

# The study of false memories

A replication and extension of  
Roediger and McDermott

# Roediger and McDermott

## Meta-theoretical question

- (1) memory as photograph versus memory as reconstruction
- (2) “recovered” childhood memories of trauma versus “false” memories
- (3) legal testimony of accuracy of memory

# Roediger and McDermott- background

## Prior work

- (1) memory distortions over time -- Bartlett
- (2) reconstructive memory -- Loftus
- (3) low error rates in recognition memory  
-- Underwood
- (4) intrusions in free recall -- Deese

# Roediger and McDermott

Alternative explanations for memory effects

- (1) connection strength models of memory
- (2) network models of association

Theoretical statement

- (1) not testing theory but rather testing phenomenon
- (2) need to get a robust measure of false memory in order to study it

# 205 Replication of R & M

- Can we get the same effect?
- What is the effect of presentation (study) time
- What is the effect of type of presentation?
- Do study and recall have parallel effects on false memory effect?
- Do real memories and false memories behave the same way?

# Method

- Materials
  - 16 lists of 15 words (R&M lists 1-16)
  - 16 recall/math lists
  - 3 pages of math problems
  - Recognition list (3 words from each of lists 1-24 plus the “prime” from all lists)

# Method

- Procedure
  - Study words presented for 3 seconds
  - Recall interval of 90 seconds
  - Half the lists were presented visually, half orally
  - Instructions to “recall” or to do math problems
  - 3 minute filler task
  - 3 minute recognition task

# How to study several within subject variables at the same time

- Counterbalancing to avoid confounding
- Conditions crossed with conditions
- Conditions balanced across orders

# Results - Descriptive

- Descriptive statistics vs. Inferential stats
- Describe the results --
  - Say it in words
  - Say it in pictures (figures)
  - Say it in numbers
- Inferential: What is the likelihood that the results could happen by chance?
  - Estimate a parameter and give confidence intervals for that parameter

# Results - selective summary

- No need to report every analysis, just the ones that tell the important story
- Think about how to aggregate the data to best summarize it
- Transforms of data to make more understandable
  - e.g., percent correct rather than raw number
- Story must be truth
  - don't hide “inconvenient data”
  - assume someone else will want to analyse your data<sup>10</sup>

# Data= Model + Error

- The process of science is improve the model and reduce the error
- Models are progressively more complicated
- Consider the recall data:
  - Model 0: Data
  - Model 1: Data = Mean + Error
  - Model 2: Data = Position<sub>i</sub> + Error

# Results

- Recall (manipulation check)
  - Is there a serial position effect?
    - Primacy
    - Recency (particularly given the instructions)
  - Did people just recall on recall tasks?
  - Do the lists differ in recall ease?
- Recognition
  - Is there a false memory effect?
  - What manipulations affect it?

# Central Tendencies and error

- Sample means reflect population values +/- error variability
- standard deviation of a mean (the standard error) =  $s.d/\sqrt{N}$
- observed mean +/- 1 standard error includes the population value 68% of the time
- means that differ by 2.8 standard errors are unlikely to be from same population
- errors of within subject designs are more complicated to show

# Modeling the Determinants of Recognition

- Does the type of word (real versus false) make a difference
- Does recalling versus not recalling the list make a difference
- Does study time affect subsequent recognition?
- Does recall time affect subsequent recognition
- Do these variables interact with each other
  - does the relationship between  $x$  and  $y$  depend upon  $z$ ?

# Multiple ways to model variance

- t test compares the difference of two groups
- F-test (ANOVA) is a generalization of t to compare multiple groups
- If the independent variable is categorical, then it can be thought of in terms of groups and we can use ANOVA
- If the independent variable is continuous, then we use the linear model.
- ANOVA is a special case of linear model

# Recall and Recognition

## Hypothesis testing

- How likely would differences of this magnitude be observed if in fact there were no effect in the population.
- Null Hypothesis Test
  - $H_0$  The groups do not differ in the population
  - $H_1$  The groups come from different populations
  - How likely are the results if  $H_0$ ?
  - What is the probability of data given  $H_0$ ?
  - Reject  $H_0$  if  $p < \text{critical value}$

# Alternative to hypothesis testing

- Effect size and confidence interval.
- How big is the effect and what is the expected range of the effect?

# Significance testing using Analysis of Variance

- ANOVA as a generalization of t-test.
  - t-test compares the difference between two means in terms of the expected standard deviation of the mean = observed standard deviation/sqrt(N-1)
- ANOVA compares the variance of the sample means to the variance within groups
- Possible to do ANOVA for multiple comparisons (combinations of variables)

# Interpretation of ANOVA

- Each anova is a comparison of two estimates of the population variance:
  - an estimate from the variance between groups and an estimate from the variance within groups.
- F is the ratio of these estimates. If the two groups are random samples from the same population, we would expect the F ratio to be 1. The more the F deviates from 1, the less likely is the hypothesis that the samples came from the same population.

# ANOVA also can examine interactions

- Two variables have an interactive effect upon a dependent variable if the effect of the first ( $X_1$ ) upon the dependent ( $Y$ ) depends upon the value of the second Independent Variable ( $X_2$ )

# Analysis of Variance main effects and interactions

		Variable 2	
		Level A	Level B
Variable 1	Level 1	1-A	1-B
	Level 2	2-A	2-B

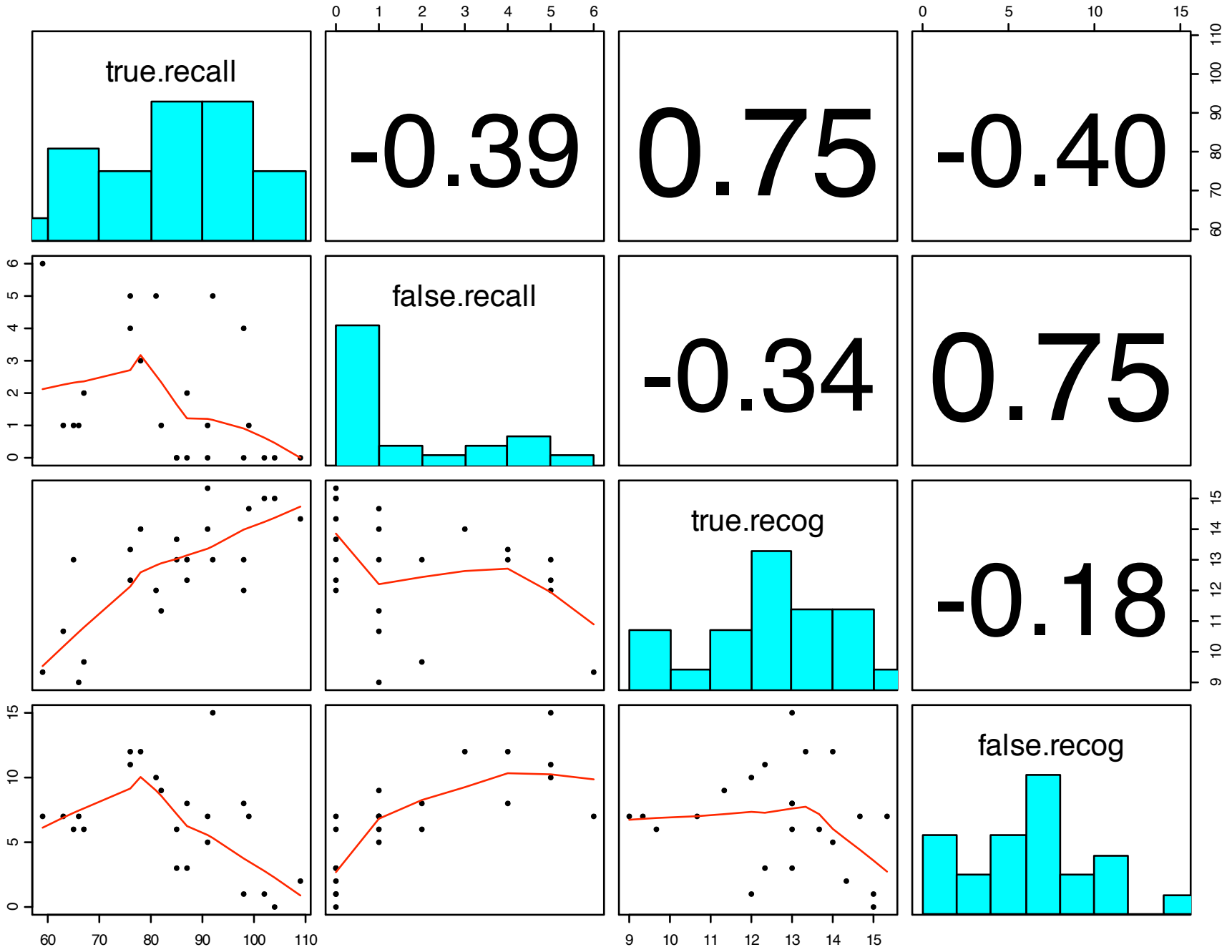
What is the effect of Variable 1?

What is the effect of Variable 2?

Does the effect of Variable 1 depend upon Variable 2

# Correlational data

- Possible to examine the relationship between individual differences in recall and recognition
- Is recall a reliable construct?
  - Estimate of coefficient alpha is based upon correlations within separate recall measures
- Is recognition a reliable measure
  - Does recognition for words on one trial relate to recognition on other trials



# But correlations are between participants

- Perhaps some participants are better than others
  - short term memory ability
  - interests
  - language facility
- Consider the probability of recognizing given that you recalled the word (the conditional probability)

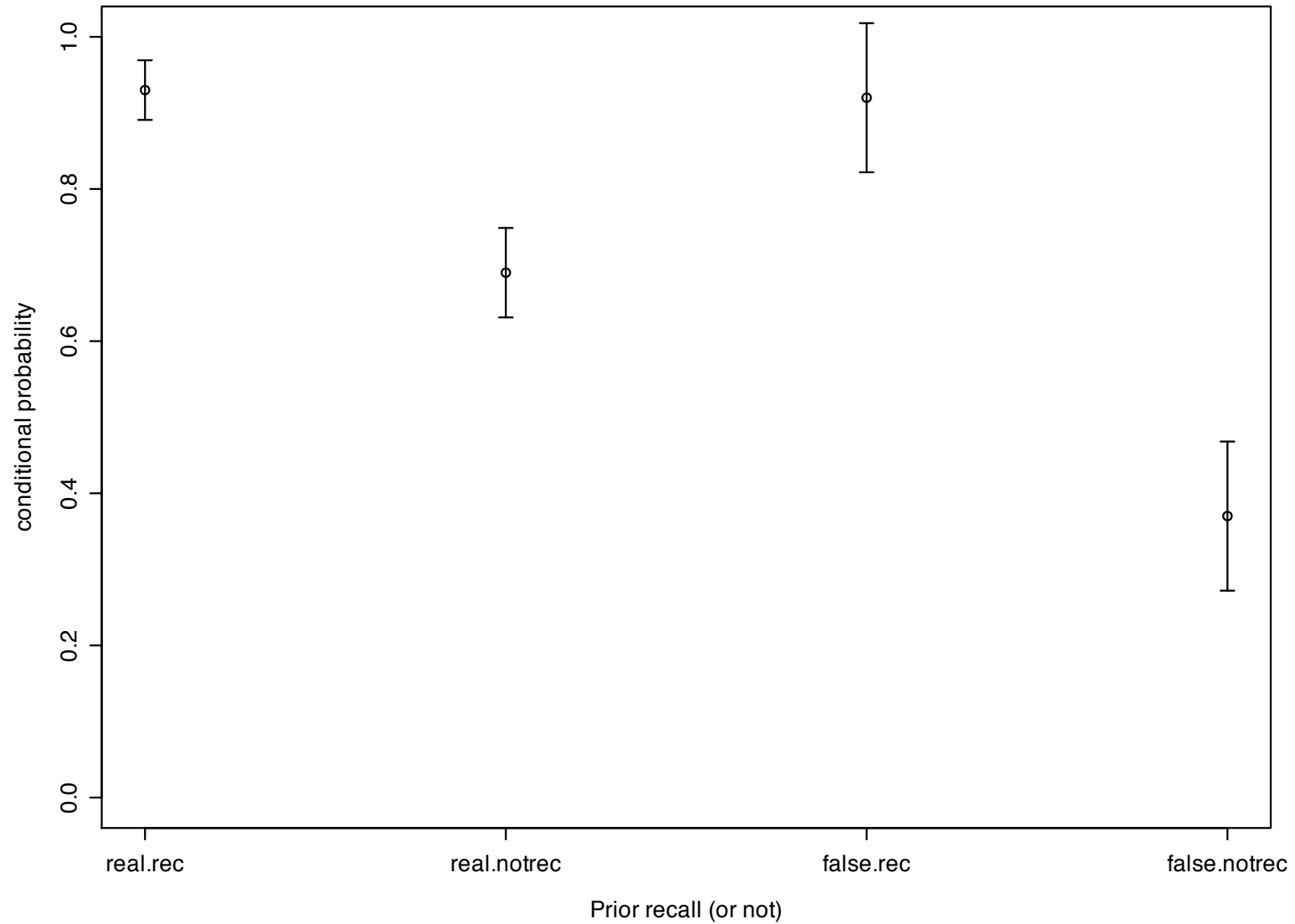
# Calculating conditional probabilities

	Recognized	Did not recognize	Total
Recalled	A	B	A+B
Did not recall	C	D	C+D
Total	A+C	B+D	A+B+C+D

$$P(\text{recog}|\text{recalled}) = A/(A+B)$$

# Conditional probability

Conditional probability of recognition given prior recall



# What do the data show?

- In words:
  - Prior recall facilitated subsequent recognition for target words and non presented but primed words
- In numbers:
  - Probability a word was identified as “old” if it had been recalled was .93 for target words and .92 for (false) primes. If not recalled, the probability of being identified as “old” was .69 for targets and .37 for false primes.

# Need to convert the frequencies to conditional probabilities

- Probability of recognition | prior recall =
  - frequency of recognition and recall/ frequency of recall (with and without recognition)
- This asks the question: “if you recalled a word (either a real word or a false word) does that facilitate subsequent recognition?”
- Can examine the effect of recognition | prior recall for real and false words

# Interpreting conditional recognition

- Prior recall facilitated subsequent recognition
- False words were recognized less than real words
- But, the effect of prior recall did not differ between false and real words.
  - Does this imply that the processes are the same? No, but
  - We can not show that the processes differ

# Conclusions

- Big picture
  - Possible to show false memory, particularly in a recognition task
- Smaller picture
  - variables that affect false recognition
- Take home message:
  - What does this all mean