

Psychophysics

Introduction

Filip Děchtěrenko, Jiří Lukavský

“It is more useful to study one animal for 1000 hours than to study 1000 animals for one hour” — B. F. Skinner

Science

Only 36%
of studies
replicated!!

RESEARCH

RESEARCH ARTICLE

PSYCHOLOGY

Estimating the replicability of psychological research

Open Science Collaboration

Reproducibility is a defining feature of science, but the reproducibility of current research is unknown. We conducted replications of 200 experimental and correlational studies published in three psychology journals using high-powered designs and original materials when available. Replication effects were half the magnitude of original effects, representing a substantial decline. Ninety-seven percent of original studies had statistically significant results. Thirty-six percent of replications had statistically significant results; 47% of original effect sizes were in the 95% confidence interval of the replication effect size; 39% of effects were subjectively rated to have replicated the original result; and if no bias in original results is assumed, combining original and replication results left 68% with statistically significant effects. Correlational tests suggest that replication success was better predicted by the strength of original evidence than by characteristics of the original and replication teams.

of the process and main-
d project resources. Repli-
data were required to be
order to maximize transpar-
and reproducibility of the
([excuse](#)).

cations were completed by
hours. There were many dif-
ficulties and analysis strategies
varied. Through consultation
with the original authors, ob-
taining original materials,
replications maintained
original designs. Analyses con-
sidered a common effect size metric (cor-
relation) with confidence intervals

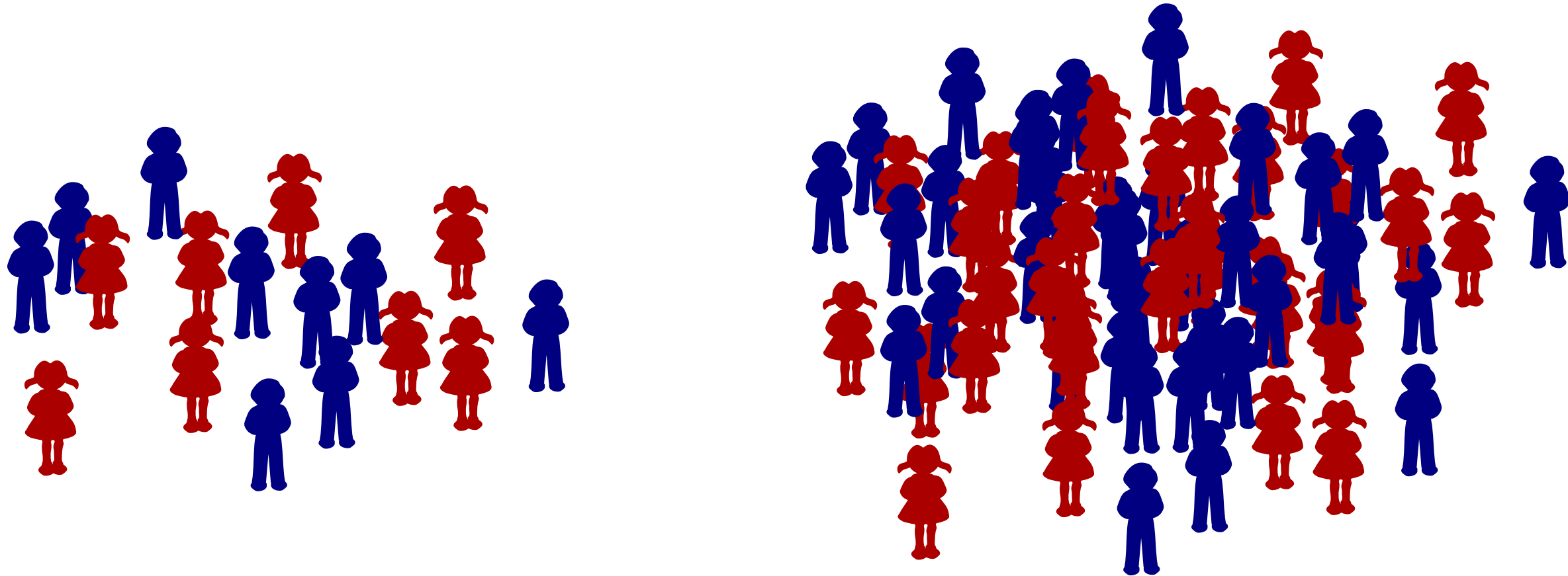
(CIs). The units of analysis for inferences about
reproducibility were the original and replication
study effect sizes. The resulting open data set
provides an initial estimate of the reproducibility
of psychology and correlational data to support
development of hypotheses about the causes of
reproducibility.

Sampling frame and study selection

We constructed a sampling frame and selection

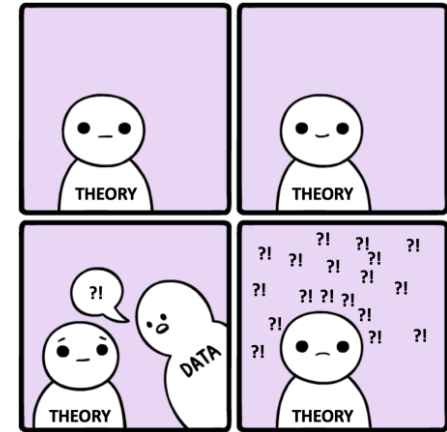
Large samples

- To increase the power of the test, the sample size can be increased



Large samples in research

- In research, we often have
 - Weak theories and models: group A will score lower than group B
 - Weak measurement methods (questionnaire)
 - Poor experimental control of variability

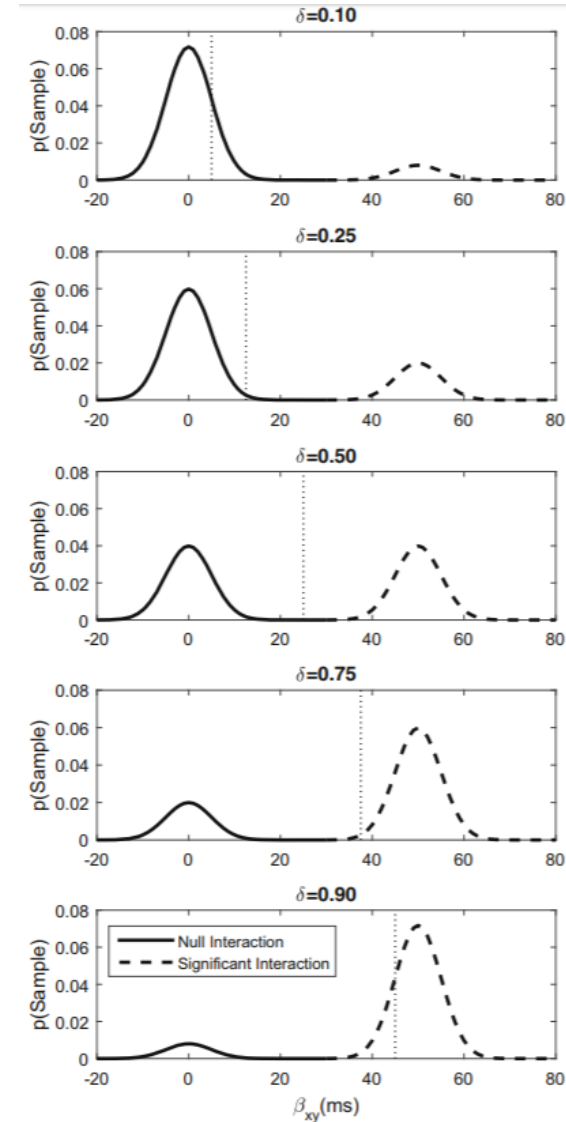


Simulation study

- How to detect a significant interaction that occurs in part of the population?
- Using the Sternberg additive method
- $RT = T_A + T_B$ or $RT = T_A * T_B$

Simulation study

- 2x2 repeated measures ANOVA
- Small-n group: interaction tested by additive method
- Large-n group: interaction tested by averaging RT for each participant



Simulation study

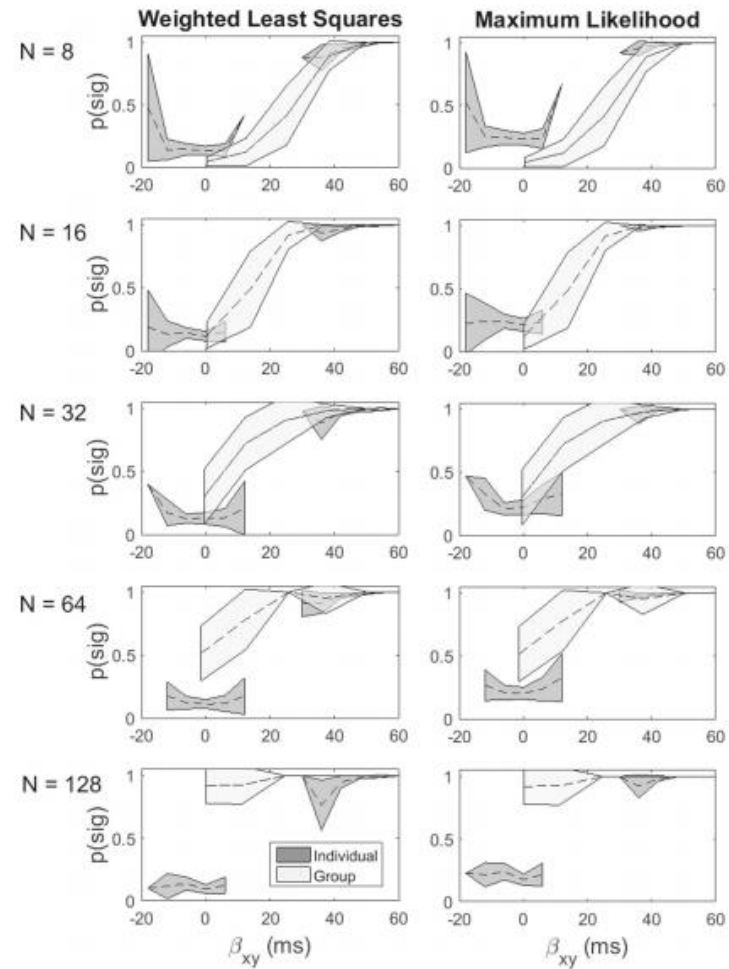
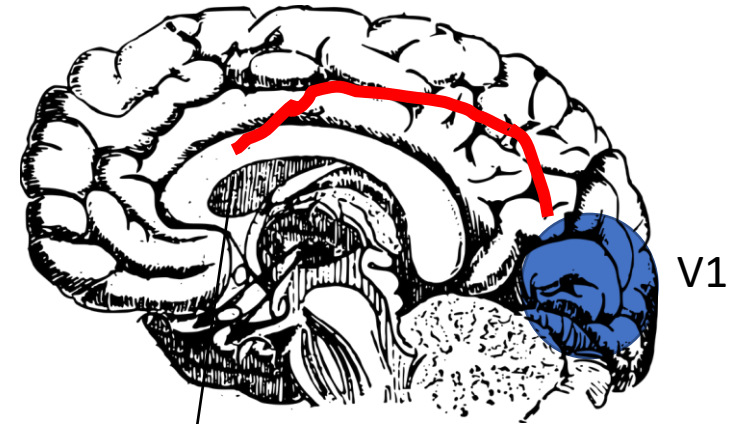


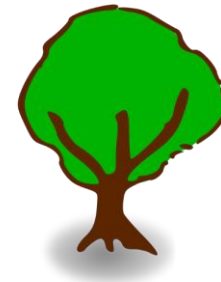
Fig. 2 Individual- and group-level analysis as a function of increasing the sample size (from top to bottom). The x -axis is the magnitude of the interaction parameter and the y -axis is the proportion of significant interactions found in the simulation

This is what psychophysics is all about!

Visual perception



Ha, that's a tree!



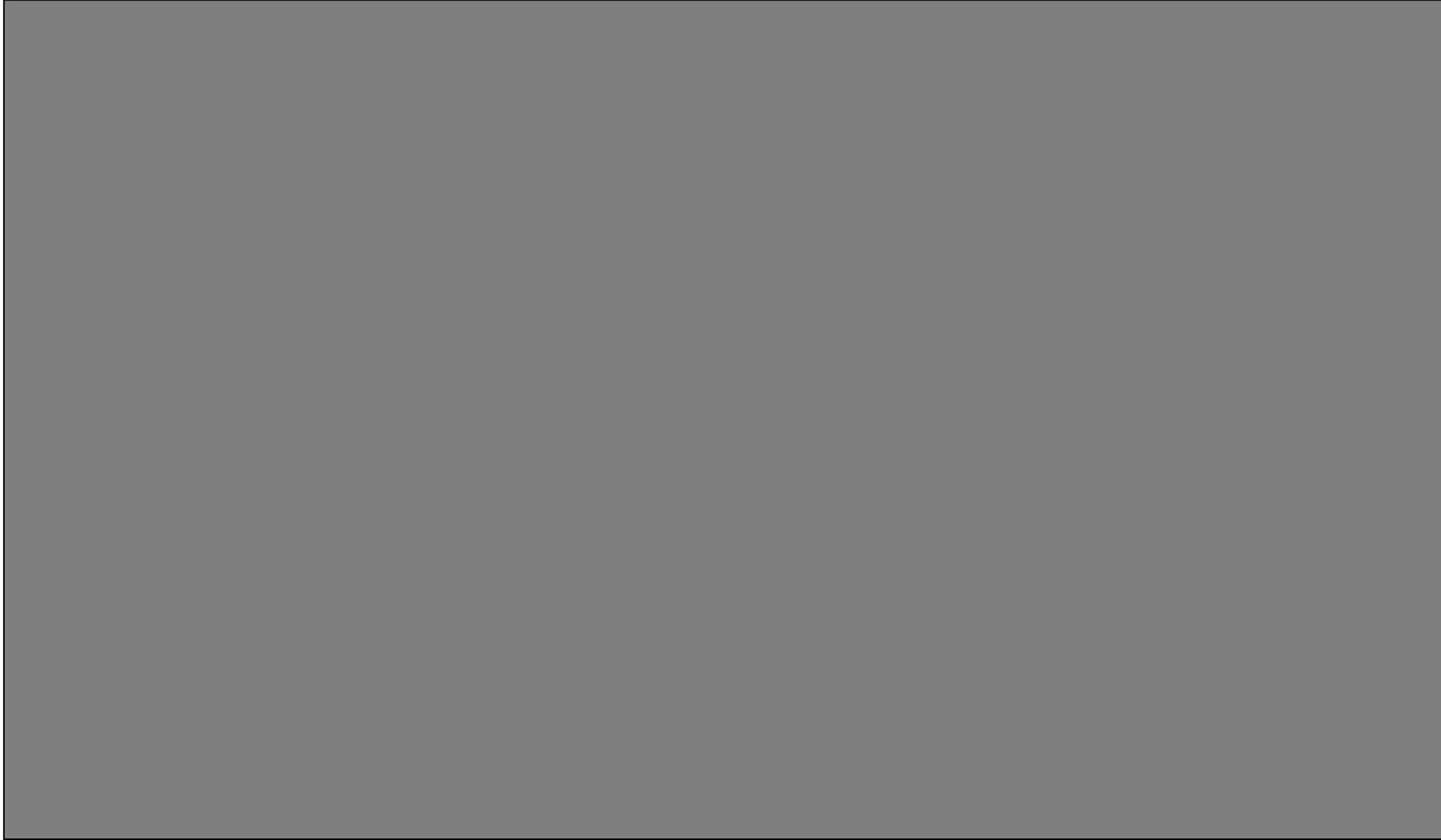
Typical example - contrast measurement

- You will be presented with a grey screen on which a lighter circle may appear for 100 ms
- Your task is to decide whether or not the wheel was present

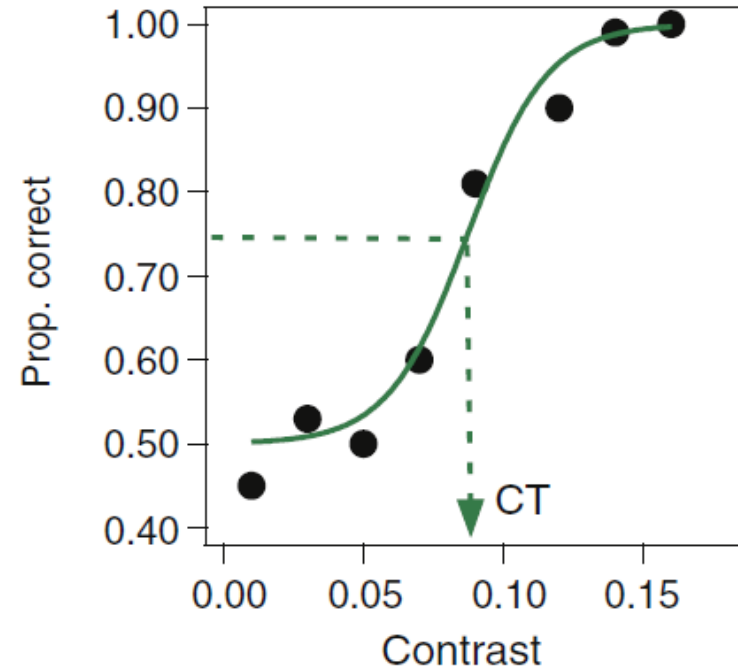
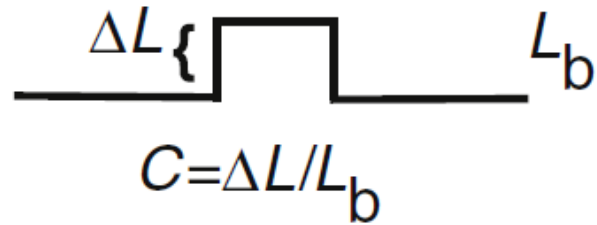
+







Typical example - contrast measurement



Covid detection

- How to describe the detection abilities of dogs to distinguish between people with and without covid-19?



The dogs trained to sniff out Covid-19

Could specially trained sniffer dogs soon be used to detect coronavirus at airports?

According to a French-Lebanese research team, the animals can detect Covid-19 in almost 100% of cases, after smelling human sweat.

Now they are training 20 dogs belonging to Lebanon's security forces to screen arrivals at Beirut airport.

If the trial is successful, the researchers hope it could be rolled out at airports around the world.

Video by Colm O'Molloy. Producer Nour Matraji.

© 12 October 2020 | [BBC News](#) | [Middle East](#)

Another example - XKCD



Epley, N., & Schroeder, J. (2014). Mistakenly seeking solitude. *Journal of Experimental Psychology: General*, 143(5), 1980.

<https://xkcd.com/642/>

How to know the other is interested?

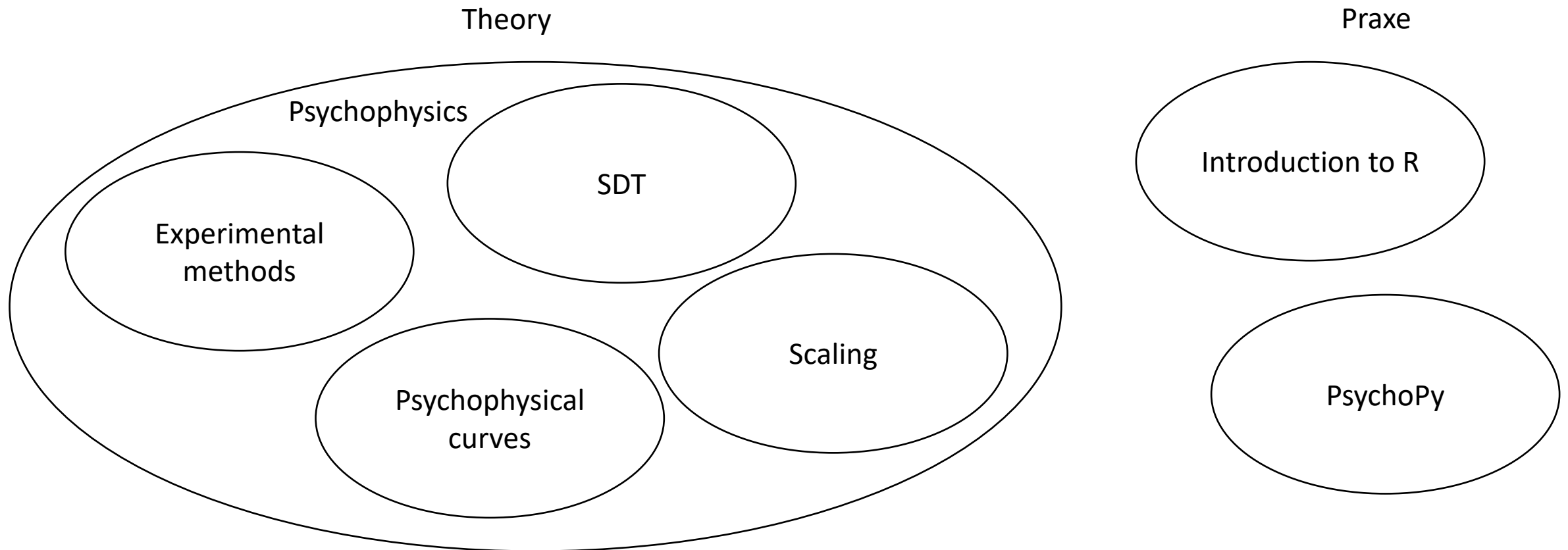
- There are different strategies:
 - "If he blinks and smiles, he's interested."
 - "I don't want to be wrong, so I'd rather assume he's not interested."
 - "He's breathing, so he's obviously interested."

How to know the other is interested?

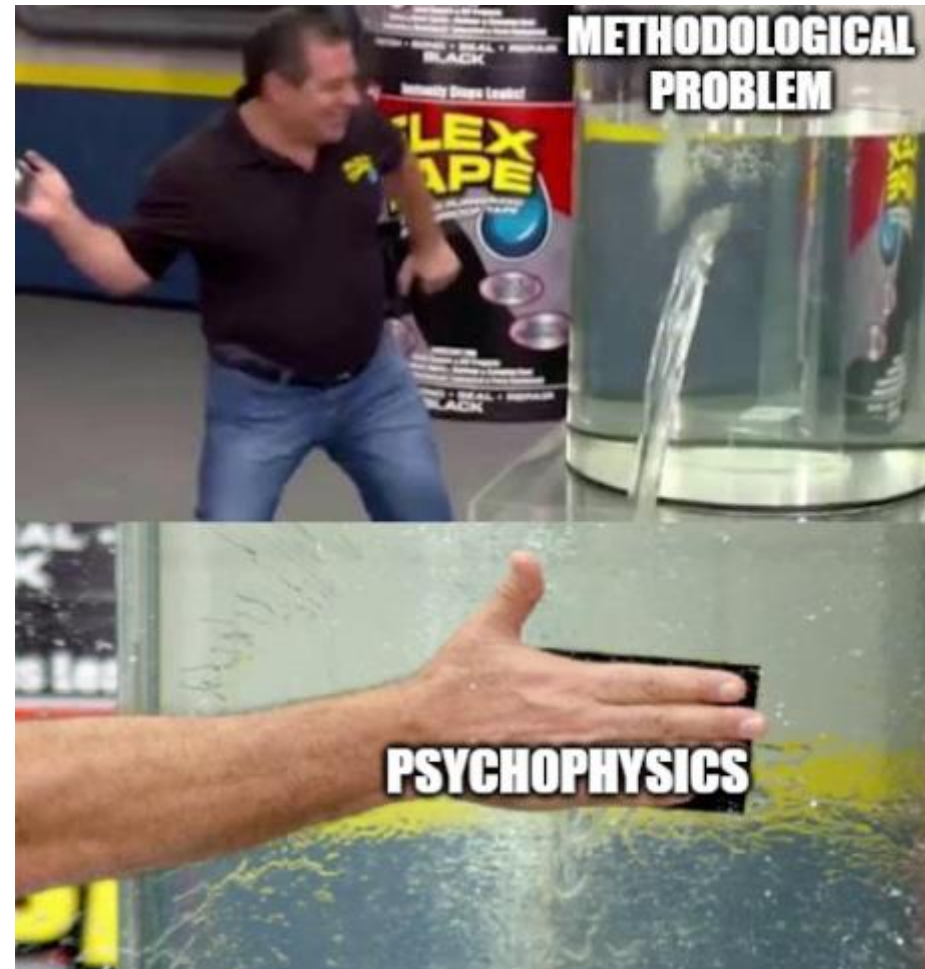
- There are different strategies:
 - "If he blinks and smiles, he's interested."
 - "I don't want to be wrong, so I'd rather assume he's not interested."
 - "He's breathing, so he's obviously interested."

- For this type of analysis we can use Signal Detection Theory (SDT)

What will be the content of this course?



Psychophysics is not for everything!



Conditions for fulfilling the course

- Design your own psychophysical experiment and present the results