

# STUDENT GUIDE

## EXPLORE 1A LESSON 16



### Part 1: Our Motivation

Record what we were trying to figure out that led to this investigation.

#### Gaps in Our Explanations:

- We aren't sure why the increased breathing rate and heart rate increased during exercise.
- Does the body need more oxygen and nutrients during exercise?

#### Questions:

- Why does body temperature elevate during a workout?
- Why does your body temperature return to normal after it elevates?
- How long does it take body temperature to return to normal after working out?



### Part 2: Analyzing and Interpreting Data

Using the Lesson 16 Data Set handout, review the experiments that scientists conducted to measure the changes in oxygen used in moderate and intense exercise. Summarize the methods that they used and the data they collected.

Study 1	Study 2
<p>The scientists wanted to measure oxygen levels in the blood during exercise. They compared blood flow and oxygen uptake in leg muscle during moderate and intense exercise. Used just one leg and isolated the quad muscle in that leg.</p> <p>Athletes completed leg extension exercises, which isolated the quadricep muscle of one leg. They did a total of 8 sets of 6 min continuous work.</p>	<p>The scientists wanted to measure the amount of oxygen inhaled during exercise. They had eight participants exercise in wheelchairs. Each workout lasted 6 min with a wheelchair on treadmill.</p> <p>The scientists measured oxygen levels with a breathing mask every 30 seconds.</p>



The scientists measured blood flow and oxygen levels in the blood using catheters in the leg muscle.	
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Compare the methods from the two studies. Are they similar or different? Is the data collected similar or different?

#### Similar

- Both studies wanted to figure out how levels of oxygen in the body change in some way (breathing or blood levels).
- About the same number of participants were used. They were around the same age, not professional athletes, and were all men.
- Both experiments had all participants do workouts at two different intensities.

#### Different

- The studies focused on different muscle groups and different kinds of exercise.
- They used different lengths of time for workouts
- The measurements were taken differently. One study measured oxygen in the breath, and one measured oxygen in the blood that was entering the leg muscle.

Review the data scientists collected and record your observations about how the amount of oxygen used compares in moderate and intense exercise.

Study 1	Study 2
<p>Figure 1a: The amount of blood flow in the leg muscle increased over time in both high-intensity and low-intensity exercise compared to blood flow at rest. It increased more for high-intensity exercise.</p> <p>Figure 1b: The amount of oxygen in the blood delivered to the leg muscle increased over time in both high-intensity and low-intensity exercise compared to blood flow at rest. It increased more for high-intensity exercise.</p>	<p>Figure 2: The amount of oxygen consumed in the breath increased over time in both the high-intensity and low-intensity exercise compared to oxygen consumption at rest. It increased more for high-intensity exercise.</p>

Compare the findings from the two studies. Explain if you think the findings are consistent with one another and why.

Both studies seem to indicate that the amount of oxygen being used and consumed by the participants is greater during exercise than it is at rest, and it is also greater for high-intensity exercise than for low-intensity exercise.

I would say that the findings are consistent with one another. However, only one study measured the changes in blood flow during exercise, so it is not possible to say if that finding is consistent.

What conclusions can you draw about the differences between oxygen use in moderate and intense exercise from these studies?

During exercise, the body uses more oxygen than it does at rest. This is shown by the increased levels of oxygen in the breath and in the bloodstream during exercise. There is also more blood flow occurring during exercise than at rest. It seems to make sense that you would need more blood flowing to get more oxygen.

How did the lens of stability and change help you analyze the data in these two studies? Based on this study and others we have analyzed previously, what can you conclude about stability and change in the human body?

We looked at how the levels of oxygen changed during exercise and during recovery. We can conclude that many of the factors in the human body that can be measured during exercise change during exercise as compared to a stable state at rest.