EFFECT OF LOCOMOTION ON BODY TEMPERATURE CONTROL MECHANISM

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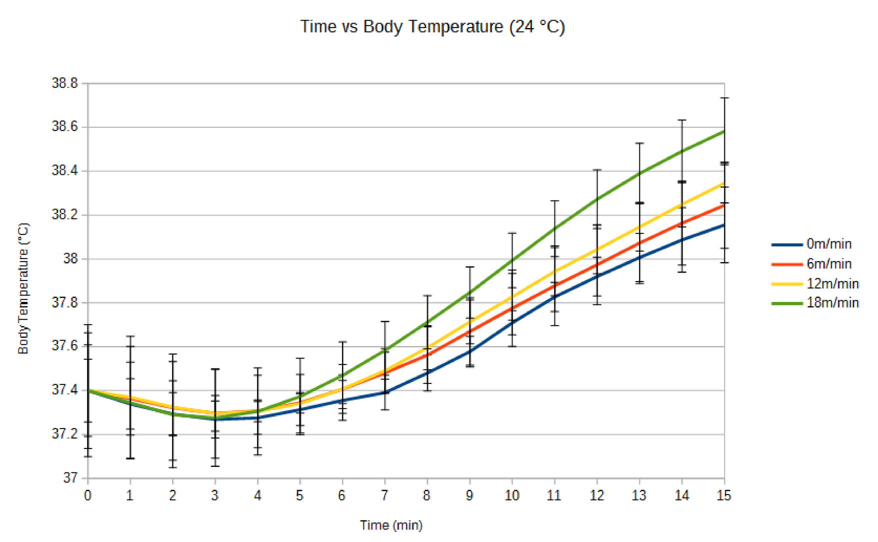
MOTIVATION

Although humans' and other mammals' body temperature may fluctuate due to daily variation, their body temperature remain relatively constant [1]. However, in some cases, they experience hyperthermia despite this thermoregulatory mechanism. For instance, a stimulant such as Methamphetamine (Meth) is known to cause life-threatening hyperthermia. The injection of Meth not only causes hyperthermia but also enhances locomotion, a movement of a body, which may complicate the temperature response. The objective of this research is to observe how various intensity level of physical activities taken in different ambient temperatures affect temperature dynamics. This will allow us to analyze thermoregulatory mechanism.

CONSTRUCTING THE EXPERIMENT

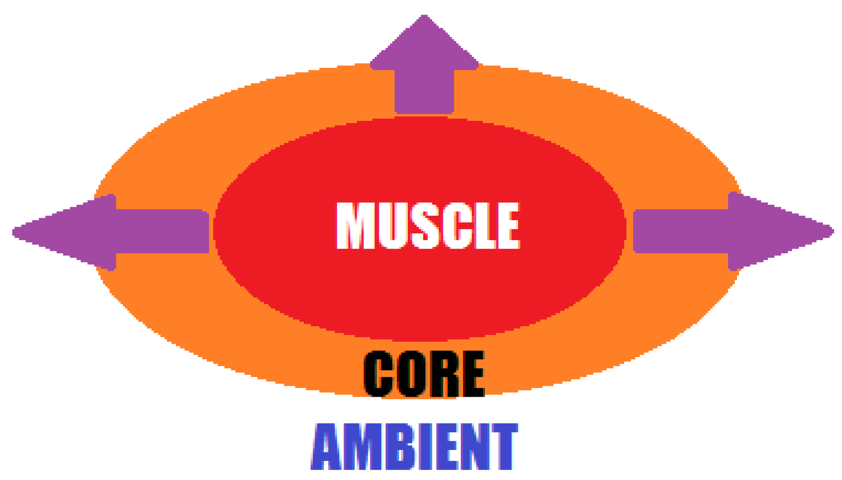
A total of 32 rats were seperated into two groups of 16 rats each; one group was tested in the cool enviornment (16°C) while the other group was tested in the hot environment (32°C). Each group was divided into 4 subgroups depending on their exercise intensity (i.e. 4 rats in each subgroup). Over 15 mins, rats were placed in a treadmill with a speed of 0m/min, 6m/min, 12m/min, and 18m/min around either the cool or the hot enviornment. Following preparation was made to execute the experiment smoothly:

- Each rat had enough time to adjust themselves to the lab enviornment.
- Before the actual experiment executed, rats were placed in a treadmill with an electric circuit behind so that they are forced to run in the treadmill with a given speed. Additionally, this allowed the training of rats so they understand that they are supposed to run in the treadmill.



METHOD

We used averaged data of four rats from each group to compare with our mathematical model. Following is the assumption that we made for our mathematical model:



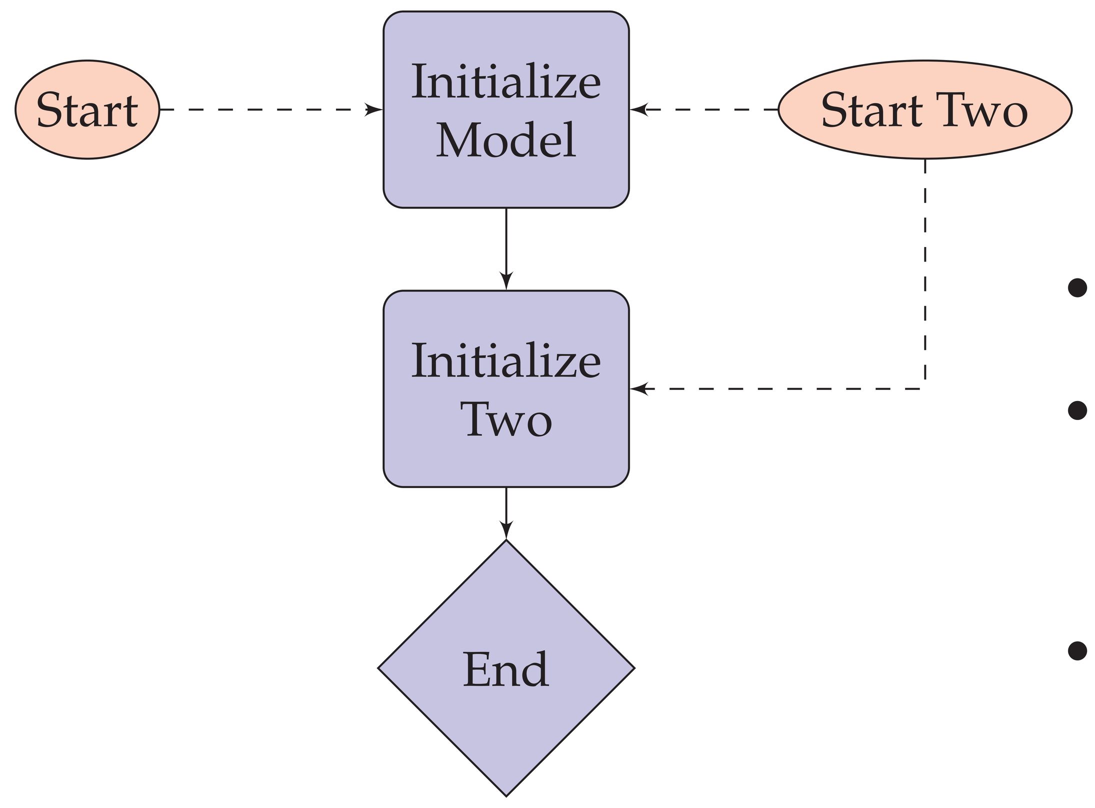
- Heat Dissipation from Muscle to core (body) to surrounding
- Muscle temperature increases as body movement increases
- Assume $\eta_{mc} = \eta_{cm}$ (i.e. the volume of muscle and the volumn of the core is the same)

$$\frac{dT_c}{dt} = P_c - \eta_{cm}(T_c - T_m) - \eta_{ca}(T_c - T_a)$$
$$\frac{dT_m}{dt} = P_m - \eta_{mc}(T_m - T_c)$$

- P_c, P_m : heat production of the core (body) and heat production of the muscle
- T_c, T_m, T_a : core temperature (37 37.4°C), muscle temperature and ambient temperature (32°C or 24°C)
- η_{ca}, $\eta_{mc} = \eta_{cm}$: heat dissipation constant between core and the ambient enviornment ($\frac{1}{50}$ in our experiment) and heat dissipation constant between core and muscle ($\frac{1}{10}$ in our experiment)

RESULTS AND DISCUSSION

CONCLUSION



- Pellentesque eget orci eros. Fusce ultricies, tellus et pellentesque fringilla, ante massa luctus libero, quis tristique purus urna nec nibh. Phasellus fermentum rutrum elementum. Nam quis justo lectus.
- Vestibulum sem ante, hendrerit a gravida ac, blandit quis magna.
- Donec sem metus, facilisis at condimentum eget, vehicula ut massa. Morbi consequat, diam sed convallis tincidunt, arcu nunc.
- Nunc at convallis urna. isus ante. Pellentesque condimentum dui. Etiam sagittis purus non tellus tempor volutpat. Donec et dui non massa tristique adipiscing.

REFERENCES

[1] J. M. Smith and A. B. Jones. *Book Title*. Publisher, 7th edition, 2012.

[2] A. B. Jones and J. M. Smith. Article Title. *Journal title*, 13(52):123–456, March 2013.

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