The Effect of Tire Pressure on Deceleration

Research Question

How does changing the tire pressure on a bike affect its stopping distance?

Background Information

The recommended tire pressure for a mountain bike is 25-50 PSI (pounds per square inch). Low tire pressure causes a tire to lose its shape and this causes the tire to have less traction.

Hypothesis

If a bike's tire pressure is lower, it will take a longer distance for the bike to stop.

Variables

What variable was changed in your experiment? (Independent Variable)

I changed the tire pressure.

What variable was measured in your experiment? (Dependent Variable)

I measured how this affects the stopping distance.

Materials

Quantity	Materials
1	Bike
1	Bike helmet
1	Digital tire pump
1	Bike spedometer
1	Measuring tape
1	Piece of paper

Procedure

1. Fill the bike tires to the highest tire pressure that will be tested.
2. Mark a line on the road where the rider should start to stop.
3. Put on bike helmet and ride the bike toward the line at 12 miles per hour.
4. Start to stop at the line.
5. Measure and record the distance it took the rider to stop.
6. Repeat the test twice more at that PSI.
7. Change the tire pressure to a lower PSI. Repeat the stop test three times at this PSI.
8. Change the tire pressure to the lowest PSI. Repeat the stop test three times at this PSI.
9. Record the results of all nine tests.

Results

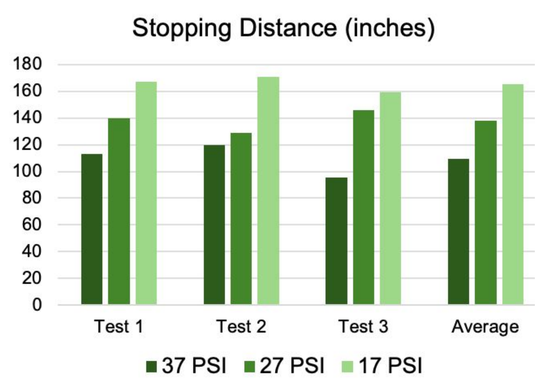
When the bike had the highest tire pressure, it stopped in the shortest distance. When the bike had the lowest tire pressure, it stopped in the longest distance.

Photos

Chart

Stopping Distance (inches)				
PSI	Test 1	Test 2	Test 3	Avg.
37	113”	120”	95.5”	109.5”
27	140”	129”	146”	138.3”
17	167”	171”	159”	165.67”

Graph



Conclusion

Changing the tire pressure on a bike does change its stopping distance. The tests showed that a bike stops faster if it has more air in its tires and it stops slower if it has less air in its tires. This evidence proves my hypothesis that, if the tire pressure is lower, it will take a longer distance for the bike to stop. This tells us it is safer to keep our bike tires pumped up.

References

David Muller; “Tread Rightly: Why Tire Pressure Matters”; Car and Driver; Accessed January 15, 2022; www.caranddriver.com/news/a15341871/tread-rightly-why-tire-pressure-matters.

Spencer Powlison; “A Beginner’s Guide to Bike Tire Pressure”; The Pro’s Closet Magazine; Accessed January 15, 2022; www.theproscloset.com/blogs/news/a-beginners-guide-to-bike-tire-pressure.

West Virginia University; “It's All About Traction: Science Behind the Sport; Accessed January 15, 2022; https://sciencebehindthesport.wvu.edu/science-behind-cycling/tires.

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The photos, chart, and graph were done by the researcher.

Reflections on Learning

Please answer the following questions about your project.

1. Where did you do your project and who supervised you?

ANSWER: I did my project at my house on my street. My supervisors were my mom and dad.

2. Please fill out the chart with the safety risks for your project and the safety measures you used.

ANSWER:

Possible Safety Risk	Safety Measures Used
Pumping tire too full	Didn't pump tire over 50 PSI
Riding a bike too fast	Rode at a slow speed of 12 miles per hour
Falling off a bike	Parent supervised
Riding a bike on a street	Made sure no cars were ocoming

Did you follow all of the Austin Energy Regional Science Fest's Elementary Rules and Guidelines?

ANSWER: Yes.

3. What gave you the idea for this project?

ANSWER: I like to ride my bike a lot.

4. What did you learn from doing your project?

ANSWER: I learned that, if you have more air in your tires, you can stop faster than if you have less air in your tires.

5. What would you change about the project and why?

ANSWER: Instead of measuring only stopping distance, I would also measure the time it takes to stop because they are similar.

6. What new questions do you have?

ANSWER: Are there other things I could change on my bike so I can go faster and still stop fast?

7. Is there anything else you want to tell your judge?

ANSWER: This project took six hours and I worked really hard on it.