

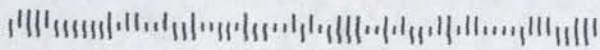
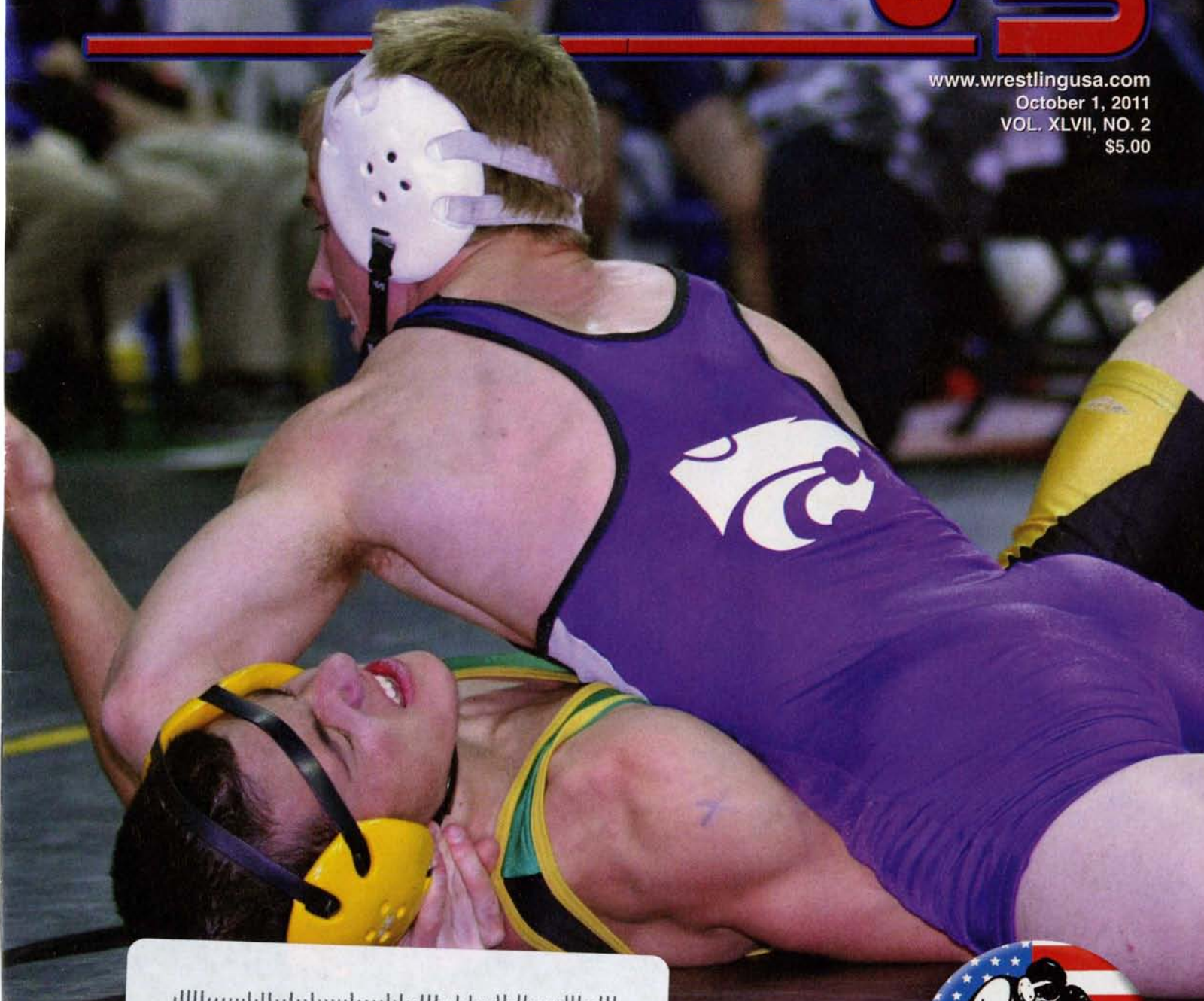
# Wrestling USA

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## EXERTIONAL RHABDOMYOLYSIS: Awareness and Prevention



By Matt Brzycki

South Dakota - 149 lbs. Jacob Horn (St. Cloud State) returns Nate Herda (Augustana) to the mat. Herda went on to win 3-1 (SV1).  
Photo by Mike Smith / MatShots.



**E**ach year, about 26,000 cases of rhabdomyolysis are reported in the United States. That's an average of about 500 cases per week. It's likely that many more go unreported. So rhabdomyolysis is rare but not that rare.

## WHAT IT IS

Rhabdomyolysis is a condition in which muscle fibers are broken down in such an extreme manner that the cell membranes are destroyed. This releases or "leaks" intracellular contents into the bloodstream in concentrations so high that it can have dire consequences. Complications include cardiac arrhythmia (an irregular heartbeat), cardiac arrest (a sudden loss of heart function), compartment syndrome (explained later) and renal (kidney) failure.

The most common risk factors for rhabdomyolysis are drug abuse, alcohol abuse, bacterial and viral infections, blunt trauma and crush injuries. But in many instances, it results from severe exertion. Here, it's referred to as "exertional rhabdomyolysis" or "exercise-induced rhabdomyolysis." Most cases of exertional rhabdomyolysis involve military and law-enforcement personnel, often recruits/trainees. In 2009, for example, there were 315 cases of exertional rhabdomyolysis in the United States military (of which 144 required hospitalization). However, there are numerous and growing reports of exertional rhabdomyolysis sustained by athletes who were pushed too hard by their coaches.

Make no mistake about it: Rhabdomyolysis is potentially life threatening; statistically, the overall mortality rate for people with rhabdomyolysis is 5%. That might sound like a small percentage but look at it this way: That's a one-in-20 chance of dying. And one of your athletes could be the one in 20.

It's important to know that those with sickle cell trait – which occurs in about seven to nine percent of the black population – are especially prone to developing exertional rhabdomyolysis. According to one study, at least 15 college football players have died since 1974 from complications of rhabdomyolysis that were associated with sickle cell trait.

Early recognition of rhabdomyolysis is extremely critical. Local signs and symptoms include muscle pain, tenderness, swelling, bruising and weakness. Systemic signs and symptoms include fever, nausea, confusion, agitation and tea-colored urine (which is often the first and perhaps most tell-tale sign of rhabdomyolysis; the dark color is due to the high urinary concentration of myoglobin, a muscle protein).

## IN THE NEWS

Recent reports suggest that exertional rhabdomyolysis is more common and more serious than previously thought. Consider the following three cases that involved athletes:

**Case #1:** On a Monday in September 2007, the men's and women's swimming team at the University of South Carolina did a workout that began with as many push-ups as possible in one minute followed by as many bodyweight squats as possible in one minute. This series of exercises was repeated for 10 minutes. Following this, the athletes had swimming practice. It was their first practice of the school year. About 24 hours after the workout, one swimmer was hospitalized with rhabdomyolysis.

The next day (a Tuesday), the athletes did a 40-minute circuit of upper-body exercises. The exact exercises and protocol weren't disclosed. This was followed by swimming practice.

A day later, they performed one set of as many pull-ups as possi-

ble followed by numerous abdominal exercises. Again, swimming practice followed.

On the next day, four more athletes were hospitalized. Two more athletes were hospitalized the following day.

Of the 41 swimmers who participated in the workouts, seven were hospitalized from three to six days with severe pain, tenderness and swelling in their chest and triceps and discolored urine. They were diagnosed with exertional rhabdomyolysis with at least one having compartment syndrome.

**Note:** A muscle compartment is an enclosed space that contains muscle tissue, nerves and blood vessels. Though extremely rare, compartment syndrome is characterized by swelling that increases pressure in this space. The pressure can restrict or block the flow of blood to the compartment. This is a medical emergency that may require surgery to relieve the pressure. Left untreated, compartment syndrome can result in permanent injury to the muscle and nerves; necrosis ("death" of tissue) is a real possibility. Compartmental swelling can occur from doing severe and repetitive exercises that focus on the same muscle. This is compounded when the exercises are novel or unfamiliar to an athlete.

**Case #2:** On August 15, 2010, football players at McMinnville High School (OR) reported for pre-season camp (dubbed an "immersion" football camp). On that day, the athletes warmed up on the football field and did two timed sprints of unknown distance.

Next, the players went to the wrestling room where they did several "team building" exercises. According to the head coach, the main intent of these exercises was to build team unity and accountability to the other players. The exercises were described as "intensive" and "repetitive." The players were paired so that one was exercising and the other was spotting. The workout began with 30 seconds of chair dips and 30 seconds of push-ups. This series of exercises was repeated four more times without rest for sets of 20, 10, 7 and 5 seconds. Afterward this, the athletes switched roles. The estimated time for one athlete to complete the exercises, including transition time, was four to five minutes. The next exercises targeted the legs and abdominals for a similar amount of time. The exact exercises weren't disclosed. It was estimated that the total time in the room was 20 to 25 minutes.

**Note:** The temperature in the room wasn't measured while the athletes performed the exercises. However, an investigation by the Oregon Public Health Division found that at roughly the same time, the temperature at a nearby airport was 92 with a heat index of 91. (The wrestling room had no air conditioning.) Water was available and the coaches encouraged the athletes to drink throughout camp. However, most of the athletes didn't drink any water during the exercises in the room.

The next day (a Monday), practices were held throughout the day. Conditioning work (sprinting) was done in the evening.

A day later, the players did "light weightlifting" in the morning. Practices were held throughout the day. At some point, one of the players was hospitalized with compartment syndrome.

The next day, five more players were hospitalized including two with compartment syndrome. Two days later, six more players were hospitalized and another 10 went to the emergency department.

Of the 43 players who participated in the camp, 19 were diagnosed with rhabdomyolysis, nine of whom were hospitalized. Another three were hospitalized with compartment syndrome which required surgery.





2010 Midlands Championship Finals - 133 lbs. Tyler Graff (Wisconsin) with a single leg on B.J. Futrell (Illinois). Graff decisively won Futrell 13-6. Photo by Johnnie Johnson.

sore.") Later that day, five more players noted discolored urine.

There was no workout the following day (a Saturday) but three more players reported discolored urine. The next day, another athlete reported discolored urine.

A speed workout was done on Monday after which three more players reported discolored urine. By that evening, five players had been hospitalized with rhabdomyolysis. Of the 80 or so players who participated in the workouts, 13 were hospitalized for nearly a week.

Also of note is that during a team meeting two days prior to the squat workout, the strength coach stated that the upcoming workouts would determine "who wants to be here." A few of the players thought that the workouts were punishment for the past season (in which the team had a record of 8-5 with all five losses by seven points or less).

## COMMON DENOMINATORS

Anytime you hear that a significant number of individuals from one team or group have been hospitalized, the odds are pretty good that it's due to exertional rhabdomyolysis. The three cases of exertional rhabdomyolysis that have been mentioned share several characteristics, many of which are common to most other cases as well. These four factors combined to make the perfect storm:

- The athletes were exposed to a sudden increase in physical activity. In one case, for instance, it was the first practice of the school year; in another, it was the first mandatory workout in three weeks.

**Case #3:** On January 20, 2011, football players at the University of Iowa began their winter workouts. This was their first mandatory workout in three weeks. That day, the workout included the snatch, pull-up and bent-over row along with exercises involving a weighted sled. As part of the workout, the players also had to perform 100 reps of the barbell squat with 50% of their previous heaviest weight in that exercise. (The 100 reps were achieved in multiple sets.) The athletes were allowed to take as much time as they needed to complete all of the reps but were timed in how long it took them to accomplish this goal. Later that day, one player noted discolored urine.

**Note:** An investigation of the incident by a university committee found that there was disagreement on the accessibility of water. The players said that while squatting, they could rack the weight but weren't allowed to remove their hands from the bar thereby making it difficult to drink water. The strength coaches said that the athletes were allowed to let go of the bar, walk around and drink water.

The next day (a Friday), the players worked out again, having "unusual pain and stiffness in their legs" from the previous day. Most of them noted significant leg pain as well as difficulty in performing basic activities such as climbing stairs and putting on shoes and socks. (The investigation revealed that a number of players felt as if the coaches and trainers downplayed their complaints about their muscles being sore by saying, "Everyone is

- The exercises were severe, repetitive and, in most cases, unfamiliar to the athletes. A classic example is 100-rep squats. Often, the athletes were asked to do an exercise for as many reps as possible in a prescribed period of time (which, by the way, means that their technique will probably be poor). Severe and repetitive exercises that were unfamiliar to the athletes also increased the risk of compartment syndrome.

- The workouts used exercises that overemphasized one or two muscles. Two of the three cases targeted the upper arms; the other targeted the upper legs. This approach also increased the risk of compartment syndrome.

- The athletes were engaged in team or group workouts. For the most part, all of them did the same workouts and exercises without much in the way of individualization. This makes no allowances for different levels of fitness. Some of the exercises will surely be too demanding for a number of the athletes. In fact, it's very rare for an individual to get rhabdomyolysis when training alone without being prodded by someone.

Although it wasn't evident in all three cases, another risk factor for exertional rhabdomyolysis is a hot, humid environment. In hot conditions, the cell membranes become more permeable. As a result, there's a greater risk of rhabdomyolysis and it can occur earlier in a workout. A final risk factor for exertional rhabdomyolysis is inadequate hydration but the three cases that were discussed here had either no or conflicting information on this aspect.



### ANOTHER CASE OF NOTE

The preceding cases of exertional rhabdomyolysis involved athletes. This next one doesn't but is still worth mentioning because it illustrates the grave consequences of training gone amok.

On September 19, 1988, police trainees in Massachusetts began a 14-week program at a state-sponsored training academy. In the first three days, the trainees performed highly strenuous exercises and activities including push-ups, sit-ups, squat thrusts and running. Exercise was also used as a punishment for infractions.

**Note:** During this time period, the daytime temperature ranged from 75 to 80 with a heat index of 75 to 80. Water was available to the trainees but only during three or four short breaks throughout the day. Considering the adverse conditions and circumstances, an investigation by the Massachusetts Department of Public Health characterized their water intake as "grossly inadequate."

On September 21, five trainees were hospitalized. Shortly thereafter, the training program was suspended.

All 50 trainees – repeat: all 50 trainees – showed some evidence of rhabdomyolysis. Of the 50 trainees, a total of 13 were hospitalized with complaints of nausea, abdominal and back pain and discolored urine. Nine of them had evidence of renal insufficiency; six received dialysis for renal failure. One trainee – who had collapsed during an afternoon run on the track – died about six weeks later from complications of heat stroke, rhabdomyolysis and hepatic (liver) and renal failure.

### EXERCISING PRECAUTION

So what can you do as a coach to reduce the risk of exertional rhabdomyolysis? You can take a giant step in avoiding a nightmare scenario by incorporating these precautionary measures:

1. Recognize the signs and symptoms of rhabdomyolysis. For example, complaints of swollen muscles and discolored urine are red flags. Together, these two signs are strong indicators of rhabdomyolysis. Remember, early action is absolutely crucial in decreasing the possibility of long-term complications.

2. Allow an adequate break-in period. Following any extended layoffs, your athletes should ease back into their workouts with a lower volume of training (fewer exercises, sets and reps). As they improve their fitness, the volume can be increased.

3. Raise the level of intensity gradually. Your athletes shouldn't be pushed too hard in the early stages of training. As they improve their fitness, the intensity of the workouts can be elevated.

4. Increase the length of recovery periods. Your athletes should be given sufficient time to recover between exercises/sets. As they improve their fitness, the recovery periods can be shortened.

5. Ensure adequate hydration. Water must be provided and your athletes must be given access to it as needed. Dehydration increases the risk and severity of rhabdomyolysis. The risk and severity are amplified when athletes do strenuous exercises in a dehydrated state.

6. Modify training in high heat and humidity. Rhabdomyolysis can occur in cool environments. However, it's much more common in high temperatures.

7. Identify athletes with sickle cell trait. The need to screen for sickle cell trait is gaining greater traction in the athletic community. As noted earlier, those with sickle cell trait have a higher potential for exertional rhabdomyolysis. The aforementioned precautions are especially applicable to athletes with sickle cell trait.

### A CASE OF NEGLIGENCE

On or about December 11, 2005, Makimba Mimms, who served 11 years in the United States Navy, did a CrossFit workout in the Manassas World Gym (VA) that was supervised by a trainer who was an employee of Ruthless Training Concepts. The workout was a series of dumbbell thrusters (each rep is a combination of a bodyweight squat followed by a shoulder press), burpees (aka "squat thrusts" and "bends and thrusts") and "air" (bodyweight) squats. Each exercise was done for 15 reps. This series of exercises was repeated two more times for 10 and 5 reps. The workout took about 20 minutes to complete.

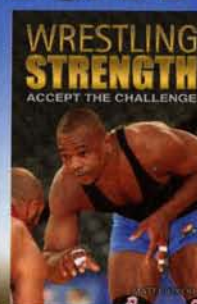
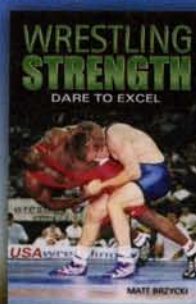
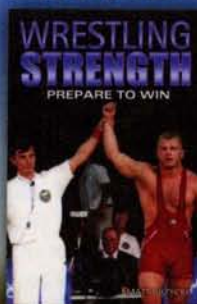
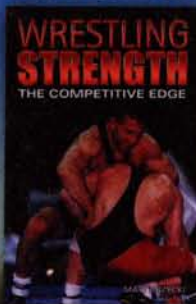
As a result of the workout, Mimms was hospitalized with exertional rhabdomyolysis. He sued Ruthless Training Concepts, the trainer and the gym for negligence and a jury awarded him \$300,000. (Helpful hint to those in the fitness profession: It's generally not a good idea to use "ruthless" in the name of your business. If you get sued for any reason, being associated with the word "ruthless" will not help your case.)

### THE LAST REP

Athletes should work hard. But their workouts need to be reasonable not reckless . . . or ruthless.

*Matt Brzycki has authored, co-authored or edited 17 books on strength and fitness including four that are devoted to wrestling. His latest book is Youth Fitness: An Action Plan for Shaping America's Kids.*

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