STEM Project

Chapter 1: Science toolkit

Pages 1–28

Walk the line

Consider the following scenario:

An inventor, Sunni Day, invents a solar panel device that will charge a mobile phone. She tests her device on a sunny day – and finds that it charges her phone in less than 30 minutes. She starts selling her solar panel device, promising a charge time of less than 30 minutes. Soon Sunni starts getting complaints – it is taking some people much longer than 30 minutes to charge their phone. What has gone wrong?

One of the most important aspects of science and engineering is **reproducibility**. When you carry out a scientific experiment, or test an engineering component, you must do it in a way that gives reproducible results – this means that if the test or experiment is repeated, the same results will occur.

In the scenario above, Sunni did not consider variables that could have impacted on her test. The amount of sunlight, the location of the solar panels and the battery type are all variables that could have affected her charge time.

So to be able to make a reliable conclusion from an experiment or test, you need reproducible results. This means all variables that can affect the results must be identified and controlled. Often it is not until a different scientist repeats an experiment that variables emerge that have been overlooked at first.

In this task, you will improve an experiment to make it reproducible.

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Walking in a straight line

In 1916, American zoologist Asa Schaeffer discovered that a single-celled organism, an amoeba, always moved in a spiral pattern when placed on a cylindrical surface. He decided to test whether this was also true for humans with no visual reference point (when they cannot see where they are going!).

To test this, he blindfolded one of his friends and asked him to walk in a straight line across a field. His friend walked in a clockwise spiral until he hit a tree stump.

Given what you have been told about Schaeffer's experiment, could it be concluded that blindfolded people will always walk in a circle? Why/why not?

If Schaeffer's experiment was repeated using different people in different locations, do you think the results would be the same every time? Why/why not?

What variables could help or hinder a person to walk in a straight line when blindfolded? Consider variables connected with the body, the terrain and other aspects of the environment (e.g. noise).

Your task is to improve Schaeffer's experiment design to make it more reproducible.

To do this, think about the variables you have considered above. Describe in your method how you will stop these variables from affecting the results.

Also, make sure you consider safety in your experiment design – how will you ensure your test subjects do not walk into things?

Once you have designed the experiment, try it out with as many test subjects as you can find. Record your results in the Data and results section.

Experiment

Aim: To test if it is possible to walk in a straight line while blindfolded.

Hypothesis: It is not possible to walk in a straight line while blindfolded.

Materials: Blindfold

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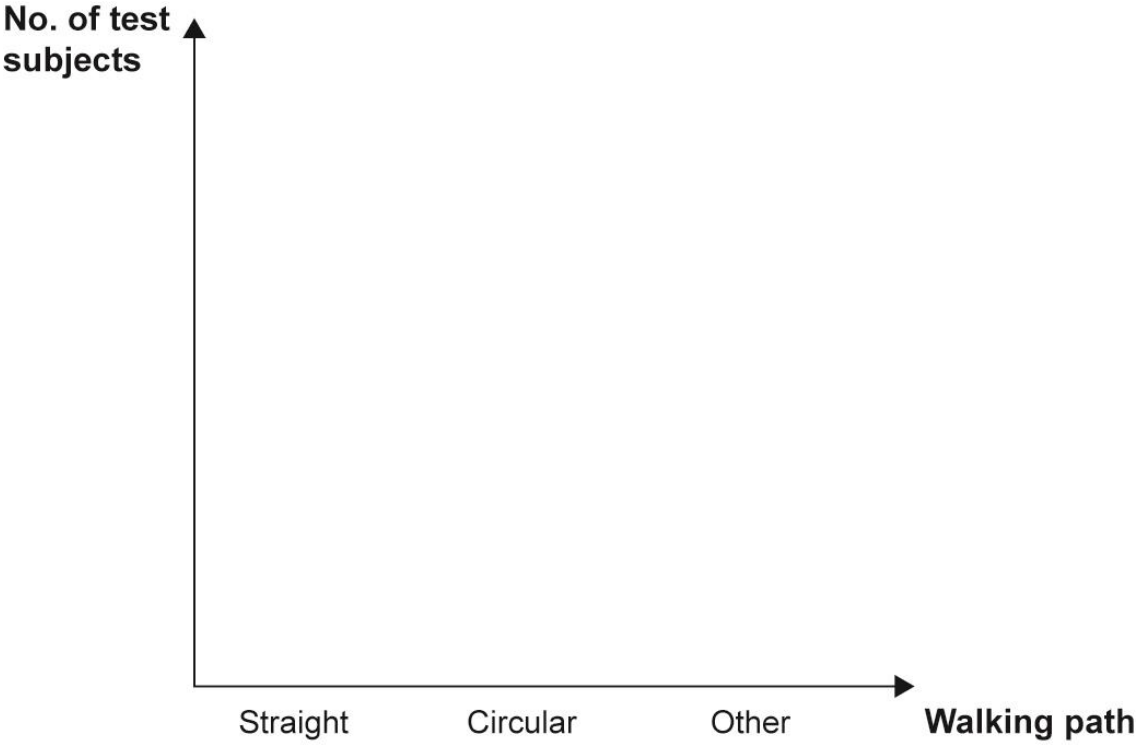
Method:

In the frequency table below, use a tally to collate the results of your experiment. Collate the number of test subjects who demonstrated straight and circular walking paths. If some walking paths were neither straight nor circular, place them in the 'Other' category.

Walking path	Tally	Total
Straight		
Circular		
Other		

Graph the results below in a column graph.



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Discussion and reflection

Were the results the same for all test subjects?

Was the hypothesis proven, disproven or inconclusive? ('Inconclusive' means that you were not able to confidently say either way.)

Can you draw any reliable conclusions from your experiment?

Do you think if another scientist carried out your experiment in a different location, they could reproduce your results?

Were there any variables that you discovered were not accounted for in your experiment? If so, how could you modify your experiment to account for them?

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