Introduction

- Provide motivation for the study
- Introduce the main ideas so that we can understand the hypotheses

Vertebrate skeletal muscle has the ability to generate varying forces upon activation and stimulation, and the extent to which it does so can vary on a variety of different factors. Properties of their contractions, i.e. variable force output, tetanic contractions, fatigue due to extended contractions, response to environmental temperature can be observed through the observation of force amplitude and force development via a force transducer reading (Butler 2018).

Muscle fibers have an "all-or-none" method of responding to stimulations, that is to say that each individual sarcomere will always contract with the maximum amount of force it can if a stimulus above a certain threshold voltage is able to reach it (Butler 2018). However, the entire muscle is still able to control the amount of force it is able to output by selectively stimulating either a greater or lesser number of fibers in a process known as "recruitment" (Butler 2018). To cause the muscle to output more force upon a load, it must first recruit more muscle fibers than usual to start contracting. This can be done electrically via the motor neuron running the fibers by either a) increasing the frequency of stimuli over a certain period of time or b) increasing the voltage/amplitude of the stimulus (Butler 2018). In this way, a muscle is still able to produce a variable, graded response of force despite being made up of individual fibers which are only capable of delivering a digital on/off-type response on their own.

Introduction

- End with Hypothesis paragraph to prepare the reader for the Methods

Note: Now that you all have a more sophisticated understanding of physiology, “predictions” are not needed and generally not given in papers. (You can just state that you‘ll be increasing stretch, what you‘ll be varying, etc.)

If you did a good job describing the mechanisms in the paragraphs above, *it should be obvious what directions these relationships are expected to go* (or it can be left open-ended if we don‘t know).

Now we‘re ready for the methods! And have a clear understanding of the study.

Short and sweet is best!

. . .

Temperature has a profound effect on many biological processes. In the body of an organism are many cellular components that can change due to fluctuations in temperature. Typically, cellular processes slow under cold temperatures and speed up (molecules are more excited, enzymatic activity is also sped up) under warmer temperatures (Wither 1992). In the muscle there are many cellular processes that may be impacted by the change in temperature such as the release of Ca ions which are important for muscle contractions.

We will be investigating the physiological properties of skeletal muscle from the isolated toad gastrocnemius. More specifically we will examine the effects of stimulus amplitude on contractile force, ~~demonstrate the tension-length relationship in the gastrocnemius~~ the effect of increasing pre-stretch (or pre-load) on contractile force, analyze the stimulus effect of pulse frequency on contractile force, explore tetanus and muscle fatigue, and understand the effect that temperature has on contractile force. predict ~~We hypothesize that 1) as the stimulus intensity increases the contractile force from the gastrocnemius will increase, 2) as the tension increases on the gastrocnemius its contractile force will also increase, 3) as the time interval between stimuli decreases the contraction force waves will combine to create a larger wave whose amplitude is the sum of both contraction's forces, 4) tetanus will be achieved when the interval between stimuli is short enough that the muscle does not have time to relax, 5) a gradual decrease in contraction force following maximum force generation will be observed as high frequency stimulation duration increases corresponding to muscle fatigue, and 6) the contractile forces will change proportionally with changes in temperature.~~

End here. The rest is not really needed.

force?