STUDENT GUIDE EXPLORE 2 LESSON 21



Part 1: Our Motivation

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

- How does milk help us recover to perform for a second workout?
- Are glucose and proteins the reason milk helps with recovery?
- Do we get energy from milk?



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Part 2: Analyzing and Interpreting Data

Use the Lesson 21 Data Set handout, and review the experiments scientists conducted to explore how recovery beverages can help restore muscle glycogen after exercise. Summarize the methods that they used, the data they collected, and their findings.

Data Set 1	Data Set 2
In this study, cyclists completed glycogen- depleting workouts and then drank one of three different recovery drinks, including a carbohydrate-protein drink, a carbohydrate- matched drink, or a calorie-matched drink.	In this study, cyclists completed a 75-minute cycling workout at 70% of their max effort, followed by six one-minute sprints at 125% max effort, with six one-minute rests in between each sprint. The last sprint was followed by a four-hour recovery period. They drank one of
Participants completed two hours of cycling at 70% max intensity followed by 1-min sprints/1-min leisure pace until their blood glucose dropped to a level indicating the liver glycogen stores were used up.	three different recovery drinks: a carbohydrate drink (CHO), a carbohydrate/protein drink (CHO-PRO), or a carbohydrate-amino acid drink (CHO-AA).
' Researchers used an NMR scanner to measure the amount of muscle glycogen in the quadriceps muscle before exercise, after exercise, and at intervals throughout recovery time.	Researchers obtained muscle biopsies to measure the amount of muscle glycogen following the end of the last sprint and at the end of the recovery period. They found that all of the drinks increased the
	amount of muscle glycogen between the end of

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They found that all of the beverages replenished glycogen, and the carb-protein drink	exercise and the end of recovery. The carb and carb-protein were higher at the end than
had a larger and faster response than the	the carb-aa drink, but not by a lot. The carb
others.	and carb-protein ended at about the same
	levels.

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

The two investigations were similar. The goal of each was to determine which kind of recovery beverage recovered muscle glycogen the most. Both involved cycling, and both had a long cycling workout followed by sprints to exhaustion.

The first study used NMR to measure muscle glycogen levels and the second used muscle biopsies. NMR took more measurements throughout recovery vs. biopsies which just compared the start of recovery to the end of recovery.

Both studies found that drinks with carbohydrates helped replenish muscle glycogen stores. From this perspective, we can say that the findings of the two studies are very consistent.

How did scientists use the lens of stability and change in designing and analyzing the results of this study? Is this consistent with how we've seen scientists use this lens previously?

Scientists measured how glycogen levels in the body change in response to drinking a recovery beverage after a workout. This is a similar example to what we have seen previously because, yet again, we see that scientists are measuring the changes in the quantity of a molecular factor in the body.

What conclusions can you draw about how milk helps our bodies recover after intense exercise?

It looks like consuming a beverage with carbohydrates in it helps to replenish muscle glycogen stores during the first few hours of recovery. This could mean that milk also can help restore glycogen because it contains carbohydrates, like lactose and sucrose, that get digested into glucose which can restore glycogen.