PHIL 110 B
Lecture 3

Evidence and Experiments

Welcome to Lecture 3.

Not All Evidence is Equal



Anecdotes → Correlation vs. Causation → Experimental Design → The Ladder of Evidence

The Illusion of the Anecdote



A cousin's vivid story

Sickness → Remedy → Recovery

Timeline A

✗?

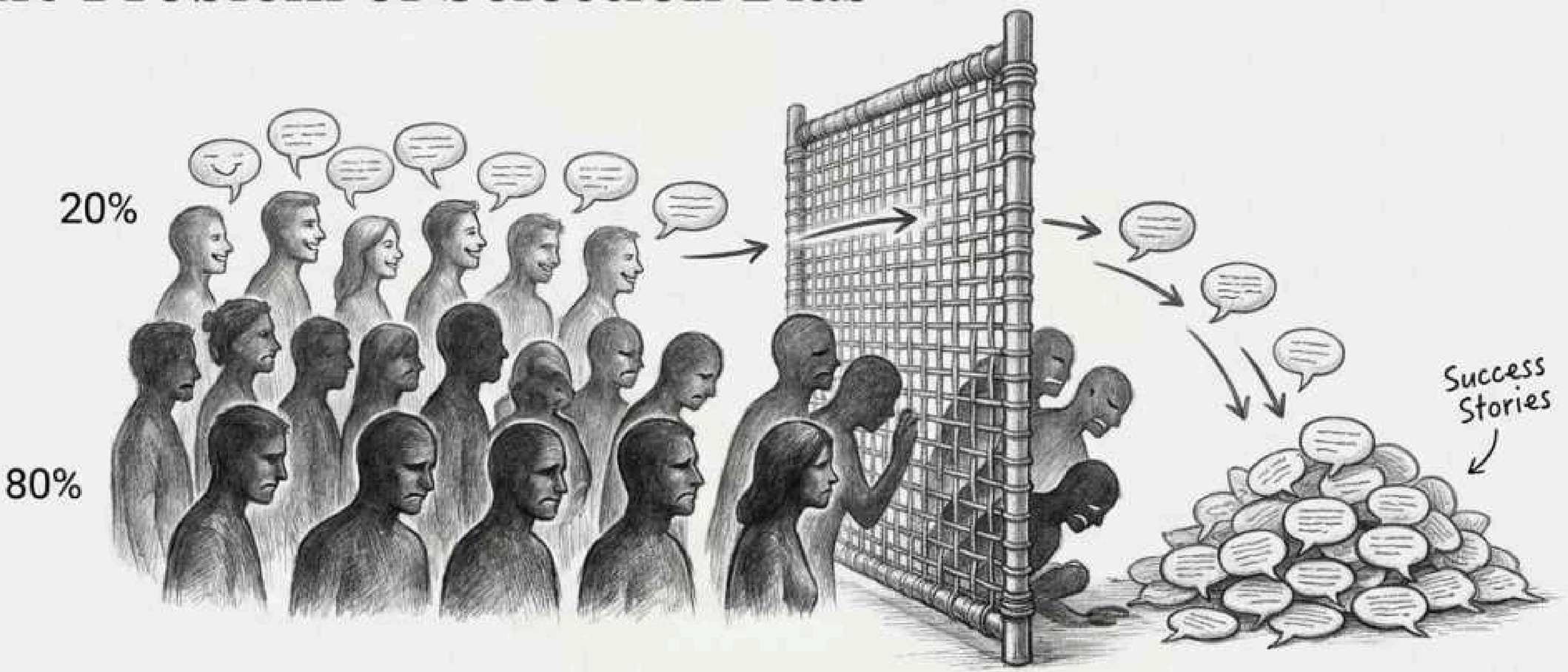
The unseen alternative

Sickness → Time → Recovery

Timeline B

Anecdotes generate ideas to test. They cannot settle whether an idea is true because they lack a comparison. Many illnesses improve on their own.

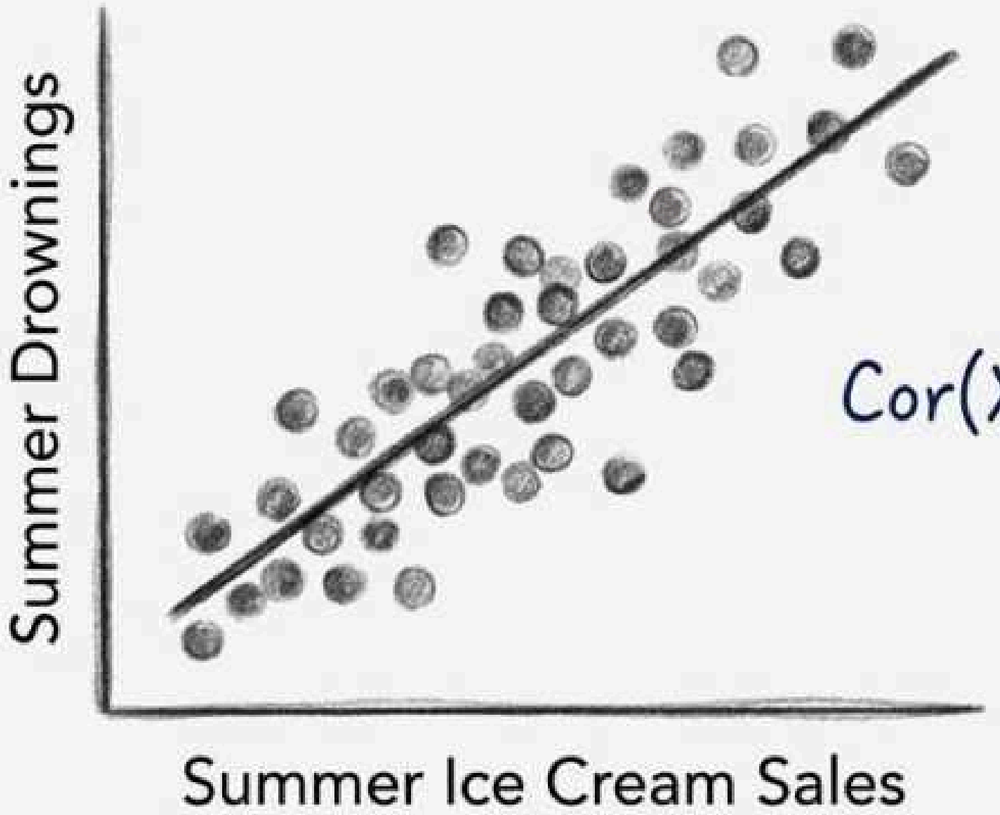
The Problem of Selection Bias



Key Insight: Collecting more stories reveals almost nothing about frequency if failures remain silent.

Rule: We need counts of everyone, not just the happy ones.

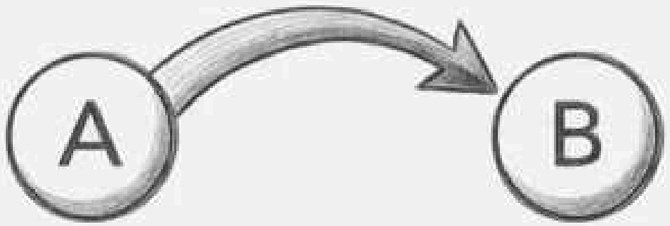
Correlation: A Starting Point



$Cor(X, Y) \neq Cause(X \rightarrow Y)$

Variables rising and falling together provides real information, but does not tell you what is causing what.

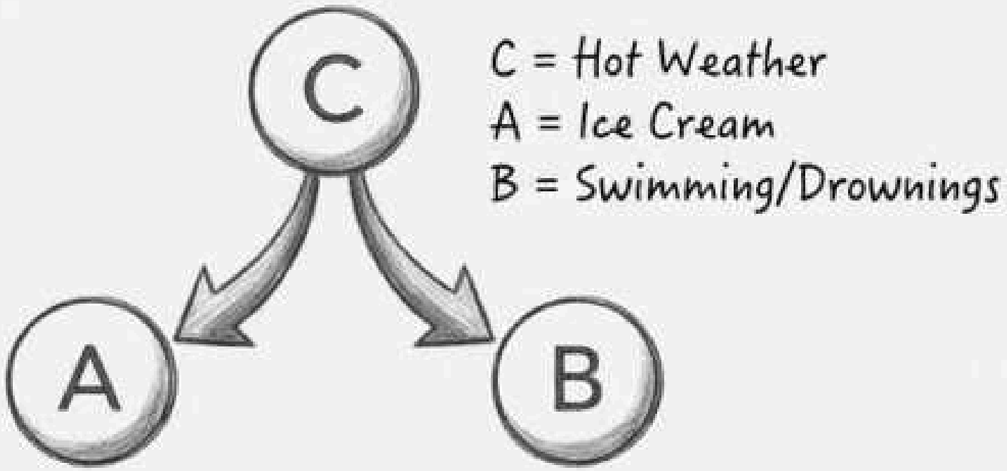
Mapping the Possibilities

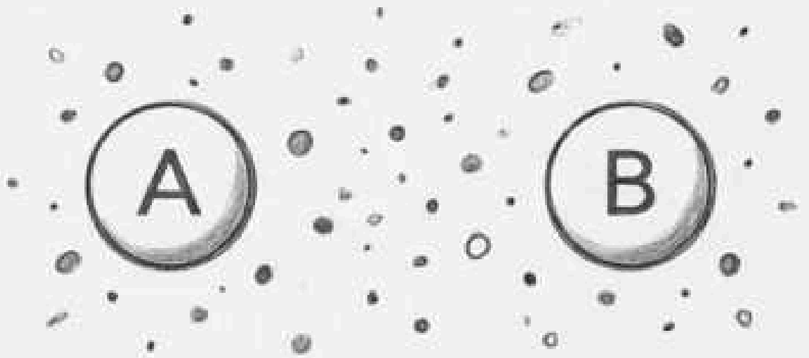


A → B



B → A



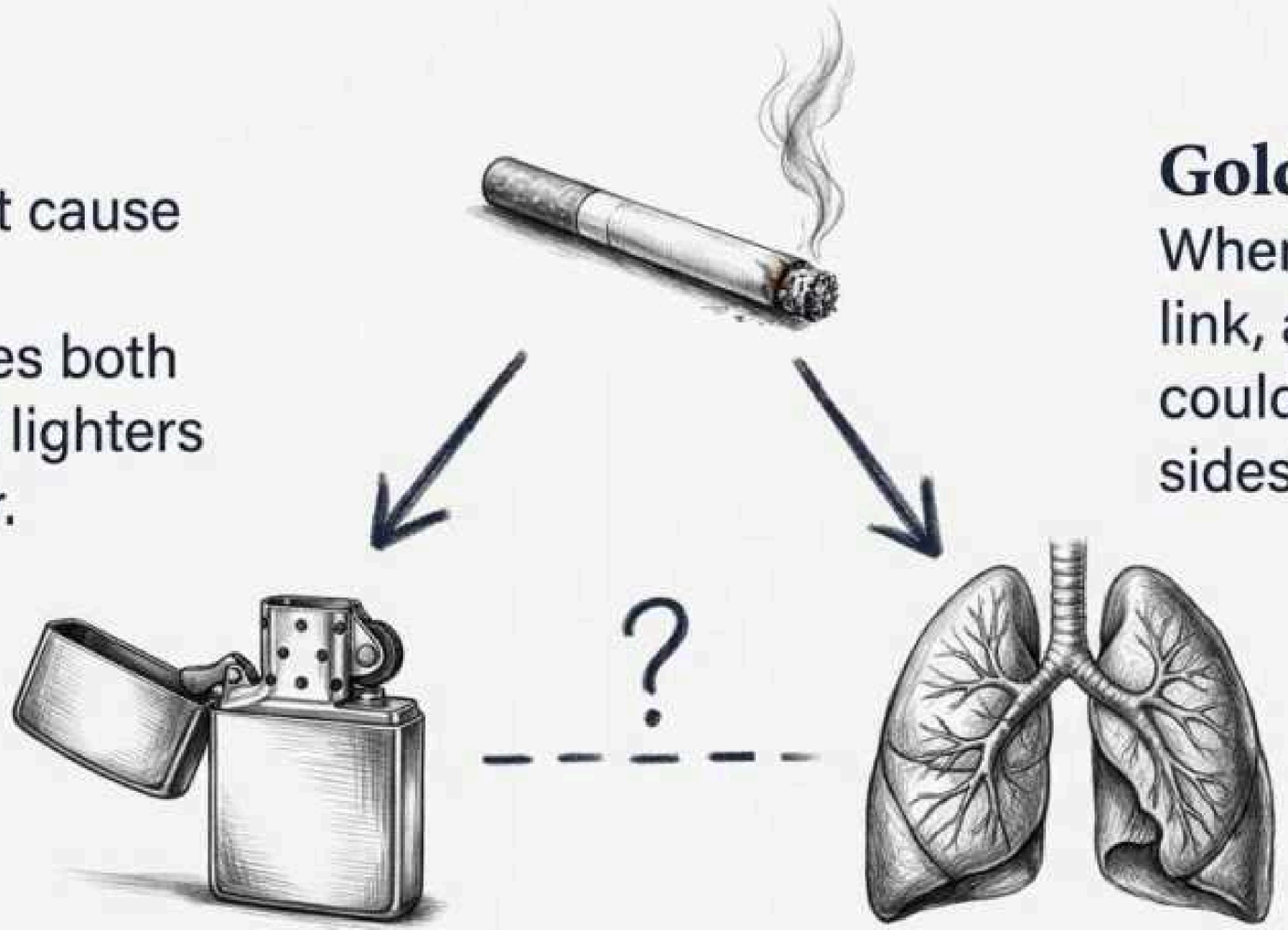


Chance / Statistical Noise

When A and B are linked, ask: Does A cause B? Does B cause A? Or is a confounder causing both? Ice cream does not drown anyone.

Confounders Hide Everywhere

Lighters do not cause lung cancer.
Smoking causes both the carrying of lighters and the cancer.



Golden Rule:
Whenever you see a link, ask: What else could produce both sides?

Reverse Causation



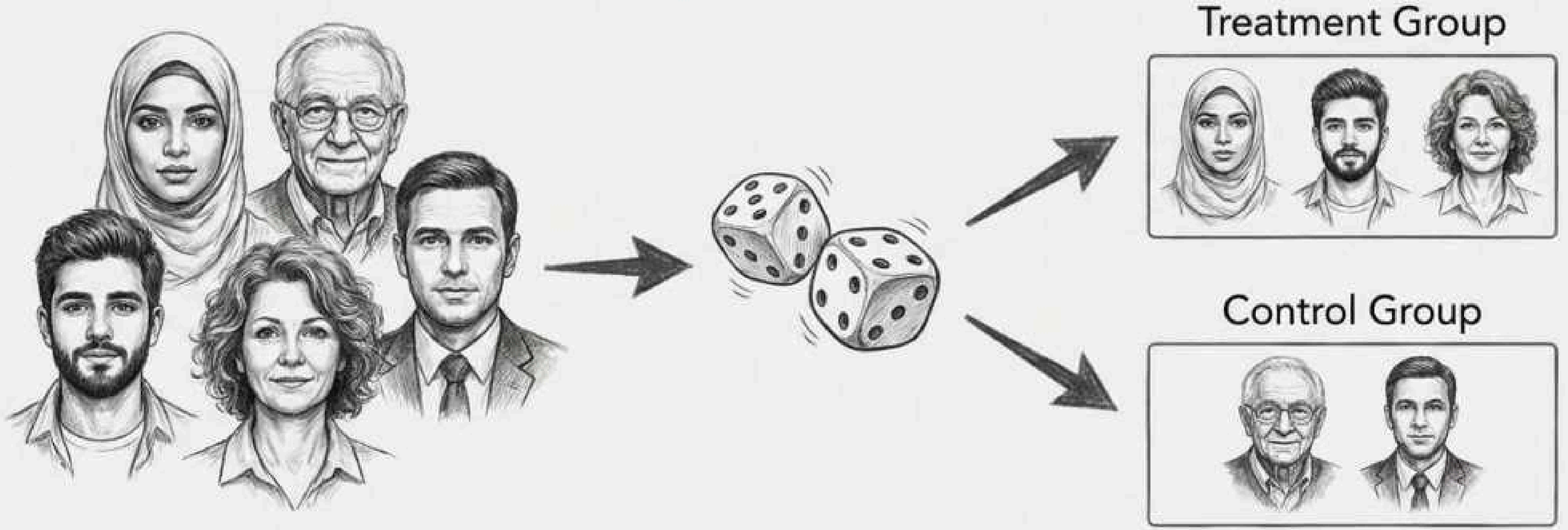
Correct Flow: Sickness → Medicine
Sickness → Hospital

~~**Incorrect Flow:** Medicine → Sickness
Hospital → Death~~



- **Insight:** Hospitals have more deaths than homes, yet hospitals are not the cause of death.
- **Rule:** Ensure the supposed cause chronologically precedes the effect.

The Randomised Controlled Trial (RCT)



Mechanism: Chance assignment spreads all differences evenly between groups—even unknown differences nobody thought of.

Result: If the groups end up different, the treatment is the likely reason.

The Power of the Placebo



Real Pill = Sugar Pill (Placebo)

Key Insight: Expectation alone can make you feel better. Illnesses come and go on their own.

The Test: A fair trial asks whether the real treatment does more than hope and time alone.

The Necessity of Blinding

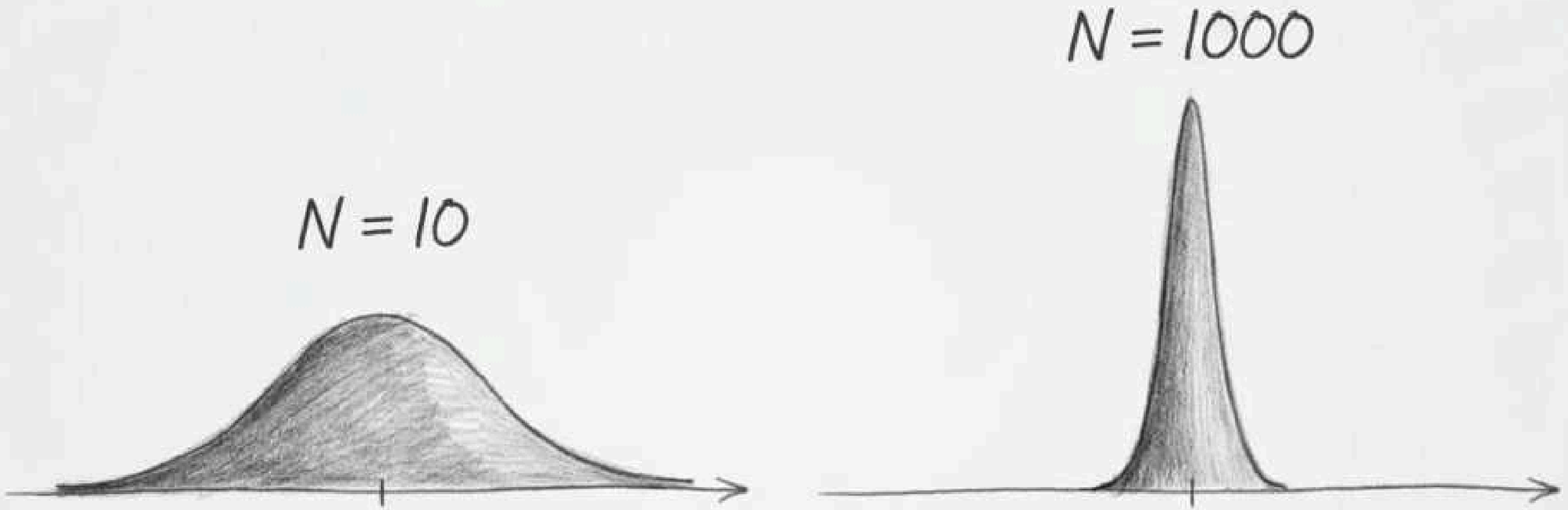




Single-blind: Patients do not know their group.
Double-blind: Neither patients nor researchers know.

The Clever Hans Effect: Without double-blinding, we unconsciously signal the answers we want to see.

Sample Size Dictates Reliability



7/10 heads = Unsurprising.

700/1000 heads = Astonishing.

Small groups swing wildly by chance. A result from 12 people is a hint.
A result from 12,000 people is reliable evidence.

Observational Studies

Context: Used when experiments are impossible or unethical (e.g., forcing people to smoke for 30 years).

4 Pillars of a Strong Observational Case:

1. Large effect size
2. Consistent across many studies
3. Grows with the dose
4. Plausible biological mechanism



Systematic Reviews & Meta-Analyses

Mechanism: Searching for and pooling numbers from all available studies, not just favourable ones.

Warning: Selecting only favourable studies (cherry-picking) can make almost anything look proven.



The Ladder of Evidence



This is a guide, not an absolute rule. A well-run observational study can beat a sloppy trial.

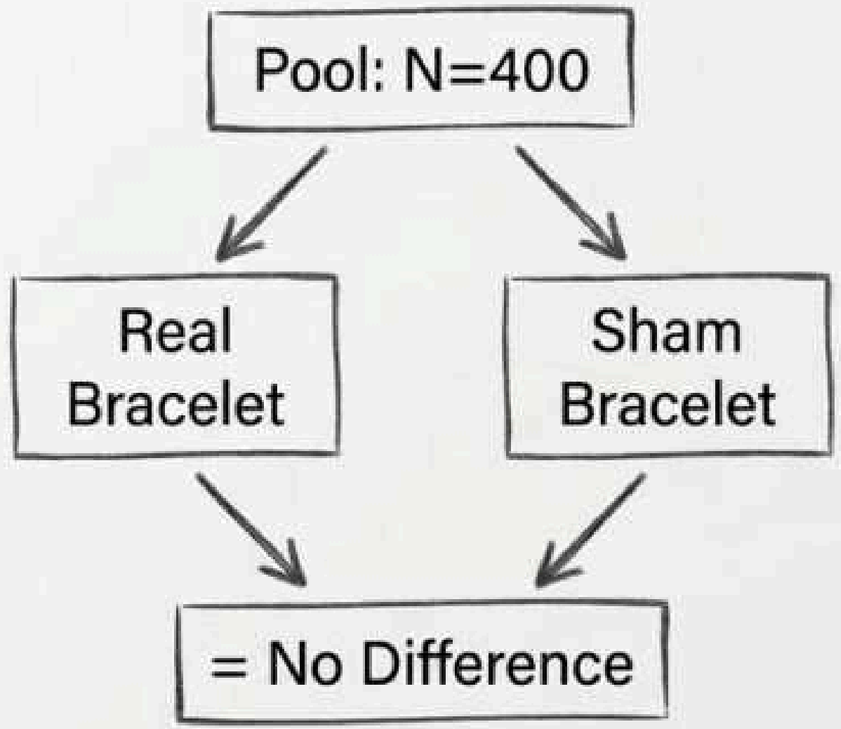
Reading the News: A Defensive Checklist



Weighing the Evidence: Copper Bracelets

Copper bracelets	Compariision matrix





The friend's story and the trial can both be honest. Yet only the trial tells you whether the bracelet, rather than time or hope, was responsible.

The Danger of Publication Bias

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The visible studies overstate the true effect because studies finding nothing are rarely published.

Good reviewers hunt for unpublished results; researchers must pre-register studies before they begin.

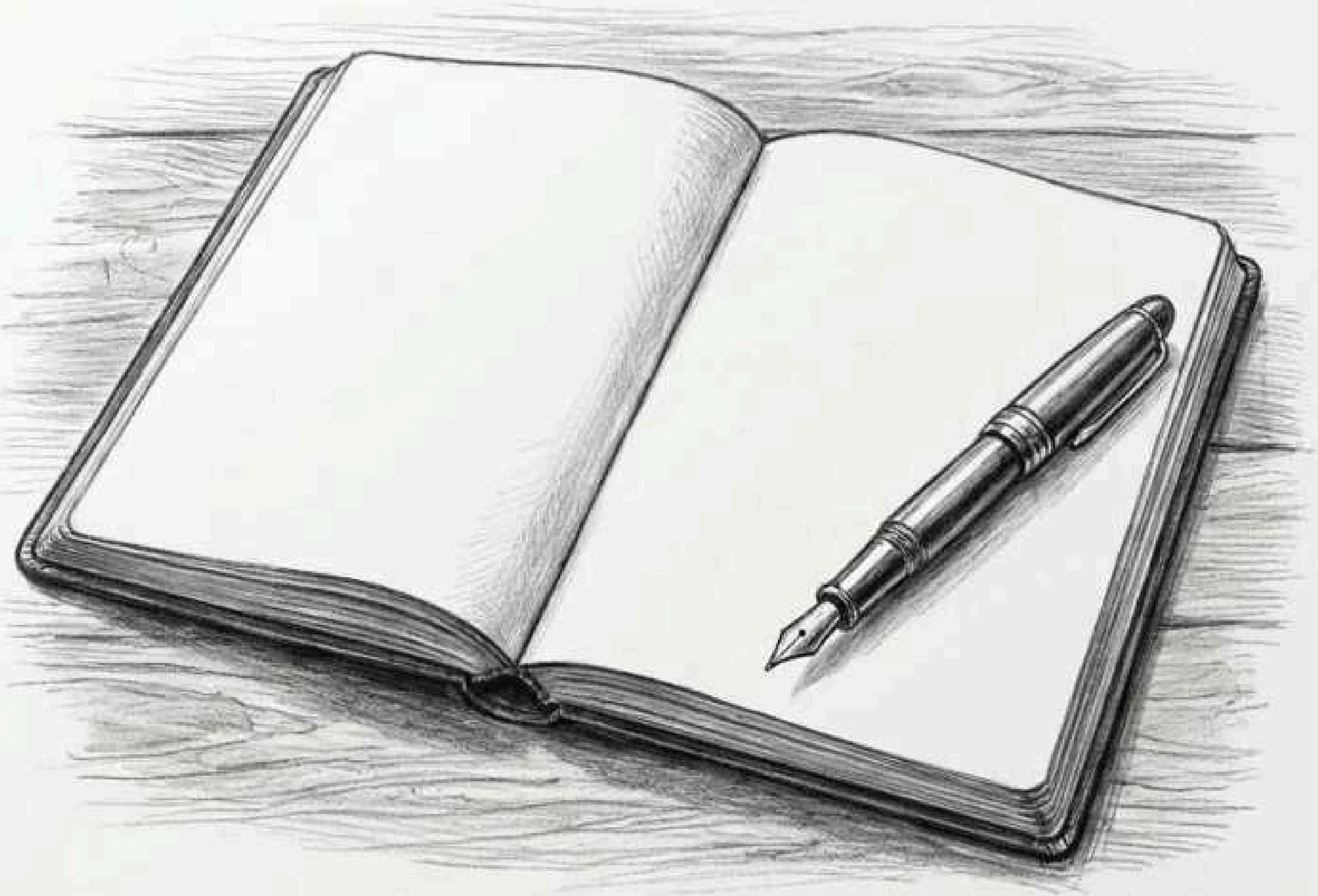


Reflection & Application

Think of a health product or habit you have seen recommended.

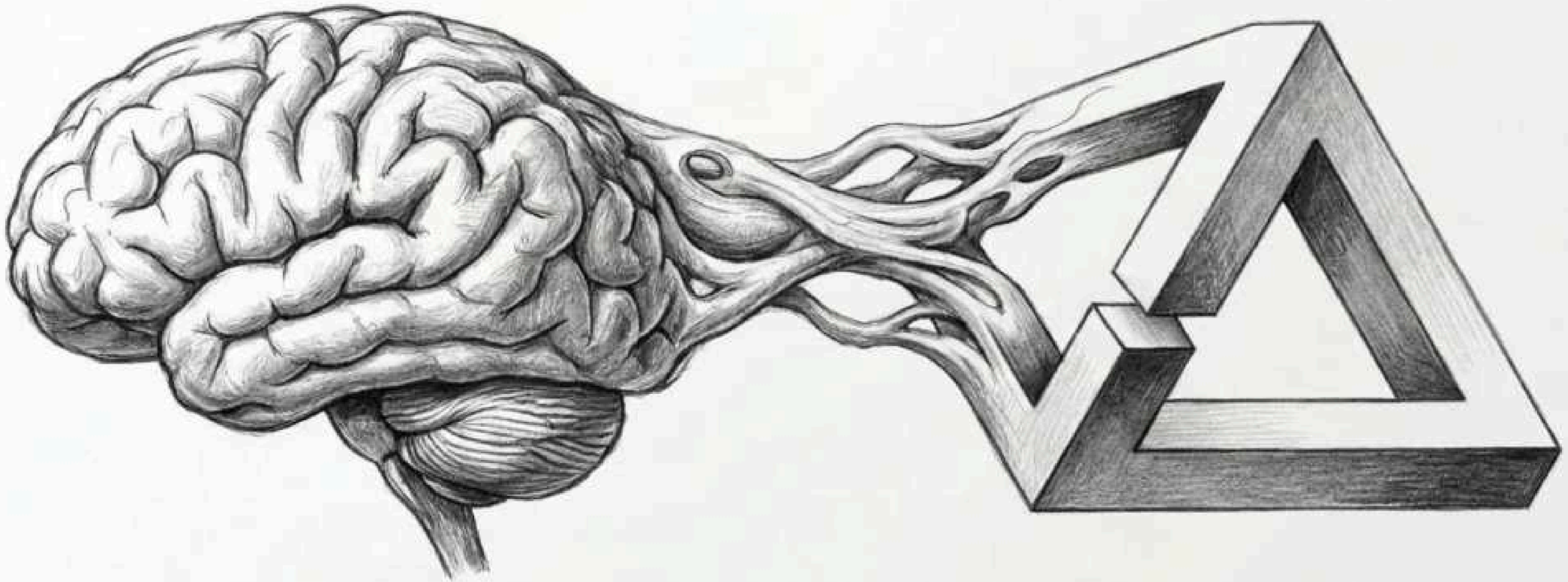
Where does its evidence sit on the ladder?

If you do not know, how could you find out?



Looking Ahead

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In lecture four, we turn to a harder subject:
the ways in which our own minds fool us.