

# **Research Methods in Cognitive Science**

## **Week 4: Replication...Replication...Replication**

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# Outline

- Types of replication
  - Close
  - Conceptual
- Evaluating Replications
- The replication recipe (Brandt et al. 2014)
- Why teaching replication is important
- Replication Activity

# Why?

1: Carrots improve vision	2: No, they don't
	
False positive? (Type I error)	Miss? (Type II error)
Truth: no effect Finding: effect	Truth: effect Finding: no effect

- Influential difference between the two experiments?

## Ultimate Chocolate Chip Cookies



837 Ratings



382 Comments

Prep  
45 MIN

Total  
45 MIN

Servings  
48



I was out of vegetable oil, so I used motor oil instead, and I replaced the nuts with pencil shavings.

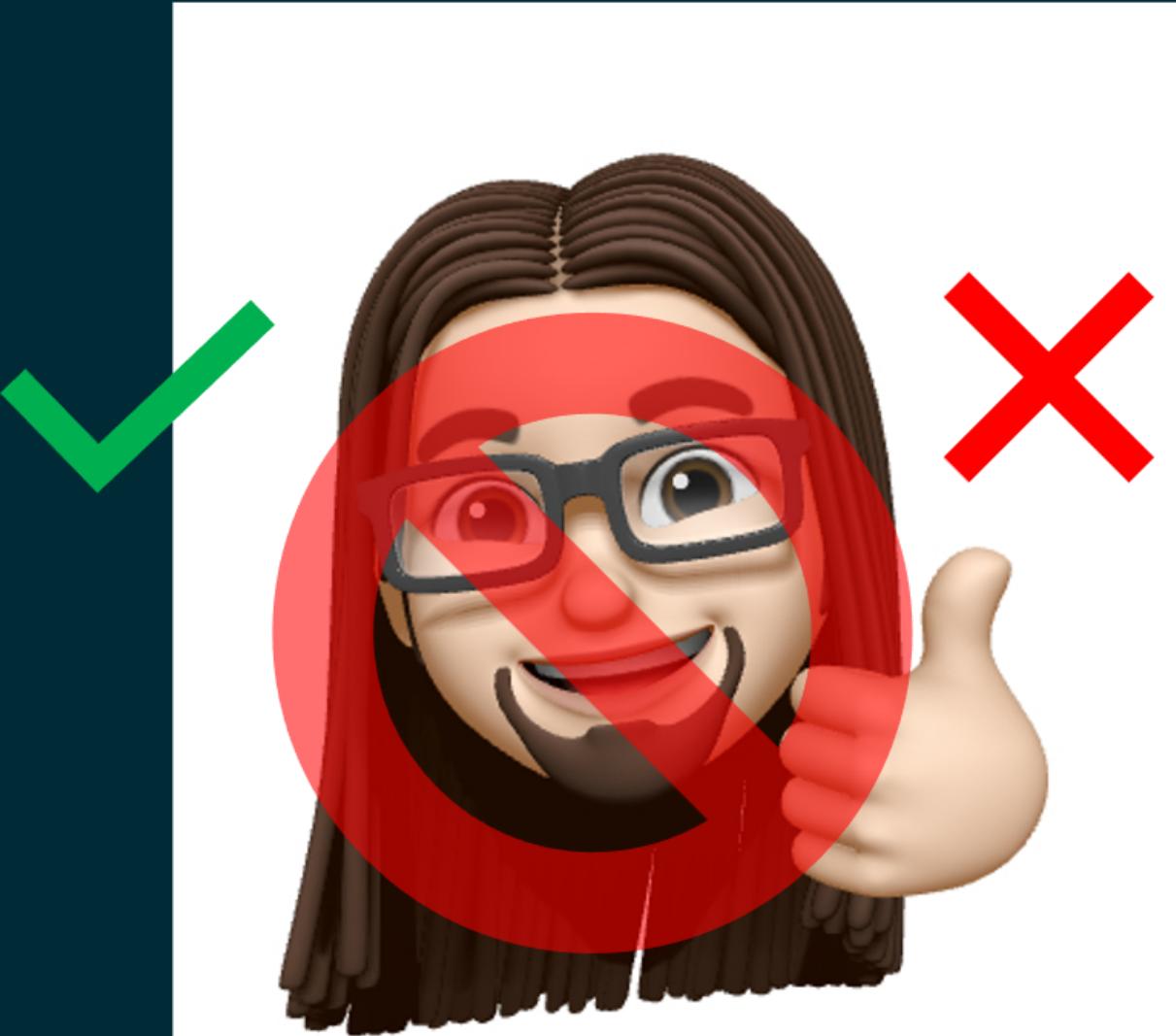
Absolutely disgusting, I can't believe people would rate this recipe so highly.



# Types of Replication

- Direct/exact/close replication
  - New experiment/study matches the original as closely as possible
- Conceptual replication
  - New study attempts to test the same idea as the original, but may differ significantly in implementation

Replications are not strictly "successes" or "failures"



- Not all studies provide equally strong evidence
- Study 1
  - N = 20, two groups
  - Not-preregistered
  - Reports novel, unexpected finding
- Study 2 (close replication)
  - N = 200
  - Preregistered
  - Does not demonstrate novel, unexpected finding



# Guide to Replicación



## Brandt et al. (2014)

- A 36-question guide to conducting convincing (good) replications
- 5 main ingredients

# Ingredient 1

- Carefully define the effects and methods that the researcher intends to replicate

## The Nature of the Effect

1. Verbal description of the effect I am trying to replicate:
2. It is important to replicate this effect because:
3. The effect size of the effect I am trying to replicate is:
4. The confidence interval of the original effect is:
5. The sample size of the original effect is:
6. Where was the original study conducted? (e.g., lab, in the field, online)
7. What country/region was the original study conducted in?
8. What kind of sample did the original study use? (e.g., student, Mturk, representative)
9. Was the original study conducted with paper-and-pencil surveys, on a computer, or something else?

# Ingredient 2

- Follow the methods of the original study as closely as possible
  - Sometimes not possible
    - Authors do not provide enough detail
    - Authors do not share their materials
  - Contact them (for projects you may have to do this :))

## Designing the Replication Study

10. Are the original materials for the study available from the author?
  - a. If not, are the original materials for the study available elsewhere (e.g., previously published scales)?
  - b. If the original materials are not available from the author or elsewhere, how were the materials created for the replication attempt?
11. I know that assumptions (e.g., about the meaning of the stimuli) in the original study will also hold in my replication because:
12. Location of the experimenter during data collection:
13. Experimenter knowledge of participant experimental condition:
14. Experimenter knowledge of overall hypotheses:
15. My target sample size is:
16. The rationale for my sample size is:

## Ingredient 3

- High statistical power
  - Rule of thumb: collect 2.5 times the original sample size
    - This is what we are shooting for here

## Ingredient 4

- Make complete details about the replication publically available
  - Publicly posting protocols, stimuli, and other materials on OSF

# Ingredient 5

- Evaluate replication results and compare them to the results of the original study
  - Not enough to say success/failed based on significant result

## Reporting the Replication

30. The effect size of the replication is:
31. The confidence interval of the replication effect size is:
32. The replication effect size [is/is not] (circle one) significantly different from the original effect size?
33. I judge the replication to be a(n) [success/informative failure to replicate/practical failure to replicate/inconclusive] (circle one) because:

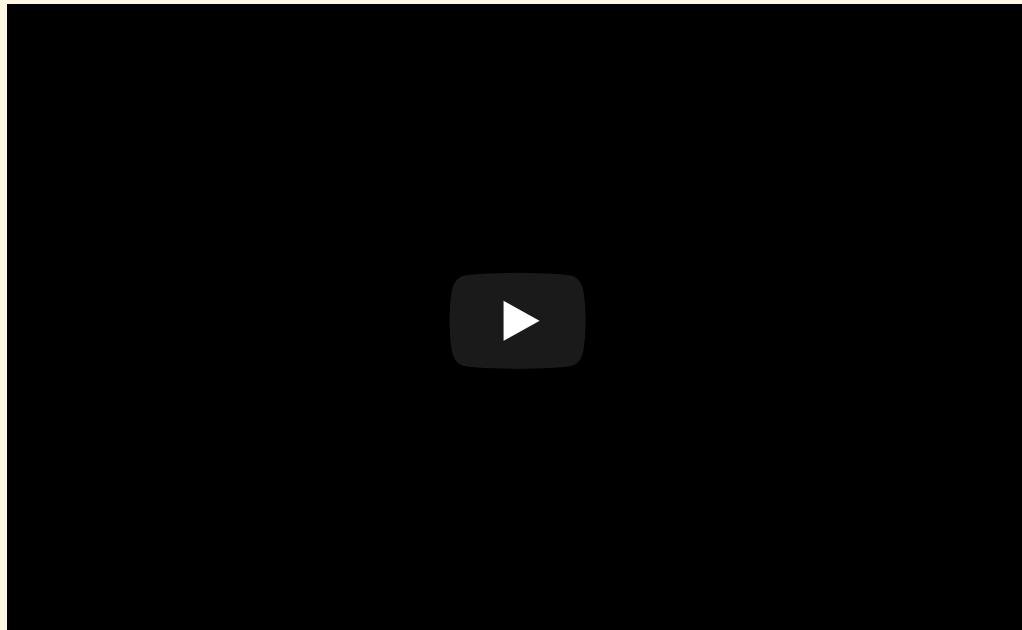
- Note important methodological differences:
  - Online vs. lab
  - Equipment (CRT vs. LCD)
  - Cultural differences

# Teaching Replication Is Important

- Educational benefits:
  - Fits the needs of the full range of students
  - Learn to read an article closely
  - Trace the steps of the experts
  - Gather relevant materials
  - Plan logistics of carrying out protocol
  - Create an analysis plan
  - Recruit participants and collect data
  - Analyze data and write up results
  - Compare results to original findings
- Scientific benefits:
  - Addresses replication crisis
  - Employs best practices

# Replication Activity

- Strak, Martin, & Stepper (1988): Facial Feedback Hypothesis
  - Our facial expressions can trigger emotional reaction

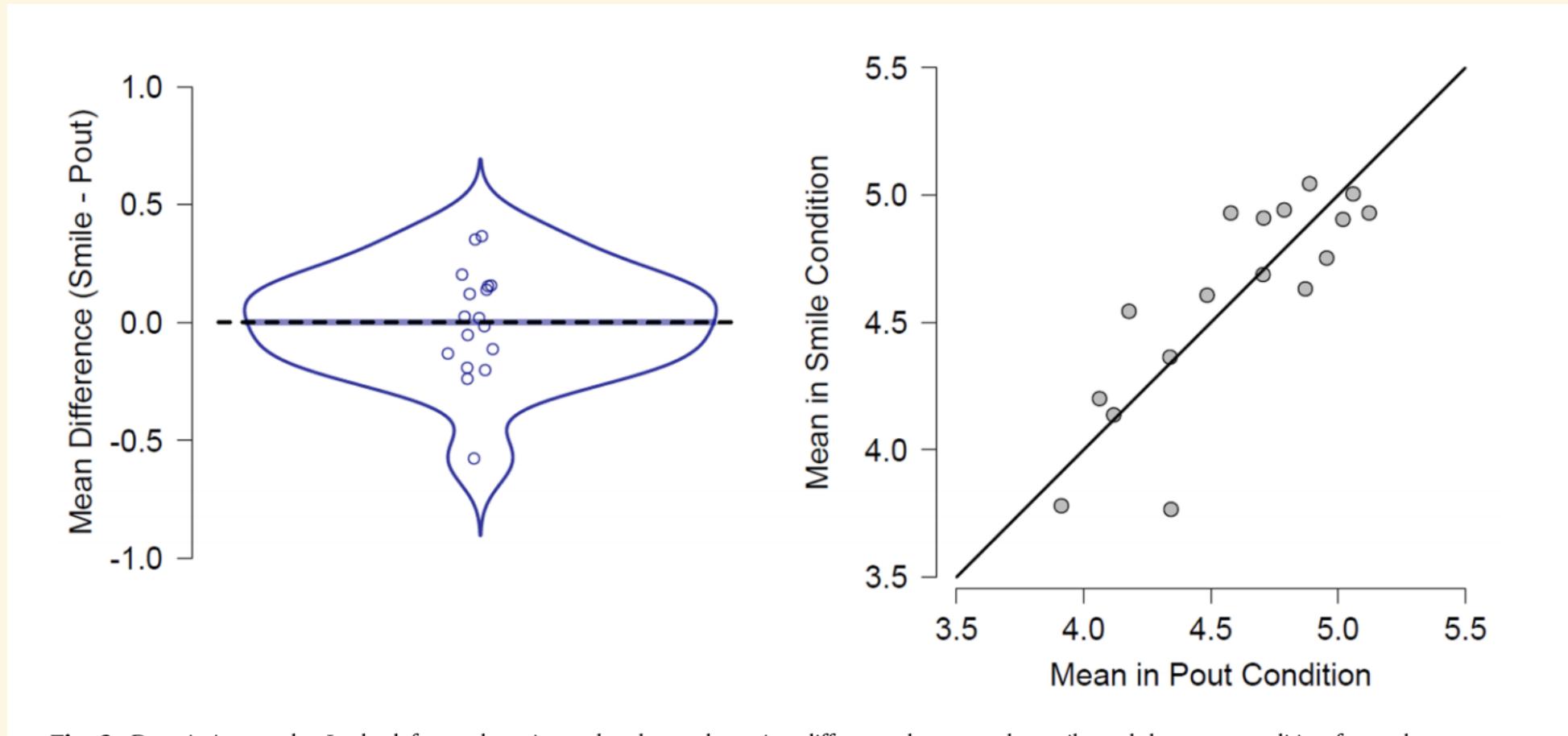


# Group Discussion

1. Do you think this study replicated?
2. Why/Why not?
3. How much are you willing to bet on it?
4. What are the potential issues with this study (i.e., has anything changed since this study?)  
Would findings replicate in different cultures?

# RRR (Wagenmakers et al. 2016)

- 17 labs with over 1000 participants from different countries



# Concluding Message

- Replication is important!
- Science is a continual process of updating what we know (self-correcting)
- Psychology has changed in the last decade
  - Open science is becoming the norm (I hope)
- Science/Psychology/Cognitive Science is not fucked :)