

Scientific Theory

Theory

- Most accurately describe a large class of observations on the basis of a model which contains only a few arbitrary elements, and it must make definite predictions about the results of future observations.
- Constructed to explain and predict phenomenon.
- Are specific – they must state what will happen (and sometimes what will not happen).
- Theories are modified and rejected based upon evidence and are supported by a large set of data.
- No theory is infallible.
- Scientific method
 - Propose a theory.
 - Derive predictions (hypotheses) from this theory.
 - Test these predictions by.
 - Collecting empirical data.
 - Using falsifiable hypotheses.
 - Verifying the results.
 - Modify the theory.

Hypotheses

- Hypotheses are specific predictions derived from theories.
- A testable prediction about the expected outcome of the research.
- E.g. It is hypothesised that anodal tDCS over left PPC will increase attention to the left side of space.

Critical Thinking

- Questions
 - What am I being asked to believe or accept?
 - What evidence is there to support this?
 - Are there alternative ways to interpret the evidence?
 - What additional evidence is needed to help me evaluate the alternatives?
 - What conclusions are most reliable?
- Many students misunderstand this concept and think it means they need to attack a claim.
- Critical thinking is a set of skills that allow us to evaluate claims in a scientific, open-minded fashion.
- There are six basic principles for critical thinking – extraordinary claims, testability, Occam's razor, replicability, ruling out rival hypotheses, correlation is not causation.

Extraordinary Claims

- David Hume proposed that extraordinary claims require extraordinary evidence.
- The more a claim predicts what we already know, the more persuasive the evidence for this claim must be.
- E.g. alien abductions.

Testability

- Scientists try to test the predictions of their theories as well as those of rival theories.
- A genuinely informative theory will predict specific outcomes and does not try to explain everything.
- A sound scientific theory will make novel predictions (sometimes risky predictions) – an observation that would be expected if theory is true.
- Scientific theories must be testable.

Occam's Razor

- Aka the principle of parsimony (the simplest route).
- Involves 'shaving off' unnecessarily complex explanations to arrive at the simplest explanation.
- The simplest explanation is one which also accounts for the information.

Replicability

- Implies that the findings of a study can be duplicated consistently.
- Not always possible to replicate – sample.