Does Size Matter? A Study of Metabolism in Physically Active/Inactive Male Crickets

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What is Metabolism?

The amount of energy that an animal consumes in a given amount of time. This could be calculated through respiration. Respiration is a process in living organisms involving the production of energy, typically with the intake of oxygen and the release of carbon dioxide. This occurs through the oxidation of glucose molecules, a process which requires oxygen. Exercise causes crickets to have an increase in oxygen intake in order for their metabolic rate to go back to an equilibrium. This oxygen intake could be measured by a respirator.

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6H_20 + 6CO_2 + \text{energy}$$

(glucose + oxygen → water + carbon dioxide + energy)

Objective

Our object was to use respirometers to measure the total volume of oxygen consumed by crickets of different sizes after physical activity and at rest.

Procedure

1) **Two male crickets with a significant difference in size were chosen. We also used a rock in one chamber as our controlled variable.**
2) **A Large cricket was first chased around a plastic tub with our hand for 30 seconds.**
3) **We put the cricket in a respirator and measured the intake of Oxygen every 5 minutes for 30 minutes. We also measured the oxygen intake of the cricket at rest, and the rock at the same time.**
4) **The above steps were repeated with the small cricket.**

Hypothesis

We Hypothesized that the larger cricket would have a higher metabolic rate while at rest and after physical activity than the smaller cricket.

Figure 1: Image of respirometer set up

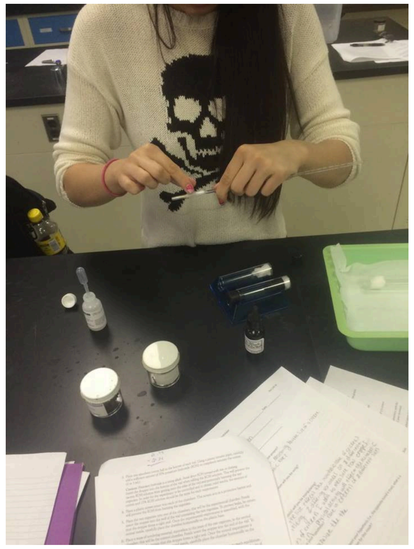
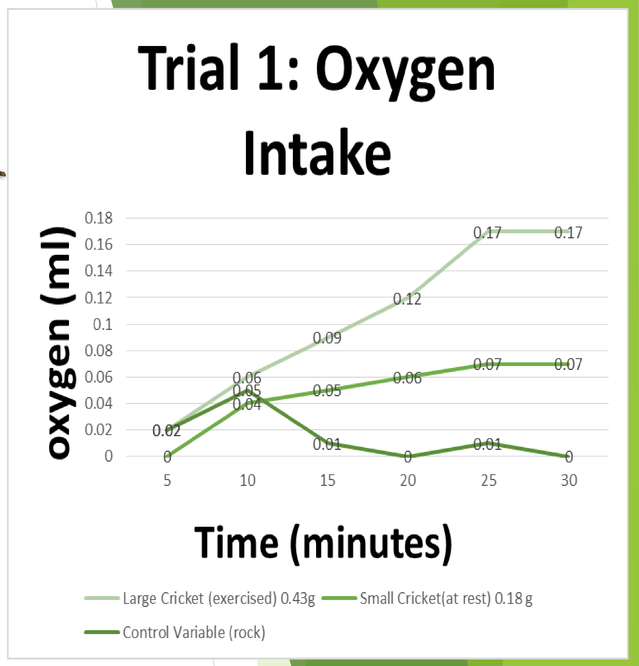


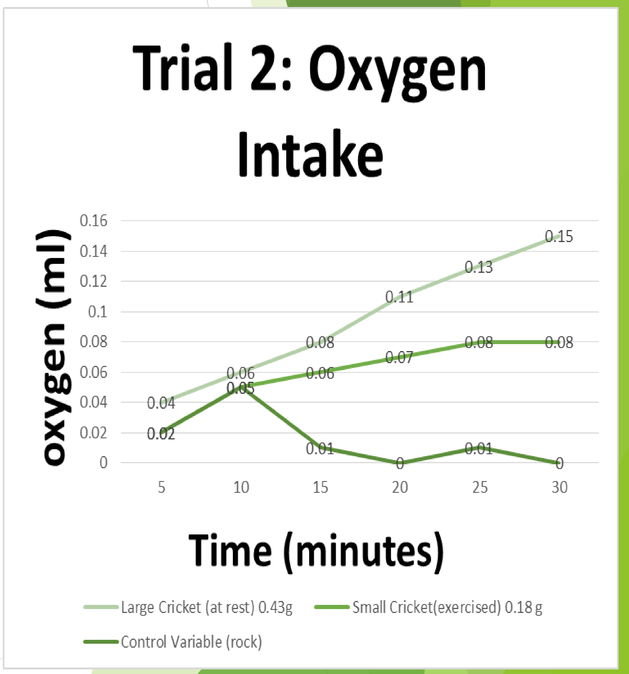
Figure 2: Image of trial 1 crickets in respirometer

How does Physical Activity & Size Affect Metabolic Rate?

- **The Metabolic Rate increases with size because more energy needs to be expanded amongst the cricket.**
- **Physical activity increases metabolic rate; the more intense the activity, the greater this post activity metabolic boost and the longer it takes for your metabolic rate to return to its resting level.**

Results





Conclusion: Size Matters!

We concluded with our experimental data that the larger cricket had a higher rate of respiration at rest and after physical activity compared to the smaller cricket at rest and after physical activity. SO YES SIZE DOES MATTER!

Acknowledgments

Gillooly, J. F., Brown, J. H., West, G. B., Savage, V. M., & Charnov, E. L. (2001). Effects of size and temperature on metabolic rate. Science, 293(5538), 2248-51. Retrieved from

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