The 1.5%-Per-Week Rule
Part 2: Water Loss

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In the last article, we discussed the rate of fat loss using diet, training or a combination of both approaches. The bottom line is that removing body fat is a slow process that requires diligence and discipline, but it should be the goal to help maintain optimal performance and health of wrestlers. But it also requires that wrestlers have the extra body fat to be lost.

The Appeal of Dehydration

Compared to losing 1-to-2 pounds per week as fat, a wrestler can generate a little body heat and sweat. He'll easily drop 2 to 4 pounds of fluid weight in an hour. If the coach heats up the wrestling room or the wrestler wears a sweat suit to impede the cooling effect of sweating, that rate of sweat fluid loss could jump to 5 to 9 pounds per hour – making this a much quicker process compared to strict dieting for fat loss.

Why does this discrepancy exist – the energy to lose fluids vs. energy to lose fat? It's not really a fair comparison, but it is something that wrestlers have applied for a long time to make weight. Here's the explanation: When a wrestler loses a pound of fat, the body mass has been lost as carbon dioxide – the fat is burned up through the chemistry of metabolism. It will take overeating by another 3,500 Calories to add it back to the body. When a pound of sweat is lost, relatively little calories are burned. The weight loss is from loss of water in the sweat. The fluid weight will be immediately regained the next time anything containing water is consumed -- water with no calories or an equal volume of a chocolate shake.

So what is the link between calories, heat and sweating? When we work and burn fuel, be it fat or carbohydrate, most of the energy is wasted as heat. At best, only 25% of the energy goes into accomplishing the desired work. A scientist could measure this by comparing a technically sound wrestler and a novice wrestler. The novice is inefficient and wastes more as energy (heat) because of poor position and mechanics. The coach sees this in the fatigue of the two wrestlers; the novice tires first. The heat leads to an increase in body temperature, which is faster in the inefficient wrestler. For either wrestler, the body functions well within a very narrow temperature range. Going outside of this range – roughly 95.5 to 102 ºF – causes fatigue and can be injurious to the body. The body must rid of the extra heat from exercise.

To remove or dissipate heat, the body produces a layer of fluid on our skin – sweat. Heat is dissipated as the sweat evaporates or "is boiled" off the skin. Physics tells us it takes about 600 Calories (580 to be exact) of heat energy to "boil" a liter (roughly one quart) of water off our skin. The action has a cooling effect. To dramatize this is, put a little rubbing alcohol on your arm skin and waive your limb in the air or blow on the alcohol. It feels cool because the alcohol evaporates. The evaporation of sweat follows the same principle, it just occurs more slowly. Sweating allows an athlete to continue exercising for a long time in the heat by maintaining the body temperature within the tight range.

The drawback in making weight is that a wrestler can't drink any fluids once fluids are lost. Now with a limited amount of fluid in the blood stream – only about 5 quarts when well hydrated – the dehydrated blood must pull fluid from the muscle space to refill the blood stream and keeps the cardiovascular system functioning. Even when the body does so, the cardiovascular system still exhibits signs of being compromised – the rapid pulse and the lowered blood pressure, which contributes to lightheadedness and general fatigue. If the wrestler returns to the wrestling room in this state and begins another workout, the cardiovascular system is incapable of the demands – supporting the work and cooling the body. Also, the body no longer has an adequate reserve of fluid for sweating. As the wrestler exercises in a dehydrated state, the body temperature rises much faster and to a higher point, which can be dangerous for the athlete's safety.

One misconception that exists is that the body can adapt to being dehydrated. That is not correct. The body can adapt to exercise in the heat. But if the body is compromised by being dehydrated, it loses its ability to tolerate the heat and keep the body safe in a hot environment. There is even evidence that dehydration of the muscle, aside from calorie restriction, causes the muscle protein to break down. If this is an attempt to adapt, it is an undesirable one.

A summary of the effects of dehydration at various levels of dehydration can been seen in the adjacent table.

Age-Old Question

Wrestling coaches will say, "Okay I get it. Dehydration isn't good. I can't get as much out of my athletes when they cut out the fluids. But is all dehydration bad? What if they skip drinking the day of or night before a meet?

The reality is that this is only a part of the reality. Most wrestlers, even in the present day of the minimal weight programs, take an approach similar to the true case study presented in the adjacent graph[1]. The wrestler, who was measured to have 7% body fat on Sunday (Sun.), competes on Friday (Fri.). Between Thursday and Friday, he lost about 2 pounds, just short of 2% of his body weight. Research shows that two-percent dehydration is the point at which endurance is

measurably decreased. At 1% dehydration, the body's ability to cool itself is diminished. So even with this relatively minor weight loss, this wrestler will have compromised his performance and safety overnight; not greatly, but to some extent.

The complete reality, though, is that this wrestler experienced a 6.7% decrease in his initial body weight, when we start with Sun. For some reason, wrestlers and their coaches forget the four or five days leading up to the match, and the weight at which the wrestler started as the week began. The progressive increase in urine specific gravity (USG) each day suggests that weight loss is a result of fluid loss. The kidneys work hard to conserve body water, and make very concentrated urine (high USG). A retest of the skinfolds on Friday reveals the wrestler is still at 7% body fat, and confirms the weight reduction is achieved by fluid loss or loss of lean tissue (muscle). The dehydration will clearly compromise his endurance and his ability to cool his body. If he wrestles a match, he may get by, and in fact he may win because of the size and power advantage. If he is heading to the wrestling room for another two-hour practice, he can't train as hard, and his safety is compromised.

Solutions?

Aside from the frustration of filling the line up within a limited timeframe at the start of the season, how does the coach get an already lean wrestler down to a lower weight class? Dehydration or the reduction of muscle mass is the only choice, and neither is desirable. However, that is the objective of the minimal weight program – to phase out dehydration and establish a fair and safe field of competition for wrestlers.

The point of this two-part series is to inform and educate coaches, and clear up confusion over the limits on the rate of weight loss. That may relieve some of the frustration with the system, but not necessarily resolve the issues of making weight and filling a line up. What options do coaches have?

- Attempt to decrease the wrestler's body fat to below the 7% mark. In other words, tap into more fat for weight loss. In fact, the college system allows wrestlers to drop to 5% as the minimum; and being 5% will not disqualify your high-school wrestler from competing. *Cautions*: This is tough to achieve in an already lean wrestler. Calorie restriction to reach 5% body fat will negatively impact training. In addition, a wrestler measured to be 7% body fat might truly be 4 or 5% body fat. The error in the skinfold method may have overestimated him at 7%.
- Develop wrestlers where they are. In-season often focuses on the focus for making weight and physical conditioning. Technical improvement takes second fiddle. Reverse this approach. Focus on continual skill advancement throughout the season. Refine well-known moves, and add

new options and follow-ups to set ups and favorite attacks. *Caution:* This requires a knowledgeable and observant coach, one who pays attention to the details of execution of the moves. The coach must able to give appropriate and timely feedback to his wrestlers, and design practices to improve technique continually. This requires an above-average coach. Average coaches will opt for weight cutting.

- Address strategy. Besides the technique he uses in a match, a wrestler also needs strategy, particularly if he is wrestling a larger wrestler, one who has been cutting weight. The smaller wrestler needs to keep the match close, and win in the third period when endurance, which the weight cutter has lost, becomes a significant factor. The smaller wrestler needs to execute high-percentage moves, be mat savvy, maintain good position and pressure on the opponent if scoring isn't possible in a given situation, and control the flow of the match.
- Lift weights and grow into the weight class. Be stronger at the end of the season. How many wrestlers start strong but fade in the tournaments because they are burned out after weight cutting has taken its toll? If a wrestler can grow into the weight class to the point that he needs to begin cutting weight only by the end of the season, he spares himself three months of nutritional deprivation and improves his chances of not becoming over trained. He is fresh when it really counts.
- Recruit more athletes to fill the line up. The name of the wrestling game is not only pursuit of excellence, it is also participation. More participants help fill in the gaps in the line up. More participants give the depth in the event of injury, illness or skin infections. Depth provides more bodies to push the Varsity wrestlers. There's a good chance that the number one wrestler at the deepest weight classes on a team is also the team star. Competition helps bring everybody to the top of their sport.

These are options. To become solutions, they require a long-term commitment to impact a team and the sport; longer and more energy than it takes to sweat off a couple pounds. Coaches should keep in mind the minimal weight program was established by sports medicine and adopted by the sport-governing bodies that oversee wrestling (NCAA, NFHS, and state associations) to help optimize the training and safety of wrestlers. This approach has been endorsed by the American College of Sports Medicine and the American Academy of Pediatrics as one that is safe for all wrestlers.

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and sports nutrition, many of which focus on weight loss and performance in wrestlers.

[1]Adapted from Horswill. Making weight and cutting weight. In **Sports Medicine and Science in Combat Sports**. R. Kordi, N. Maffulli, R. Wroble, W.A. Wallace (ed) Oxford: Bladon Medical Publishing *in press* 2007.

Table. Levels of Dehydration and Associated effects

Wrestler Case Study

Adapted from Horswill in press 2007

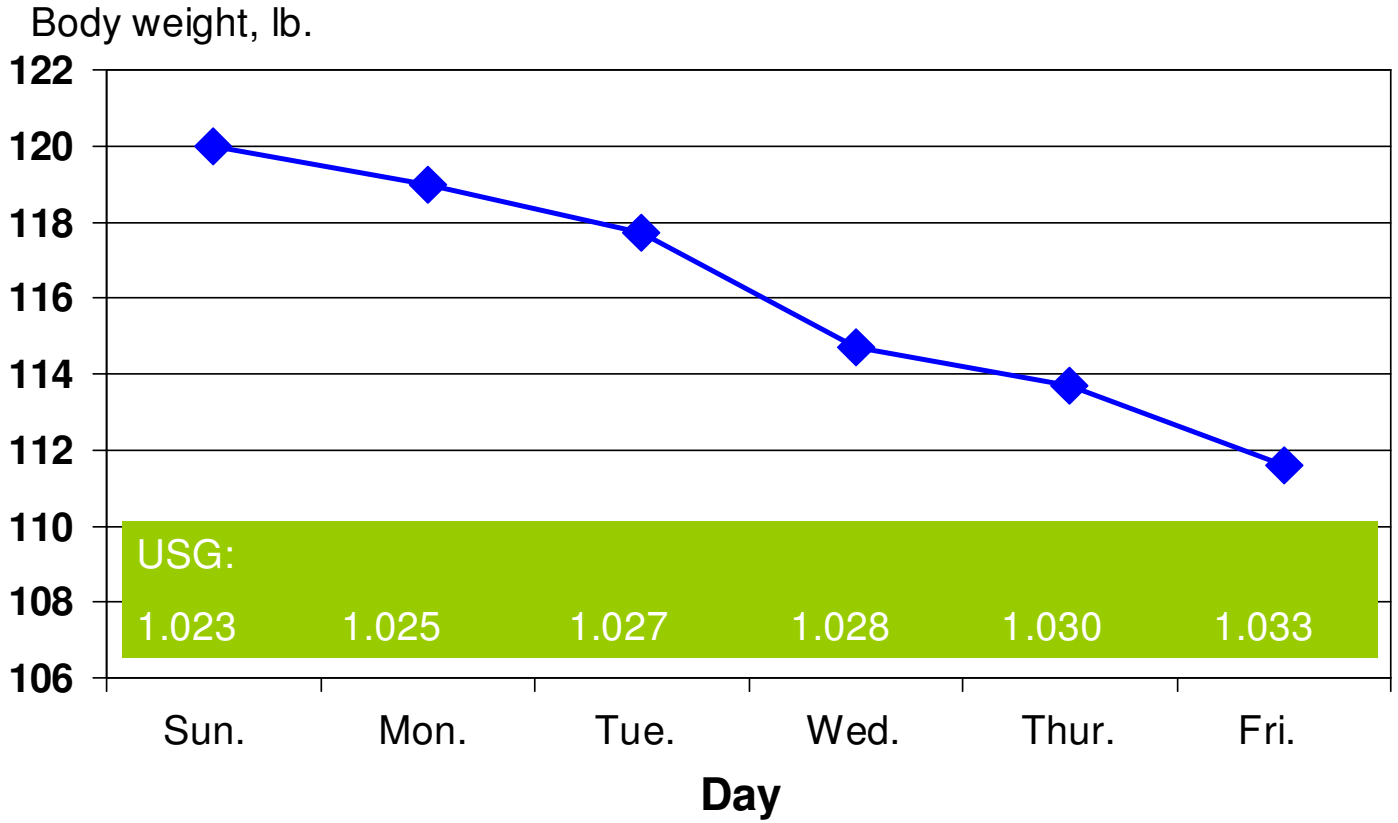

Table. % Dehydration and physiological impact on the body.

Adapted from Jordan et al. *Victory at the Training Table*. Canton, OH: PRC Publishing, 1994, p 45.

CT: core body temperature elevated at rest and during exercise; HR: heart rate elevate; BO: blood pressure decreased; SBF: decreased skin blood flow, which leads to further overheating, MBF: decreased muscle blood flow, which decrease oxygen and nutrient delivery to muscle; SV: decreased stroke volume of the heart so less oxygen is delivered with each beat; ME: decreased muscle electrolytes; RBF: decreased renal blood flow, which stresses the kidneys. The effects are cumulative. For example, whatever happened at 1% continues to happen at 2% and beyond.