

Lecture 9 and 10: Pseudoscience

1. Definitions

*Compare and contrast the definitions of science, bad science and pseudoscience.
Why do pseudoscientific products bother pretending to be scientific?
Define and state the differences between science and pseudoscience.*

Science: a process and technique, not a series of facts

Good science: involves the three central components of scientific thinking (empiricism, rationalism, scepticism) and peer review

Bad science: plagiarism, faking data, lack of ethics

Pseudoscience: claim, belief or practice that is presented as science that

- Does not adhere to valid scientific methods
- Lacks supporting evidence or plausibility; and/ or
- Difficult to reliably test
- May pretend to be scientific to add credibility

2. Influences of perception

List and give an example of three factors that can influence our perception?

- Cultural
- Previous education
- Gender
- History of exposure
- Negative experience with X
- Family values
- Religious values
- Socio-economic position

3. Hallmarks

Hallmarks of pseudoscience.

Describe three hallmarks that differentiate pseudoscience from science?

Differentiate between scientific and pseudoscientific claims.

Science	Pseudoscience
Based on empirical evidence	Uses testimonials/anecdotes
Corrects and updates itself	Rarely modifies itself
Embraces new results	Relies on old data, if any (e.g. Ancient Egyptians)
Is not selective (uses all data available)	Selective data usage (e.g. cherry picking)
Does not depend on authorities	Use of overconfident fringe experts and authorities

Welcomes testing and verification	Does not lend itself to independent testing
Is objective	Often subjective, uses emotive language
Can be expressed accurately	Uses science-sounding language/jargon as well as inventing new physical processes

4. FiLCHeRS

What do the letters in the acronym FiLCHeRS stand for?

Using the acronym FiLCHeRS, be able to explain in detail why one product or process is considered pseudoscience rather than science?

Describe each of the criteria in the FiLCHeRS.

Use the FiLCHeRS to debunk a pseudoscientific product or claim.

- This acronym is used to determine if something is pseudoscience

4.1 Falsifiable – *a test could prove it false.*

- It must be possible to produce evidence (quantitative data) that would prove a claim false
- If nothing could ever disprove a claim it is meaningless
- This rule can be violated in two ways
 - o Undeclared claim
 - A statement so broad or vague that it cannot be tested or falsified
 - o The multiple out
 - An inexhaustible series of excuses intended to explain away evidence that would seem to falsify a claim
 - E.g. If it doesn't work it's because you didn't believe enough
 - Cannot be tested

4.2 Logical – *arguments should be valid and sound*

- Any argument offered as evidence in support of a given claim must be valid and sound
- To be valid, the arguments premises must be true
- To be sound, the rules of logic must be correctly used to reach conclusions based on such premises.

4.3 Comprehensive – *has all evidence been considered?*

- The evidence offered in support of a given claim must be exhaustive
 - o All evidence must be analysed
- No cherry picking

4.4 Honest – *all evidence evaluated without deception?*

- Any evidence offered in support or a given claim must be evaluated without deception
- Dishonesty in real science too
 - o Deliberate misinterpretation of the data
 - o Cherry picking
 - o Ignoring ethical guidelines
- But in pseudoscience
 - o Ignorance
 - o Belief systems