REAL SCIENCE: SCIENCE SKILLS QUIZ

INSTRUCTIONS

Read the following science article and answer the following questions.

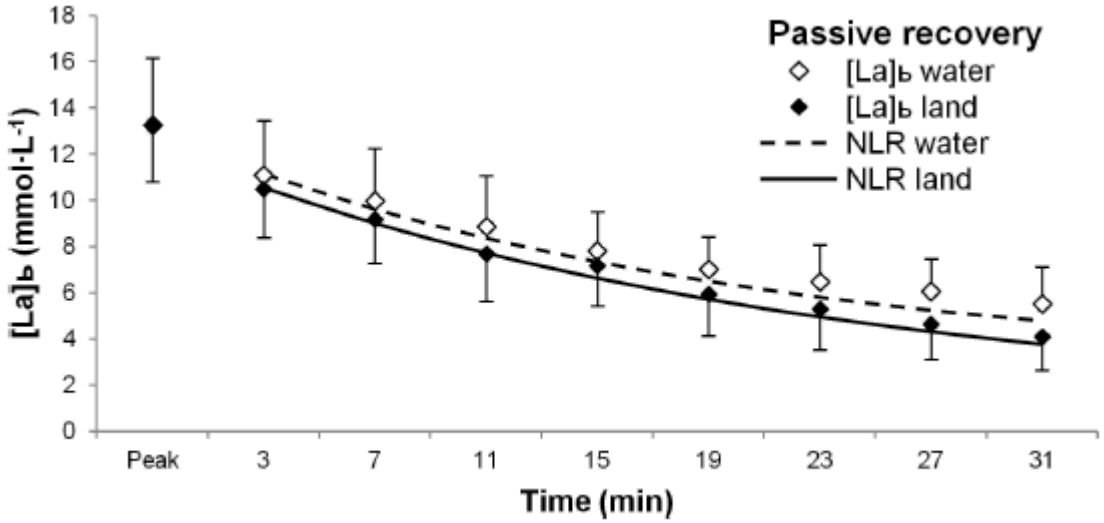
RESEARCH: MUSCLE RECOVERY AFTER EXERCISE

When muscles are undergoing strenuous exercise, there may not be enough oxygen intake for glucose to be converted via cellular respiration. Thus, glucose is converted into energy by glycolysis, which produces lactic acid (also known as lactate) as a byproduct. Lactic acid is what causes the burning sensation in muscles during and after exercise.

When we stop exercising, our bodies start to remove the lactic acid that has built up. A group of scientists conducted an experiment to study how to remove lactic acid from muscles (aka. recovery) after high-intensity exercise.

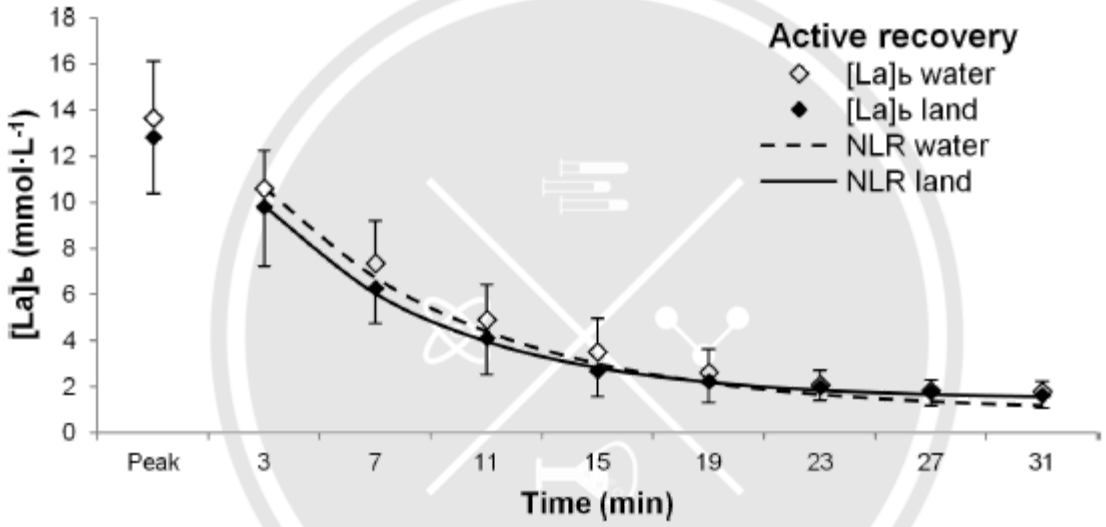
Experiment 1 – Passive recovery

Scientists studied the effect of soaking in water on how quickly lactic acid is removed from the blood. Participants were led through a high-intensity exercise for 30 minutes. Immediately following the 30 minutes of exercise, blood samples were collected to determine the peak (or maximum) amount of lactic acid in the blood. Half the participants were then instructed to sit in a warm pool while the other participants were instructed to sit in a chair next to the pool. Blood samples were taken regularly to measure lactic acid concentrations (symbol [La]b). Individual participants' concentrations for each time were averaged. The overall results are shown in the graph below.



Experiment 2 – Active Recovery

Scientists studied the effect of low intensity exercise following high intensity exercise on how quickly lactic acid is removed from the blood. Participants in this experiment did exactly as the participants in experiment 1 did but with one difference. Following their exercise, half the participants were instructed to ride a stationary bike while being immersed in water (the participants' heads were above water and they were able to breath) while the other participants were instructed to ride a stationary bike next to the pool. Blood samples were collected and averaged just like in experiment 1. The overall results are shown in the graph below:



QUESTIONS

1. Which of the following constitutes a pair of independent and dependent variables being studied?

a) Independent: water immersion; Dependent: lactic acid concentration
b) Independent: water immersion; Dependent: active recovery
c) Independent: lactic acid concentration; Dependent: time
d) Independent: Active recovery; Dependent: water immersion
e) Independent: Active recovery; Dependent: passive recovery

2. What is a conclusion the researchers can make from the data?

a) Passive recovery is better than active recovery.
b) Water immersion is beneficial to recovery
c) Passive recovery along with water immersion produces the best recovery
d) Riding a stationary bike with water immersion produces the best recovery
e) Water immersion has no effect on lactic acid recovery during active recovery

3. If the concentration of lactic acid in a blood sample is 7 mmol / L,, which participant could the blood sample have come from?
a) After 27 minutes of passive recovery, not immersed in water
b) After 15 minutes of passive recovery, immersed in water
c) After 31 minutes of passive recovery, not immersed in water
d) After 5 minutes of active recovery, not immersed in water
e) After 11 minutes of active recovery, immersed in water

4. Assuming the original experiment was done in a room and pool set at 25 degrees Celsius, how would the graph be different if passive recovery was done in a pool at room set at 10 degrees Celsius?
b) the slope of both curves would be more steep
a) the slope of both curves would be less steep
c) the peak would be higher
d) the peak would be lower
e) the concentration of lactic acid would be less for both curves

5. In a similar study, participants were asked to jog lightly beside a pool as part of recovery. What concentration of lactic acid would likely be found in a blood sample taken 11 min in recovery?
a) 4 mmol / L
b) 6 mmol / L
c) 8 mmoL / L
d) 10 mmol / L
e) 12 mmol / L

6. In a future study, scientists want to study how cold temperatures affect recovery. What is a hypothesis scientists could make?
a) If recovery occurs more quickly, then it is due to participants soaking in cold water after exercise.
b) If athletes soak in cold water after high intensity exercise, lactic acid recovery will slow down.
c) Cold temperatures may have an effect on lactic acid recovery.
d) Soaking in cold water after exercise reduces lactic acid recovery time by improving circulation
e) If hot temperatures increase swelling, then cold temperatures will decrease inflammation and improve recovery.

7. During recovery, some athletes sit in a chamber filled with a higher concentration of oxygen. Assuming this helps recovery, how would the above graphs change?
a) The peak would increase
b) The peak would decrease
c) Slope would be more steep
d) Slope would be less steep
e) No change

8. Which participant would have the lowest concentration of lactic acid after 15 minutes of recovery?
a) Active recovery, not immersed in water
b) Active recovery, immersed in water
c) Passive recovery, not immersed in water
d) Passive recovery, immersed in water
e) Unknown

KEY

1. A
2. E
3. D
4. B
5. A
6. B
7. C
8. A