Title: Measuring Lung Capacity

Problem: How does changing volunteers with different fitness levels affect the size of the balloons they blow into?

Hypothesis: When you get more exercise, your muscles need more oxygen, which you will get when you breathe. Air moves into the lungs through the trachea and then back out again. When each breath is completed, the lungs still contain some air, known as the residual volume. Each inhalation adds additional air. Each exhalation removes about the same volume as was inhaled. A person with a higher fitness level will inhale more air and exhale a similar amount of air. Volunteers with different fitness levels will blow balloons into different sizes. A person with a higher fitness level will blow the biggest balloon.

Materials: balloons, pen, tape measure, volunteers, markers, yarn, ruler, computer

Procedure:

1. Buy all the materials.
2. Set up a data table
3. Ask a volunteer to blow into a balloon after a normal breath to determine his/her reserve lung air capacity.
4. Wrap the yarn around the middle of the balloon and measure the circumference.
5. Lay the yarn next to the ruler and measure the length in centimeters
6. Record the result in the data table
7. Ask the volunteer to blow into the balloon again after a deep breath to determine his/her vital lung capacity.
8. Repeat steps 5 and 6.
9. Determine his/her fitness level by asking how many minutes of strenuous activity he/she does each day. Rate their fitness level on a scale of 0-10, based on the following chart, and record the data in the data table.

If a person exercises…	Rating
1 to 2 hours for 5-7 days a week	10
1 hour for 4-5 days a week	9
30 minutes for 4-5 days a week	6
30 minutes for 2-3 days a week	4
30 minutes for one day a week	2
No exercise at all	0

11. Measure his/her height and weight
12. Record the data in the data table.
13. Repeat all the steps for different volunteers.

Sample Data Table

Student	Age	Height	Weight	Fitness level	Circumference of the balloon with		Gender
					normal breath (cm)	deep breath (cm)	

14. Create a graph and analyze the results.
15. You can create a graph on a graphing paper on the “Create a graph” program in your Chromebook.

Write your conclusion:

Claim - A claim is a statement that answers the research question. Make a claim that answers the research question:	
Evidence - Evidence is found in the experimental design and in the data from the experiment. List 3 pieces of evidence that would support your claim. To help you come up with some ideas consider these questions: - Did the heavier or taller people always have more reserve air capacity? - What about vital capacity? - Did physical fitness have a bearing on the results of either?	
Reasoning - Reasoning explains the “Why” of the claim. Take each piece of evidence and explain how it supports the claim and why you saw these results.	

Sample Data

Student	Age	Height	Weight	Fitness level	Circumference of the balloon with		Gender
					normal breath (cm)	deep breath (cm)	
Coco	9	4’	80 lbs	8	14	18	female
Lailah	9	4’	75 lbs	10	21	31	female
Henry	10	4’	85 lbs	8	15	20	male
Jordan	10	4’2”	90 lbs	8	13	16	male
Nora	10	4’5”	90 lbs	8	16	17	female
Berkeley	10	5”	90 lbs	8	16	17	female
Malachi	10	4’10”	100 lbs	8	17	20	male
Afsheen	10	4’5”	80 lbs	6	12	15	female
Charlie	9	4’9”	85 lbs	8	14	18	male
Jonelle	10	4’5”	80 lbs	9	15	18	female
Henry E	9	4’	80 lbs	10	20	22	male
Alia	9	4’	82 lbs	8	13	17	female
Deterick	10	4’2”	85 lbs	9	18	20	male
Kaiden	10	4’5”	90 lbs	10	22	30	male

Analysis: Most people breathe in about a pint of air with each breath. A person may take in four quarts of air in a really deep breath, which is almost 8 times he or she would usually breathe. The more you practice breathing deeply, the more efficient your body gets at it. In conclusion, vital lung capacity is what is increased by exercise. It can also be lowered by other factors, such as smoking, asthma, or breathing very polluted air.

Ref:
https://bio.libretexts.org/Learning_Objects/Worksheets/Book%3A_The_Biology_Corner_(Worksheets)/Anatomy_Worksheets/Investigation%3A_Measuring_Lung_Capacity

Claim:
People who exercise regularly will be able to blow up larger balloons because they have greater lung capacity.

Evidence:
In the experiment, volunteers with different fitness levels blew into balloons. The balloons blown by those who exercised more regularly were larger compared to those blown by less active individuals.

Reasoning:
Exercise increases the body's need for oxygen, which strengthens the respiratory muscles and improves lung efficiency over time. When a person breathes in, air travels through the trachea into the lungs. Some air always remains in the lungs after exhalation, called residual volume. With regular exercise, the lungs can hold and process more air per breath. Therefore, individuals who are more physically fit tend to have a greater lung capacity, allowing them to blow more air into a balloon in one breath.

🫁 Understanding Lung Volumes 🫁

Tidal Volume (TV): The amount of air you breathe in and out normally. 🟩
Inspiratory Reserve Volume (IRV): The extra air you can inhale after a normal breath. 🟨
Expiratory Reserve Volume (ERV): The extra air you can exhale after a normal breath. 🟦
Resi... See more

