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# **Critical Reasoning Lecture-Seminar 6 Methods in Psychology**

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# Introduction

# Psychology (the science)

- According to the British Psychological Society:

“Psychology is the scientific study of the mind and how it dictates and influences our behaviour, from communication and memory to thought and emotion.”

- Psychology, like any other science:

- \* formulates hypotheses
- \* provides predictions
- \* conducts studies
- \* collects evidence
- \* tests hypotheses

# Design, setting and data-collection types

- In this lecture, we focus on the kinds of studies and evidence that are used to test hypotheses.
- To be precise, we examine three aspects that provide various ways of doing research:
  - (1) the design type
  - (2) the setting type
  - (3) the data-collection type
- Although the ideas we encounter have applications beyond psychology, most of our examples are from psychology.



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# Design Types

# Different types of studies

- There are two major design types or 'research designs'. As a first approximation, we can describe them as follows:

**Experimental studies:** These directly test the law-like relationship between two variables by manipulating one.

**Observational studies:** These also test the law-like relationship between variables but via passive observation.

*NB:* Other types exist but are not used as frequently. More on this next week.

# Variables

- To understand the foregoing types of studies, we need to first understand the notion of a variable.
- Roughly speaking, a variable is something we can measure and whose values vary.

## **General examples:**

- \* the size of beaks
- \* the volume, pressure and temperature of a gas
- \* the mass of an object

## **Psychological examples:**

- \* aggressive behaviour
- \* stress levels
- \* cognitive load

# Rerum cognoscere causas

- What we are ideally after, in experimental studies, is to discern a causal relation between variables.

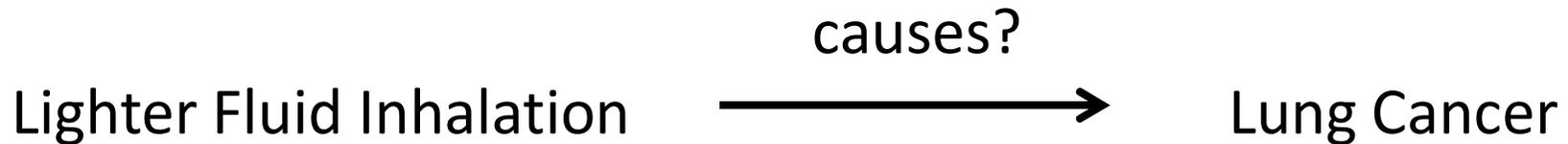
**Convention:** We call a potential cause the ‘independent variable’ and the effect the ‘dependent variable’.



- In psychology, the dependent variables typically concern some behavioural properties, e.g. cognitive performance.
- Well-designed experiments seek to keep confounders fixed allowing only the manipulation of IV.

# Rerum cognoscere causas: Lighter fluid example

- Suppose we want to find out whether lighter fluid inhalation is causally related to lung cancer.

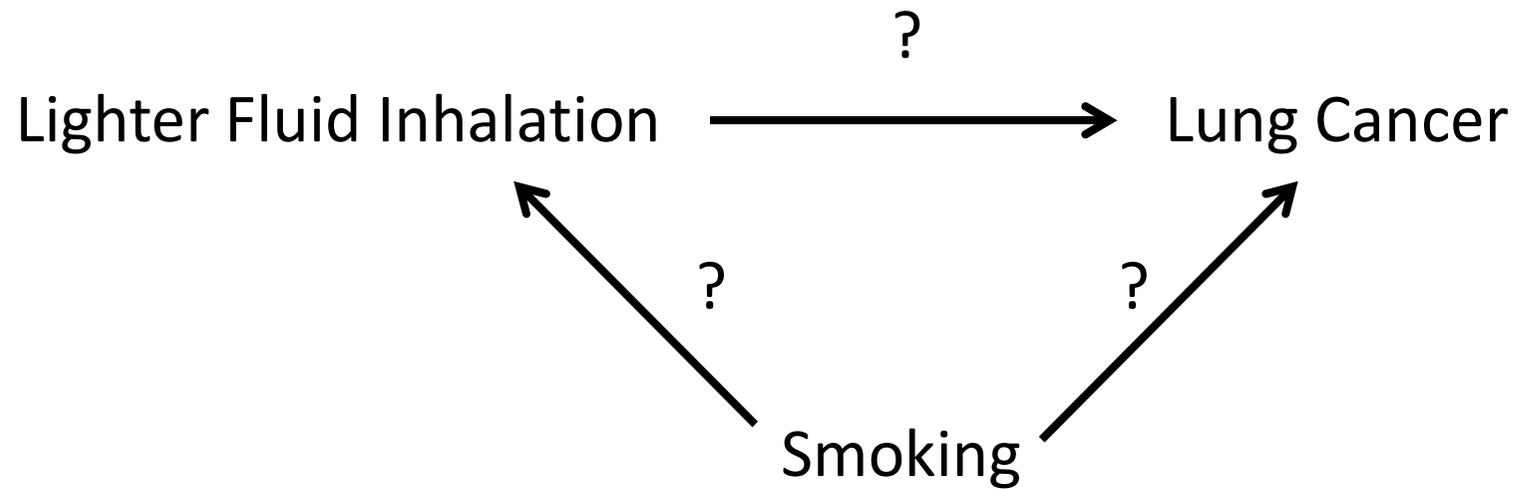


- We know that positive correlations between variables are necessary but not sufficient for causal relations.
- Why are they not sufficient? Because something else may be the cause of both – a.k.a. ‘common causes’.

## Rerum cognoscere causas: Lighter fluid example (2)

- The following is an example of a putative common cause:

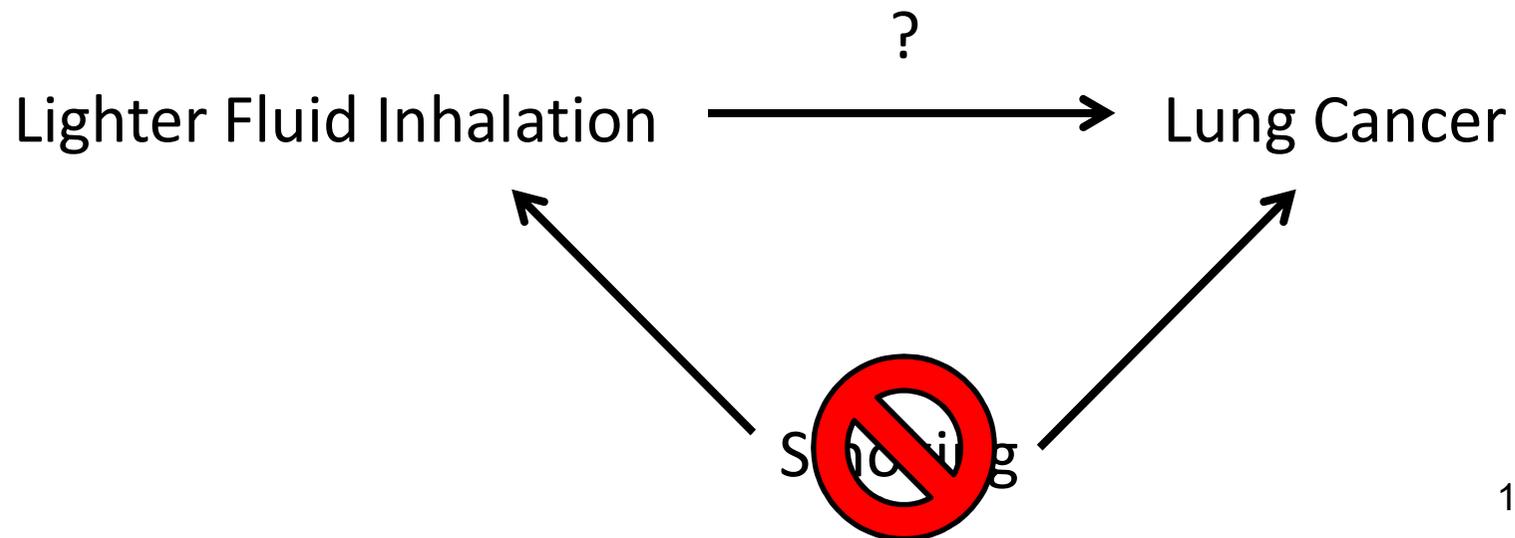
**Hypothesis:** Smoking causes an increase in lighter fluid inhalation and at the same time causes lung cancer.



- How do we find out which of the following relations hold?

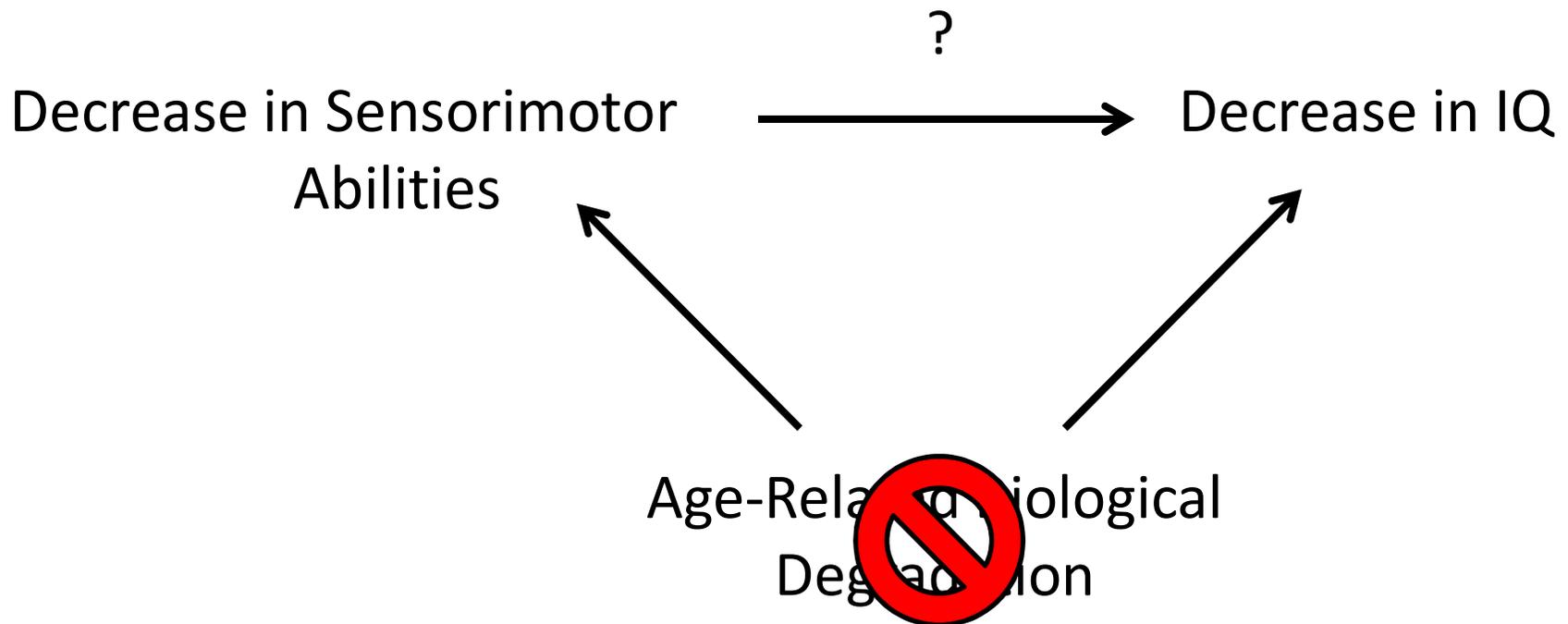
## Rerum cognoscere causas: Lighter fluid example (3)

- One way to find out: keep the potential confounder fixed.
- We can do this by looking at test subjects who don't smoke but vary in relation to lighter fluid inhalation.
- If  $P(\text{LC} \mid \text{LFI} \ \& \ \text{not-S}) \approx P(\text{LC} \mid \text{not-LFI} \ \& \ \text{not-S})$ , then lighter fluid inhalation is causally irrelevant to lung cancer.



# Rerum cognoscere causas: Cognition example

- In this case, we can keep the potential confounder, i.e. age-related biological degradation, fixed.



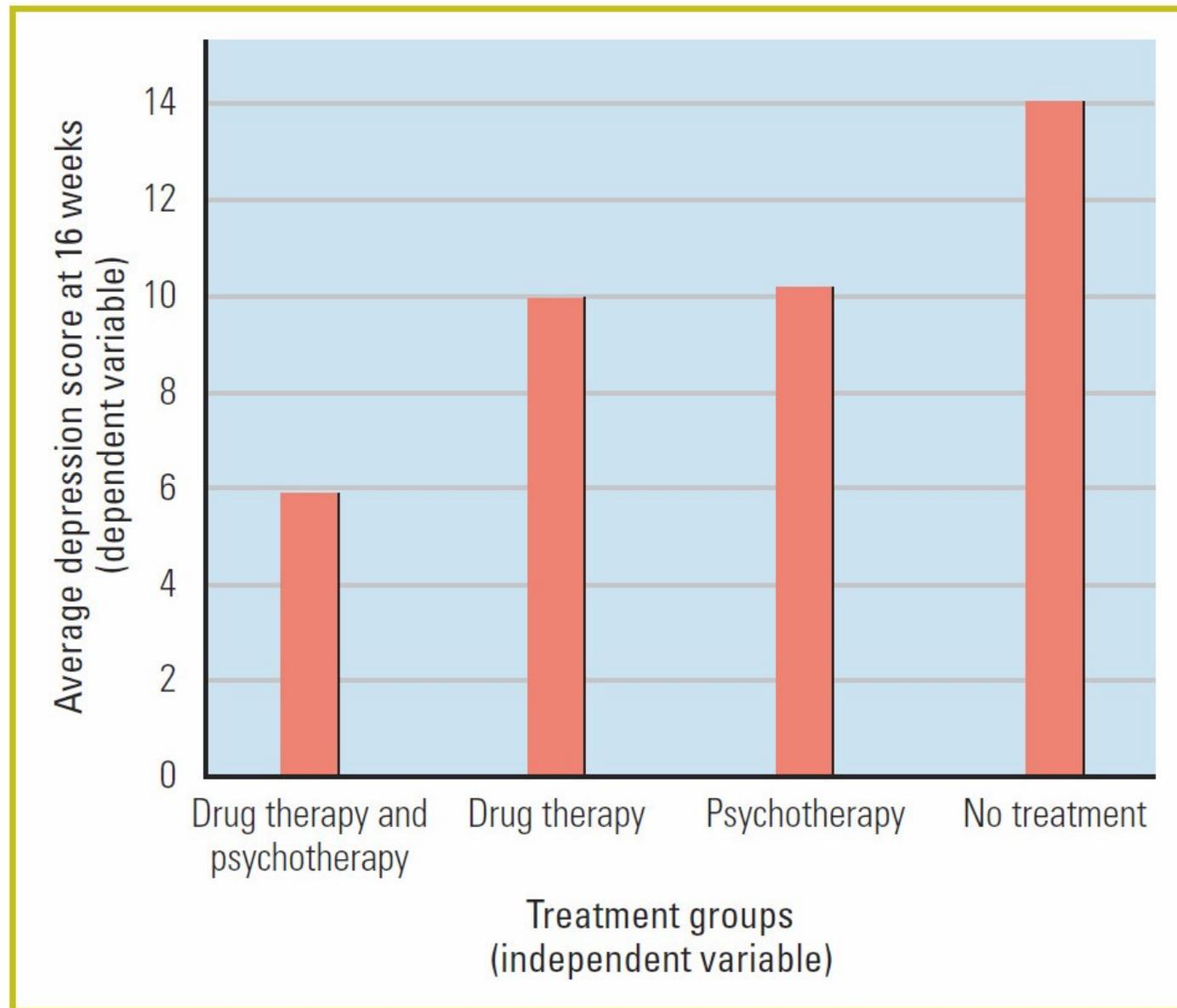
# An actual experiment: Depression Treatments

- Alberto DiMascio et al. (1979) randomly divided patients with major depression into four groups.
- Each group handled differently:
  - (1) antidepressant drugs + psychotherapy
  - (2) only antidepressant drugs
  - (3) only psychotherapy
  - (4) nothing
- At the end of 16 weeks, measurements were taken of the mood and behaviour of individuals via sets of questions.



**What is the independent and what the  
dependent variable in this study?**

## An actual experiment: Depression Treatments (2)



# Observational studies: The fallback option

- Oftentimes, we cannot set up experiments. This may be because of practical, legal or ethical reasons.

**Example:** Bullying at school and its effects on performance in intelligence tests.

- Note that this affects psychology as well as other sciences that study humans but not sciences like physics.
- In such cases, we resort to passive observational (also known as *correlational*) studies.
- The hope is that, though no causal link can be established through them, we may still identify useful information.

## Example: Discipline and development study

- Diana Baumrind (1971) studied the relation between parental disciplinary styles and psychological development.
- Three kinds of disciplinary styles were identified:

*authoritarian, authoritative and permissive.*

- She then rated the behaviour of children on things like whether they were friendly or co-operative in the nursery.

**Result:** Children in authoritative families scored better.

This seems to support the hypothesis that the authoritative style of parenting is better for psychological development.

# Observations vs. experiments

- “[It is] tempting to think of the parents’ discipline style as the independent variable and the children’s behavior as the dependent variable and to conclude that differences in the former *caused* the differences in the latter. But because the study was not an experiment, we cannot justifiably come to that conclusion. The researcher did not control either variable, so we cannot be sure what was cause and what was effect” (Gray 2014: 31).
- In fact, alternative explanations can be provided:
  - \* children’s behaviour causes parental disciplinary style
  - \* the causal relationship goes both ways
  - \* common cause, e.g. living in a good neighbourhood

**Is a well-conducted experiment sufficient to establish the cause of some effect?**

Yes

No



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# Setting Types

# Laboratory studies

- The lab is an area that is specifically constructed to:
  - (a) help researchers gather data and
  - (b) shield the study from unwanted sources of bias.

Advantage: controlled, generally more uniform, conditions.

Disadvantage: artificial and thus not clearly generalisable.

# Field studies

- Any area other than a lab but typically an area where the object of study can be found in its 'natural' habitat.

## Examples:

- \* at home
- \* in the workplace
- \* in shopping malls
- \* ...

Advantage: natural and hence more easily generalisable.

Disadvantage: uncontrolled and non-uniform conditions.



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# Data-Collection Types

# Self-reports vs. observations

- There are two types of data-collection methods:

**Self-report methods:** The subject being studied is asked to assess or describe their own mental state or behaviour.

Examples: Through questionnaires or interviews.

**Observation methods:** The researcher assesses/describes the subject under study or data is collected automatically.

Examples: Direct (e.g. looking) or indirect (e.g. computer recording reaction times) monitoring of their behaviour.

## A Proviso

- Each method has its own advantages and disadvantages.

“Questionnaires and interviews can provide information that researchers would not be able to obtain by watching subjects directly. However, the validity of such data is limited by the subjects’ ability to observe and remember their own behaviors or moods and by their willingness to report those observations frankly... Naturalistic observations allow researchers to learn firsthand about their subjects’ natural behaviors, but the practicality of such methods is limited by the great amount of time they take, the difficulty of observing ongoing behavior without disrupting it, and the difficulty of coding results in a form that can be used for statistical analysis.” (Gray 2014: 33-34).



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# Citations and Science

# The social background of science

- Fierce competition for funding, jobs and prestige means increase in pressure to decide quality in an impartial way.
- Since we can't measure the quality of researchers directly we use proxies like citation numbers.
- Those affected include:
  - \* individuals
  - \* departments
  - \* universities
  - \* journals
  - \* publishers
  - ...

# Example: Google scholar



Steven Pinker

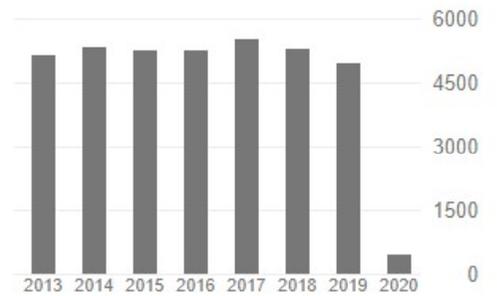
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Language Learnability and Language Development, With New Commentary by the Author: With New Commentary by the Author S Pinker Harvard University Press	5606 *	2009
The better angels of our nature: Why violence has declined S Pinker Penguin Group USA	4105	2012
Learnability and cognition: The acquisition of argument structure S Pinker MIT press	3368	2013
Natural language and natural selection S Pinker, P Bloom Behavioral and brain sciences 13 (4), 707-727	3348	1990
Unconscious cerebral initiative and the role of conscious will in voluntary action B Libet Behavioral and brain sciences 8 (4), 529-539	3041	1985

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2 <a href="#">Handbook of International Economics</a>	book series	25.020 Q1	9	0	15	0	176	12	14.67	0.00	
3 <a href="#">Econometrica</a>	journal	19.932 Q1	158	59	187	2561	932	179	3.78	43.41	
4 <a href="#">Journal of Finance</a>	journal	18.318 Q1	249	64	226	3145	1529	218	5.23	49.14	
5 <a href="#">Journal of Political Economy</a>	journal	16.309 Q1	159	48	110	2414	540	103	4.90	50.29	



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# The Value of Negative Results

# What are negative results?

- **Negative results:** Data that fail to support a hypothesis.
- That is, they support the so-called 'null-hypothesis'.

## **Example:**

*Hypothesis  $H_1$ :* Regularly eating fruit increases the life expectancy of those with acute lymphocytic leukemia.

*Null-hypothesis ( $H_0$ ):* There is no such relation between the said variables.

*Negative results:* No (strictly speaking: no statistically significant) difference in life expectancy between the groups.

# The current state of affairs

- There is a strong tendency against the publication of negative results.
- This reflects, among other things, the unwillingness of:
  - \* journals to publish papers that are not going to garner as much attention.
  - \* scientists to be associated with failed attempts to support their hypotheses.
- In either case, reputations suffer in quantitative (citation #s) and qualitative ways (where a paper gets published).

## Increasing dissent

- There is already some dissent to this status quo. Indeed, dissent is becoming more vocal, e.g. Fanelli (2011).
- It is argued that the absence of negative results leads to various other unwanted consequences. Among these, it:
  - \* increases the chance of repeatedly testing the same (false) hypotheses, wasting both time and resources.
  - \* exaggerates estimates of effect size in meta-analyses since only (or mostly) positive results are pulled together.
  - \* discourages scientists from testing new hypotheses as they may end up getting absolutely nothing out of it.



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The End