Hydration Knowledge and Guidelines for Wrestling

Éva Kőrösi, Saam Falahati, Szabolcs Molnár, Babak Shadgan

United World Wrestling
Medical, Prevention and Anti-Doping Commission

Whenever we exercise, we lose fluid. This happens through perspiration, as well as when we breathe, releasing water vapor into the air. If the exercise is of high intensity, or if the temperature or humidity is high, one can lose a huge amount of fluid very quickly. If this fluid loss is not rectified, this can lead to dehydration. For this not to occur, it is important that an athlete has a proper, personalized hydration plan.

During exercise, our muscles produce heat as a byproduct of metabolism, and sweating has a prominent role in keeping our body temperature as constant as possible. We can only fight against heat if there is enough fluid in our bodies. The body's normal core temperature is around 37 °C, but when we exercise, it can rise. If the core body temperature reaches 40-41°C, it can be fatal. In warm or hot conditions, an adult athlete can lose between 1 and 2.5 liters of sweat per hour of intense competition or exercise. Sweat rates over 3.5 liters per hour have been observed with some world-class athletes who were competing in very hot and highly humid climates.[5,28] For wrestlers, fluid loss is a fairly common occurrence for almost all competitors.

When we sweat, we excrete not only water but also valuable electrolytes like sodium. If the athlete is properly trained and acclimatized, then during exercise, the amount of sweat increases, but the electrolytes being excreted will be less. This is a favorable process because the body is more economical with excreting electrolytes (Table 1). Sodium is highly important as it plays a central role in the function of several organs. Therefore, this is the reason to make a personalized plan for the adequate replacement of sodium within the athlete's hydration plan. The amount of sodium in the sweat of a properly trained and acclimatized athlete is around 115-690 µg/liter. If the athlete has not properly trained or is not acclimatized yet, this range can be much bigger, from 920 µg/liter to 2300 µg/liter.[23] This amount can be very dangerous if lost rapidly, such as when some athletes attempt to reduce body weight for competition through dehydration.

Average concentration of electrolytes in sweat (mmol/liter)	
Sodium	20-80
Potassium	4-8
Calcium	0-1
Magnesium	< 2
Chloride	20-60

Table 1: Fluid and electrolyte loss and replacement in exercise.[20]

To avoid injuries and all the negative effects of dehydration, athletes must be in a properly hydrated state when they start a training session or competition. Proper hydration is not only about avoiding electrolyte loss and dehydration but also how not being overhydrated too. For example, a poor hydration regime, such as excessive consumption of certain sports drinks and other fluids, can lead to hyperhydration, leading to complications such as convulsions. Dehydration is linked to poor performance, heat stroke, muscle cramps and even acute kidney injury.[31]

Negative Effects and Consequences of Dehydration in Wrestlers

Wrestling is a sport where, unfortunately, dehydration is common. Naturally, fluid loss can occur during high-intensity training, which is often complicated when the wrestler tries to gain weight for their competition. A dehydrated athlete has a decreased volume of blood through the body. During exercise, the heart will not be able to pump the proper amount of blood to meet the cardiac demand; therefore, the heart has to work harder, which will raise the heart rate of the athlete. It can lead to a higher risk of cardiovascular problems and lead to muscles developing lactic acidosis. The muscles won't receive enough oxygen, so exhaustion sets in earlier than it should.

What are the important signs and symptoms?

At mild or moderate dehydration, you might experience the following:

- Thirst
- Dry mouth, lips and tongue
- Dizziness or light-headedness
- Headache
- Dark urine

At severe dehydration:

- Extreme thirst
- Very dry mouth
- Breathing faster than usual
- Faster heart rate
- Low blood pressure
- Elevated body temperature
- Oliguria or anuria.
- Be irritable, drowsy, or confused

What can we do if we experience the signs and symptoms below?

- If you are in a warm place, leave it.
- Move to a cool place.
- Remove unnecessary clothes.
- Drink fluid with adequate electrolytes.
- Stop moving and rest a little.
- Eat quickly, absorbing carbohydrates.

To ensure optimal performance, it is important for the athlete to begin training while hydrated and avoid losing more than 2% of body weight from dehydration.[1] Based on previous research, athletes do not perceive a lack of fluid or a decrease in performance up to a 3% level of dehydration.[9,18]

If the athlete is dehydrated at the beginning of training, it will be compounded by the next training session. This raises not only the chance of dehydration but also the chance of injury and reduces the athlete's performance.

Level of Dehydration **(Based on % body weight reduction)**	**Consequences**
2%	This amount can lead to a 5-10% drop in performance. The chance of injury increases, and a strong feeling of thirst appears. While most of athletes feel thirst at 2% of dehydration, this does not apply to everyone. The aerobic capacity decreases by 10-20%.[5]
3-5%	Performance drops by 20-40% and the sign of central fatigue appears. This will result in decreased concentration, increased confusion, and aggressiveness. There is already a serious risk of injury. Deterioration of anaerobic, high-intensity performance and sport-specific elements.[31]
8%	Dizziness, shortness of breath, confusion, aggressiveness.
>8%	Life threatening condition.
Core Temperature	
Around 37 °C	Normal
> 38 °C	Central fatigue and alternation in prefrontal cerebral activity.[26]
> 40 °C	Hyperthermia.[27] Life-threatening condition.

Table 2: Consequences of dehydration and rise in core temperature.

Heat cramps or heat-related muscle cramps often occur during prolonged exercise. The cause of heat cramps is profuse and repeated sweating. Muscle spasms and intestinal pain (smooth muscle) characterize it. When experiencing the first signs of this problem, it can help if the athlete consumes 480 ml of a sports drink with adequate electrolyte replacement with one teaspoon of salt.[7]

Overhydration, which generally causes **hyponatremia,** meaning that the blood sodium level is abnormally low. Athletes mostly suffer from overhydration when they drink too many hypotonic drinks, which have low electrolyte (e.g., sodium) levels. Sodium is an electrolyte which helps regulate the amount of water that's in and around your cells. In hyponatremia, the sodium in your body becomes diluted. When this happens, your body's water levels rise, and your cells begin to swell. This swelling can cause many problems, from mild to life-threatening.

Signs and symptoms include nausea and vomiting**,** headache**,** confusion, coma, seizures, energy loss, drowsiness and fatigue, restlessness and irritability, muscle weakness, spasms, or cramps. Overhydration is also primarily because athletes do not have a hydration protocol.

Heat stroke is associated with a disturbance in the functioning of the central nervous system, which is caused by obstructed sweating in the presence of high humidity and temperature, generally with excessive performance. This causes the core temperature to rise excessively. After this occurs, blood circulation can be disturbed, and sweating decreases or even ceases. Cerebral edema, loss of movement coordination or behavioral disturbance may occur. If left untreated, it can be fatal. If this condition exists, the athlete needs immediate medical attention.[14]

Heat index	Environmental temperature (°C)								
	21	24	27	29	32	35	38	41	43
Relative humidity	Apparent temperature (°C)								
0%	18	20	23	26	28	30	33	35	37
10%	18	21	23	27	29	32	35	38	41
20%	19	22	24	28	30	34	37	41	44
30%	19	23	25	29	32	36	40	45	51
40%	20	23	26	30	34	38	43	51	58
50%	20	24	27	31	36	42	49	57	66
60%	21	24	28	32	38	46	56	65	
70%	21	25	29	34	41	51	62		
80%	22	26	30	36	45	58			
90%	22	26	31	39	50				
100%	22	27	33	42					
Apparent temperature	Heat-stress risk with physical activity or prolonged exposure.								
32-40 °C	Heat cramps or heat exhaustion possible.								
41-53 °C	Heat cramps or heat exhaustion likely. Heat stroke possible.								
54 °C and up	Heat stroke very likely.								

Table 3: The Heat Index shows the relative effects of temperature and humidity.[6]

**Caution: This chart is a guideline for assessing the potential severity of heat stress. Reactions to heat can be individual. Heat illnesses can occur at lower temperatures than indicated in this table. Exposure to full sunshine can increase values up to 8 °C.*

There are other risks which increase the athlete's dehydration. Such as the following:

- Diarrhea and vomiting (Gastroenteritis)
- Laxatives
- Diuretics (which can lead to an anti-doping violation)
- Dieting and inadequate fluid replacement
- Illness with fever

Proper Ways of Hydration in Wrestling

It's important to drink enough water and electrolytes, regardless of whether you're exercising or not. On a regular day, it's recommended to drink at least 2000-2500 ml of water.[12] However, if you're doing physical activity, it's important to calculate your sweat rate to determine exactly how much water you need. Athletes may need to consume additional water and electrolytes throughout the day. The right amount of electrolytes needed varies depending on individual circumstances, and there is no specific recommendation. It's best to consult with a specialist who can help you find the right electrolyte replacement supplement for your needs.

Some General Tips to be Well-hydrated

1. Monitor your fluid loss and calculate your sweat rate!

It's worth taking the time to measure your body weight whenever you have a training session. Measure it before and after training, so you can see clearly how much fluid you lose. The amount can vary depending on the temperature and humidity of the environment and the length, type and intensity of training.

- **Calculation of sweat rate**

  The sweat rate shows how much fluid an athlete loses during a particular exercise. We need to record a total of 6 pieces of data: the weight of the athlete before training, the weight after training, the amount of fluid consumed during training, the length of training, the intensity of training and the type of training.

  The difference in weight before and after training and the amount of fluid consumed during training shows how much weight the athlete has lost. Example: before training 82 kg, after training 81 kg, 1 kg is the weight difference. The athlete drank 0.5 liters of liquid during training. If we add these two values, we calculate that the athlete lost 1.5 kg during training. Once that's done, let's look at how long the workout was. If the training was 2 hours long, then we should divide the weight lost by the length of the training session. We get the sweat rate: 1.5 kg/2 hours = 0.75 L/hour. The intensity and type of training must be recorded so that both the athlete and the coach can calculate how much fluid replacement is required for an exact type, intensity, and length of training. This will change if we re-calculate it in every session.

- **Based on sweat rate, how much fluid should be replaced?** During exercise, the intestinal system can absorb a maximum of 0.8 liters of liquid per hour. So, there is no point in taking in more than 0.8 liters of fluid per hour. We aim to replace as much liquid as possible while the athlete does not drink more than 0.8 liters per hour. There are estimated sweat rates, but you should always follow your own personalized plan.

2. Prepare for hydration

You should always carry those supplements like an isotonic powder or oral rehydration solution, which you need to hydrate properly.

3. Contact a specialist

It is recommended to consult with a sports dietitian to develop a personalized hydration plan. It's important to avoid over-drinking as well. If an athlete experiences constant thirst despite consuming fluids, it may indicate that they are not consuming the appropriate type or quantity of fluids.

4. Divide your fluid intake

It's important to avoid excessive drinking at once. A good goal is to drink 2-3 liters of water throughout the day and maintain your hydration by drinking before, during, and after your workout, following your personalized hydration plan. To achieve optimal hydration, athletes should consume 5-10 ml of liquid per kilogram of body weight 2-4 hours before training, according to ACSM.[1,3]

5. Use isotonic products

Pure water is not ideal, even for short-term loads. Professionals, like sports dietitians or a doctor, will help you find the best product for you.

6. Use special formulas

Various **O**ral **R**ehydration **S**olutions (ORS) are optimally suitable for fluid and electrolyte replacement.[32]

7. Maintain your sodium balance

Eating high-salted foods can help to prevent a sodium deficit and maintain or restore hydration. Sports drinks and other beverages with a high sodium concentration can help maintain a high plasma sodium level.[36]

Examples of good sources[7]:

- Salt: 1/4 teaspoon (or 1.5 grams) has 590 mg of sodium.
- Salted pretzels (483 mg sodium/stick)
- Tomato juice (882 mg sodium/cup)
- Sodium-containing sports drinks (e.g., Gatorade contains 110 mg sodium/250 ml)
- Chicken noodle soup (1107 mg sodium/250 ml)
- Tomato sauce (1481 mg sodium/cup)
- Cheddar cheese/shredded (700 mg sodium/cup)
- Pepperoni pizza (817 mg sodium/slice)

8. Do not restrict fluids

We all know that restricting fluids can be a fast and seemingly easy method to reduce your body weight. This weight loss is only temporary and can be dangerous for your health, and this condition has a significant detrimental impact on performance.

9. Do not rely on thirst

Your thirst should not be an indicator of drinking. As a professional athlete, you should always drink as is planned in your hydration plan. Whenever you feel thirsty, you are already at 2-5% dehydration.

10. Pay attention to colours

You should always pay attention to your urine colour! If it's getting darker, you should drink more water (Figure 1).

To be properly hydrated, the athlete must drink an adequate amount of fluid 24 hours before exercise. During the last 2-3 hours before intense exercise, it is recommended to consume food and drink with a diet high in carbohydrates, with moderate protein and fat content. The replacement of fluids should be slow if the athlete has restricted themselves of foods and fluid before weigh-in. During exercise, the reduced absorption will cause discomfort, and the stomach can only work slowly.

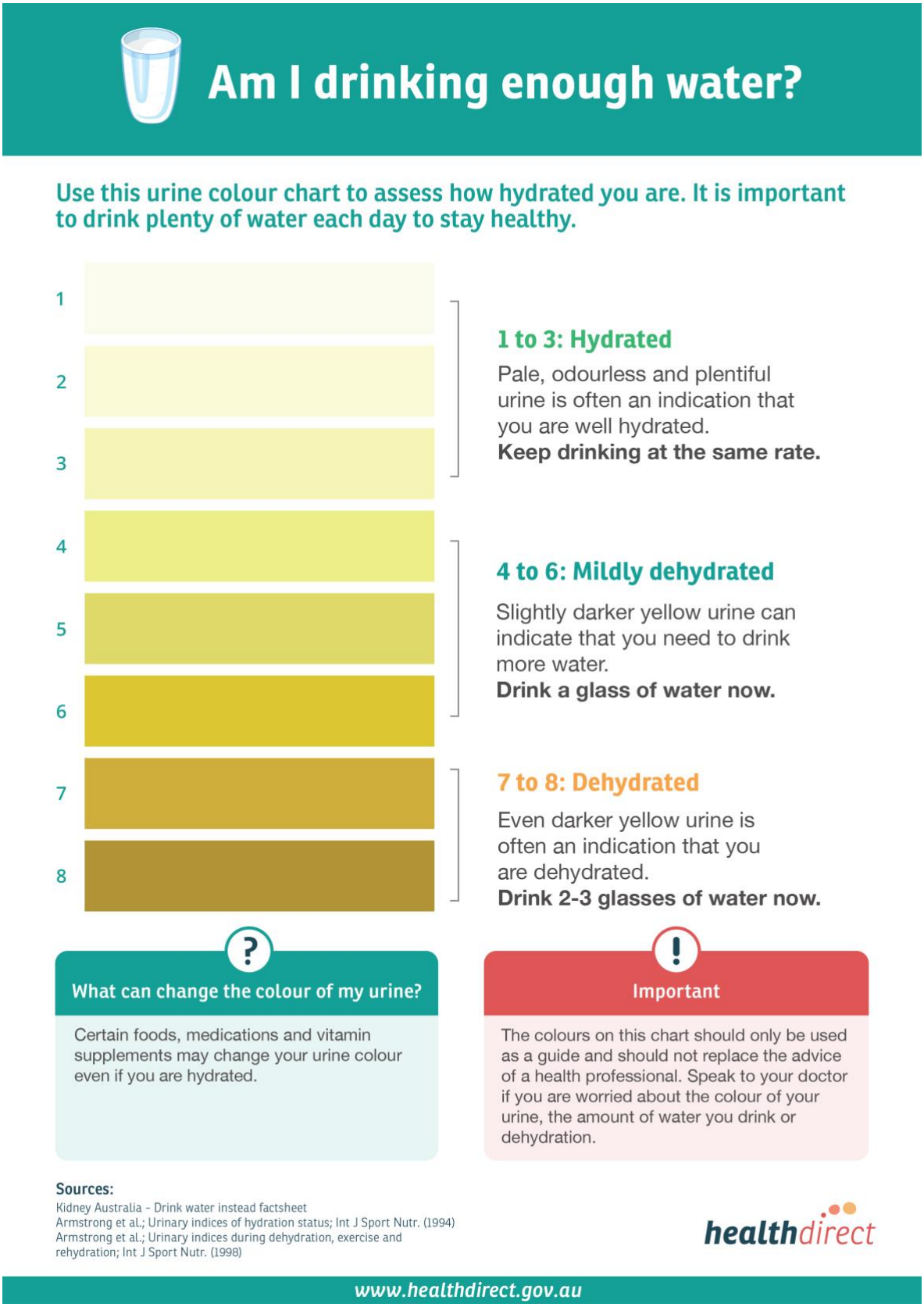

Figure 1: Dehydration Urine Chart.[13]

Fluids for Rehydration

Tap water: not recommended as not adequate for hydration; there are not enough ions in it. The composition is different in every town or country all over the world.

- **Mineral water:** you can hydrate well with them, but each mineral water has a different ion composition. While one is high in calcium, the other has a high magnesium or sodium component. It is worth alternating them; if possible, the athlete should not always consume the same one. If you travel to a foreign country, consume mineral water from a bottle. Avoid tap water to not have gastroenteritis with diarrhea which worsens your hydration condition.
- **Fruit juice:** not suitable for hydration, but natural sugars in it will give you energy.
- **Vegetable juice:** not suitable for hydration, but natural sugars in it will give you energy.
- **Soups:** not suitable for hydration.
- **Isotonic drink/powder**: the best for hydration, developed for this purpose.

Fluid intake summary	
During the day	2-3 liters of water
2-4 hours before training	5-10 ml of liquid per kilogram of body weight
During training	Maximum 800 ml of isotonic drink/hour, depend on your own hydration plan
After training	In 3-5 hours after the exercise, replace the lost fluid by 150%.

Table 4: Fluid intake summary.

Why does the athlete feel that he/she constantly wants cold food/drinks during weight cutting?

When the athlete drinks less and is dehydrated, the core temperature rises even without exercise. The athlete feels that he/she wants cold air, cold drinks, and food because the body cannot maintain the core temperature. When this sensation occurs, this is a symptom that the athlete is already dehydrated. Previously we mentioned that there is no point in drinking more than 0.8 liters of fluid in an hour during exercise because it has a major influence on gastric emptying time. While there is a maximum dose for an hour, there is a minimum dose to consume too. To maintain your well-hydrated state, you should consume around 420-660 ml of fluid every hour.[25,30] Carbohydrate intake has a close relation to rehydration, as it binds to water when it gets stored in the muscles. Sports beverages commonly contain carbohydrates, with an 8% concentration. If this concentration rises above 7%, the gastric emptying time decreases, but if it's lower than 7%, the emptying time is not significantly affected.[29] This is the reason why the recommended concentration for sports beverages is greater than 8%.[2]

There is only one way to avoid dehydration; it is to assume that there is a constant output of fluids, so there must be a constant input of fluids to keep the balance.

There are two main factors which influence fluid intake: thirst and taste. Nervousness, focusing on the competition, or other factors can all distract the athlete from the feeling of thirst. Also, the appearance of thirst is individual, so you should not rely on it. The taste is another issue; humans are more likely to consume what they like. So, if they don't like the taste, they will choose voluntary dehydration. Thirst and taste are the two most common reasons why athletes have an insufficient consumption of fluids. If the athlete begins to consume fluid when he feels thirsty, then there is no hope for keeping fluid balance in the body. Athletes should train themselves to consume fluids as scheduled and not as they need fluid. There are other important factors which have a huge impact on whether fluid will be consumed or not. These are the colour, odour, temperature and even the texture of the beverage. Most athletes like cool beverages with 6-7% carbohydrate solution. If the fluid is too sweet or salty, they will consume less.[11,15]

The temperature of the solution has huge importance, as it affects the gastric emptying time. Those fluids, which have a temperature similar to the body temperature, leave the stomach quicker than those which are too hot or cold.[33] But, during exercise, cold fluids are quicker than room and body temperature fluids.[10] Based on empirical observation, however, athletes tend to drink more fluids when it is colder.

Carbohydrates are the main components of the fluid, and they can come in different molecular combinations. There are the monosaccharides like glucose (single molecule), the disaccharides like table sugar (two monosaccharides in a bond) and the polysaccharides like starch (many monosaccharides held together).

Carbohydrate and fluid intake recommendation before and after exercise		
Strategy	**When?**	**Amount of carbohydrate~~/~~ or fluid**
Load before training	60 minutes before training.	1-4 g per kg body weight, 1-4 hours before exercise.
	2-4 hours before training	5-10 ml of liquid per kg of body weight.
Rapid load after training	If there is less than 8 hours between 2 trainings.	1-1.2 g carbohydrate per kg body weight in the first 4 hours, after that resume usual amount of intake.
	In 3-5 hours after training.	Replace the lost fluid by 150%.
Carbohydrate load	If the training lasts for more than 90 minutes of sustained/intermittent exercise.	10-12 g carbohydrate per kg body weight for 36-48 hours.
Carbohydrate intake recommendations during exercise		
Duration of exercise	**Amount of carbohydrates**	**Type of carbohydrates**
Less than 45 minutes	None	None
45-75 minutes	Small amount (mouth rinse)	Any
1-2 hours	30 g per hour	Any
2-3 hours	60 g per hour	Glucose, maltodextrin
more than 2.5 hours	90 g per hour	Multiple transportable carbohydrates (fructose, glucose, maltodextrin)

Table 5: Carbohydrate and fluid intake recommendation before and after exercise and during exercise.

Wrestling Regulations Around Hydration During Competitions

If you want to reach a properly hydrated state, you should create the body composition which is the most suitable for you. You can get there with a personalized diet. The athlete must separate two weights. The first is the weight with which the athlete trains and the second is the competition weight**. The difference between the two weights should not be more than 5%.**

If the difference is greater than 5%, the athlete cannot reach his competition weight without causing serious damage to their body. Your muscles may be severely damaged, with a high risk of injury, disorientation, etc. If the athlete does not exceed this 5% limit, he can switch between the two weights quickly and easily without reducing peak performance.[22] When we are thinking about competition, the work for a well-hydrated state starts days before the real competition. To help understand the process, we divide it into 4 phases:

1. Making the weight

Those days before the competition, when the athlete starts making his competition weight. Ideally, approximately 4-7 days before the event. In this case, the athlete should not stop drinking liquids. Make sure to use supplements to replace the electrolytes and carbohydrates. Tap water is never sufficient for replacement.

2. After weigh in

When the athlete finally gets through the process of the weigh-in, from then on, it is highly important what they eat and drink. There is a 3–4-hour period before the first match. Make sure that you only consume easily digestive foods and drinks with high carbohydrates, electrolytes and fluid.

3. During matches

To have maximum performance, the athlete should have a personalized plan defining fluid intake. What kind of fluid and how much to drink in an hour or between matches? The length of the time between two bouts is important, as this is the time that the stomach has to digest and absorb. If the competitor goes to the finals, we also need to ensure that the weight will not exceed the competition weight, as the next morning, the wrestler needs to be at the competition weight again. You should check and monitor your well-being, performance, changes in body weight and urine colour and quantity during the competition if you want to control the liquid supply.

4. Rehydrating and regeneration after the competition

The first 48 hours after the competition is highly important to ensure the athlete drinks and eats enough carbohydrates.

Strategies and advice for liquid supply control during and after the competition	
Minimization of intestinal complaints	Low intake of fats, fibers, and spices. Low amount of food or liquid to drink in a time.
Adequate amount of liquid	Try not to exceed 0.8 liters per hour, and do not drink too much at once.
Adequate amount of carbohydrate	High glycemic index carbohydrate. If the intake is higher than 60 g per hour, it should be multiple transportable carbohydrates.
Adequate amount of sodium	20-40 mg per kilogram of body weight, 1-2 hours before competition. If the duration of the exercise is more than 2 hour and the intensity is high, the sodium intake should be 1g/hour.
Glycerol (Should be under supervision of a specialist)	1.2-1.4 g for every fat free bodyweight, 90-120 minutes before the event starts.
Liquid replacement after competition	The best to choose: skimmed milk, isotonic drink or fruit juice. Do not drink alcohol, coffee, or tea with caffeine in it.

Table 6: Strategies and advice for liquid supply control during and after the competition.

Making a Plan

We already discussed the sweat rate, which varies from individual to individual and is greatly influenced by the circumstances. So, if you already know your individual parameters, then you can follow these steps to adapt to what is happening.

We aim to maintain an adequate liquid and energy supply for the muscles and the central nervous system, mainly from carbohydrates.

1. Are you well hydrated?

Check the following:

- Well-being
- Performance
- Changes in body weight
- Colour and quantity of urine (dark and low amounts suggest high concentration due to increased dehydration)

2. Will the exercise be prolonged or intense?

The right amount of fluid, carbohydrates, and sodium should be calculated depending on your sweat rate.

3. Check the circumstances

Temperature, humidity, season, real-feel (Wet Bulb Globe temperature - WBGT), etc.

4. Maximize fluid access options

Make sure to have the proper fluids available. When it comes to supplements, there are a few substances that can help absorb fluids from the stomach. Carbohydrates (monohydrates) are the number one option, while glycerin is less common but still beneficial for hydration. Studies suggest that caffeine can also aid in the absorption of fluids, but it's important to understand its effects and potential side effects before use. Caffeine can enhance cognitive performance and muscle energy during exercise.[19] It's important to be cautious with sodium supplementation and avoid using supplements that contain only sodium. A "food first" approach is recommended, with supplements used only for optimal results.

Advantages and Disadvantages of Food

Generally, there are other beneficial and essential nutrients in food as part of the natural matrix. They can be more affordable than supplements, and foods are less likely to cause an unintentional positive doping test. Insufficient carbohydrates and electrolytes can be challenging, as a more significant amount of food has to be taken for 60-90 g of carbohydrates per hour. It may lead to gastrointestinal discomfort. The exact content of a food may vary, depending on the cooking method, recipes, soil composition, etc.[24] Contact a professional who will help you personalize your hydration protocol.

Intravenous (IV) Infusion is an Illegal Method of Hydration in Sports

World Antidoping Agency (WADA) has a list which not only contains prohibited substances but there are also methods which are prohibited from use. We can distinguish banned substances and methods as they are prohibited at all times or in competition. There are a few exceptions which are connected to a particular sport.

IV infusion is a banned method. The use of IV infusions in sports is commonly linked with rehydration after exhaustive effort, and this situation is arguably the primary cause of debate on the need for and efficacy of various rehydration methods. It must be understood that using IV fluid replacement following exercise and acute weight reduction to correct mild to moderate dehydration is not clinically indicated nor substantiated by the medical literature. **There is a well-established body of scientific evidence to confirm that oral rehydration is the preferred therapeutic choice, potentially even more effective than IV infusions.**[37]

Another common cause of dehydration is infectious diarrhea, particularly frequent when travelling in foreign environments. Also, in such clinical situations, oral rehydration is the preferred and most effective method of rehydration unless the medical condition justifies the choice of IV treatment.[37]

The IV infusions are prohibited because some athletes may use them to:

a) enhance their performance by increasing plasma volume levels,

b) mask the use of a Prohibited Substance,

c) distort the values of their Athlete's Biological Passport.

The exact wording from the WADA prohibited list is as follows:

The method is not prohibited in 3 exceptions:

- Hospital treatments
- Surgical procedures
- Clinical diagnostic investigations

However, a TUE (Therapeutic Use Exemption) would be necessary even if the infusion itself is delivered in the setting of one of the three exceptions (more than 100 ml/12hrs). Athletes should always apply for a TUE if they had an intravenous treatment (more than 100 ml/12hrs) in any environment which does not comply with the three exemptions. Examples of inappropriate settings where IV infusions are prohibited despite applying for TUE unless an athlete is clinically unstable and in an emergency:

- Medical practitioner’s office
- Hotel room
- In a home
- Tent or vehicle
- Event organizers’ medical facility
- First aid station
- Start-finish line facility
- IV clinics or any clinic/treatment room or center outside a hospital facility unless a clinical diagnostic investigation or surgical procedure has been performed.

Even if the IV infusion or injection contains no prohibited substance, a TUE must be submitted for the prohibited **method.**

If the IV infusion or injection does contain any prohibited substance, a TUE must be submitted for the banned **substance**.

The athlete may apply for retroactive TUE, as per the International Standard for TUE, in a medical emergency or under clinical time constraints.

If an athlete is clinically unstable and, in an emergency, treatment with IV fluids should never be withheld. The health and well-being of the athlete must always remain the priority.

TUE Procedure for IV Infusion

To apply for a TUE, the athlete needs to gather the following:

1. Medical history

A summary of the athlete's history, which contains the examinations to confirm the diagnosis or the clinical condition that resulted in the need for an IV infusion or injection. The application for TUE should give an accurate description of the clinical situation. In case of a hospital treatment, surgical procedure or clinical diagnostic investigation, the IV infusion is not prohibited only if a banned substance is administered.

The athlete is advised to obtain and keep a copy of every medical record.

2. Diagnostic criteria

A precise diagnosis or clinical condition should be established regarding the International Classification of Diseases standards of the World Health Organization (ICD-11).

3. Relevant medical information

Any existing co-morbidities should be listed that would influence the decision for granting a TUE. A precisely detailed description of the IV injection or infusion (substance, rate) or any other relevant clinical information from the physician. It must be proven why the physician used an intravenous therapy and why it was not treated orally.

When an IV infusion is administered, the following criteria should be fulfilled:

1. A well-described diagnosis and clinical condition.
2. It was not medically reasonable to try a permitted alternative treatment.
3. The treatment has been ordered by a physician and administered by qualified medical personnel in an appropriate medical setting.
4. Adequate medical records of the treatment are available.

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