Confirmation Bias and Pseudoscience

1 Introduction

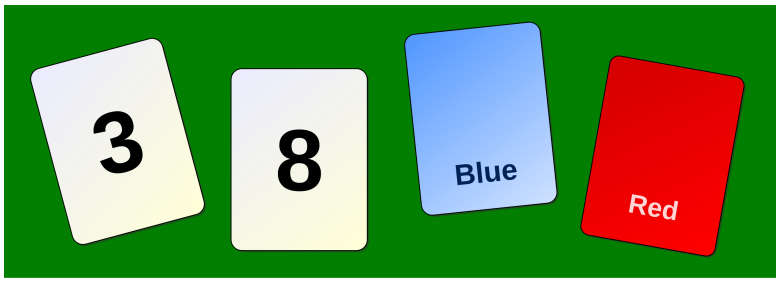
In this lecture, we will explore the concept of **confirmation bias** and how it plays a crucial role in shaping our beliefs, particularly in the context of pseudoscience. We will begin with an interactive example to illustrate how confirmation bias works, followed by a discussion on its implications and connections to pseudoscientific thinking.

2 The Wason Card Selection Task

We start with a classic example of confirmation bias known as the **Wason Card Selection Task**. Consider the following rule:

> "If a card has an even number on one side, then it has a blue color on the other side."

Below are four cards, each showing a number on one side and a color on the other:



The cards show the following: **3**, **8**, **Blue**, and **Red**.

Question: Which card(s) do you need to turn over to test whether the rule is true?

Most people tend to choose the cards showing **8** and **Blue**. This choice reflects a common cognitive bias known as **confirmation bias**, where individuals select evidence that could confirm the rule. However, this approach is flawed.

2.1 Slido Poll

To make this exercise interactive, please participate in the Slido poll using the following link: [**Insert Slido Poll Link Here**].

2.2 The Correct Solution: Disconfirmation

The correct approach is to test the rule by seeking out disconfirming evidence. To do this:

- **Turn over the card showing 8**: This is correct because if there is any color other than blue on the other side, the rule is falsified.
- **Turn over the card showing Red**: This is also correct because if there is an even number on the other side, the rule is falsified.
- **Do not turn over the card showing Blue**: The presence of an even number on the other side would confirm the rule, but it does not test it rigorously.
- **Do not turn over the card showing 3**: The odd number is irrelevant to the rule about even numbers and blue colors.

This exercise demonstrates that effective testing of a hypothesis often involves seeking evidence that could potentially disprove it, rather than just confirming it.

3 What is Confirmation Bias?

Confirmation bias is the tendency to search for, interpret, and remember information that confirms one's pre-existing beliefs or hypotheses while giving disproportionately less consideration to alternative possibilities or disconfirming evidence.

Humans are naturally inclined to favor information that supports their existing views because it is cognitively easier and more emotionally comforting. This bias can lead to errors in judgment and decision-making, as it skews the interpretation of evidence.

Connection to Cherry-Picking Data:

Confirmation bias is closely related to the concept of **cherry-picking data**, which you have already studied. Cherry-picking occurs when individuals selectively present data that supports their argument while ignoring data that may contradict it. Both practices involve a selective focus on confirmatory evidence, which can lead to distorted conclusions and flawed reasoning.

4 Examples of Confirmation Bias in Different Contexts

Confirmation bias can manifest in various areas of life, including:

(a) **Political Beliefs:** People often consume news from sources that align with their political views, reinforcing their existing opinions. This selective exposure to information can create echo chambers, where contradictory viewpoints are minimized or ignored.

(b) **Personal Relationships:** In relationships, confirmation bias can cause individuals to remember instances that confirm their feelings about someone, while disregarding behaviors that do not fit their perception. This can reinforce stereotypes and misunderstandings.

(c) **Medical Diagnosis:** Doctors and healthcare professionals can also fall victim to confirmation bias. For example, a doctor might fixate on a diagnosis that matches initial symptoms, ignoring alternative explanations. This can lead to incorrect treatment decisions.

(d) **Superstitions:** Superstitions often arise from confirmation bias. People remember events that seem to support their superstitions (e.g., wearing a lucky shirt leading to a win) while ignoring instances that do not (e.g., wearing the shirt and losing.)

As we studied previously:

> "Correlation does not imply Causation."

Because of our own confirmation bias, we are often led to believe that correlation does imply causation.

5 Historical and Modern Examples of Pseudoscience

Let's look at some examples where confirmation bias has played a role in sustaining pseudoscientific beliefs:

Phrenology:

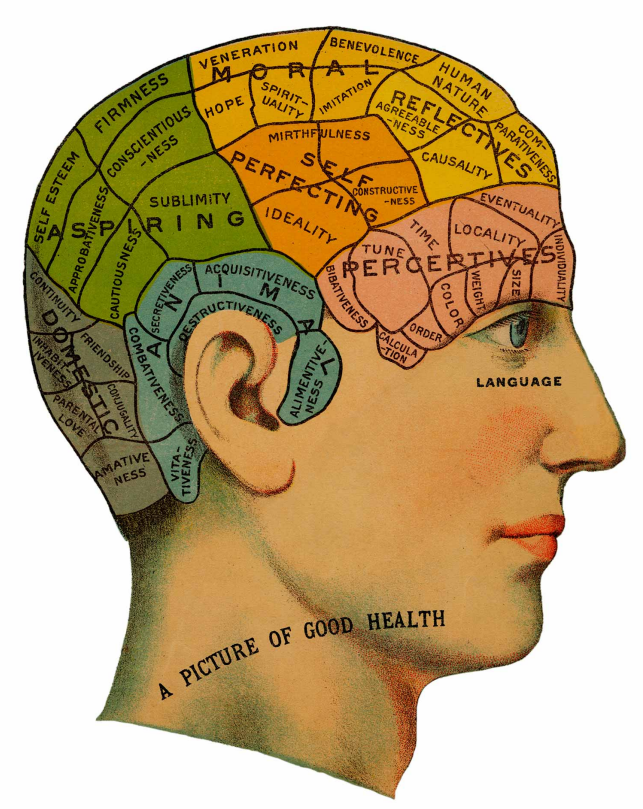


Figure 1: Phrenology chart

In the 19th century, phrenology was a popular belief that one could determine personality traits based on the shape of the skull. Phrenologists often ignored evidence that contradicted their claims and focused on cases that seemed to support their theory.

Alchemy:

Figure 2: Alchemical symbols

Alchemists sought to turn base metals into gold. Despite countless failed experiments, they clung to the few that appeared to support their beliefs, disregarding the overwhelming evidence against their theories.

Astrology:

Figure 3: Astrology chart

Astrology involves making predictions based on the positions of celestial bodies. Astrologers often rely on vague statements that can be interpreted in many ways, allowing believers to focus on predictions that seem accurate while overlooking those that do not fit.

Anti-Vaccine Movement:

Figure 4: Anti-vaccine movement illustration

The anti-vaccine movement is a modern example where confirmation bias plays a significant role. Despite extensive scientific evidence showing that vaccines do not cause autism, some people continue to believe in this link by selectively interpreting anecdotal evidence and ignoring large-scale studies that contradict their beliefs.

6 Karl Popper and Falsifiability

The philosopher Karl Popper introduced the concept of **falsifiability** as a criterion for scientific theories. According to Popper, for a hypothesis to be considered scientific, it must be testable and capable of being proven wrong.

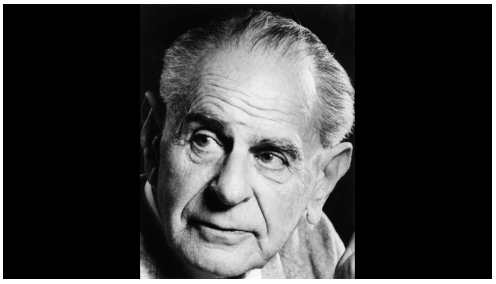


Figure 5: Karl Popper

> "True ignorance is not the absence of knowledge, but the refusal to acquire it."
> — Karl Popper, *Conjectures and Refutations: The Growth of Scientific Knowledge*

In other words, to be considered scientific, a hypothesis must be structured in such a way that it can be disproven by evidence. This principle is central to distinguishing between science and pseudoscience. While scientific theories invite scrutiny and attempt to falsify their own claims, pseudoscience often avoids disconfirmation, making it inherently unscientific.

7 Current Events

Let's explore some recent examples where confirmation bias and pseudoscience have influenced public perception and decision-making:

- COVID-19 Misinformation: The spread of misinformation during the COVID-19 pandemic is a powerful example of how confirmation bias can lead people to accept or reject scientific information based on pre-existing beliefs. We will discuss how different groups have selectively accepted information that aligns with their views, leading to widespread misinformation.

- Climate Change Denial: Despite overwhelming scientific consensus on climate change, confirmation bias plays a role in climate change denial. Some individuals and groups selectively focus on data that downplays the severity or existence of climate change, ignoring the broader scientific evidence.

8 Further Reading and Resources

For those interested in exploring confirmation bias and pseudoscience further, the following resources are recommended:

- **"The Psychology of Judgment and Decision Making" by Scott Plous**: A comprehensive overview of cognitive biases, including confirmation bias.
- **"You Are Not So Smart" by David McRaney**: A book that explores various cognitive biases, including confirmation bias, in an accessible and engaging way.
- **"The Demon-Haunted World" by Carl Sagan**: A classic work that discusses the importance of scientific thinking and skepticism in combating pseudoscience.
- **"Bad Science" by Ben Goldacre**: This book exposes the misuse of science by media and marketers and discusses how confirmation bias plays a role in spreading misinformation.
- **Skeptical Science (skepticalscience.com)**: A website dedicated to debunking climate change denial and other forms of pseudoscience.
- **FactCheck.org**: A non-partisan website that evaluates the truthfulness of statements made in the media, useful for identifying and understanding confirmation bias in current events.

9 Conclusion

In summary, confirmation bias is a powerful cognitive bias that can lead to flawed reasoning and the persistence of pseudoscientific beliefs. Karl Popper's principle of falsifiability provides a crucial tool for distinguishing between science and pseudoscience. Always seek out disconfirming evidence and be critical of your own assumptions. This approach will help you avoid the pitfalls of confirmation bias and embrace the true spirit of scientific inquiry.