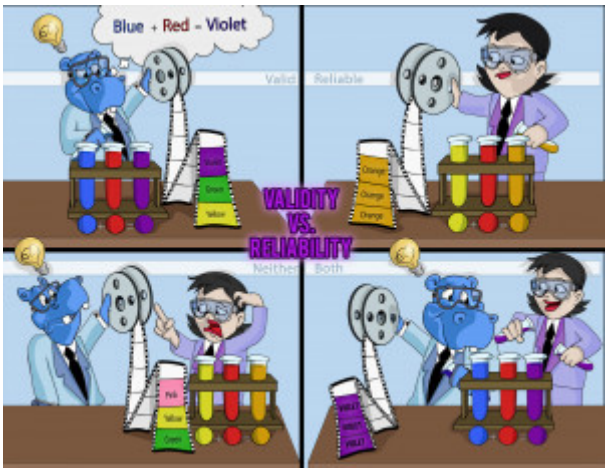
Validity vs. Reliability

It's important when designing and conducting experiments to determine whether the experiment is valid and reliable. A valid experiment must test the hypothesis, and a reliable experiment is repeatable with consistent results. An experiment can be valid, testing the hypothesis, but not be reliable or repeatable. An experiment can also be reliable and repeatable without testing the hypothesis at all. Some experiments are even both!

However, successful experiments are valid and reliable, meaning they test the hypothesis and are repeatable with consistent results. The conclusions from those experiments are trustworthy.



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A valid experiment tests the hypothesis, but may not be reliable

Hypothesis-Hippo Testing whether Red and Blue make Valid-Violet, but Reliable-Reel shows inconsistent results

A valid experiment will test the hypothesis properly. The experiment doesn't necessarily need to conclude that the hypothesis is supported, but it does need to test it fully. However, some experiments are valid but not reliable. This is the case if the results are not consistent and the experiment is not repeatable.

A reliable experiment is repeatable with consistent results, but may not be valid

Reliable-Reel showing Repeated experiments with Consistent results, but not Valid-Violet

A reliable experiment will be repeatable and have consistent results in each experimental study. However, sometimes experiments are reliable and repeatable without actually testing the hypothesis fully. Those experiments are reliable, but not valid.

Some experiments are neither valid nor reliable

Intended Valid-Violet results not achieved and Reliable-Reel showing inconsistent results

Some experiments are neither valid nor reliable, and those experiments have the least trustworthy conclusions. Not only is the hypothesis not tested, but the experiment is not repeatable and the results are inconsistent.

An experiment should be valid and reliable for the conclusion to be trustworthy

Experiment with intended Valid-Violet and Consistent results on Reliable-Reel

In order for the conclusions of an experiment to be trustworthy, the experiment must be valid AND reliable. This means the experiment must test the hypothesis fully, and the experiment must be repeatable with consistent results in each study.