENT OF ACUTE HEAD INJURY**

Following a head injury, an athlete should be returned to practice or a game **ONLY** if he/she meets **ALL** of the following criteria. (See schematic)

1. Head injury did not result in any loss of consciousness;
2. Any "confusion" or altered mental status clears in less than 15 minutes;
3. The injured athlete has had no other concussion or significant head injury during the present season;
4. The athlete checks out "clear" on mental status, orientation, concentration and memory tasks before and after exertional provocative tests. (see below)

#### **MANAGEMENT OF HEAD INJURIES THAT INTERRUPT RETURN TO PLAY**

Any athlete whose concussion involves loss of consciousness, doesn't "clear" in 15 minutes or who has had previous concussions should not return to play or practice until medical clearance is obtained. Generally, an athlete is advised not to return to play or practice in a contact sport until he/she is asymptomatic and clear for at least one week. This has traditionally meant no headache, confusion or any of the problems listed below.

These recommendations have been based on the awareness of the increased vulnerability of the brain to concussions occurring close together and of the cumulative effects of multiple concussions on long-term cognitive function. Research is now revealing some fairly objective and relatively easy-to-use tests which appear to identify the subtle residual effects of concussion not found by traditional evaluation. These identifiable deficits frequently persist after the obvious signs of concussion are gone and appear to have relevance to whether an athlete can return to the game with relative safety. The significance of these deficits is still under study and the evaluation instruments represent a work in progress. They may be helpful to the professional determining return to play in conjunction with consideration of the severity and nature of the injury; the interval since the last head injury and the level of play.

**SOME SIGNS OF CONFUSION/CONCUSSION:** Confusion can be defined in many different ways and listed below are some of the signs and symptoms frequently associated with minor head trauma (a.k.a. "ding," "Bell Rung," Dazed). Most categories of impairment appear to be deficits of attention, concentration, information processing speed and memory. We also have suggested some of the means of assessing these signs and symptoms to decide whether the athlete is "clear" to return to action.

1. Thinking deficits: Tests such as the Paced Auditory Serial Addition Task (PASAT), and Trails Making A & B Test have proven to be helpful in identifying post-head-trauma residual problems brain function.
2. Lack of sustained attention: Difficulty sustaining adequate focus to complete a task or persevere with a coherent stream of thought can be a sign of poor attention. Repeating digits forward and backward, stating the months of the year in reverse order or counting backwards by a certain interval are ways of identifying this lack of concentration ability.
3. Confused mental status: Disorientation to time, date, place, address and phone number may be helpful; however, recent studies suggest that information relating to the game such as opponent, score, quarter, play was injured on and individual assignment on the play are more relevant to identifying deficits after minor head trauma.
4. Amnesia: Retrograde amnesia usually represents a more serious deficit than post-traumatic amnesia.
5. Dazed look or vacant stare.
6. Slurred or incoherent speech.
7. Vomiting and/or nausea.
8. Slow motor and verbal responses.
9. Emotional liability: Reactions that seem out of proportion and inappropriate, as well as combative and/or aggressive behavior can be seen for a period of time after a concussion.
10. Memory deficits (short-term and delayed memory): A common manifestation is the repeated asking of the same questions over and over again. Asking for details of the contest, names of teams in prior contests, remembering three words or objects at 0 and 5 minutes and asking about significant recent news events are ways of evaluating memory status.
11. Poor coordination: A recent study indicated an individual's balance was abnormal for three to five days after a concussion even without other residual signs and symptoms. Tests of strength, coordination and agility, such as finger-to-nose testing and tandem gait observations, can be helpful in analyzing the athlete's state of coordination.
12. Dizziness.
13. Headaches: This is a very important symptom and has been one of the gold standards of clinical symptoms to help determine return to play.
14. Restlessness: Changing position frequently and having trouble resting or "finding a comfortable position" can be manifestations of post-head-trauma difficulties.
15. Neurasthenia and hyperesthesia: Neurasthenia, which is nervous weakness, exhaustion and irritability, and hyperesthesia, excessive sensitivity to various sensory stimuli such as touch, pain, light, sound, etc.

It is very important that these assessments be done both in the resting state, and if the individual appears "clear," to ask the athlete to perform many of them after sufficient exercise such as short sprints, push-ups, sit-ups and knee bends to raise the heart rate. If any abnormal signs return, the athlete should be withheld

from participation.

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**EXAMPLE OF A SPECIFIC INSTRUMENT THAT IS BEING USED TO DO SIDELINE ASSESSMENT OF ATHLETES WITH CONCUSSION:**

Outlines in the included schematic is a fairly comprehensive list of signs, symptoms and observations that can be utilized to determine if an athlete is "clear" of any abnormalities that would prevent return to play. Several investigators have been working on quick and efficient checklists for sideline assessment that can be performed by individuals with varying degrees of training and could be an alternative if a professional is not on hand. Dr. Kutner and Dr. Barth are working on a Sideline Concussion Checklist (SCC) that looks very promising. Drs. McCrae, Kelly, Bartolic, et al have developed a Sideline Assessment of Concussion (SAC) instrument, which has been validated on hundreds of athletes. The test has a reasonable user-friendly system for grading concussions and utilizes tests that can be done on the sideline. In addition, a scoring system is included to serve as a guideline to help in decision-making and suggests a course of action to follow on return to play. A palm card, as provided by the Brain Injury Group and the Academy of Neurology, has summarized the experience and consensus of a number of researchers in this field. The palm card and a packet of tests materials with information on scoring, etc. can be obtained from the Brain Injury Association, 800-321-7037.

The schematic below reflects the latest recommendations on concussion management in a form we believe should be helpful to schools, especially if no medically trained individual is available on the sideline.

