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Preventing sudden death in sport

An Extra 60 minutes…

An additional 60 minutes between football practices provides a crucial opportunity for athletes to rehydrate, consume vital food and nutrients and lastly, provides adequate time to allow body temperature recover prior to another practice.

Hydration

Athletes that are highly trained and acclimatized to hot conditions who compete in hot environments may lose as much as 3 liters an hour in sweat. [1-3] Such high sweat rates can easily lead to dehydration which has been shown to increase core body temperature, decrease performance, and increase overall physiological strain.[1,2] For practices lasting three hours, a common 2-liter per hour sweat rate equates to 6 liters of total fluids lost. Athletes with such high sweat rates are unable to digest enough fluids to replace these losses as they are usually only being able to comfortably consume around 1.2-1.5 liters an hour (given that the opportunity to drink is available). A 150-pound athlete in this scenario who does replaces a minimal amount of these losses could become 9% dehydrated. Therefore, two hours following practice provides crucial time to replace these lost fluids. The table below represents an example of how different rehydration opportunities can drastically alter hydration status.

Percent Dehydration Based on Rehydration Strategy and Time of Match

	Pre-practice hydration status	Mid-practice hydration status	Post-practice hydration status	1 hour post practice + 2 liters of water	2 hours post-practice + 4 liters of water
Maximal rehydration possible*	0%	-1%	-2%	0%	0%
Minimal rehydration (0.5L/hr)	0%	-2%	-4%	-2%	0%
Starts practice slightly dehydrated and minimal rehydration	-2%	-4%	-6%	-4%	-2%

*Maximal rehydration possible is based on consumption of 1.5 liters of fluid per hour

Nutrition

This time period following a practice is similarly crucial for nutritional considerations. It is imperative for athletes to consume food post exercise for recovery needs, but also to perform maximally in another upcoming practice. Carbohydrates are critical in fueling exercise, however the body can only store limited amounts of carbohydrates. Muscle glycogen can be depleted as quickly as within 3 hours of exercise. (see figure A below) While larger meals may be eaten within 2-4 hours prior to a practice, smaller meals that may be tolerated 1 hour prior to a low intensity workout is likely uncomfortable prior to a high intensity practice.[3,4] In order to completely to restore muscle glycogen and consequently exercise capacity, athletes ideally need >8 hours to consume these nutrients.[5 (see figure B below)] Highest reported rates of glycogen resynthesis during carbohydrate feeding are reported to take place within the 2-6 hours following exercise.[5] Therefore, a two-hour break as opposed to a one-hour break provides the opportunity to comfortably eat a significant amount of calories and nutrients needed for another practice. [3,4]

Figure A

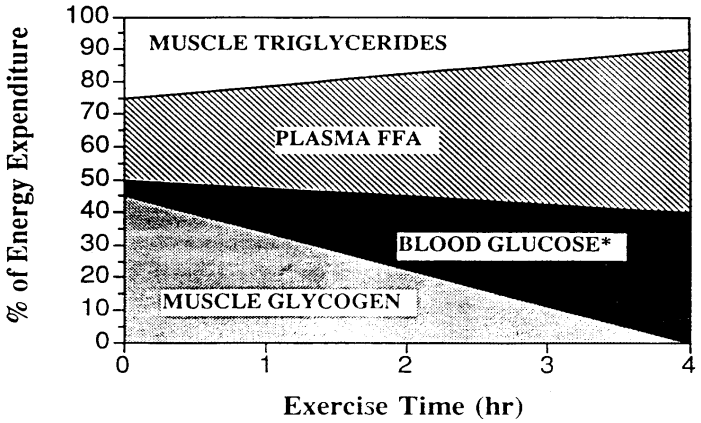


FIGURE 3. Percentage of energy derived from the four major substrates during prolonged exercise at 65–75% of maximal oxygen uptake. Initially, approximately one-half of the energy is derived each from carbohydrate and fat. As muscle glycogen concentration declines, blood glucose becomes an increasingly important source of carbohydrate energy for muscle. *After 2 h exercise, carbohydrate ingestion is needed to maintain blood glucose concentration and carbohydrate oxidation. FFA, free fatty acids. From references 3 and 4.

Figure B

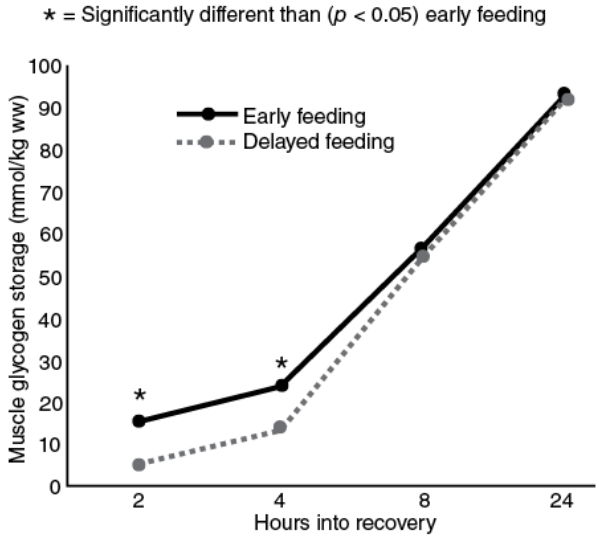


Figure 5.8 Time course of muscle glycogen resynthesis with postexercise carbohydrate supplementation.

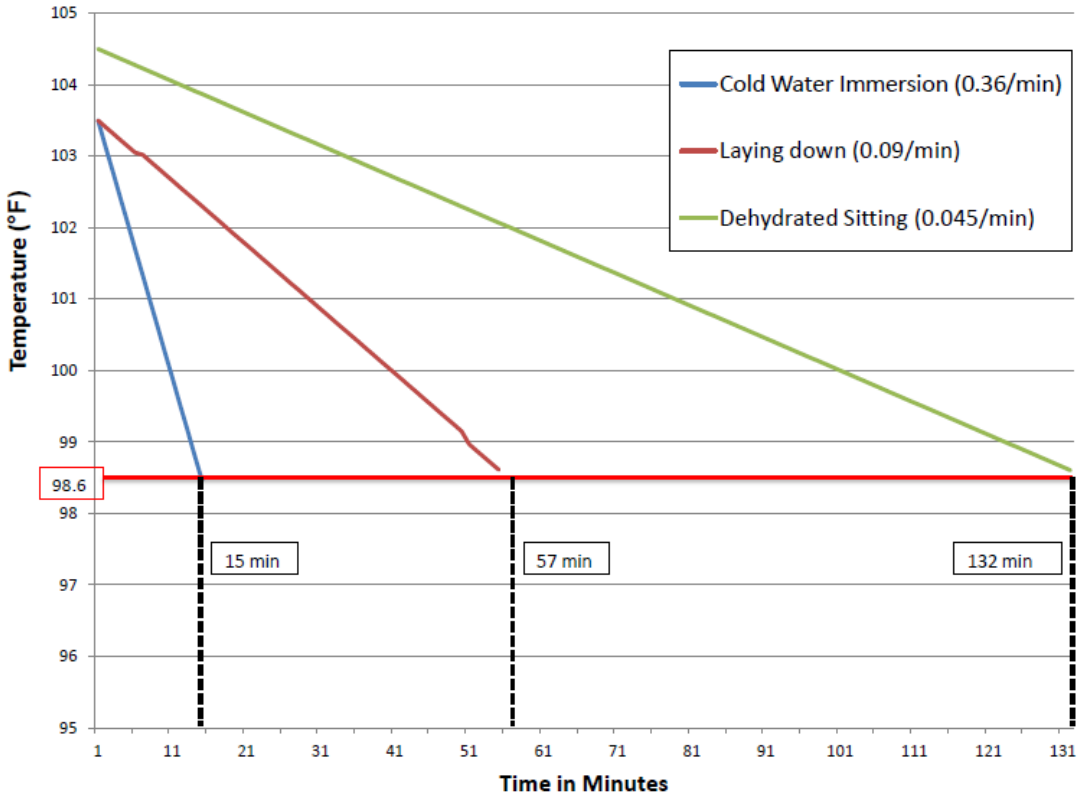
Adapted from Ivy et al. 1988 (75), Parkin et al. 1997 (116), and Burke and Deakin 2000 (22).

Core Body Temperature

Research has shown that during subsequent same-day strenuous exercise sessions an increased level of core body temperature and cardiovascular strain that did not return to normal has been observed.[6–8] This demonstrates that there is a carry-over between one bout of exercise and a second bout of exercise. It is well-known that longer recovery between bouts of exercise can result in decreased thermal strain.[9]

In a systematic review comparing cooling rates in hyperthermic individuals, it was determined that a cooling rate below <.078°C/min was unacceptable for the proper cooling of an athlete. Sitting on a stool and lying down on a stretcher were only 0.06 and 0.02°C/min suggesting that these methods will not bring an athlete's body temperature back down to a safe level in a quick enough period of time.[10] This is similar to what a youth athlete would be doing during a break between practices.

Cooling rates for cold water immersion, passive cooling (such as lying down), and dehydrated sitting have been shown to be 0.36, 0.09, and 0.045°C/min in the research.[10–12]



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