

Academic Writings and Presentations

Logics

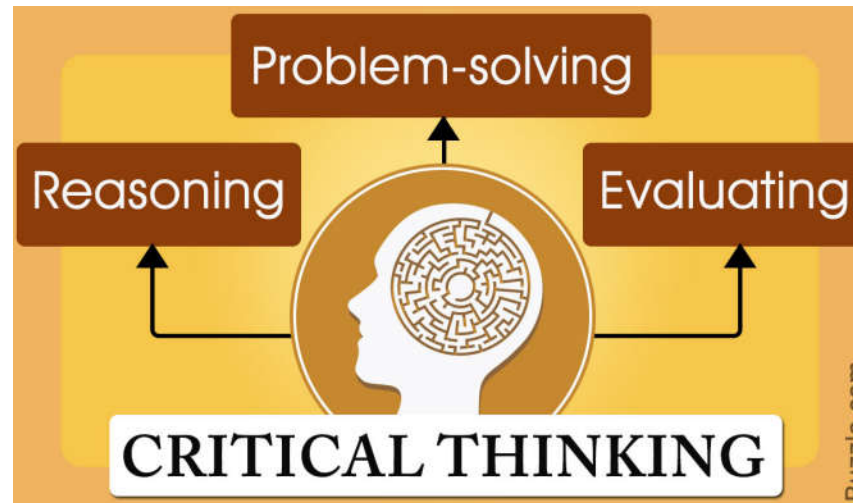
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Critical Thinking 批判性思维



“杠精”

6 CRITICAL THINKING STANDARDS

Clarity

Can others understand your point?

Accuracy

What is the source for each of your claims?

Depth

Do you address the complexity?

Relevance

Do you raise key issues?

Breadth

Do you cover all viewpoints?

Precision

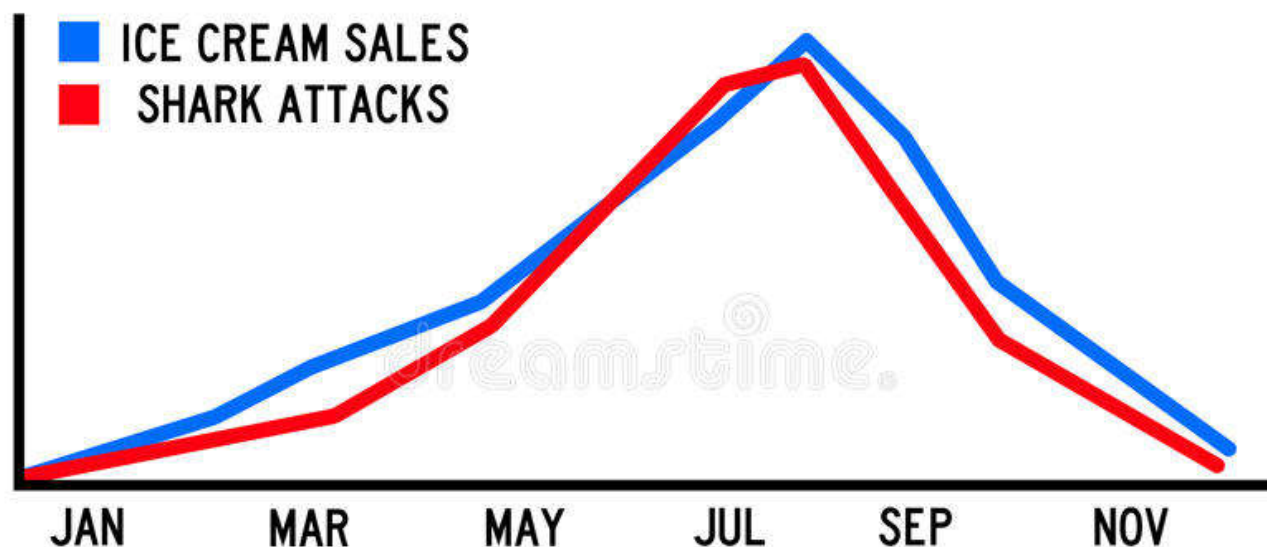
Is your point specific enough?

Common Logic Errors

- **Correlation vs. Causation**
- **Survival bias**
- **Reduction**
- **Multiplication**
- **Faulty generalization**
- **...**

Correlation vs. Causation

CORRELATION IS NOT CAUSATION!



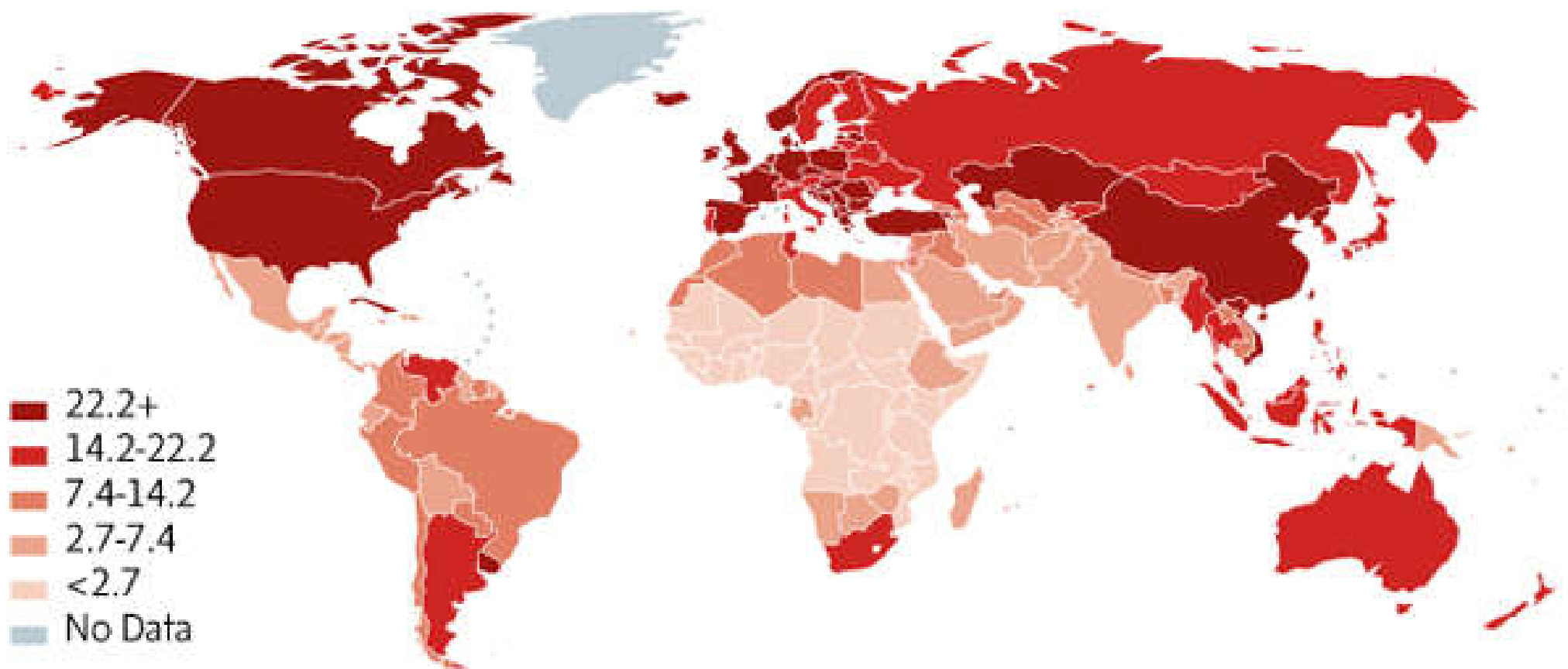
Both ice cream sales and shark attacks increase when the weather is hot and sunny, but they are not caused by each other (they are caused by good weather, with lots of people at the beach, both eating ice cream and having a swim in the sea)

coincidence, correlation, causation, ...

Correlation vs. Causation

LUNG CANCER

Mortality rate per 100,000, both sexes



richness leads to lung cancer?

Correlation vs. Causation

专家历时 40 余年研究发现：多休假可以延长寿命

参考消息网 昨天

德媒称，在慕尼黑举行的欧洲心脏病学会大会上，芬兰赫尔辛基大学的医学人员介绍了一项新研究成果，其结论是“休假可以延长寿命”。该研究同时在《营养、健康与老龄化》期刊上发表。

Take a vacation -- it could prolong your life

Date: August 28, 2018

Source: European Society of Cardiology

Summary: A 40-year Finnish study of middle-aged male executives finds that taking vacations could prolong life.

T. E. Strandberg, *et al.*, *J. Nutr. Health. Aging* **22**, 885 (2018)

longer vacation -> longer lifespan?

Correlation vs. Causation

打麻将能抗抑郁？万人调查发现打麻将的中国老人抑郁率更低

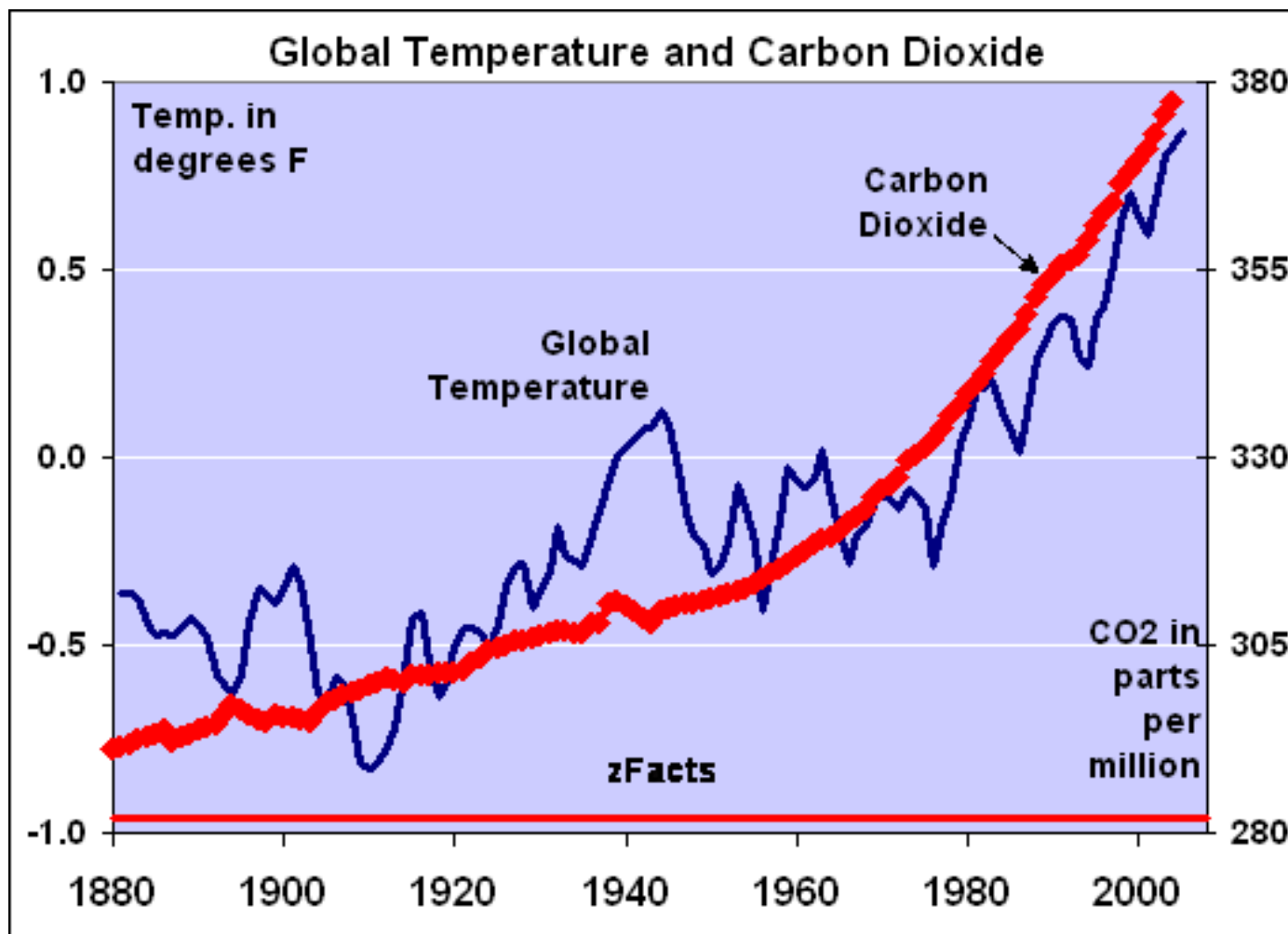
From: 科研圈 科研圈 Today

R. Wang, *et al.*, *Soc. Sci. Med.* **238**, 112518 (2019)



Playing Mahjong -> Less Depressive?

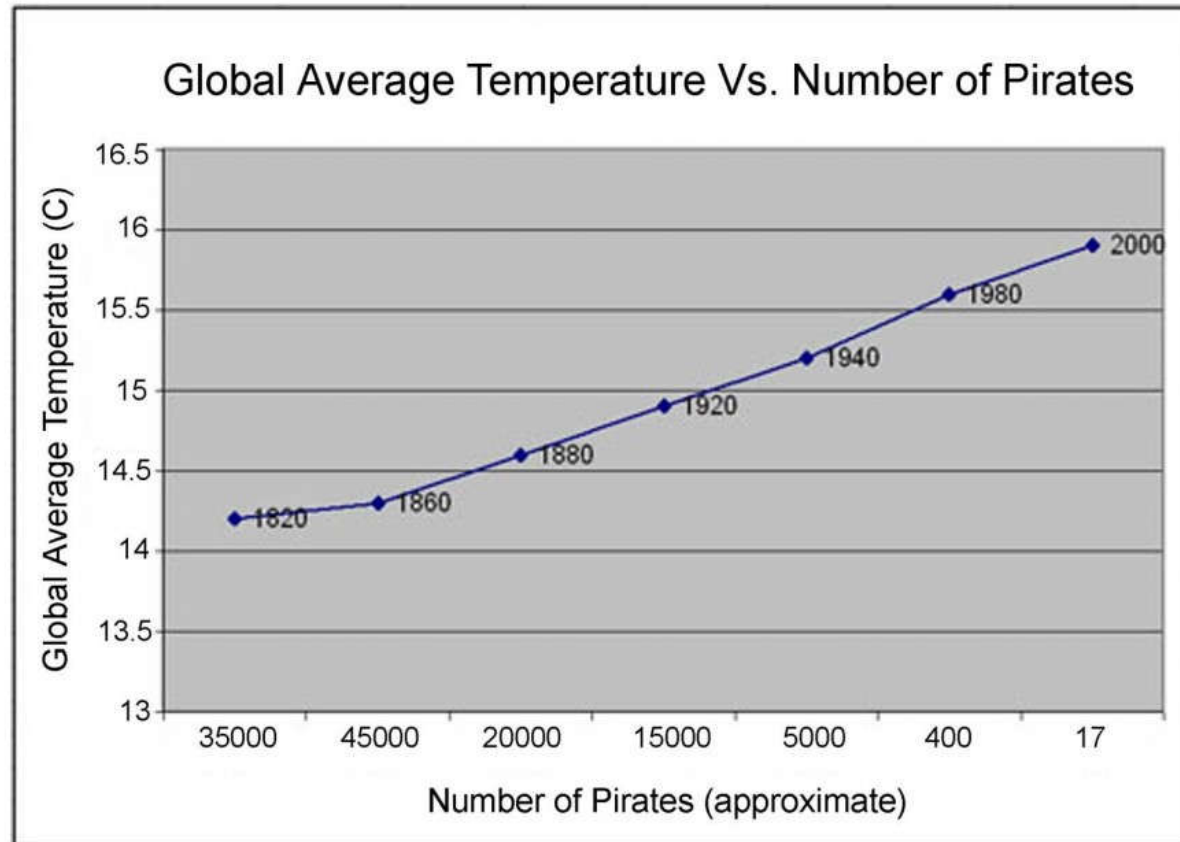
Correlation vs. Causation



global warming and human activity?

Correlation vs. Causation

STOP GLOBAL WARMING: BECOME A PIRATE

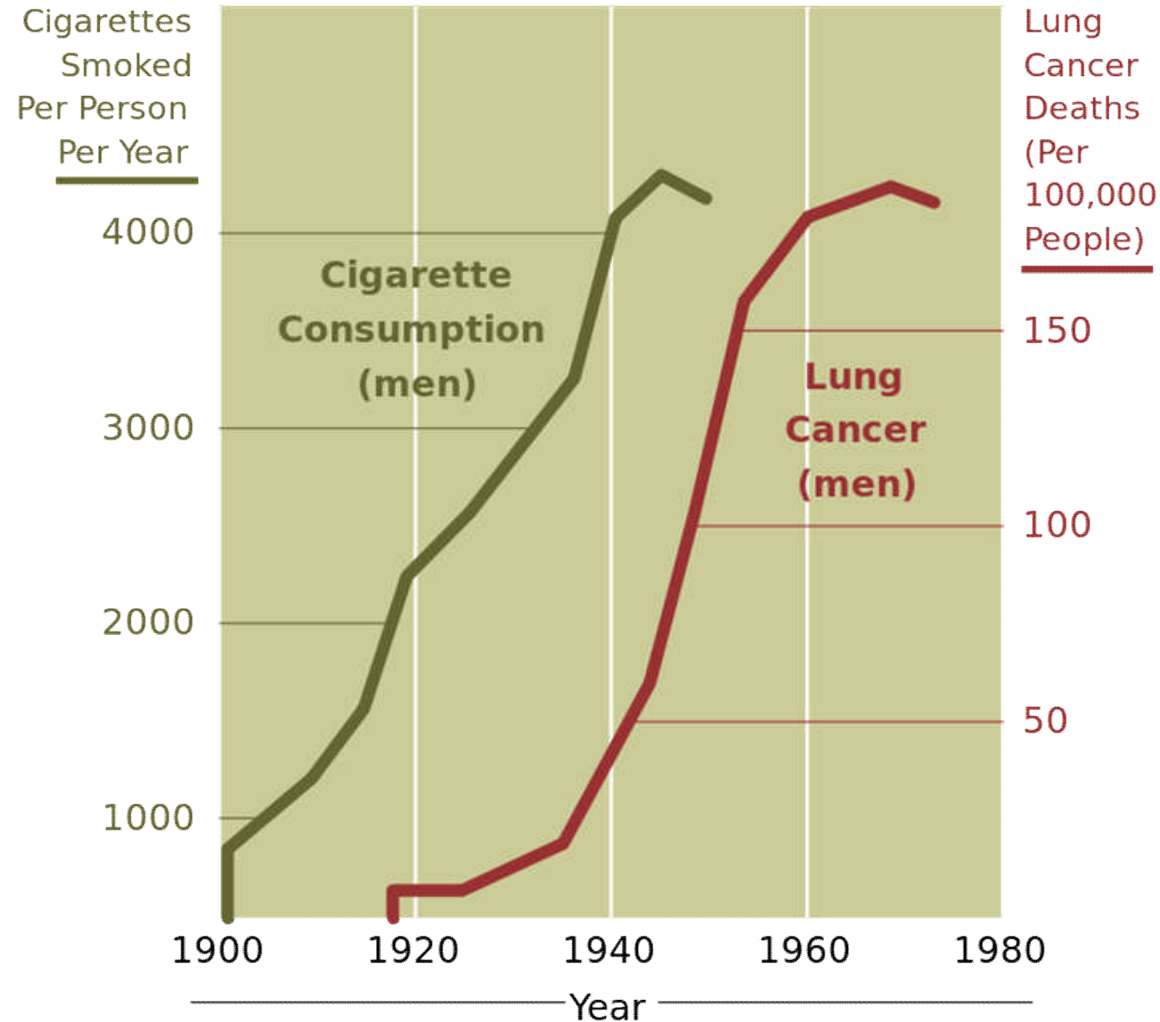


WWW.VENGANZA.ORG

global warming and human activity?

Correlation vs. Causation

20-Year Lag Time Between Smoking and Lung Cancer

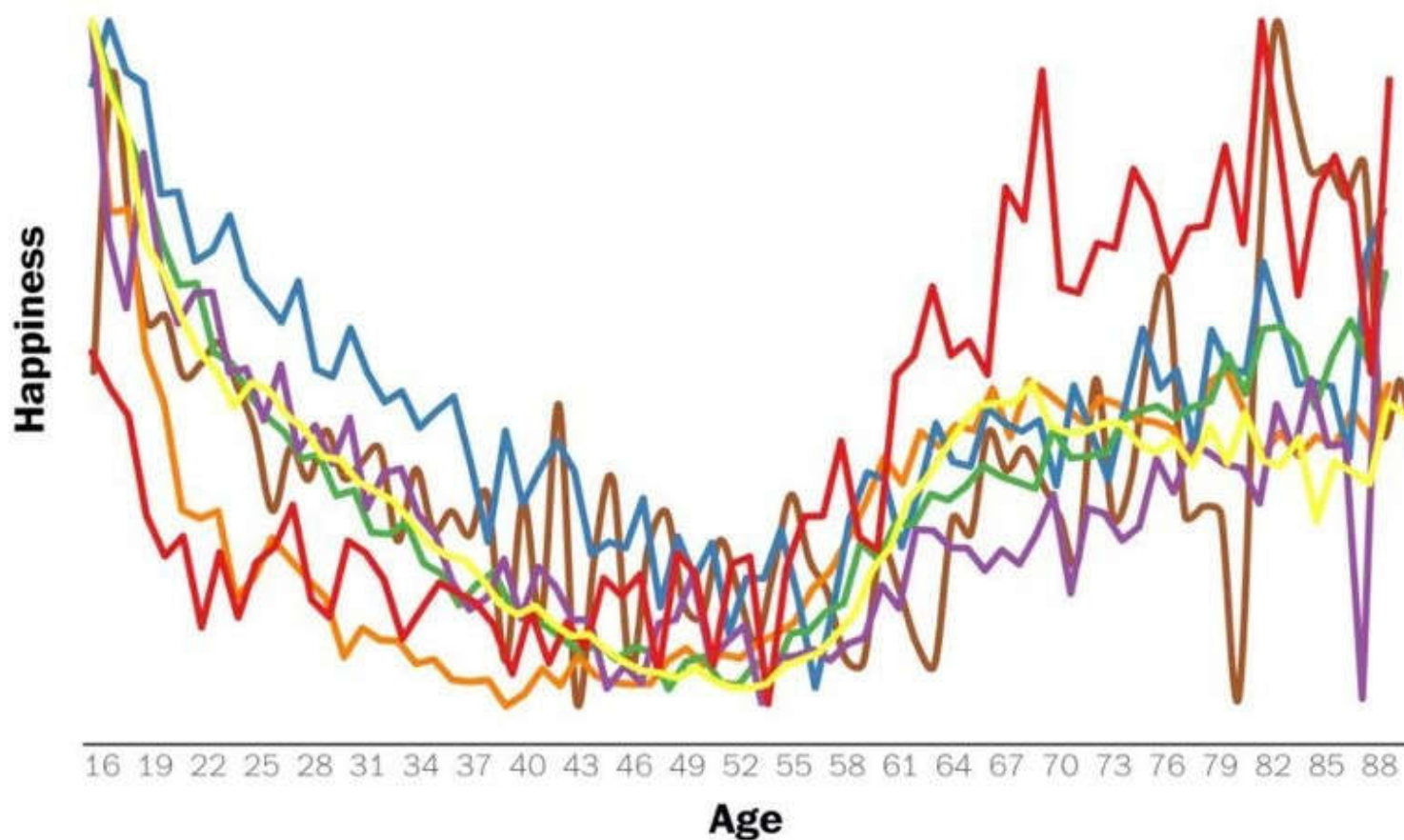


smoking leads to lung cancer?

The shape of happiness

Relationship between happiness (or life satisfaction) and age across seven major surveys

Note: Trend lines are scaled to a common minimum and maximum range



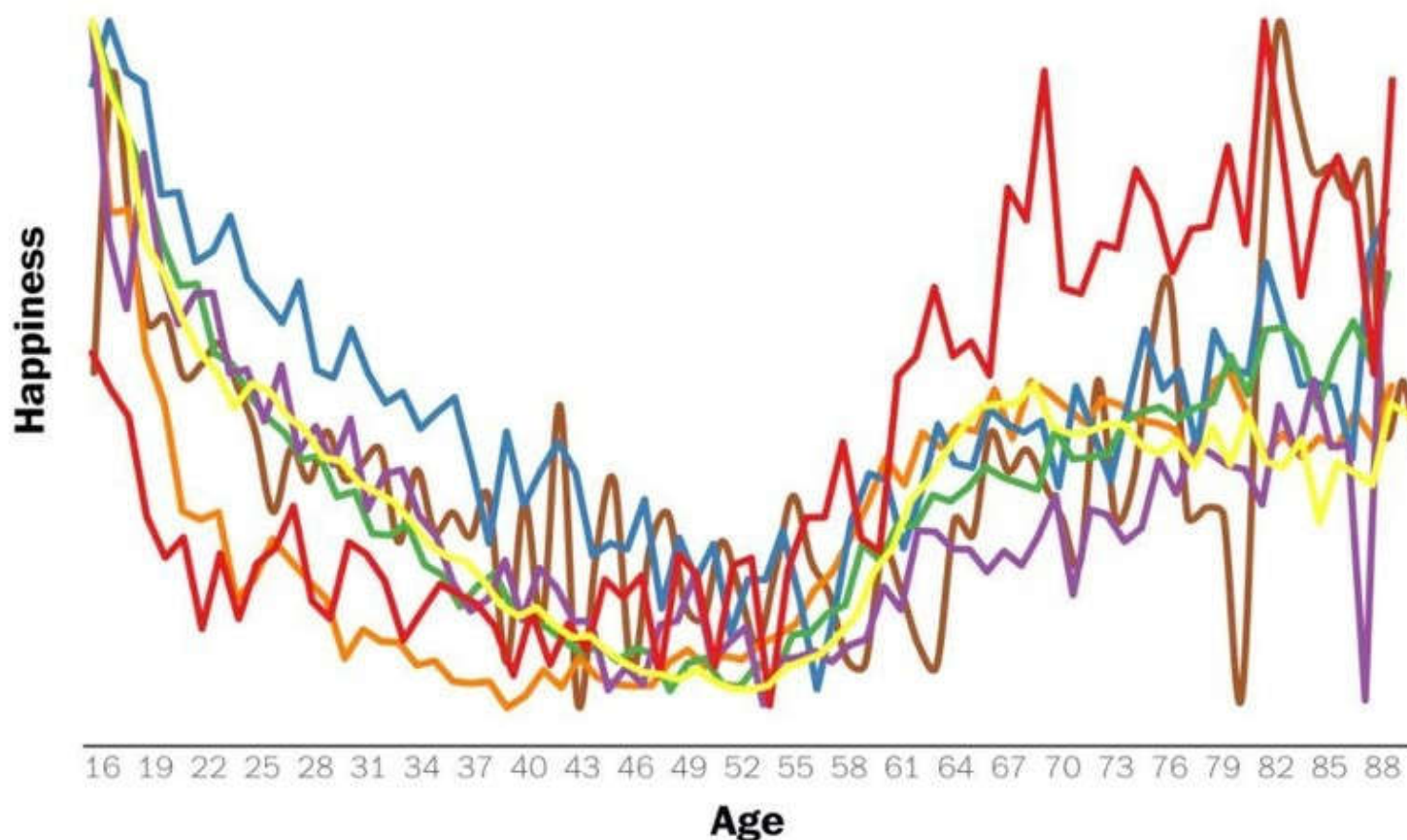
Survival Bias

*dead people
cannot talk ...*

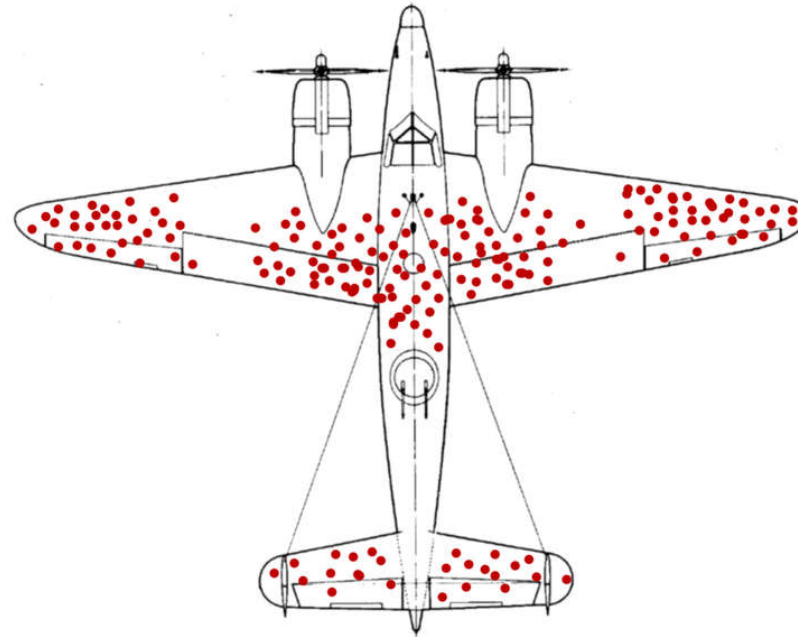
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Survival Bias



During World War II, researchers from the Center for Naval Analyses had conducted a study of the damage done to aircraft that had returned from missions, and had recommended that armor be added to the areas that showed the most damage.

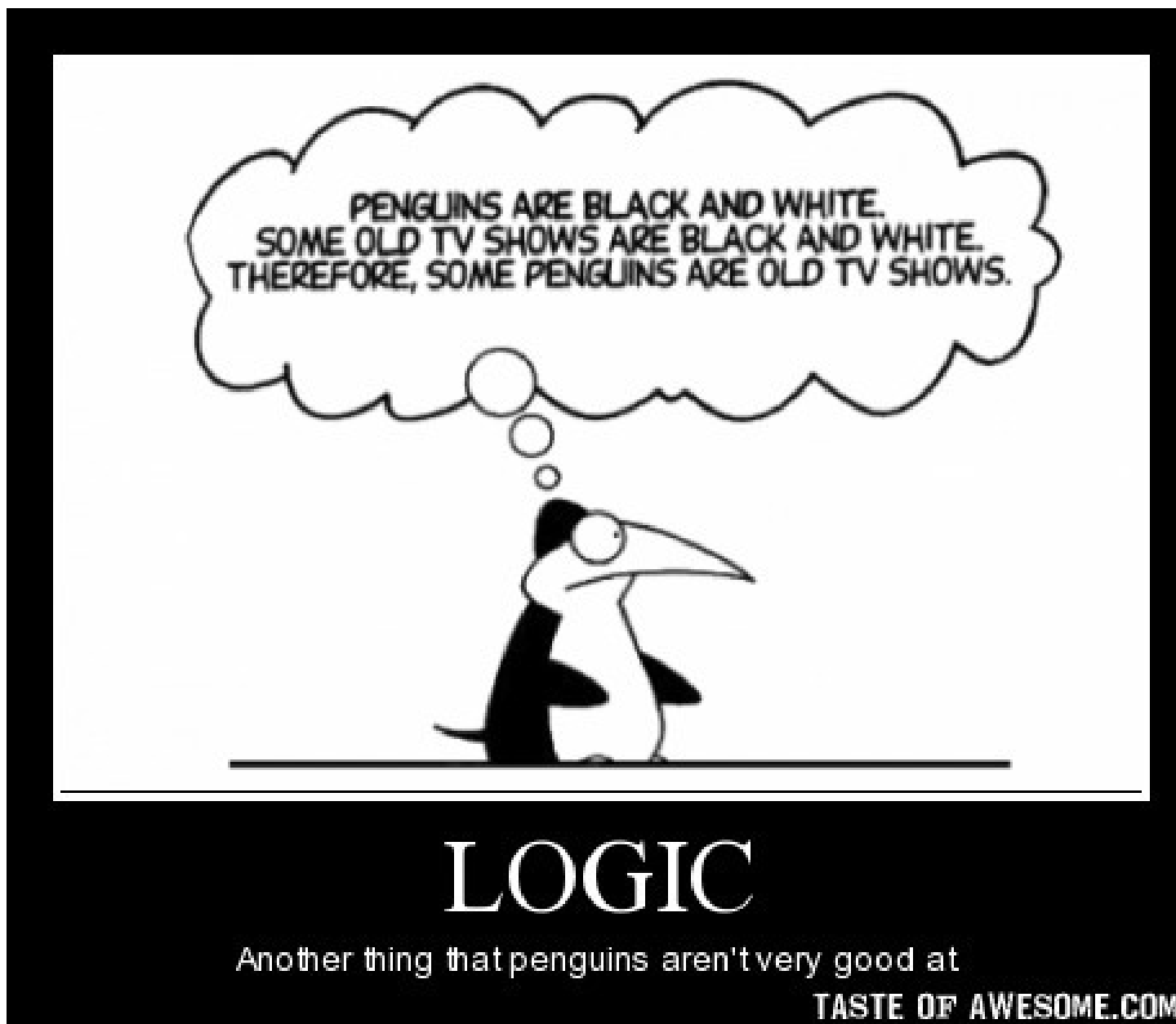
Fallacy of Reduction

- **Oversimplification**

A farmer asked a theoretical physicist for help, to give a solution to increase the milk production at a dairy farm. The physicist thought for a few days, returned to the farm, saying to the farmer, "*I have the solution, but it works only in the case of spherical cows in a vacuum*"



Faulty Generalization



Faulty Generalization



Faulty Generalization

1 is a number
2 is a number
->
1 = 2

3 is a prime (质数)
5 is a prime
7 is a prime
->
all odd numbers
are prime

陨石为什么总是落在坑里呢？



4678

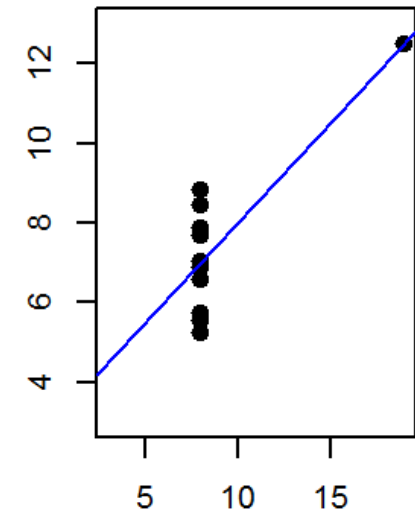
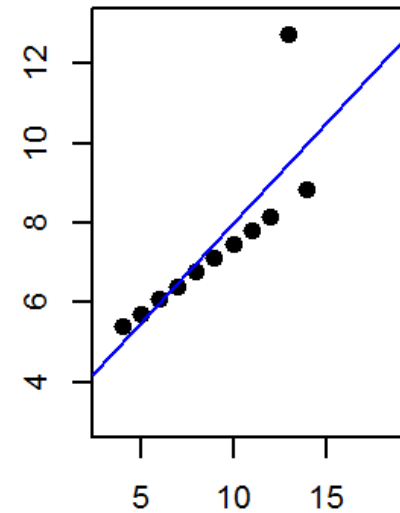
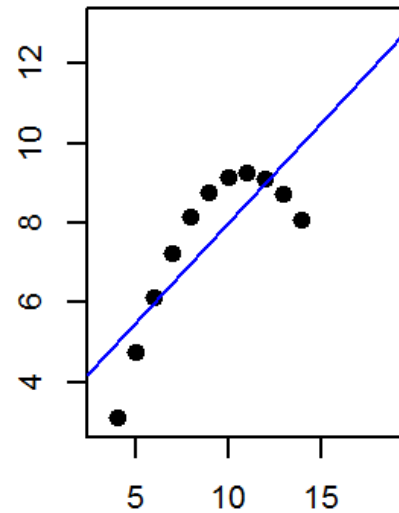
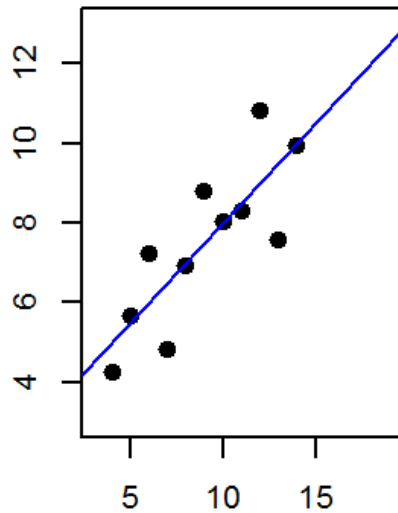
[Why do meteors always land in craters?](#) (self.shittyaskscience)

submitted 4 months ago by able-danger

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Data Process



"With four parameters I can fit an elephant, and with five I can make him wiggle his trunk"

— John von Neumann



Clinical Trials

- **Randomized 随机**
- **Double-blind 双盲**
- **Controlled groups 对照组**
- **Placebo effect 安慰剂效应**
- **Large sample 大样本**