

Fatigue

When we think of skeletal muscles getting tired, we often use the word fatigue, however, the physiological causes of fatigue vary considerably. At the simplest level, fatigue is used to describe a condition in which the muscle is no longer able to contract optimally. To make discussion easier, we will divide fatigue into two broad categories: **Central fatigue** and **peripheral fatigue**. Central fatigue describes the uncomfortable feelings that come from being tired, it is often called "psychological fatigue." It has been suggested that central fatigue arises from factors released by the muscle during exercise that signal the brain to "feel" tired. Psychological fatigue precedes peripheral fatigue and occurs well before the muscle fiber can no longer contract. One of the outcomes of training is to learn how to overcome psychological fatigue. As we train we learn that those feelings are not so bad and that we can continue to perform even when it feels uncomfortable. For this reason, elite athletes hire trainers that push them and force them to move past the psychological fatigue.

Peripheral fatigue can occur anywhere between the neuromuscular junction and the contractile elements of the muscle. It can be divided into two subcategories, **low frequency** (marathon running) and **high frequency** (circuit training) fatigue. High-frequency fatigue results from impaired membrane excitability as a result of imbalances of ions. Potential causes are inadequate functioning of the Na^+/K^+ pump, subsequent inactivation of Na^+ channels and impairment of Ca^{2+} channels. Muscles can recover quickly, usually within 30 minutes or less, following high-frequency fatigue. Low-frequency fatigue is correlated with impaired Ca^{2+} release, probably due to excitation coupling contraction problems. It is much more difficult to recover from low-frequency fatigue, taking from 24 hours to 72 hours.

In addition, there are many other potential fatigue contributors, these include accumulation of inorganic phosphates, hydrogen ion accumulation and subsequent pH change, glycogen depletion, and imbalances in K^+ . Please note that a factor not on the list is lactic acid as it does not contribute to fatigue or muscle soreness. The reality is we still don't know exactly what causes fatigue and much research is currently devoted to this topic.



This content is provided to you freely by BYU-I Books.

Access it online or download it at https://books.byui.edu/bio_264_anatomy_phy_l/746_fatigue.

