



Name: _____

Introduction

Understanding and testing drag force is important in different sports to give athletes an edge. Scientists are constantly developing materials that help athletes deal better with drag force. This experiment demonstrates the effects of drag force on a runner.

Question

What effect does drag have on a runner?

Vocabulary

1. In relation to physics, define the term drag.

Hypothesis

2. Complete the following sentence by circling the correct option.

A runner experiencing more drag will SLOW DOWN or SPEED UP

Materials

- Runner (you)
- 2 x witches hats (or plastic bottles)
- Stop watch
- Timer (someone from your family)
- Small plastic bag (i.e. shopping or freezer bag)
- Large plastic bag (i.e. garbage bag)

Method

1. Set up a running course by placing the witches hats (or bottles) around 15 m apart (you can step this out if you don't have access to a measuring tape).
2. Stand with the timer (with stop watch) at one of the cones.
3. When the timer says "go" (and starts the stop watch), run up to and around the second cone and back to the timer.
4. As you pass the timer they stop the stop watch.
5. Record this value in the table below.
6. Repeat this trial 3 times (have at least a one minute rest in-between).
7. Repeat the experiment holding the small bag behind you and then the large bag behind you so that they act like a parachute.

Results

Time taken to complete running course (seconds)

Trial	No bag	Small bag	Large bag
One			
Two			
Three			
Average (total/3)			

3. Calculate the average time for each of the experimental trials.
4. Use excel to display the average results on a column graph (the experimental trials should be on the x axis and the time on the y axis)

Discussion

1. Describe the result trends in a sentence (make sure you mention results in the sentence).

2. Did the results match the hypothesis? Provide a reason as to why these results were obtained.

3. Compare your result to two other class members. Provide some suggestion why you think these similarities and differences exist.

4. Describe why reducing drag in sport is important.

5. Describe a non-sporting situation where reducing drag is important.

6. A fair test using the scientific method always has clear independent (experimental), dependent (observed) and controlled variables. Identify the variables in the experiment by completing the table below. The following clip may help you: <https://www.youtube.com/watch?v=iaewZmc4TYQ>

Choose from the following items and write it in the In drag experiment column for each variable listed in the table below:

- The different size bags
- The length of the running course
- The time taken to complete the course

Variable	In drag experiment
Independent	
Dependent	
Controlled	

7. Do you think that this was a fair test? What modifications could you make to the method to make this test fairer?

Conclusion

8. Write one clear paragraph that summarises your findings. The conclusion should relate directly to the question answered, your hypothesis and the results that you obtained (make sure you quote your results).

Good sentence starters are *“The question that was investigated...”*, *It was predicted that....*, *“The results were ...”* and *“The results indicated that...”*.

Investigate further

1. Speedo designed a “shark skin suit” to help swimmers gain an edge. Find out the effect that this suit had on world record times and if athletes are still wearing it now.
2. Wind tunnels are used extensively in many industries to test for drag. Find out how a wind tunnel works and how different industries use it.
3. “Slip streaming” or “drafting” is a technique used by athletes to gain an edge. Find out what this technique involves and how much of an advantage athletes can get.