PERCEIVED COMPLIANCE OF HIGH SCHOOL ATHLETIC TRAINERS WITH NATA HEAT ILLNESS PREVENTION GUIDELINES

by

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ABSTRACT

Exertional heat illness is the leading cause of death among high school athletes across the United States. Numerous organizations, such as the National Athletic Trainers' Association (NATA) have developed recommendations for athletic trainers and other healthcare providers to assist in preventing and managing heat-related illness. Although these recommendations are available to all athletic trainers, many cases of heat illness continue to occur each year. The purpose of this study was to determine the compliance of high school athletic trainers with the current NATA recommendations for heat illness prevention. One hundred and eighty three high school athletic trainers across the U.S. completed a survey regarding their levels of compliance with varying components of the recommended guidelines. No participants responded as complying with every guideline. This lack of compliance may have a negative affect on preventing heat-related illness in athletes, however future studies need to be completed to determine the necessity and effectiveness of these guidelines.

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CHAPTER I

INTRODUCTION

Many athletes are willing to do almost anything if they believe it will allow them to maximize their abilities. They use nutritional supplements, give their best efforts during practice, participate in injury prevention workouts, and rehabilitate injuries. Since heat illness is not considered an "injury," often it is not properly prevented, recognized or managed by the athlete. This reason exemplifies the importance of healthcare providers and athletic programs taking responsibility for ensuring athlete safety through heat illness education and prevention techniques.

The umbrella term "heat illness" can refer to one of five main heat-related issues (Binkley, Beckett, Casa, Kleiner, & Plummer, 2002). These include heat syncope, exercise-associated cramps, heat exhaustion, exertional heat stroke, and exertional hyponatremia (Binkley et al., 2002). All five conditions are preventable and can be affected by fluid intake, diet, type of training, and training conditions. It is important that all heat illnesses are recognized and treated immediately regardless of the perceived severity (Binkley et al.; Casa, 1999).

The National Athletic Trainers' Association (NATA) published a set of 24 guidelines with recommendations for best practice of preventing, recognizing, and managing heat illness. These recommendations span the time from before athletic participation through treatment of the heat-related incident and the athlete's return to participation (Binkley et al., 2002). Prevention is the gold standard for heat illness management, but immediate recognition and treatment are critical if prevention fails (Binkley et al.; Casa, 1999).

Binkley et al. (2002) claim that following these guidelines can improve an athlete's overall health, safety, and performance, however many physically active individuals experience some form of heat illness at least once during their lifetime (Jung, Bishop, Al-Nawwas, & Dale, 2005). This continuation of incidents could be due in part to how closely the recommendations are followed. If on-site healthcare professionals and/or athletic programs abide by only some guidelines and not others, the risk of developing a heat-related illness increases.

Purpose Statement

The purpose of this study was to determine the extent to which athletic trainers perceive that they follow the guidelines for heat illness prevention recommended by the NATA and determine if demographics of athletic trainers have an influence on compliance (Binkley at al., 2002).

Research Questions

1. How closely do high school athletic trainers perceive that they follow the exertional heat illness prevention guidelines set forth by the NATA?
2. What effect do the demographics of high school athletic trainers have on perceived compliance with the NATA heat illness prevention guidelines?
3. What effect does employment status of the high school athletic trainer have on perceived compliance with the NATA heat illness prevention guidelines?
4. What are the reasons athletic trainers do not follow all NATA heat illness prevention guidelines?

Hypotheses

1. There will be a difference in perceived guideline compliance amongst different types (with regards to employment status) of high school athletic trainers.
2. Heat illness prevention guidelines requiring resources and funding will be followed less than heat illness prevention guidelines that do not require athletics resources and funds.

Limitations

1. Participants had a limited amount of time to complete the survey (four weeks).
2. Perceived compliance may not represent actual compliance, as the survey was distributed in January, which is months after the end of the hot, humid season for most athletic trainers.

Definition of Terms

1. Athletic Trainer: a board certified healthcare professional who specializes in emergency care and injury prevention, diagnosis, treatment, and rehabilitation.
2. Compliance: modifying one's behaviors based on the request of another individual, in this instance the other individual being the NATA heat illness prevention guidelines.
3. Demographics: statistical data pertaining to the study participants regarding information about sex, age, years of certification, employment status (ie. full-time, part-time, outreach, etc), size of high school, number of athletic trainers working at the high school, number of years working at the high school, and number of sports for which the athletic trainer is responsible.

4. Heat illness: the umbrella term for medical conditions caused by excessive heat exposure, especially during physical activity; includes heat syncope, exercise-associated muscle cramps, heat exhaustion, exertional heat stroke, and exertional hyponatremia.
5. Heat index: the apparent temperature; how the temperature feels to the human body when relative humidity and air temperature are combined.
6. NATA: National Athletic Trainers' Association; the professional membership association for athletic trainers and others who support the profession.
7. NATA heat illness prevention guidelines: recommendations for athletic trainers and other healthcare professionals for preventing heat-related illness in sport, early detection of heat-related illness, emergency management strategies, and return-to-play procedures.
8. Perception: an individual's interpretation of and response to sensory information; perception of past memories can be influenced by events occurring after the original situation or by filling gaps in one's memory.
9. WBGT: Wet-bulb globe temperature; a measure of heat taken in direct sunlight that is calculated using temperature, humidity, wind speed, sun angle, and cloud cover.

Significance of the Study

Most cases of heat-related illness are preventable if proper steps are taken (FRONTLINE, 2011). Findings may reveal why there are still over 9,000 cases of heat-related illness even though the NATA guidelines are designed to minimize incidences (CDC, 2010). Eliminating incidences of heat-related illness requires athletic programs, including athletic directors, coaches, and athletic trainers, to closely follow all prevention recommendations. The results of this study should motivate athletic trainers and athletic programs to reevaluate and adjust their own practices with regard to the prevention and management of heat-related illnesses. Athletic programs may consider hiring an athletic trainer if they do not already have one or hiring an additional athletic trainer if extra assistance is needed to properly care for the athletes. This study will also give participating athletic trainers the opportunity to carefully consider their influences on decreasing the incidence of heat-related illness among their athletes.

CHAPTER II

LITERATURE REVIEW

Each new season brings groups of athletes training and competing to the greatest of their abilities. It is a common misconception that resistance and cardiovascular training will result in greater effort and performance during competition (Casa, 1999). Many athletes are unaware of the importance of proper nutrition and hydration, which can lead to a variety of musculoskeletal injuries and heat-related illness (Bergeron, 2007; Casa). Exertional heat illness is one of the most common problems in athletics. This occurs most often when exercising in hot, humid environments and/or at a high intensity for a prolonged period of time (Casa). Although only three categories of heat illness are commonly known, the NATA also recognizes an additional two heat-related illnesses (Binkley et al., 2002). All five classifications of heat illness can occur in any environmental condition, but are more likely to occur during activity in hot, humid conditions (Binkley et al.).

Heat-related illness is most easily managed through prevention. Preventative techniques include educating athletes on proper fluid intake and diet and on recognizing and treating heat illness, as well as utilizing a heat acclimatization process and identifying athletes who may be predisposed to heat illness (Binkley et al., 2002). Developing a plan of action on how the situation will be managed should a heat-related illness occur is also imperative because rapid and proper treatment is critical (Binkley et al.; Casa, 1999). The NATA offers guidelines for healthcare professionals to refer to for the most recent recommendations regarding the prevention, recognition, and management of heat-related illnesses (Binkley et al.). Healthcare providers are not always present for training sessions, so coaches and athletes should have knowledge about heat-related illness. There is no available research pertaining to athletic trainer compliance with heat illness prevention guidelines or the prevalence of heat-related illness due to the lack of compliance with specific prevention guidelines. This review of the literature has been organized into the following sections: prevalence and consequence of heat-related illnesses, treatment of heat-related illnesses, history of heat illness management, NATA guidelines, the influence of perception on survey results, and summary.

Prevalence and Consequence of Heat-Related Illnesses

Heat illnesses occur regularly during physical activity in warm and humid climates as well as in cooler conditions (Binkley et al., 2002). In 2006, 4.74 out of 1000 college football players in the southeastern region of the United States experienced exertional heat illness between August and September, whereas the CDC determined that heat illness is affecting over 9,000 high school athletes each year (Cooper, Ferrara, & Broglio, 2006; CDC, 2010). Exertional heat illness is the leading cause of death in high school athletes (Badgeley, McIlvain, Yard, Fields, & Comstock, 2013). An athlete who develops any of these illnesses will exhibit a decrease in performance and is at an increased risk for the condition to become a medical emergency (Casa, 1999). Seasonal athletes, specifically those initiating practice in the late summer, are at a higher risk for developing a heat illness than are athletes who train year-round or begin in the colder season and adjust to the environment as the weather changes (Binkley et al.). Proper acclimatization to the heat is essential for minimizing the number of heat-related illnesses that arise during exercise but can be difficult for many athletes due to the essence of their sporting activity (Binkley et al.).

Losing 2-3% of one's body weight during high-intensity exercise in hot, humid environments results in dehydration (Coris et al., 2004). For every 1% of body weight lost due to dehydration during these training conditions, the athlete experiences a heart rate increase of 3-5 beats per minute (Coris et al.). Fluid losses of any body weight percentage leads to increases in vascular resistance and to decreases in blood pressure, sweat production, and blood volume (Coris et al.). This combination can result in decreased blood flow to the skin, which will hamper heat dissipation (Coris et al.). If no thermoregulatory adjustments are made during exercise in the heat, core body temperature can raise approximately 1°C every five minutes, which can result in a more rapid onset of exertional heat illness (Coris et al.). Adequate hydration is important for avoiding heat illness regardless of the temperature (Binkley et al., 2002; Casa & Yeargin, 2005; Williams & Blackwell, 2012). The umbrella term "heat illness" can be broken down into five main categories: heat syncope, exercise-associated muscle cramps, heat exhaustion, exertional heat stroke, and exertional hyponatremia (Binkley et al.).

Heat syncope describes the dizziness that occurs immediately after strenuous activity in the heat and presents itself as similar to the sensation felt when standing up too quickly after sitting or laying down (Binkley et al., 2002). This occurs most often during the first five days of heat acclimatization due to peripheral vasodilation, reduction in cardiac output, pooling of blood, reduced venous return, or dehydration (Binkley et al.). Signs and symptoms include sweaty or pale skin, tunnel vision, dizziness, decreased pulse rate, and a normal rectal temperature ranging from 36-40°C (Binkley et al.).

Exercise-associated muscle cramps, more commonly known as "heat cramps," are one of the most common complications in athletes (Bergeron, 2007; Jung et al., 2005).

Heat cramps are "involuntary, painful spasms of large muscle groups" that can occur during or after intense exercise (Stofan, Zachwieja, Horswill, Murray, Anderson, & Eichner, 2005). Heat cramps are often confused with the classic muscle cramp, which occurs from muscle fatigue due to lack of training or muscle overload (Valentine, 2007). Another key difference is the classic muscle cramp occurs in the muscle being worked, whereas heat cramps can occur anywhere (Bergeron, 2008). Heat cramps often occur bilaterally and can travel from one large muscle group to another (Stofan et al., 2005). Incidences of heat cramps can range from minor to severe cramping and involve painful muscular contractions historically caused by a combination of dehydration, muscular fatigue, and electrolyte imbalances (Binkley et al., 2002; Casa, 1999). More recent research indicates that heat cramps are not related to the biochemical changes due to exercising in heat, but rather are due to a spinal neural mechanism related to fatigue (Brooks, Fahey, & Baldwin, 2005). Contrary to their name, heat cramps can occur in any climate (Bergeron, 2007). Heat cramps are more easily preventable in cool weather due to a longer onset to sweating, making them more difficult to prevent in hotter and more humid climates due to elevated sweat rates (Armstrong & Casa, 2009).

Exercise exhaustion, or heat exhaustion, most often occurs in hot, humid environments (Binkley et al., 2002). Symptoms include headache, dizziness, nausea, excessive sweating, vertigo, syncope, extreme heat sensations on the head or neck, and the inability to continue activity (Binkley et al.; Casa, 1999). Two types of heat exhaustion may occur at different times. Water-depletion heat exhaustion occurs during or after activity when the athlete does not consume a sufficient amount of water to restore what is lost through his or her sweat. Salt-depletion heat exhaustion occurs after participating in a few consecutive days of strenuous activity when the athlete's sodium levels are too low due to lack of sodium consumption (Casa). Treatment recommendations must be implemented immediately, including removing the individual from activity, placing the individual in a shaded area, placing ice bags on the individual for quicker cooling, and rehydrating with cold water and/or a salt containing liquid (Binkley et al.; Casa).

Exertional heat stroke can be difficult to differentiate from heat exhaustion because both conditions occur during physical activity in hot and humid environments and present similar symptoms (Binkley et al., 2002). Often, the best way to assess heat stroke is to obtain a rectal temperature greater than 40°C. (Binkley et al.; Casa, 1999). Heat stroke is a potentially fatal medical emergency requiring accurate diagnosis and immediate treatment (Binkley et al.; Casa). The risk of mortality increases the longer an individual's core temperature remains above 41°C (Binkley et al.). Individuals suffering from heat stroke often experience impairments in mental function and thermoregulation, tachycardia, hypotension, hyperventilation, seizures, and coma (Binkley et al.; Casa).

Aggressive and immediate treatment of exertional heat stroke is essential. This includes removal of equipment and clothing as well as whole-body ice water immersion of approximately 1-10°C. Lowering the individual's core temperature as rapidly as possible is critical (Binkley et al., 2002; Casa, 1999). Vital signs and core temperature should be monitored every 5-10 minutes throughout the cooling process to ensure effectiveness and avoid overcooling (Binkley et al.). If ice water immersion is not effective, the emergency medical system should be activated as soon as possible (Binkley et al.).

Exertional hyponatremia is rare and results from excessive water consumption and/or inadequate replenishment of sodium, most often during exercise lasting four or more hours (Binkley et al., 2002). This condition occurs when serum-sodium levels are less than 130mmol/L, which can be attributed to two different mechanisms (Binkley et al.). Water intoxication is due to a combination of excessive liquid consumption and unnecessary water retention (Binkley et al.). The other is due to inadequate water consumption and lack of sufficient sodium replacement (Binkley et al.). Physiologic and neurologic dysfunction occur when cells begin to swell from too much water, which the athlete experiences in the form of headache, disorientation, and extremity swelling (Binkley et al.). Differentiation from heat exhaustion or heat stroke includes mental compromise, increasing headache, altered consciousness, and a rectal temperature below 40°C (Binkley et al.). Immediate activation of the emergency medical system is critical because exertional hyponatremia can be fatal if left untreated (Binkley et al.).

According to the Centers for Disease Control and Prevention (CDC), the prevalence of heat-related illness is ten times higher for high school football players than other high school sport participants (CDC, 2010). August yielded the greatest number of total time-loss incidences of heat-related illness with 70% of those occurring during football practice or competition (CDC). These incidences accounted for approximately 30 time-loss heat illnesses per school year and do not include heat cramps (CDC). Time-loss heat illnesses include severe dehydration, heat exhaustion, and heat stroke. Cooper et al. (2006) determined that heat cramps accounted for 86 of the 112 cases of heat-related illness during football training over the three-month period from August to October in the southeast United States. Heat exhaustion attributed to 28 of the 112 cases and heat stroke attributed to eight of the 112 reported incidences (Cooper et al., 2006).

Treatment of Heat-Related Illness

Heat illnesses that are not identified or are improperly managed can be fatal. The number of high school athlete fatalities due to heat-related illness rapidly increased between 2007 and 2011 (FRONTLINE, 2011). According to the Korey Stringer Institute and Dr. Doug Casa, leading expert on heat stroke and the Institute's Chief Operating Officer, death from exertional heat stroke is one of the leading causes of sudden death in sport and every fatality due to exertional heat stroke can be prevented (BOC, 2011; FRONTLINE). The first 5-10 minutes are the most critical for decision-making and initiating rapid cooling, if necessary, when managing heat-related illnesses. The number of minutes the athlete's core temperature remains above the cell damage threshold (105-106°F) can determine the athlete's health outcome (FRONTLINE).

Effective treatment methods differ based on the type of exertional heat illness. If treatment is not aggressive enough or inappropriate for the type of heat illness, the athlete's health will deteriorate and his or her condition can become fatal (FRONTLINE, 2011). Exercise-associated muscle cramps and heat syncope are not classified as medical emergencies unless they are mistreated and symptoms continue to worsen (Binkley et al., 2002). Heat exhaustion, exertional heat stroke, and exertional hyponatremia are all, or can all become, medical emergencies, which make appropriate management critical (Binkley et al.; FRONTLINE).

Exercise-associated muscle cramps and episodes of heat syncope can be resolved rapidly when treated properly (Binkley et al., 2002). The athlete suffering from heat cramps must immediately discontinue activity and begin consuming sodium-containing fluids while stretching and massaging the cramping muscle (Binkley et al.; Starkey, 2013). Often times a recumbent position may assist with better blood distribution for cramping leg muscles (Binkley et al.). If the athlete becomes nauseous or begins to vomit and cannot orally ingest fluids, the emergency medical system should be activated to assist with intravenous fluid replacement (Binkley et al.). The athlete demonstrating signs of heat syncope should be moved to a shaded area and given fluids to rehydrate, have his or her legs elevated above head level, and have his or her vitals monitored until the athlete makes a full recovery (Binkley et al.).

Treatment of heat exhaustion varies based on the athlete's symptoms (Binkley et al., 2002). Cognitive function and vital signs should be assessed for abnormalities and more serious conditions (Binkley et al.). Rectal temperature is the recommended method for measuring core temperature as it is a more accurate measurement during exercise compared to oral, tympanic, or axillary temperature measurements (Binkley et al.). If core temperature is elevated above 39°C, rapid cooling must be initiated by moving to a shaded area and given fluids, removing excess clothing, and applying ice towels, ice bags, or fans (Binkley et al.). The athlete must be transferred to a medical care facility if symptoms continue to worsen, do not subside, or if intravenous fluids are deemed necessary (Binkley et al.).

The most critical factor in managing heat stroke is immediate, aggressive cooling (Binkley et al., 2002). Clothing and equipment should be removed and the athlete should be placed far enough into a cold tub that the water (2-15°C) covers the trunk and extremities (Binkley et al.). Vitals must be assessed every 5-10 minutes and the athlete should be removed from the cold tub when his or her core temperature decreases to 38-39°C (Binkley et al.; Starkey, 2013). The emergency medical system should be activated for rapid transport to a medical facility, but transportation should not occur until the athlete's core temperature is reduced to 38-39°C (Binkley et al.). If a cold tub is not available, removing clothing and applying cold towels or ice bags to as much of the body as possible will assist with rapid cooling (Binkley et al.). First aid equipment for air management may also be necessary (Binkley et al.).

Exertional hyponatremia cannot be successfully treated at a training facility. If core temperature is below 40°C and all symptoms are similar to those indicating heat stroke, exertional hyponatremia should be suspected and immediate transport to a medical care facility is required (Binkley et al., 2002; Starkey, 2013). All fluids should be withheld from the athlete until permission to consume fluids is granted by a physician (Binkley et al.).

History of Heat Illness Management

Current heat-related illness prevention and management techniques have not been historically recognized as the most accepted methods. Guidelines were regularly altered throughout the 20th century by varying organizations and researchers. Organizations providing these variations in management techniques include the American Medical Association (AMA), the American Nurses Association, and Sports Medicine Australia (SMA).

In 1965, the AMA published guidelines pertaining to heat illness prevention in football players (Murphy & Ashe, 1965). Summer conditioning, specifically in a warm or hot environment, was promoted but no other acclimatization guidelines were offered

(Murphy et al., 1965). Athletes were encouraged to wear different, lightweight practice and competition uniforms early in the season compared to those they wore later in the season (Murphy et al.). It was recommended that pre- and post-practice weigh-ins were regularly posted on a communal board so coaches could monitor their athletes' weight fluctuations (Murphy et al.). If an athlete lost five pounds during one practice session, coaches were to regularly observe the athlete, but if an athlete lost ten pounds during one practice session, coaches were to be on high alert (Murphy et al.). There were no set guidelines as to when a player should be held from practice (Murphy et al.). Salt and water were to be consumed as a 0.10% sodium chloride solution or in the proportion of one salt tablet per six ounces of water (Murphy et al.). No recommendations were made as to how much or how often liquid intake should occur. Use of a sling psychrometer was the final recommendation, which suggested that when wet bulb globe temperature (WBGT) was greater than 24°C, activity should be postponed or cancelled (Murphy et al.).

The American Nurses Association updated guidelines for the prevention of heat-related illness in 1981. An acclimatization period in extreme heat was encouraged, which was to take 10-20 days of 10-15 increments of exercise (Boyd, Shurett, & Coburn, 1981). Clothing recommendations included light weight, light colored, and loosely fitting attire that covered as much skin as possible to decrease the amount of direct sunlight on the skin (Boyd et al., 1981). Individuals were advised to avoid exercise during the hottest parts of the day and salt and water intake were to be increased simultaneously to avoid imbalances and ensure adequate intake of both (Boyd et al.). Nurses were also encouraged to provide public education about heat-related illness and prevention techniques (Boyd et al.).

Sports Medicine Australia reviewed thirteen guidelines from 1996-2004 associated with heat-related illness. Recommendations about fluid intake, clothing, and temperature were comparable across all thirteen guidelines (Larsen, Kumar, Grimmer, Potter, Farquharson, & Sharpe, 2007). Fluids were deemed necessary before, during, and after exercise but no guidelines specified an amount of fluid or carbohydrate drink intake (Larsen et al., 2007). Intake recommendations included 16-17ozs of fluid pre-exercise and 5-9ozs of fluid every 15-20 minutes during exercise (Larsen et al.). A discrepancy was apparent regarding the length of time prior to exercise that fluids should be consumed, as one guideline suggested a range from 30-120 minutes pre-exercise (Larsen et al.). Lightweight, light colored, and breathable clothing were to be worn during exercise sessions (Larsen et al.). When temperatures exceeded 30°C during outdoor exercise, 10-15 minute breaks were encouraged to be taken regularly (Larsen et al.).

There was no consensus on how WBGT should be used to determine the length of rest breaks based on the temperature (Larsen et al., 2007). There was agreement however, that athletes were at a high risk of heat illness when WBGT readings were at or above 27.8°C (Coris, Ramirez, & Van Durme, 2004). No acclimatization guidelines were agreed upon as some guidelines suggested that progression should occur in increasing length and intensity from 50% to 60% to 80% over three days, whereas other recommendations suggested starting at 20% and increasing in 20% increments (Larsen et al.). Full acclimatization was determined to take approximately 10-14 days for adults with disagreement regarding the length of time it would take for children (Larsen et al.).

One guideline noted that children would take longer than adults, possibly 8-10 days, but contradicts other guidelines by noting that adults would require only 4-7 days in a hot environment (Coris et al., 2004).

Prevention recommendations for heat-related illnesses have become more specific and stricter overtime. As more data and information has been collected about heat-related illnesses, their causes, and treatment options, management plans have been modified to incorporate the new information.

National Athletic Trainers' Association Guidelines

The NATA was founded in 1950, but did not release a set of guidelines for heat-related illness prevention and management techniques until 2002 (Binkley et al., 2002; NATA, 2014). The NATA is a professional organization for athletic trainers that sets bylaws and a code of ethics, promotes the expansion of athletic training as a profession, and publishes position and consensus statements to promote awareness of important issues to athletic trainers (NATA). After 52 years without heat-related illness prevention guidelines, the NATA was likely persuaded to develop standards for heat illness management by the death of Minnesota Vikings Korey Stringer (Korey Stringer Institute, 2010). Stringer's death was due to exertional heat stroke during training camp in 2001, only one year before the NATA published the gold standard for heat illness prevention and management (Korey Stringer Institute).

The NATA published the position statement *National Athletic Trainers' Association position statement: Exertional heat illnesses* outlining the different types of heat illness, how to recognize and treat each type, and an in-depth set of guidelines for the prevention of exertional heat illnesses (Binkley et al., 2002). Recommendation guidelines are a subset of the position statement as a whole and were designed to assist certified athletic trainers and allied health professionals in providing the best prevention, recognition, and treatment strategies (Binkley et al.). The position statement warns that following these guidelines does not guarantee prevention of heat-related illness, but rather following the recommendations should minimize incidences (Binkley et al.). Part of the first prevention guideline includes a prevention checklist for certified athletic trainers to ensure athletes are as safe as possible when exercising in hot and humid environments. This checklist contains sections such as pre-event participation, hydration status checks, environment assessment, coach and athlete responsibilities, event management, treatment considerations, and situation specific considerations (Binkley et al.; Casa, 1999). Following this checklist is only one component of the NATA's guidelines for prevention of exertional heat illness.

The NATA promotes athlete and coach education on exertional heat illness and encourages athletes to take responsibility for their well-being. Physician supervised pre-participation physicals should be conducted before the first day of practice to identify athletes who are more prone to heat illness and ensure optimal health before beginning activity according to the second guideline (Binkley et al., 2002). A 10-14 day period of gradually increasing exercise length and intensity is considered in the third guideline to be an ideal acclimatization period (Binkley et al.). The fourth guideline explains that all athletes and coaches should be educated on prevention, recognition, and treatment methods for heat illness management (Binkley et al.). Guidelines five and six encourage the promotion of a balanced diet, proper hydration, and healthy sleep patterns (Binkley et al.; Casa et al., 2005). Educating athletes about these topics can improve athletes' sodium, water, and nutrient consumption and alter their sleep patterns to better utilize their rest time for recovery (Binkley et al.). Proper fluid intake requires matching urine and sweat losses and proper diets will provide the required sodium for muscle function and ideal hydration (Binkley et al.).

General environmental guidelines for practice and event participation are essential. Participant number, amount of equipment, and practice length should all be considered in combination with WBGT measured by a sling psychrometer according to guidelines seven through nine (Binkley et al., 2002; Casa et al., 2005). If the WBGT exceeds 28°C, the level of risk is extremely high and all practices or events should be delayed or rescheduled until the WBGT decreases (Binkley et al.; Casa et al.). If conditions according to the WBGT are extreme and exercise continues, a work to rest ratio of 1:1 should be utilized (Binkley et al.). Intense exercise in high risk conditions should utilize a 2:1 work to rest ratio, in moderate conditions a 3:1 ratio, and in low risk conditions a 4:1 work to rest ratio (Binkley et al.). Environmental conditions should be continuously monitored from before activity begins until the activity is completed (Binkley et al.).

It is imperative that proper supplies are readily available to allow for minimal incidences of exertional heat illness. NATA guidelines note that adequate amounts of both water and sodium containing fluids be easily accessible during all exercise sessions and the amount consumed be enough to prevent the athlete from losing more than 2-3% of his or her body weight due to fluid loss (Binkley et al., 2002). For each kilogram of body weight lost during practice, athletes should consume 30-34ozs of liquid prior to the start of the next exercise session (Binkley et al.; Casa et al., 2005). High-risk athletes should partake in pre- and post-exercise weigh-ins to monitor their fluid losses and gains during and between practices (Binkley et al.; Starkey, 2013). The guidelines also suggest that athletes practice in shaded areas and wear minimal, light colored, loose fitting, and absorbent clothing and equipment when possible (Binkley et al.). Lastly, NATA guidelines recommend that local hospitals and emergency medical personnel be informed ahead of time of events drawing large crowds that will take place in hot and humid conditions (Binkley et al.).

The NATA guidelines are highly regarded by most athletic trainers and healthcare providers. This position statement specifically offers preventative and emergency care related to heat illness. The extent to which healthcare providers follow the guidelines published by these governing agencies is unknown, but noncompliance with these guidelines can contribute to the number of heat-related incidences occurring during exercise in hot, humid environments.

The Influence of Perception on Survey Results

Often individuals perceive the same event or experience differently from others. Numerous psychologists have theorized reasons for this occurrence. Kenny's theory of self-perception explains that all individuals have a desire for self-enhancement, some more than others (Kenny, 1994). When individuals are driven by these desires, they naturally accentuate their positive qualities while minimizing their negative qualities (Kenny). Individuals may not accurately recall past events due to the influence of self-enhancement. Friedman's strength theory also explains why an individual's perception of the past may be skewed. According to Friedman (1993), detailed memories of events fade as time passes and the individual has new experiences. Recollections of past events are likely to differ if asked about within one week of the event compared to if asked about six months in the future. Perception can be influenced in a variety of ways making it critical that the concept of perception is considered when completing studies that involve directly asking individuals for information.

Summary

Exertional heat illness affects athletes every year during months with peak levels of heat and humidity. The simplest way to manage exertional heat illness is through prevention, which requires athlete and coach education combined with the effort put forth by the health care professional and the coaching staff. Often athletes do not understand the severity of heat-related illnesses and that if symptoms are ignored, the outcome can be fatal (Casa, 1999). Understanding the effects of varying environmental conditions on athletes as well as proper hydration, diet, and education, is imperative for optimal and safe performance (Binkley et al., 2002). Heat illness prevention is relatively simple, prompting the concern regarding its continuous prevalence.

The NATA has published a number of guidelines for prevention of exertional heat illness, but athletes continue to experience varying degrees of exertional heat illness. The continuous occurrence of heat-related illness might be due to an issue with heat illness prevention guideline compliance rather than to the prevention techniques themselves. How closely high school athletic trainers and their respective athletics programs follow the NATA guidelines on exertional heat illness prevention may play a role in why many athletes continue suffering exertional heat illnesses during the hottest and most humid months. This perceived compliance of high school athletic trainers can be measured by surveying the high school athletic trainers themselves about their own prevention practices compared to those recommended by the NATA.

CHAPTER III

METHODS

Participants

Certified athletic trainers (*N* = 183) currently working at high schools were recruited to participate in this study. Each participant was certified by the Board of Certification for the Athletic Trainer and licensed by the state in which each participant works. Athletic trainers are health care professionals who provide emergency care, preventative services, clinical diagnoses, and therapeutic intervention and rehabilitation services in collaboration with physicians (NATA, 2014).

Participants read and electronically signed informed consent prior to the start of the survey (see Appendix A). Informed consent was presented at the beginning of the survey. Before continuing with the survey, participants selected the option that indicated they understood the purpose of the study, that participation was voluntary, their role in the study, any risks associated with completing the survey, and how they could contact the principal investigator should questions or concerns arise.

Instrumentation

The instrument used for this study was a survey (see Appendix B) distributed to certified athletic trainers working at high schools in the United States. The survey included three sections: demographics questions, "yes/no" questions, and percentage-based questions, which included one multiple select question with an option for an open-ended response in the percentage-based questions section. Guidelines were divided into separate components deriving the guideline. Survey questions were asked in two different formats to gain a better understanding of how much athletic trainers comply with certain guideline components rather than simply they do or do not comply. Survey questions, excluding those regarding participant demographics and three questions regarding general athletic training practices, were based off the prevention guidelines recommended by the NATA (Binkley et al., 2002).

Demographics questions were utilized to gather more specific information about the participant while maintaining anonymity. These questions included those pertaining to sex, age, years of certification, education level, and employment status. Employment status refers to the official title of the athletic trainer (ie. graduate assistant, clinic outreach, part-time game coverage, etc.). Questions pertaining more specifically to participants' responsibilties included the number of certified athletic trainers at the high school, the number of years working at the high school, how many students attend the high school, and which sports the participant is responsible for during the fall and spring seasons.

Each question pertaining to heat illness management corresponded with a heat illness prevention guideline from the NATA position statement, with some guidelines having more than one question addressing it. Three additional questions were included to assess general athletic training practices at participants' schools. Questions were posed to gather information about sports medical coverage and permission to treat heat-related illnesses, pre-participation physical examination requirements, athletic trainer coverage, and access to emergency care equipment. The survey also inquired about coach and athlete education on heat-related illness management, if sport activity is altered based on hot, humid environments, if local emergency personnel are notified of major events ahead of time, and about the responsibilities of the athletic trainer. Other questions pertained to diet, hydration, clothing and equipment, sleep patterns, and work to rest ratios during intense exercise in the heat.

Procedures

Prior to requesting permission from the Institutional Review Board (IRB), a pilot study was completed. Sixteen athletic trainer colleagues that graduated within the last two years were asked to participate in the pilot study, with only two responding and completing the preliminary questionnaire. They were asked to report how long the survey took to complete and if they had comments or concerns about any questions. Two statisticians, who are also certified athletic trainers, reviewed the survey as well. Lastly, one expert with a PhD in Exercise Science, who served as an athletic trainer when the heat illness crisis and Korey Stringer incident peaked, reviewed the survey. No data was collected from the pilot study. The final survey was modified based on the comments received from pilot study participants.

Permission was requested and granted from the IRB at Middle Tennessee State University (see Appendix C). Participants were recruited from the NATA database. The NATA Research Survey Service was utilized to randomly send out 1,000 emails to secondary school athletic trainers across the United States containing the link to an anonymous survey. As a student NATA member, this service was used at no additional cost.

The NATA required a completed application, which included a link to the survey and the body of the email that was generated, IRB approval, an informed consent form, a word document of the survey, and a description of the targeted survey participants. Two weeks after the initial email was sent, the NATA sent a second email with the same link to the survey to increase participation. Two hundred, twelve athletic trainers responded to the survey, however survey data of only 183 participants was analyzed due to participants' lack of response (*N* = 23) or not meeting participant criteria (*N* = 6).

Participants were asked to complete a questionnaire regarding their perceived compliance with components of 15 of the 18 NATA exertional heat illness prevention guidelines. The survey was completely anonymous and was completed in approximately 10-20 minutes. There were 44 total questions. Ten questions were with regard to the participants' demographics. Eighteen questions were in the form of "yes or no" questions. Fifteen questions required the participant to respond by typing a percentage from 0-100, 0% representing "never", 50% representing "half the time," and 100% representing "always," regarding how often they perform specific heat illness management tasks. One question in the percentage-based section was multiple choice with a free response option regarding why guidelines are not followed. The questionnaire was implemented through the online survey system SurveyMonkey. Prior to being directed to the screen of survey questions, participants were required to read and electronically sign informed consent. Participants had one month to complete the survey. After one month, the data from the survey was collected and analyzed to allow for conclusions about compliance with NATA exertional heat illness prevention guidelines.

Data Analysis

Data analyses were completed using Statistical Package for the Social Sciences. Frequency was calculated for participant characteristics and each of the 18 "yes/no" questions regarding components of the NATA guidelines and the three additional questions about general athletic training practices at participants' schools. Mean and standard deviation were calculated for descriptive characteristics of participants and each of the 16 percentage based questions regarding the NATA guidelines. These were used to determine how much compliance varied for each component of the 15 surveyed guidelines. How much the compliance of athletic trainers varied based on employment status and education was also assessed through comparison of mean and standard deviation of the 16 percentage based questions for each grouping of participants' education levels and job descriptions. One of the 16 percentage based questions was used to obtain additional information from participants about why they do not exhibit full compliance.

CHAPTER IV

RESULTS

Participants in this study varied in age, number of years as a certified athletic trainer, and number of years working at their respective high schools. They were similar in number of athletic trainers employed by their respective high schools as well as in the number of sports they are responsible for in the fall and the spring. Most participants were female, hold a Master's degree, and/or are employed as full-time athletic trainers at high schools. Descriptive and frequency characteristics of the participants are illustrated in Table 1 and Table 2 (Appendix D).

Eighteen NATA heat illness prevention guideline components were presented in the form of a "yes/ no" question. When asked to select "yes" or "no" in response to statements pertaining to individual guidelines, all but two participants responded "no" to at least one question. A frequency table was used to determine the percentage (%) of participants who follow or do not follow specific guideline components. Guideline component compliance ranged from a maximum of 99.5% of participants authorized to examine athletes demonstrating signs of heat illness and having fluids readily available at all times to a minimum of 8.8% of participants having a rectal thermometer available on the field, in the locker room, and in various other locations. Table 3 (Appendix D) demonstrates the percentage of participants complying with this set of guideline components.

Both participants who responded "yes" to every question responded as following the remainder of the guideline components less than 100% of the time. No participants responded as following every guideline. Mean (*M)* and standard deviation (*SD*) were calculated for questions asking for participants to indicate the percent of time they follow specific guideline components. Participants' responses varied greatly as demonstrated by large standard deviations for each guideline component.

There was little variance in means between participants of different education levels (Table 4, Appendix D). The greatest differences were in minimizing warm-up time or conducting the warm-up in the shade when possible [75.47 (± 34.38) compared with 61.49 (± 38.02)] and in utilizing specific work to rest ratios during intense exercise [62.64 (± 43.67) compared with 54.61 (± 39.49)]. Participants with Bachelor's degrees responded as complying more often than participants with Master's degrees for minimizing warm-up time and conducting the warm-up in the shade as well as for utilizing work to rest ratios.

Greater variance was demonstrated between participants with different job titles (Table 5, Appendix D). Participants in the "Other" category responded as complying the most, though data cannot be described as significant as $N = 2$. The greatest difference was in "ensuring that athletes are consuming approximately 1-1.25 L of fluids per kilogram of body water lost." Part-time athletic trainers reported the most compliance [65.33 (± 44.22)] and outreach athletic trainers with additional clinic responsibilities reported the least compliance [39.05 (± 38.17)]. The most overall compliance was with "ensuring that a telephone or two-way radio to communicate with medical personnel and summon emergency medical transportation is available." Part-time athletic trainers reported the most compliance [100.00 (± 0.00)] and athletic trainers with teaching responsibilities reported the least [90.86 (± 28.43)].

Thirty questions were taken directly from components of 15 out of 18 NATA heat illness prevention guidelines. The percentages of overall athletic trainer compliance and the average percentage of guideline component compliance are organized into the guidelines from which they were originally derived (Table 6, Appendix D). These demonstrate that although compliance with some components of the guidelines may be high, other components of the same guideline may be low. Therefore, guideline compliance may be lower than it appears due to individual components having lower compliance.

Three additional questions were asked regarding high school athletic trainers that were not based on the NATA heat illness prevention guidelines. These were used to assess athletic trainer sports coverage, responsibilities for making decisions regarding severe environmental conditions, and equal access to emergency equipment across all sports (Table 7, Appendix D). There are minimal differences in participant demographics or between means of participant responses per guideline question. There is significant variance from the mean of participant responses for most guideline questions. Analysis of percentages and means of the data demonstrate lack of compliance with NATA heat illness prevention guidelines.

CHAPTER V

DISCUSSION

Research clearly indicates heat-related illnesses are preventable; however, they continue to occur each year. Before 2002, heat illness affected 1.2/100,000 total individuals per year, with 47.6% (.57/100,000 total) of those individuals 19 years of age or younger and 75.5% of incidences related to sport and exercise; which led to the development of the NATA position statement on exertional heat illnesses to reduce the number of occurrences each year (Binkley et al., 2002; Nelson, Collins, Comstock, & McKenzie, 2011). According to Casa, heat-related illnesses should be 100% preventable and the NATA guidelines maintain that if followed, they should drastically reduce the number of heat-related illnesses that occur in sport each year (Binkley et al.; FRONTLINE, 2011). Despite the implications of the NATA heat illness prevention guidelines in 2002, heat illness has continued to occur at a rate of 2.5/100,000 total individuals per year in 2006, a 133.5% increase from 1997. Although the incident rates in 2010 decreased to 1.34/100,000 total individuals per year, with .48/100,000 individuals 19 years of age or younger, that rate still indicates that individuals are continuing to suffer from a completely preventable illness (FRONTLINE; Wu, Brady, Rosenberg, & Li, 2014). These occurrences lead to questions regarding whether these incidences are due to the lack of guideline compliance or to faulty guidelines. Thus, the purpose of this study was to determine how closely high school athletic trainers perceive they follow the NATA guidelines.

The NATA position statement on exertional heat illness provides 18 prevention guidelines. One hundred and eighty-three athletic trainers completed the NATA heat illness prevention guidelines compliance survey. The survey consists of 34 questions, 31 based on 15 of the 18 NATA heat illness prevention guidelines and three based on experience as an athletic trainer, to determine athletic trainer compliance with each individual component within the 15 guidelines. Questionnaire items consisted of 10 demographic questions, 18 yes/no questions, and 16 percentage questions. The results of the present investigation indicate athletic trainers do not fully follow the standards for heat illness management recommended in the NATA position statement: exertional heat illnesses. Interestingly, though all participants followed various combinations of the NATA guidelines, none followed 100% of the NATA heat illness prevention guidelines. This could be a major factor in the reason heat illnesses still occur today. One cannot determine if more heat related illnesses could be prevented by utilizing the NATA guidelines if athletic trainers are not fully following and complying with all components of the guidelines. The data will be discussed by frequency of participant compliance and frequency of guideline component compliance.

Approximately one quarter of participants (26.9%) notify local hospitals and emergency personnel before mass events in the heat and humidity. When the heat index reaches “high” or “extreme” levels, the chances of heat illness drastically increase in both athletes and spectators (Binkley et al., 2002; Cooper et al., 2006). Notifying emergency response teams and hospital emergency rooms of large events being conducted in these environmental conditions can assist with rapid and effective treatment by allowing those units to be more prepared ahead of time.

Of 183 participants, only 8.8% have a rectal thermometer readily available. This percentage is extremely low for compliance with a guideline component designed to help prevent heat illness. Compliance with the remaining components of this guideline included athletic trainer compliance of 85.2%, 88.0%, and 53.6% and an average of 96.02% guideline component compliance. Though the remainder of this guideline is followed the majority of the time, this one component is not. Most high school athletic trainers do not have a rectal thermometer because they are unwilling to take a rectal temperature of a minor, especially if the minor is of the opposite sex. Many high school athletic trainers also claim that a rectal temperature would not change their course of treatment. This leads to the argument as to whether having a rectal thermometer readily available is critical for decreasing the incidence of heat illness.

Traditionally rectal temperature has been the gold standard for achieving an accurate core temperature (Canadian Paediatric Society, 2000). In some instances, this may still be true. In others, a combination of factors may be present that can alter the rectal temperature reading (Canadian Paediatric Society). According to the Canadian Paediatric Society and Drs. Sund-Levander and Grodzinsky (2010), rectal thermometers should not be used on individuals above the age of five or those participating in exercise due to how slowly the rectal temperature changes compared to other sites, such as internal organs, during periods of rapid temperature change. This results in a strong debate as to the importance of rectal thermometer use being promoted by the NATA as a gold standard for assessing core temperature when heat illness is suspected. The majority of participants responded as not having a rectal thermometer, which is considered a lack of guideline compliance, but without further research it is not possible to know if rectal thermometers have a significant role in decreasing heat illness.

Lastly, though not a component of an NATA guideline but just as interesting, less than half of participants (49.2%) responded athletic trainer coverage is equal across all sports. Without equal coverage, athletic trainers are more likely to identify an athlete suffering from heat illness on the field they are covering than they are to identify an athlete on another field. This imbalance could result in unequal treatment and insufficient intervention for managing the athlete's condition.

Next, the study examined 16 survey questions to determine the frequency with which participants abide by specific portions of the NATA guidelines. Responses varied greatly from 0-100%. All but three of the examined guidelines were followed in their entirety, on average, at least 70% of the time. Guidelines, including their individual components, followed less than 70% of the time were: warm-up time and location in extreme environments; utilization of a work to rest ratio during intense exercise; and weigh-ins and water consumption. Warm-up time in extreme environments was minimized or conducted in shade 65.99% of the time, a work to rest ratio was utilized during intense exercise 57.06% of the time, and participants ensured athletes consumed 1-1.25 L/ kg body water lost 51.19% of the time while performing weigh-ins of high-risk athletes 41.31% of the time. A lack in compliance of any of these three guidelines can increase an athlete's risk of developing a heat illness (Binkley et al, 2002; Casa, 1999; Coris et al, 2004).

In extreme heat and humidity, an adequate warm-up remains essential for allowing the athlete to adjust to the environment. However, too lengthy or strenuous of a warm-up in these conditions can result in sweat loss and an increase in the athlete's core temperature, causing them to become more prone to exertional heat illness before the practice or event begins (Maughan & Shirreffs, 2011). Conducting warm-ups in a shaded area can relieve the athlete of direct sunlight, providing the athlete with the opportunity for achieving the same physiological adaptations necessary to safely begin exercise without the increased predisposition to heat illness (Maughan et al., 2011). If a field does not offer enough shade to accommodate an entire team, an alternate form of warm-up should be conducted based on the heat index. The NATA only mentions these modifications should be made, but does not offer recommendations for how an athletic trainer should determine proper warm-up adjustments. If athletic trainers and athletic teams are not following this guideline, they are placing their athletes at an increased risk of a dangerous illness that could be avoided, so the position statement should include a section on modifying warm-ups when no shade is present.

Utilizing a work to rest ratio during practices allows athletes the opportunity to reduce their core temperature by decreasing their heart and sweat rates and resting in a shaded area (OSHA, n.d.). During exercise in extreme conditions, athletes are at greater risk for developing heat illness due to how rapidly their core temperatures increase (Coris et al., 2004). By incorporating sufficient amounts of rest time into practices, athletes can perform at a higher ability longer into practice because core temperatures will not remain as high as pushing straight through a full practice. Rest periods also give athletes an opportunity to consume necessary fluids they may not otherwise be drinking during the work periods of practice. Not following this guideline can create a dangerous situation for athletes with increasing body temperatures and not enough rest time to allow those temperatures to decrease or remain at a safe level.

Athletes are not always aware of the importance of hydration or how much water they need to consume to stay hydrated. Dehydration can negatively affect an athlete's thermoregulatory system, rapidly increasing the athlete's risk of exertional heat illness (Coris et al., 2004). Every 1% decrease in body weight due to water loss results in physiological impairment, which if untreated, can result in a core temperature increase of 1°C every five minutes (Coris et al.). Based on this rate of rising temperature, onset of heat illness can occur within the first half hour of exercise, especially if the athlete begins in less than a euhydrated state (Coris et al.) To minimize this, pre- and post practice weigh-ins can be used to monitor fluctuations in body weight to determine how much water needs to be consumed prior to the start of the next practice (Casa, 1999; Coris et al.). Having these measurements can allow athletic trainers to hold an athlete from activity who does not replenish enough lost water between practices, as measured by a weight comparison from the previous practice weigh-ins. When athletic trainers do not encourage proper fluid consumption or have an objective way to determine the safety of a high-risk athlete participating in exercise, athletes have a greater chance of starting practice predisposed to exertional heat illness due to dehydration.

All three of these guidelines are to be completed before the athlete develops symptoms of heat illness. This means they are solely designed to prevent heat illness, which should be the goal of any high school athletic trainer during hot, humid seasons. They require minimal supplies and funding to complete and athletic trainers can recruit coaches to assist in ensuring they are all met due to the simplicity of the guidelines. At most, they require the athletic trainer's time, which is often minimal at high schools. Participants responded as not complying with these guidelines due to a lack of extreme temperature variation throughout the year, inability to ensure adequate hydration of all athletes, lack of a scale, and lack of time for one athletic trainer to individually address hundreds of athletes. If high school athletic trainers had the extra assistance they needed to comply with these guidelines and put in the extra time and effort before athletes began to show signs and symptoms of exertional heat illness, fewer athletes would develop those symptoms or suffer from exertional heat illness.

The results indicate that athletic trainers do not follow the standards for heat illness management recommended in the NATA position statement: exertional heat illnesses. Demographics such as job title and highest completed level of education of the participants did not have a significant effect on compliance with guideline components. This indicates that lack of compliance can be generalized for all high school athletic trainers as the two demographics, job title and level of education, that should most set an athletic trainer's skill set and experience apart from another's do not indicate a difference in compliance.

Information obtained from an open-ended question regarding why participants do not follow 100% of the surveyed guidelines suggest that some athletic trainers believe components of the guidelines are outdated or impractical. Although all survey questions are directly related to the guidelines set forth by the NATA, one participant recommended changing the guideline regarding following the Food Guide Pyramid, as it is no longer used because MyPlate is the current standard for promoting a balanced diet. Another participant noted, "the guidelines are great if you live in a bubble" and suggested the U.S. Army TRADOC is more practical for determining temperature guidelines and modifications in higher temperature environments than the use of a WBGT risk chart. Lastly a third participant commented that no incidents of heat illness were experienced during the past fall season even though “acclimatization was impossible” due to preseason temperatures remaining in the 60-70°F range. The same participant also noted that a rectal temperature would not change his or her course of action in treating an athlete and that heat index information is gathered from a local NOAA station rather than a WBGT.

Guideline compliance may be influenced by individual preference and personality. Many athletic trainers use different mobile apps or online systems to determine heat index rather than using a sling psychrometer and WBGT chart. This heavy reliance on technology can have an effect on the incidence of heat illness because the heat index tracker systems may not necessarily be within a practical range of the activity, rendering that reading useless. Practices and events cannot be efficiently modified without necessary information about the current heat index, which could result in insufficient adjustments leading to heat illness. Athletic trainer personality can also hinder compliance with heat illness prevention guidelines if they cannot defend their stance on why certain aspects of practices and events should be changed based on heat and humidity. An athletic trainer who backs down the first time a coach, athletic director, or school administrator does not agree with making necessary changes based on the NATA guidelines, the risk of an athlete developing a heat illness will increase as full guideline compliance is impossible.

Future studies can be done to assess the significance of these guidelines. One study should compare compliance with heat illness prevention guidelines to the number of heat illnesses suffered by athletes. This can assist in determining if the lack of compliance with certain guidelines does or does not have a role in the occurrence of heat-related illnesses. A second study should analyze the effectiveness of each individual guideline in preventing heat-related illness. Lastly, a third study should assess guideline compliance and athletic trainer recommendations for guideline changes based on geographical location. In summary, other studies need to be done to reevaluate these guidelines as the gold standard for athletic trainers and healthcare providers to follow when managing heat-related illnesses.

Practical Applications

Based on the data collected from this study, arguably the best way to increase guideline compliance is to increase the athletic training staff, especially at larger high schools. It is impossible for one person to be at two or three practices or games at one time, which puts too much responsibility on coaches to identify an athlete developing heat illness while the athletic trainer is on a different field. Having additional athletic trainers can allow for more individualized attention to be given to higher-risk athletes in the form of completing pre- and post-practice weigh-ins to ensure that athletes are consuming enough water between practices so they do not begin exercise in a dehydrated state, which would predispose those athletes to heat illness. It could also allow for daily responsibilities to be divided between multiple athletic trainers, which can include time for an athletic trainer to work with the school administration to change different aspects about outdoor athletics that do not meet the NATA heat illness prevention standards.

Individual guideline compliance can be improved through increased funding, supplies, and education. Larger budgets would allow for athletic trainers to purchase the necessary supplies for heat illness prevention and management strategies. These supplies may include items such as a scale for pre- and post-practice weigh-ins, coolers for ice and water, and towels to submerge in ice water to use for rapid cooling. Coaches and school administrators should also be educated on what heat illness is, what can happen if it is left untreated, and the importance of following the NATA guidelines to prevent the occurrence of future heat-related illnesses. Education can assist athletic trainers in getting stubborn coaches and administration to understand that the safety of the athletes can be improved by making the necessary changes to the high schools' heat illness prevention and management strategies. Often times the school administration also needs this education to ensure athletic trainers have keys and easy access to available supplies such as ice and coolers. It is critical that NATA heat illness prevention guideline compliance is improved, which starts with having the necessary tools to provide optimal care for the student-athletes.

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APPENDICES

APPENDIX A

Informed Consent Form

Informed Consent
Middle Tennessee State University

Project Title: Perceived Compliance of High School Athletic Trainers with NATA Heat Illness Prevention Guidelines

Purpose of Project: The purpose of this study is to determine the extent to which athletic trainers perceive that they follow the guidelines for heat illness prevention recommended by the NATA and determine if demographics of athletic trainers have an influence on compliance.

Procedures: You are being asked to complete an anonymous survey. This questionnaire regards your perceived compliance with NATA exertional heat illness prevention guidelines. Questions involve selecting the option that corresponds to your answer, typing numbers, and a short free response question. The survey will take approximately 10-20 minutes. There are 44 total questions. All questions you will be asked to answer, except demographics questions, will be directly related to the heat illness prevention guidelines set forth by the NATA.

Risks/ Benefits: There are no risks associated with particpating in this study. Benefits will include obtaining information about your own perceived compliance and the findings from this study.

Confidentiality: The survey will be implemented through an online survey system (survey monkey) and no questions that would expose identity will be asked.

Principal Investigator/ Contact Information: Kristin Donald, Primary phone: (908) 675-6452, Email: kmd5d@mtmail.mtsu.edu

Participating in this project is voluntary, and refusal to participate or withdrawing from participation at any time during the project will involve no penalty or loss of benefits to which you might otherwise be entitled. All efforts, within reason, will be made to keep the personal information in your research record private but total privacy cannot be promised, for example, your information may be shared with the Middle Tennessee State University Institutional Review Board. In the event of questions or difficulties of any kind during or following participation, you may contact the Principal Investigator as indicated above. For additional information about giving consent or your rights as a participant in this study, please feel free to contact the MTSU Office of Compliance at (615) 494-8918.

Consent

I have read the above information and my questions have been answered satisfactorily by project staff. I believe I understand the purpose, benefits, and risks of the study and give my informed and free consent to be a participant.

____ ________________________

SIGNATURE DATE

APPENDIX B

NATA Heat Illness Prevention Guidelines Compliance Survey

Code #: ________________

NATA Heat Illness Prevention Guidelines Compliance Survey

Please answer the following demographics questions:

Please indicate your sex:
_____ Male
_____ Female

How old are you?
____

How many years have you been a certified athletic trainer for?
____

What is your highest completed level of education?
_____ Bachelor's
_____ Master's
_____ Doctorate

Approximately how many students attend the high school at which you work?
____

How many certified athletic trainers are employed by the high school at which you work?
____

What is your job title/ employment status?
_____ Graduate Assistant high school athletic trainer
_____ Full-time high school athletic trainer
_____ Part-time high school athletic trainer
_____ High school athletic trainer with teaching responsibilities
_____ Outreach athletic trainer with clinic responsibilities
_____ Outreach athletic trainer for game coverage only
_____ Other (please specify): ____________________

How many years have you worked at this high school?
____

Select all sports that you are responsible for covering during the Fall (choose all that apply)

_____ Football
_____ Women's Soccer
_____ Men's Soccer
_____ Volleyball
_____ Women's Basketball
_____ Cross Country
_____ Field Hockey
_____ Women's Lacrosse
_____ Men's Lacrosse
_____ Women's Swim & Dive
_____ Other: _______________

_____ Baseball
_____ Softball
_____ Women's Tennis
_____ Men's Tennis
_____ Men's Basketball
_____ Track & Field
_____ Women's Crew
_____ Men's Crew
_____ Wrestling
_____ Men's Swim & Dive

Select all sports that you are responsible for covering during the Spring (choose all that apply)

_____ Football
_____ Women's Soccer
_____ Men's Soccer
_____ Volleyball
_____ Women's Basketball
_____ Cross Country
_____ Field Hockey
_____ Women's Lacrosse
_____ Men's Lacrosse
_____ Women's Swim & Dive
_____ Gymnastics
_____ Other: _______________

_____ Baseball
_____ Softball
_____ Women's Tennis
_____ Men's Tennis
_____ Men's Basketball
_____ Track & Field
_____ Women's Crew
_____ Men's Crew
_____ Wrestling
_____ Men's Swim & Dive
_____ Cheer

Please answer the following set of questions by selecting "yes" or "no"

Athletic trainers and/or other health care providers attending practices and events are authorized to examine any athlete displaying signs or symptoms of heat illness.

_____ Yes _____ No

Athletic trainers and/or other health care providers attending practices and events are authorized to restrict an athlete from participating if heat illness is suspected.

_____ Yes _____ No

A thorough, physician-supervised, pre-participation medical screening is conducted before the season starts to identify athletes predisposed to heat illness on the basis of risk factors and those who have a history of exertional heat illness.

_____ Yes _____ No

Coaches have been educated on the prevention, recognition, and treatment of heat illnesses and the risks associated with exercising in hot, humid environmental conditions.

_____ Yes _____ No

Athletes are educated to balance fluid intake with sweat and urine losses to maintain adequate hydration.

_____ Yes _____ No

Event and practice guidelines have been developed for hot, humid weather based on the wet-bulb globe temperature, the number of participants, the nature of the activity, and other predisposing risk factors.

_____ Yes _____ No

All teams have equal access to the same emergency care equipment (ie. ice towels on all fields during practice and competition, etc.).

_____ Yes _____ No

The local hospital and emergency personnel are notified before mass participation events to inform them of the event and the increased possibility of heat-related illnesses subsequent to the event.

_____ Yes _____ No

Athletic trainer coverage time is distributed equally between all outdoor sports.

_____ Yes _____ No

The athletic trainer is responsible for calling practice if environmental conditions are too severe.

_____ Yes _____ No

Appropriate medical care is available and rescue personnel are familiar with exertional heat illness prevention, recognition, and treatment.

_____ Yes _____ No

Athletes gradually adapt (acclimatize) to exercise in heat over 10 to 14 days at my facility.

_____ Yes _____ No

Athletes have been educated on the prevention, recognition, and treatment of heat illnesses and the risks associated with exercising in hot, humid environmental conditions.

_____ Yes _____ No

Fluids are readily available at all times.

_____ Yes _____ No

A supply of cool water and/or sports drinks to meet the participants' needs is available on the field and in the locker room.

_____ Yes _____ No

Ice for active cooling (ice bags, cold tub) and for keeping beverages cool during exercise is available on the field and at various other locations.

_____ Yes _____ No

A rectal thermometer to assess body-core temperature is available on the field, in the locker room, and at various other locations.

_____ Yes _____ No

A tub, wading pool, kiddie pool, or whirlpool to cool the trunk and extremities for immersion cooling therapy is available on the field and in other various locations.

_____ Yes _____ No

What percentage of the time do you perform the following when the situation presents itself (0% indicating never, 50% indicating half the time, and 100% indicating always)? (For example, in response to “Wash hands after using the restroom.”: _100_%)

Instruct athletes to drink sodium-containing fluids to keep their urine clear to light yellow to improve hydration and to replace fluids between practices on the same day.
__________%

Instruct athletes to drink sodium-containing fluids to keep their urine clear to light yellow to improve hydration and to replace fluids between practices on successive days.
__________%

Encourage athletes to sleep at least 6 to 8 hours at night in a cool environment.
__________%

Encourage athletes to eat a well-balanced diet that follows the Food Guide Pyramid and United States Dietary Guidelines.
__________%

Check heat and humidity before and during activity and adjust practice schedules accordingly.
__________%

Utilize a work to rest ratio during intense exercise – 1:1 in very high-risk environmental conditions, 2:1 in high-risk conditions, 3:1 in moderate risk conditions, and 4:1 in low environmental risk conditions.
__________%

Weigh-in high-risk athletes (or all athletes in high-risk conditions) before and after practices to estimate the amount of body water lost during practice and to ensure a return to pre-practice weight before the next practice.
__________%

Ensure that athletes consume approximately 1–1.25 L (30-34 oz) of fluids per each kilogram of body water lost during exercise.
__________%

Ensure that athletes exercising in heat are wearing loose-fitting, absorbent, and light-colored clothing when feasible.
__________%

Minimize warm-up time when feasible, and conduct warm-up sessions in the shade when possible to minimize the radiant heat load in “high” or “very high” or “extreme or hazardous” conditions.
__________%

Ensure that a telephone or 2-way radio to communicate with medical personnel and to summon emergency medical transportation is available on the field, in the locker room, and at various other stations.
__________%

Ensure that athletes maintain proper hydration during the heat-acclimatization process.
__________%

Provide an adequate supply of proper fluids (water or sports drinks) to maintain hydration.
__________%

Ensure the amount of clothing and equipment worn by athletes is altered based on heat and humidity conditions.
__________%

Emergency supplies and equipment are easily accessible and in good working condition.
__________%

If you did not answer “100%” to all of the above questions, what are your reasons for not following all guidelines? (Please select all that apply)
_____ Lack of funding
_____ Lack of supplies
_____ Unwillingness to perform specific tasks
_____ Are not authorized to perform specific tasks
_____ Unaware of certain guidelines
_____ Other (please specify): ____

APPENDIX C

University Institutional Review Board Approval

MIDDLE TENNESSEE STATE UNIVERSITY

10/22/2014

Investigator(s): Kristin Donald, Dr. Joey Gray
Department: Health and Human Performance
Investigator(s) Email Address: kmd5d@mtmail.mtsu.edu; joey.gray@mtsu.edu

Protocol Title: High school football compliance of NATA exertional heat illness prevention guidelines

Protocol Number: #15-096

Dear Investigator(s),

Your study has been designated to be exempt. After receiving the permission letter from NATA, the exemption will be pursuant to 45 CFR 46.101(b)(2) Educational Tests, Surveys, Interviews, or Observations. ***You must obtain and submit permission from NATA before beginning your project.***

We will contact you annually on the status of your project. If it is completed, we will close it out of our system. You do not need to complete a progress report and you will not need to complete a final report. It is important to note that your study is approved for the life of the project and does not have an expiration date.

The following changes must be reported to the Office of Compliance before they are initiated:

- Adding new subject population
- Adding a new investigator
- Adding new procedures (e.g., new survey; new questions to your survey)
- A change in funding source
- Any change that makes the study no longer eligible for exemption.

The following changes do not need to be reported to the Office of Compliance:

- Editorial or administrative revisions to the consent or other study documents
- Increasing or decreasing the number of subjects from your proposed population

If you encounter any serious unanticipated problems to participants, or if you have any questions as you conduct your research, please do not hesitate to contact us.

Sincerely,

Lauren K. Qualls, Graduate Assistant
Office of Compliance
615-494-8918

APPENDIX D

Tables

Table 1

Descriptive Characteristics of Participants (N = 183)

Variable	*M* (± *SD*)
Age (years)	37.99 (± 11.83)
Years certified	14.14 (± 10.42)
High school size (# of students)	1337.19 (± 804.63)
ATs employed at high school	1.41 (± 0.654)
Total years at high school	9.74 (± 10.04)
Fall responsibilities (# of teams)	5.87 (± 2.56)
Spring responsibilities (# of teams)	6.09 (± 2.56)

Note. *M* = mean; *SD* = standard deviation; Total years at high school, *N = 182*; # = number; AT = athletic trainer

Table 2

Frequency Characteristics of Participants (N = 183)

Variable	Frequency
Sex	
Male	79
Female	104
Education	
Bachelor's	64
Master's	118
Job title	
Full-time AT	97
Part-time AT	18
AT with teaching responsibilities	40
Outreach AT with clinic responsibilities	23
Outreach AT game coverage only	1
Other	3

Note. Education and job title, *N = 182*; AT = athletic trainer

Table 3

Percentage of Athletic Trainers Complying with Components of NATA Heat Illness Guidelines

Variable	% of AT compliance
ATs are authorized to examine athletes showing signs of heat illness	99.5%
ATs are authorized to restrict athletes when heat illness is suspected	98.9%
A thorough, physician-supervised, pre-participation screening is completed prior to the start of the season	78.1%
Coaches are educated on prevention, recognition, and treatment of heat illness and risks associated with exercise in heat/ humidity	92.3%
Athletes are educated to balance fluid intake with sweat and urine losses for hydration	89.6%
Event/ practice guidelines are developed for hot, humid weather based on WBGT, participants, activity, and risk factors	80.4%
Local hospital and emergency personnel are informed before mass events about increased possibilities of heat-related illness	26.9%
AT coverage time is equally distributed between all outdoor sports	49.2%
AT is responsible for calling practice if environmental conditions are too severe	78.0%
Rescue personnel are familiar with exertional heat illness prevention, recognition, and treatment	97.8%

Table 3 cont.

Percentage of Athletic Trainers Complying with Components of NATA Heat Illness Guidelines

Variable	% of AT compliance
Athletes gradually acclimatize to exercise in heat over 10 to 14 days	79.6%
Athletes are educated on prevention, recognition, and treatment of heat illness and risks associated with exercise in heat/ humidity	79.2%
Fluids are readily available at all times	99.5%
Cool water or sports drinks are available on the field and in the locker room	85.2%
Ice for active cooling and keeping beverages cool is available on the field and other locations	88.0%
A rectal thermometer is available on field, in locker room, and various other locations	8.8%
A tub to cool the trunk and extremities for Immersion cooling therapy is available on the field and in various other locations	53.6%

Note. % = percent; AT = athletic trainer

Table 4

Guideline Component Compliance Based on Education Level

Variable	Bachelor's *M* (± *SD*)	Master's *M* (± *SD*)
Instruct athletes to drink sodium-containing fluids and replace fluids between practices on the same day	80.75 (± 30.47)	83.71 (± 28.60)
Instruct athletes to drink sodium-containing fluids and replace fluids between practices on successive days	81.04 (± 26.86)	81.24 (± 28.82)
Encourage athletes to sleep at least 6-8 hours at night in a cool environment	74.06 (± 35.92)	70.24 (± 34.34)
Encourage athletes to eat a well-balanced diet following the Food Guide Pyramid	84.53 (± 27.81)	83.94 (± 22.01)
Check heat and humidity before and during activity and adjust practice schedules accordingly	82.92 (± 31.72)	82.65 (± 32.70)
Utilize a work to rest ratio during intense exercise	62.64 (± 43.67)	54.61 (± 39.49)
Weigh-in high risk athletes before and after practices to estimate body water lost during practice to ensure return to pre-practice weight	40.96 (± 46.53)	41.09 (± 43.45)
Ensure athletes consume 1-1.25 L of fluids per kilogram of body water lost during exercise	50.94 (± 43.01)	51.30 (± 40.99)

Table 4 cont.

Guideline Component Compliance Based on Education Level

Variable	Bachelor's *M* (± *SD*)	Master's *M* (± *SD*)
Ensure athletes exercising in heat are wearing loose-fitting, absorbent, and light-colored clothing	78.77 (± 35.67)	75.29 (± 31.89)
Minimize warm-up time and warm-up in the shade during "high" or "very high/ hazardous" conditions	75.47 (± 34.38)	61.49 (± 38.02)
Ensure a phone or 2-way radio to communicate with medical personnel is available	99.15 (± 4.36)	94.48 (± 20.62)
Ensure athletes maintain proper hydration during acclimatization	91.42 (± 23.46)	90.10 (± 21.56)
Provide adequate supply of proper fluids to maintain hydration	95.28 (± 14.76)	94.28 (± 19.38)
Ensure amount of clothing and equipment worn by athlete is altered based on heat/ humidity conditions	85.66 (± 30.30)	80.97 (± 81.63)
Emergency supplies and equipment are easily accessible and in good working condition	97.64 (± 12.27)	95.48 (± 15.68)

Note. *M* = mean; *SD* = standard deviation

Table 5

Guideline Component Compliance Based on Athletic Trainer Job Title/ Description

Variable	Full-time *M* (± *SD*)	Part-time *M* (± *SD*)	AT/ Teacher *M* (± *SD*)	Clinic outreach *M* (± *SD*)	Other *M* (± *SD*)
Instruct athletes to drink sodium-containing fluids and replace fluids between practices on the same day	80.60 (± 31.59)	90.94 (± 25.44)	85.14 (± 25.71)	80.71 (± 28.47)	100.00 (± 0.00)
Instruct athletes to drink sodium-containing fluids and replace fluids between practices on successive days	79.40(± 28.72)	85.63(± 28.51)	87.86 (± 22.73)	75.71 (± 32.76)	75.00 (± 35.36)
Encourage athletes to sleep at least 6-8 hours at night in a cool environment	71.69 (±33.93)	71.88 (± 40.70)	68.57 (± 36.05)	75.00 (± 33.54)	62.50 (± 53.03)
Encourage athletes to eat a well-balanced diet following the Food Guide Pyramid	81.75 (± 26.78)	87.50 (± 22.36)	87.11 (± 18.84)	87.38 (± 18.75)	62.50 (± 53.03)

Table 5 cont.

Guideline Component Compliance Based on Athletic Trainer Job Title/ Description

Variable	Full-time *M* (± *SD*)	Part-time *M* (± *SD*)	AT/ Teacher *M* (± *SD*)	Clinic outreach *M* (± *SD*)	Other *M* (± *SD*)
Check heat and humidity before and during activity and adjust practice schedules accordingly	85.54 (± 30.17)	75.00 (± 40.83)	79.66 (± 34.03)	82.62 (± 32.31)	100.00 (± 0.00)
Utilize a work to rest ratio during intense exercise	57.26 (± 41.66)	55.00 (± 40.31)	53.43 (± 42.75)	59.76 (± 37.93)	100.00 (± 0.00)
Weigh-in high risk athletes before and after practices to estimate body water lost during practice to ensure return to pre-practice weight	43.58 (± 44.70)	39.06 (±43.75)	47.09 (± 45.21)	23.81 (± 39.90)	50.00 (± 70.71)
Ensure athletes consume 1-1.25 L of fluids per kilogram of body water lost during exercise	54.16 (± 42.52)	65.33 (± 44.22)	44.71 (± 40.22)	39.05 (± 38.17)	62.50 (± 53.03)

Table 5 cont.

Guideline Component Compliance Based on Athletic Trainer Job Title/ Description

Variable	Full-time *M* (± *SD*)	Part-time *M* (± *SD*)	AT/ Teacher *M* (± *SD*)	Clinic outreach *M* (± *SD*)	Other *M* (± *SD*)
Ensure athletes exercising in heat are wearing loose-fitting, absorbent, and light-colored clothing	80.06 (± 29.38)	68.33 (± 44.79)	75.00 (± 35.27)	71.90 (± 32.15)	100.00 (± 0.00)
Minimize warm-up time and warm-up in the shade during "high" or "very high/ hazardous" conditions	64.58 (± 37.22)	68.75 (± 40.31)	62.29 (± 38.51)	72.75 (± 35.30)	100.00 (± 0.00)
Ensure a phone or 2-way radio to communicate with medical personnel is available	96.45 (± 14.35)	100.00 (± 0.00)	90.86 (± 28.43)	99.52 (± 2.18)	100.00 (± 0.00)
Ensure athletes maintain proper hydration during acclimatization	89.94 (± 23.42)	85.94 (±31.58)	93.38 (± 15.26)	90.48 (± 20.12)	100.00 (± 0.00)

Table 5 cont.

Guideline Component Compliance Based on Athletic Trainer Job Title/ Description

Variable	Full-time *M* (± *SD*)	Part-time *M* (± *SD*)	AT/ Teacher *M* (± *SD*)	Clinic outreach *M* (± *SD*)	Other *M* (± *SD*)
Provide adequate supply of proper fluids to maintain hydration	95.24 (± 18.03)	96.88 (± 12.50)	92.79 (± 20.79)	92.62 (± 17.86)	100.00 (± 0.00)
Ensure amount of clothing and equipment worn by athlete is altered based on heat/ humidity conditions	83.49 (± 29.18)	76.67 (± 37.16)	81.91 (± 35.33)	81.67 (± 30.55)	100.00 (± 0.00)
Emergency supplies and equipment are easily accessible and in good working condition	95.36 (± 16.17)	100.00 (± 0.00)	99.26 (± 4.29)	91.19 (± 22.47)	100.00 (± 0.00)

Note. *M* = mean; *SD* = standard deviation; AT = athletic trainer; Other refers to 2 athletic trainers who are also an athletic director and an assistant athletic director

Table 6

Overall Guideline Compliance Based on Guideline Components

Variable	% AT compliance	Average % guideline component compliance
Guideline 1		
Athletic trainers and/or other health care providers attending practices and events are authorized to examine any athlete displaying signs or symptoms of heat illness	99.5	
Athletic trainers and/or other health care providers attending practices and events are authorized to restrict an athlete from participating if heat illness is suspected	98.9	
Appropriate medical care is available and rescue personnel are familiar with exertional heat illness prevention, recognition, and treatment	97.8	
Guideline 2		
A thorough, physician-supervised, pre-participation medical screening is conducted before the season starts to identify athletes predisposed to heat illness on the basis of risk factors and those who have a history of exertional heat illness	78.1	

Table 6 cont.

Overall Guideline Compliance Based on Guideline Components

Variable	% AT compliance	Average % guideline component compliance
Guideline 3		
Athletes gradually adapt (acclimatize) to exercise in heat over 10 to 14 days at my facility	79.6	
Ensure that athletes maintain proper hydration during the heat-acclimatization process		90.48
Guideline 4		
Coaches have been educated on the prevention, recognition, and treatment of heat illnesses and the risks associated with exercising in hot, humid environmental conditions	92.3	
Athletes have been educated on the prevention, recognition, and treatment of heat illnesses and the risks associated with exercising in hot, humid environmental conditions	79.2	
Guideline 5		
Athletes are educated to balance fluid intake with sweat and urine losses to maintain adequate hydration	89.6	

Table 6 cont.

Overall Guideline Compliance Based on Guideline Components

Variable	% AT compliance	Average % guideline component compliance
Instruct athletes to drink sodium-containing fluids to keep their urine clear to light yellow to improve hydration and to replace fluids between practices on the same day		82.93
Instruct athletes to drink sodium-containing fluids to keep their urine clear to light yellow to improve hydration and to replace fluids between practices on successive days		81.37
Guideline 6		
Encourage athletes to sleep at least 6 to 8 hours at night in a cool environment		71.34
Encourage athletes to eat a well-balanced diet that follows the Food Guide Pyramid and United States Dietary Guidelines		84.04
Guideline 7		
Event and practice guidelines have been developed for hot, humid weather based on the wet-bulb globe temperature, the number of participants, the nature of the activity, and other predisposing risk factors	80.4	

Table 6 cont.

Overall Guideline Compliance Based on Guideline Components

Variable	% AT compliance	Average % guideline component compliance
Emergency supplies and equipment are easily accessible and in good working condition		96.19
Guideline 8		
Check heat and humidity before and during activity and adjust practice schedules accordingly		82.95
Guideline 9		
Utilize a work to rest ratio during intense exercise – 1:1 in very high-risk environmental conditions, 2:1 in high-risk conditions, 3:1 in moderate risk conditions, and 4:1 in low environmental risk conditions		57.06
Guideline 11		
Fluids are readily available at all times	99.5	
Provide an adequate supply of proper fluids (water or sports drinks) to maintain hydration		94.58

Table 6 cont.

Overall Guideline Compliance Based on Guideline Components

Variable	% AT compliance	Average % guideline component compliance
Guideline 12		
Weigh-in high-risk athletes (or all athletes in high-risk conditions) before and after practices to estimate the amount of body water lost during practice and to ensure a return to pre-practice weight before the next practice		41.31
Ensure that athletes consume approximately 1–1.25 L (30-34 oz) of fluids per each kilogram of body water lost during exercise		51.19
Guideline 13		
Ensure that athletes exercising in heat are wearing loose-fitting, absorbent, and light-colored clothing when feasible		76.96
Ensure the amount of clothing and equipment worn by athletes is altered based on heat and humidity conditions		82.45

Table 6 cont.

Overall Guideline Compliance Based on Guideline Components

Variable	% AT compliance	Average % guideline component compliance
Guideline 14		
Minimize warm-up time when feasible, and conduct warm-up sessions in the shade when possible to minimize the radiant heat load in "high" or "very high" or "extreme or hazardous" conditions		65.99
Guideline 16		
A supply of cool water and/or sports drinks to meet the participants' needs is available on the field and in the locker room	85.2	
Ice for active cooling (ice bags, cold tub) and for keeping beverages cool during exercise is available on the field and at various other locations	88	
A rectal thermometer to assess body-core temperature is available on the field, in the locker room, and at various other locations	8.8	

Table 6 cont.

Overall Guideline Compliance Based on Guideline Components

Variable	% AT compliance	Average % guideline component compliance
A tub, wading pool, kiddie pool, or whirlpool to cool the trunk and extremities for immersion cooling therapy is available on the field and in other various locations	53.6	
Ensure that a telephone or 2-way radio to communicate with medical personnel and to summon emergency medical transportation is available on the field, in the locker room, and at various other stations		96.02
Guideline 17		
The local hospital and emergency personnel are notified before mass participation events to inform them of the event and the increased possibility of heat-related illnesses subsequent to the event	26.9	

Note. AT = athletic trainer; % = percentage; data entered regarding % AT compliance and average % guideline compliance was determined based on the type of survey question; Questions regarding guidelines 10, 15, and 18 were not included in the survey

Table 7

Additional Heat Illness Prevention Information Regarding General Athletic Training Practices

Variable	% AT compliance
All teams have equal access to the same emergency care equipment	77.5%
AT coverage time is equally distributed between all outdoor sports	49.2%
AT is responsible for calling practice if environmental conditions are too severe	78.0%

Note. These variables are not based on the NATA heat illness prevention guidelines; % = percentage; AT = athletic trainer