



EVENT FUELING AND POST-EVENT RECOVERY



Soldiers consider some factors when choosing pre-event, during, and post-event fueling and recovery nutritional strategies. Although not all-inclusive, these factors include—

- Usual macronutrient intake (such as carbohydrate, protein, and fat).
- Time lapse between macronutrient intake and start of physical activity.
- Duration and intensity of physical activity.
- Environmental conditions.
- Individual gut tolerance.
- Personal taste preference.
- Duration of fueling.
- Body composition goals impact performance.

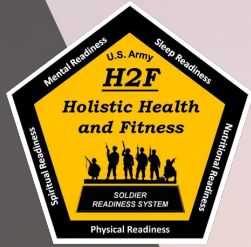


Energy or calorie needs increase with increases in exercise frequency, intensity, time, and type. Soldiers should adjust needs based on the type of exercise completed. These four variables are often referred to as the F.I.T.T. principle. Energy needs will fluctuate as changes in frequency, intensity, time, and type occur, therefore Soldiers should consult with a registered dietitian to determine their energy needs and how to adjust for alterations in physical activity, physical demands of duty, or both.

NUTRIENT TIMING



Nutrient timing involves proper fueling strategies before, during, and after physical training sessions and other strenuous activity. If done correctly, solid strategies can help to prevent energy deficits and aid in adequate recovery. When Soldiers consume nutrients is just as important as what nutrients they consume. Each and every body functions differently in response to fueling for training, so it is recommended that each Soldier practice with nutrient timing while training. Dietitians do not recommend applying recommendations for nutrient timing right before an ACFT or a performance event. Remember to train like you fight. The Warfighter Nutrition Guide contains strategies and recommendations for all aspects of performance nutrition for Soldiers.



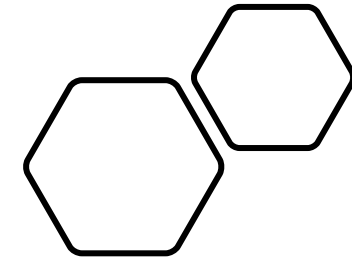
Before Exercise

Before strenuous activities, consuming carbohydrate-rich foods and fluids in the 2-4 hours before exercise helps to restore liver glycogen, increase muscle glycogen stores, and prevent hunger. Soldiers who lose appetite or feel nauseated shortly before training or ACFT should allow at least 3-4 hours between a meal and performance. Eating before gastric distress occurs allows the athlete to get the calories needed and can prevent vomiting related to nervousness. The same guidance applies to Soldiers who get diarrhea shortly before or during training. Anxiety increases gastric contractions that move food through the gastrointestinal tract. Eating can stimulate the bowels even more, so dietitians recommend eating well ahead of a physical event.

Research suggests a pre-exercise meal containing 1 to 4 grams of carbohydrate per kilogram of body weight, consumed 1 to 4 hours prior to exercise provides improved performance. Table 8-1 provides examples of pre-exercise meals. If unable to consume a meal prior to early morning exercise, consuming approximately 30 grams of easily digested carbohydrate-rich food or fluid (for example, banana, applesauce, or toast with peanut butter) one hour prior to exercise is beneficial.

Examples of pre-exercise meals

<i>Time Between Eating and Performance</i>	<i>Suggested Pre-Exercise Meals</i>
1 hour or less before exercise	Choice of: Fresh fruit such as apples, watermelon, peaches, grapes, oranges, or a sports energy bar <i>and/or</i> $\frac{1}{2}$ –1 $\frac{1}{2}$ cups (4–12 ounces) of carbohydrate electrolyte beverage
2–3 hours before exercise	Choice of: Fresh fruit, 100-percent fruit or vegetable juices <i>and/or</i> Breads, bagels, English muffins with limited amounts of butter or margarine or cream cheese, yogurt, oatmeal, pancakes with limited amounts of butter and syrup, or a sports energy bar <i>and/or</i> 2–4 cups (16–32 ounces) of carbohydrate electrolyte beverage
3–4 hours before exercise	Choice of: Fresh fruit, 100-percent fruit or vegetable juices <i>and/or</i> Breads, bagels, baked potatoes, cereal with milk, yogurt, sandwiches with a small amount of peanut butter, lean meat, or cheese, spaghetti with a tomato sauce <i>and/or</i> 4–7 $\frac{1}{2}$ cups (32–60 ounces) of carbohydrate electrolyte beverage





During Exercise

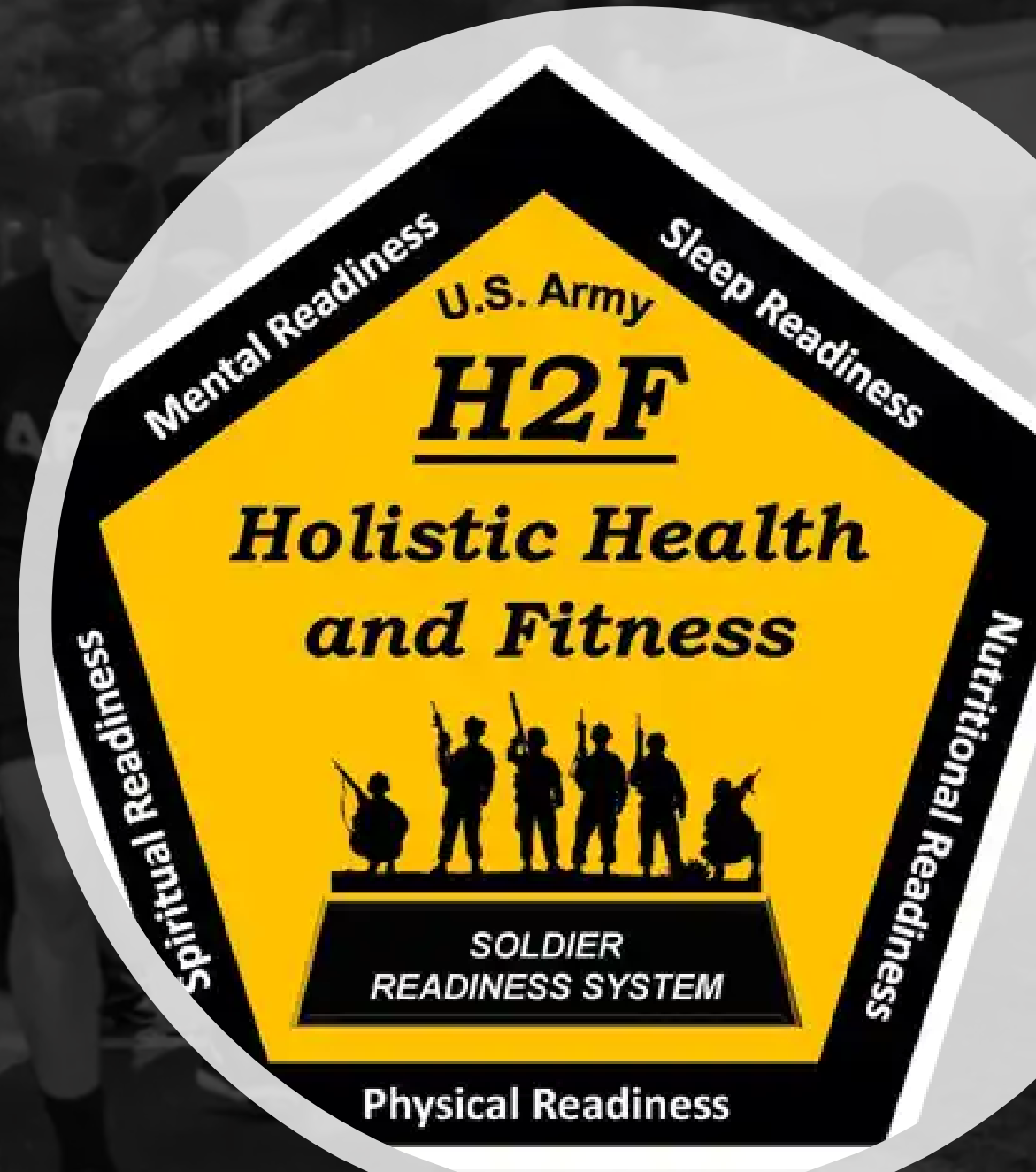
Consuming carbohydrates during exercise lasting greater than 60 minutes can delay the onset of fatigue and improve endurance capacity by maintaining blood glucose levels. Table 8-2 outlines the recommended carbohydrate intake during exercise



<i>Type of Activity</i>	<i>Recommended Carbohydrate Intake</i>
Exercise lasting less than 45 minutes	None necessary or practical
High-intensity exercise lasting 45 to 75 minutes	Small amounts of sports drink or carbohydrate-rich snacks or foods
Endurance and intermittent, high intensity exercise lasting 1 to 2.5 hours	30–60 grams per hour
Endurance and ultra-endurance exercise lasting 2.5 to 3 hours or longer	80–90 grams per hour

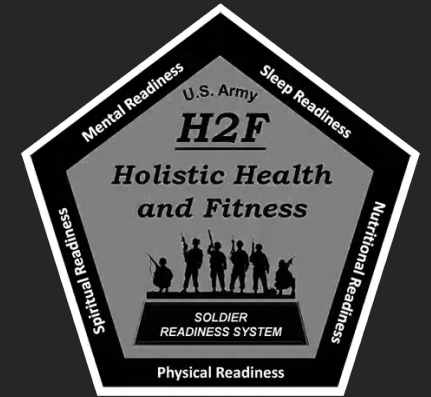
After Exercise

- Using an effective refueling strategy after exercise can help to optimize recovery and promote the desired adaptations to training. Replenishment of glycogen occurs faster after exercise due to the increased blood flow to the muscles, the increased ability of the muscle cell to take in glucose, and the muscle cells sensitivity to the effects of insulin during this period. As such, exercise promotes glycogen synthesis (restoring glycogen in the liver and muscle).
- It is critical to provide the body with 50–100 grams of carbohydrate (2 grams of carbohydrates per kilogram of body weight) and 15–25 grams of high-quality protein (5–9 grams protein per 100 grams of carbohydrates) within 30–60 minutes after exercise. This protein helps replenish muscle glycogen stores, stimulate muscle protein synthesis, and repair damage caused by intense exercise. If unable to eat a meal within 60 minutes of completing exercise, Soldiers might snack on 8 ounces (1 cup) low-fat chocolate milk, 8 ounces (1 cup) 100-percent fruit juice and a handful of nuts (about ¼ cup), 2 slices whole grain bread with peanut butter and a banana, or 8 ounces (1 cup) low-fat yogurt and a piece of fresh fruit (for example, 1 medium apple, 1 medium orange, 1 banana). When refueling, Soldier should eat a combination of foods and fluids with carbohydrates and protein to refuel targets.



HYDRATION

It does not take much water loss for performance to suffer. A mild dehydration (as measured by a change in body weight) of less than 1 percent can have a slightly negative influence on cognitive function. This involves slowed working memory, increased tension or anxiety and fatigue, and increased error-related to visual vigilance. A 2-percent dehydration more severely impacts mental function, mood, and energy level.



Fluid Recommendations

Fluid requirements can vary from 2–16 liters per day depending on workload, level of heat stress, and sweat rate. Sweat loss varies depending on age, training, and acclimation status, exercise intensity and duration, air temperature, humidity, wind velocity, cloud cover, clothing, and individual sweat rates.

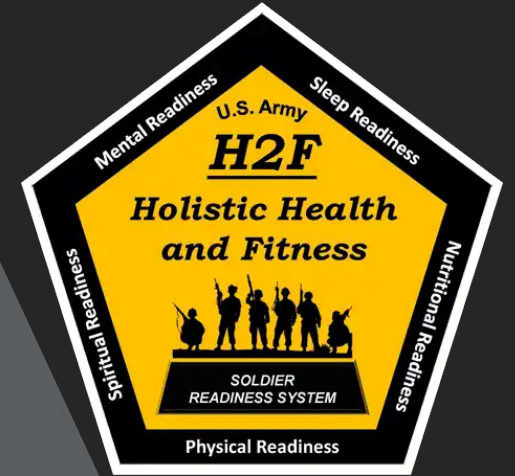
On average, 20–25 percent of fluid intake comes from food and 75–80 percent from beverages. Plain water, coffee, tea, soups, fruits, and vegetables provide fluids to support hydration. A small amount of caffeine in tea or coffee (< 200 milligrams) should not negatively affect hydration status, but if Soldiers drink more caffeine, their fluid balance may be negatively affected.

Typically, voluntary consumption of fluids—drinking to thirst—restores only some lost fluid. Whenever possible, dietitians should use weight loss to quantify fluid loss during physical activity. Table 8-3 shows fluid recommendations before, during, and after exercise. TB MED 507 provides a comprehensive guide for fluid replacement and work/rest guidelines for warm weather training conditions.



Electrolyte Recommendations

Electrolytes control the fluid balance of the body and are important in muscle contraction, among many other essential functions. Electrolytes (such as sodium, potassium, calcium, magnesium, and chloride) come from food and fluids. The loss of sodium and potassium in sweat can be quite high during prolonged physical activity, especially in warm weather. Replacing these elements is an important part of the recovery process. Most commercially available fluid replacement beverages contain electrolytes. Roughly, 1–2 grams of sodium per liter of fluid (0.25 teaspoons per quart—32 ounces) effectively replaces the sodium lost during exercise or a mission. Also, sodium is widely present in various foods and fluids, such as bagels, tomato juice, sports drinks, and milk



Fluid recommendation before, during, and after exercise

	<i>Recommendation</i>
Before	Drink at least 8–16 oz. (1–2 cups) of fluid 2 hours prior to exercise. Drink at least 4–8 oz. (1/2–1 cup) of fluid immediately prior to exercise. Drink 1–2 mL per pound body weight (for example, 2/3—1 ¼ cups for 150 lb.) 2 hours prior to exercise.
During	Drink at least 4–8 oz. (1/2–1 cup) of fluid every 15–20 minutes during exercise. Do not exceed 1.5 liter (~6 cups) per hour.
After	Drink at least 8–16 oz. (1–2 cups) of fluid after exercise. For rapid rehydration, drink ~3 cups of fluid per lb. of body weight lost.

Carbohydrate and Electrolyte Beverages ("Sports Drinks")

Fluids providing carbohydrate, electrolytes, sodium, and potassium can sustain athletic performance.

The drinks aim to—

- Maintain hydration during exercise.
- Ensure rehydration after exercise.
- Replace electrolytes lost during sweating.
- Supplement carbohydrate stores and provide fuel for the working muscles during exercise.
- Minimize muscle fatigue from strenuous workouts.
- Protect the immune system.



WARNING

OVERHYDRATING

Overhydrating can cause excessive dilution of sodium in the blood, a potentially life-threatening condition called hyponatremia. In situations where Soldiers are drinking to a schedule or regimen over prolonged periods of less intense physical activity, it is important to consider risk factors, signs, and ways to mitigate this condition.

RISK FACTORS:

- Cool and less humid conditions that make fluid loss considerably less than expected
- Overconsumption of beverages that have low sodium content
- Inadequate food consumption along with over hydration

SIGNS:

- Swollen fingers
- Disorientation
- Abdominal bloating
- Reduced urine output

MITIGATION STRATEGIES:

- Adequate food consumption
- Carbohydrate–electrolyte beverage consumption after more than 60 minutes of activity



Health and Holistic Fitness section on Physical Readiness.

