



# European Ph.D

on Social Representations and Communication

**10<sup>TH</sup> INTERNATIONAL SUMMER SCHOOL**

**OF THE EUROPEAN PHD ON**

**SOCIAL REPRESENTATIONS & COMMUNICATION**

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## **SOCIAL INFLUENCE AND COMMUNICATION IN THE NEW SCENARIOS OF THE INFORMATION SOCIETY**

**IS IT POSSIBLE TO CHANGE RISK BEHAVIOUR?**

**SCIENTIFIC DIDACTIC MATERIAL**

UNIVERSITY OF ROME "LA SAPIENZA"

COLONNA CASTLE, GENAZZANO – ROME (ITALY)  
24<sup>TH</sup> APRIL - 3<sup>RD</sup> MAY 2004

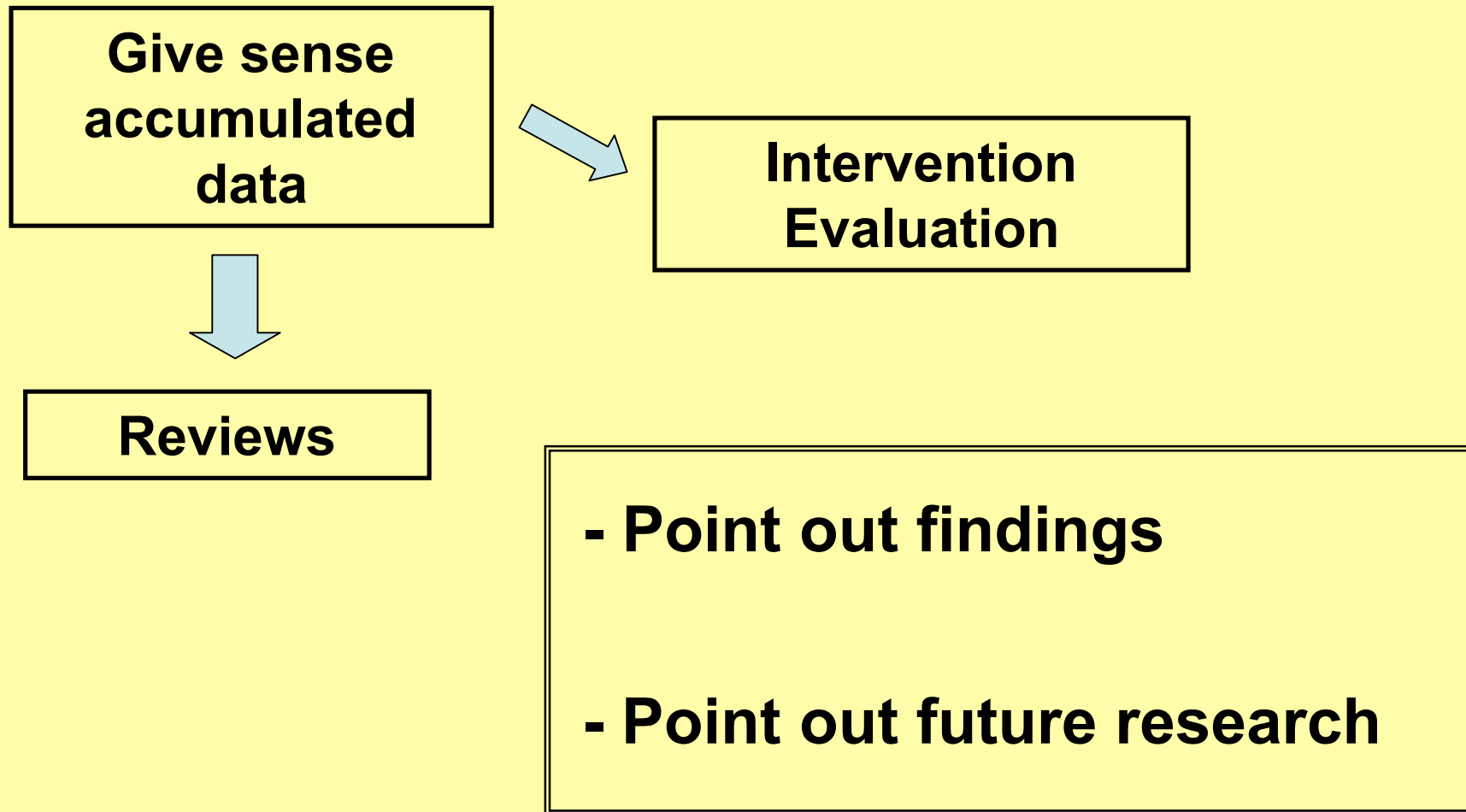
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# **META-ANALYSIS**

## **An overview**

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- **Reviews as part of scientific research.**
- **From narrative reviews to quantitative research synthesis**
- **1960-70. First attempts of integration**
- **1976, Glass: Meta-analysis (Conference *American Educational Research Association*)**

# What are the problems of narrative reviews?

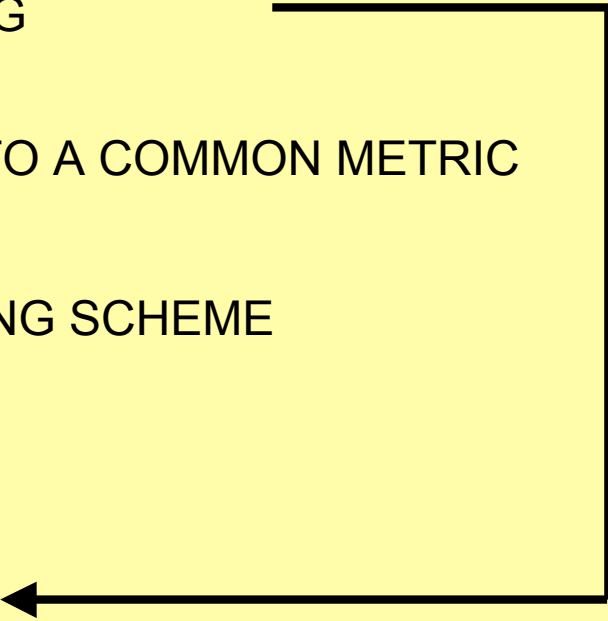
- **Inclusion of selective studies.**
- **Difficulty to analyse potential moderator variables**
- **Inadequate information about studies.**
- **Subjective weights on the studies.**

# Meta-analysis characteristics

- 
- **Precision**
  - **Objective**
  - **Replicability**

## META-ANALYSIS PHASES

1. PROBLEM: HYPOTHESIS
2. RESEARCH SEARCHING
3. TRANSFORMATION INTO A COMMON METRIC
4. DEVELOPPING A CODING SCHEME
5. DATA ANALYSIS
6. CONCLUSIONS
7. REPORT



The problem of  
sampling  
bias

# RESEARCH SEARCHING AND SELECTION

- Rigour and transparency
- What look for
- How look for
- Selection criteria:

**REPLICABILITY**

## WHAT LOOK FOR

- Search for every study in the defined population
- Quality selection? Methodological quality dilemma

## HOW TO LOOK FOR

- No formal channels** {
- **Personal contacts**
  - **Invisible schools**
  - **Internet**

- Primary formal channels** {
- **Conference Programs and Proceedings**
  - **Journals**
  - **Ascendent searching**

- Secondary formal channels** {
- **Bibliographic databases**
  - **Bibliographic reference volumes**
  - **Citation index**

# SELECTING RESEARCH

## Inclusion/exclusion criteria

**BEFORE** research  
searching

- temporal limit
- Channels

**DURING** research  
searching

- Language
- Key-words
- Incomplete abstracts

**AFTER** research searching

- Not enough information

## WHAT LOOK FOR

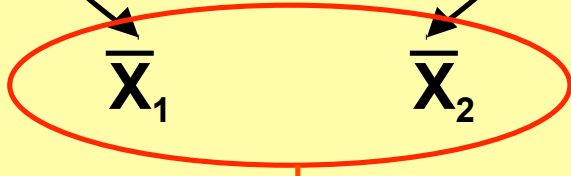
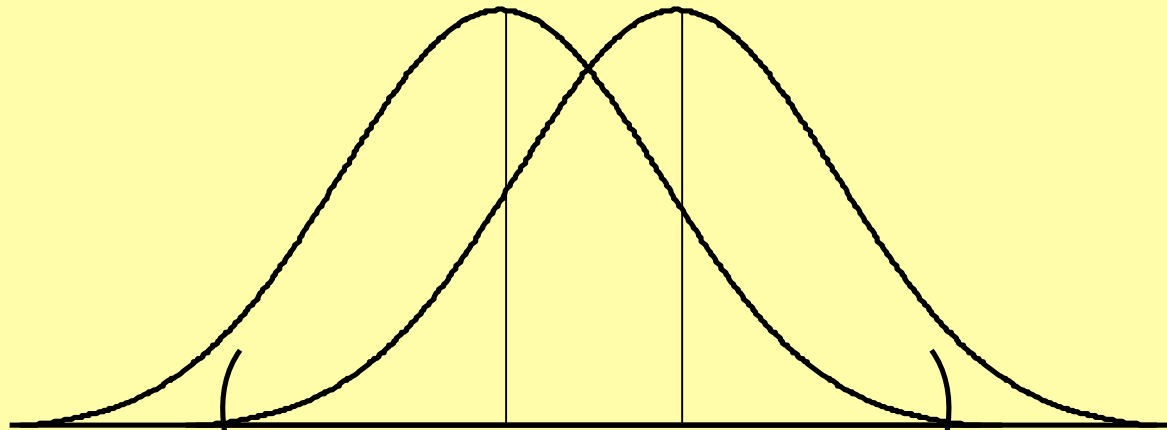
- Search for every study in the defined population (include published and unpublished manuscripts)
- Quality selection? Methodological quality dilemma
  - Methodological quality is a continuum
  - Being too restrictive may restrict ability to generalize
  - Being too inclusive may weaken the confidence that can be placed on the finding
  - An appropriate balance to the research question

## WHAT IS THE INFORMATION WE HAVE IN EACH STUDY

- **Substantive characteristics** (eg: type of treatment, duration, maintenance of program...)
- **Subject characteristics** (eg: mean age sample, educational level, mean number of years as a smoker...)
- **Methodological characteristics** (eg: attrition, quality of the study, subject source, design...)
- **Extrinsic characteristics** (eg: published vs unpublished, date of report, year,...)
- **Statistical information**

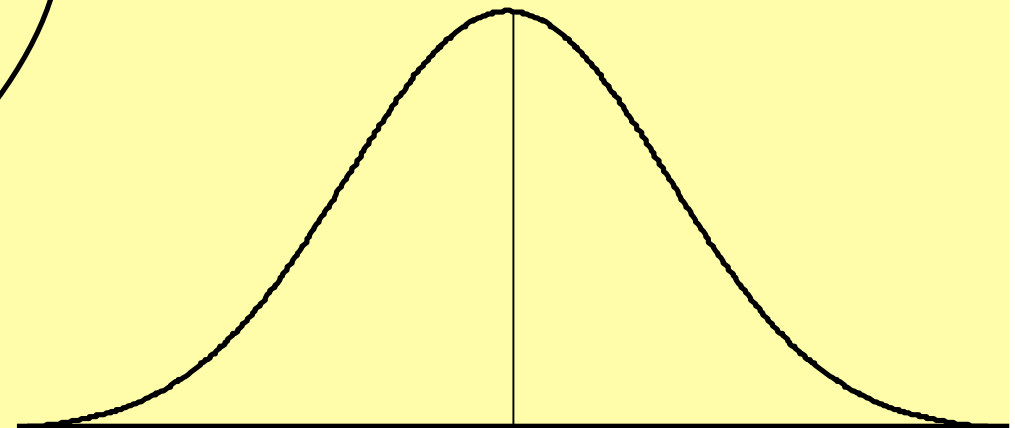
# HYPOTHESIS TESTING

## Population Distribution



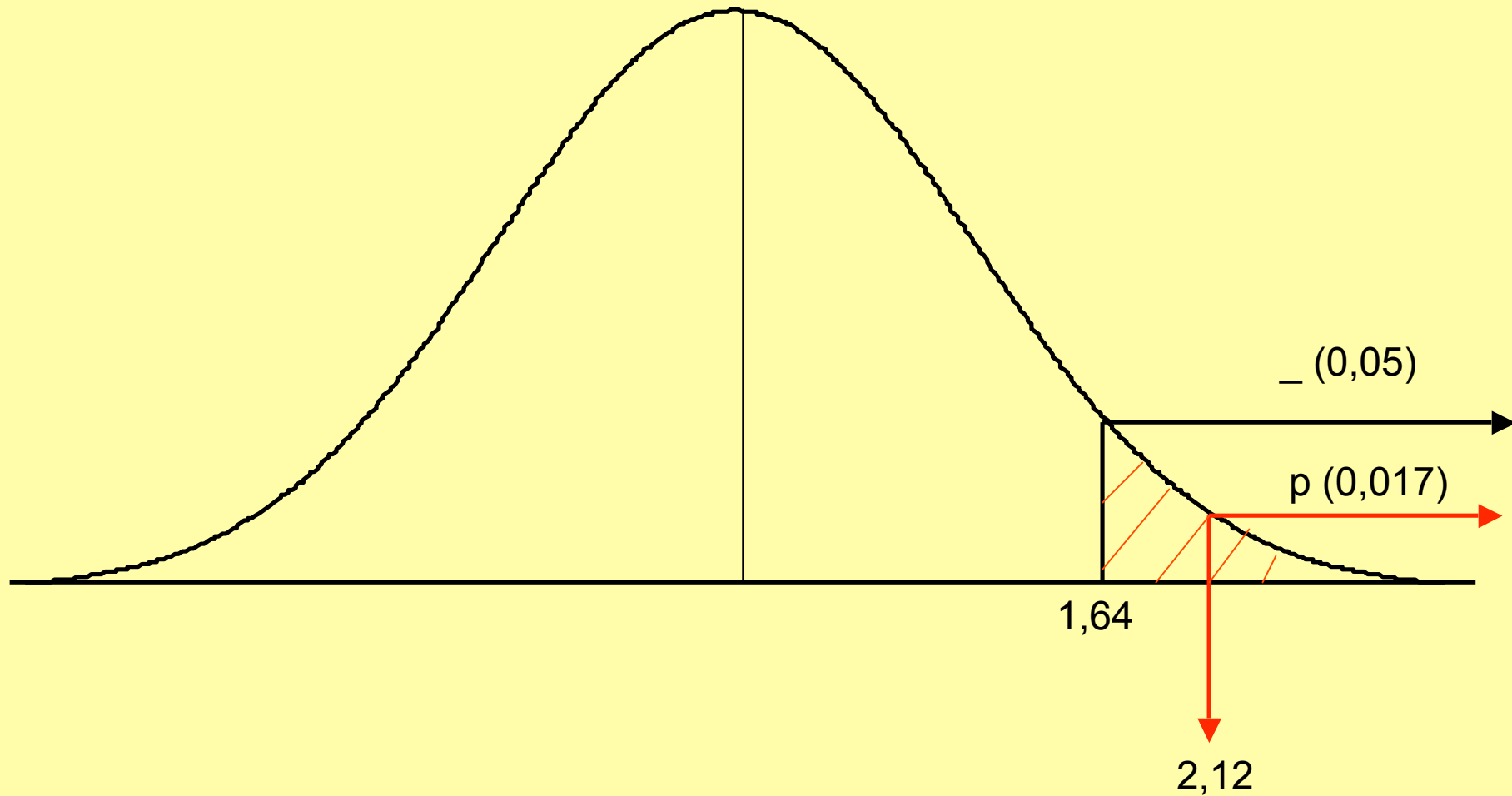
**Contrast Statistic (T)**

## Statistic Sampling Distribution

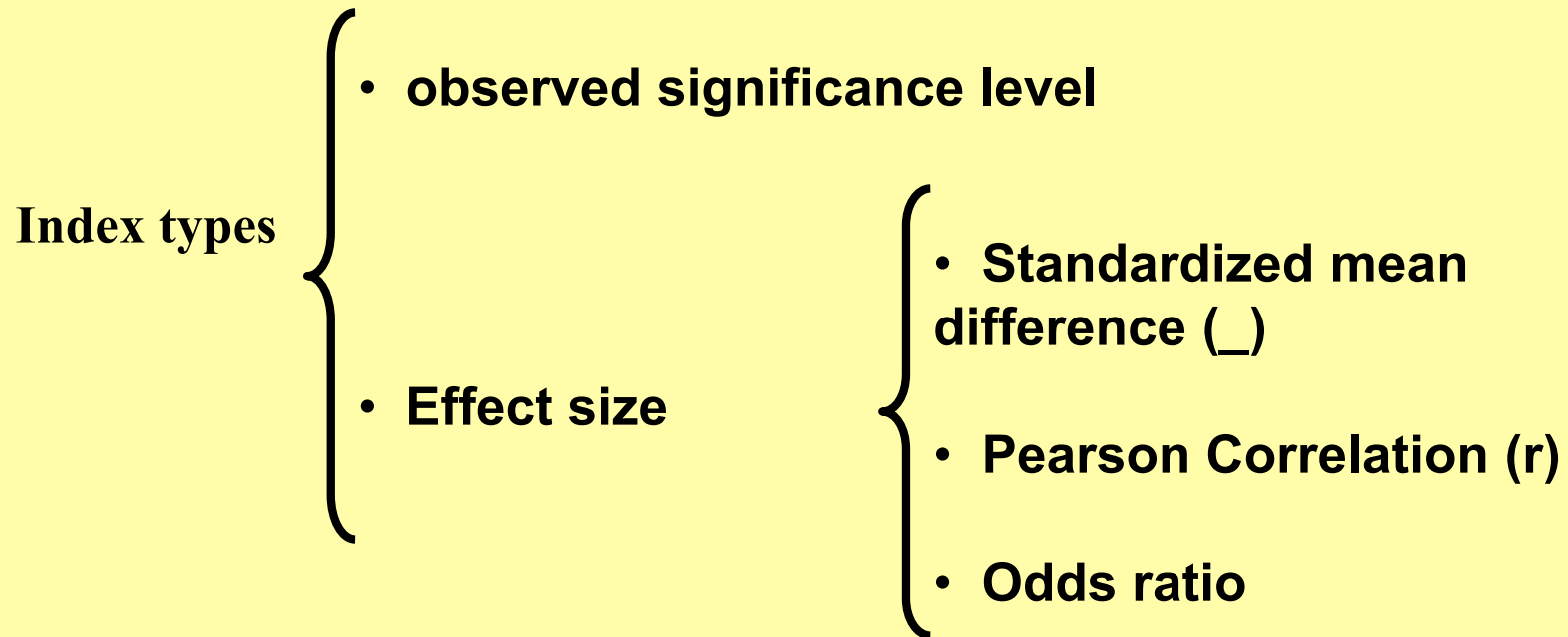


**Statistical sampling  
distribution**

**HYPOTHESIS  
TESTING**

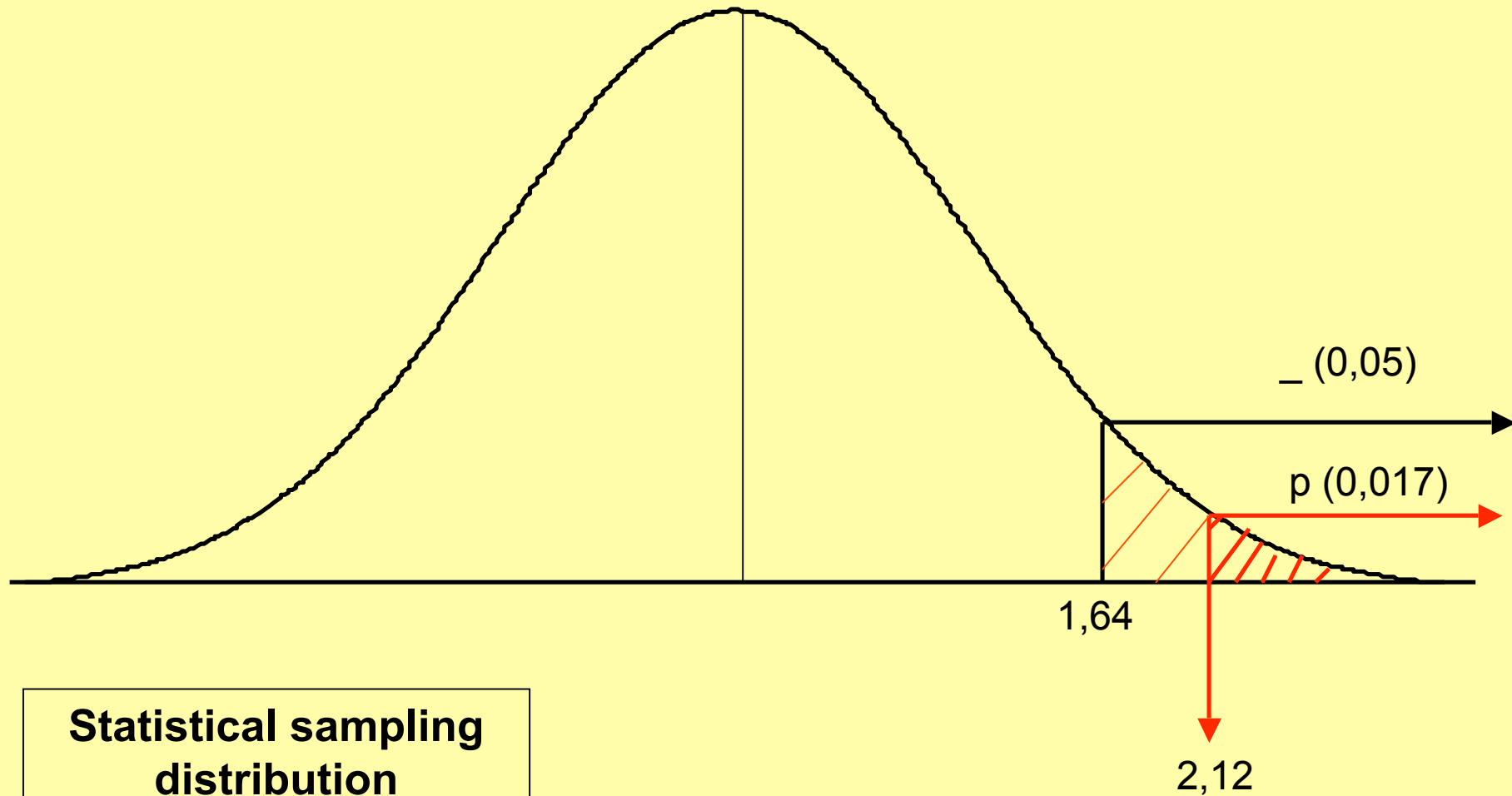


# TRANSFORMATION TO A COMMON METRIC



# OBSERVED SIGNIFICANCE LEVEL


Being  $H_0$  true, the probability to obtain a statistical value, at least as extreme as that one,



## OBSERVED SIGNIFICANCE LEVEL, 'p'

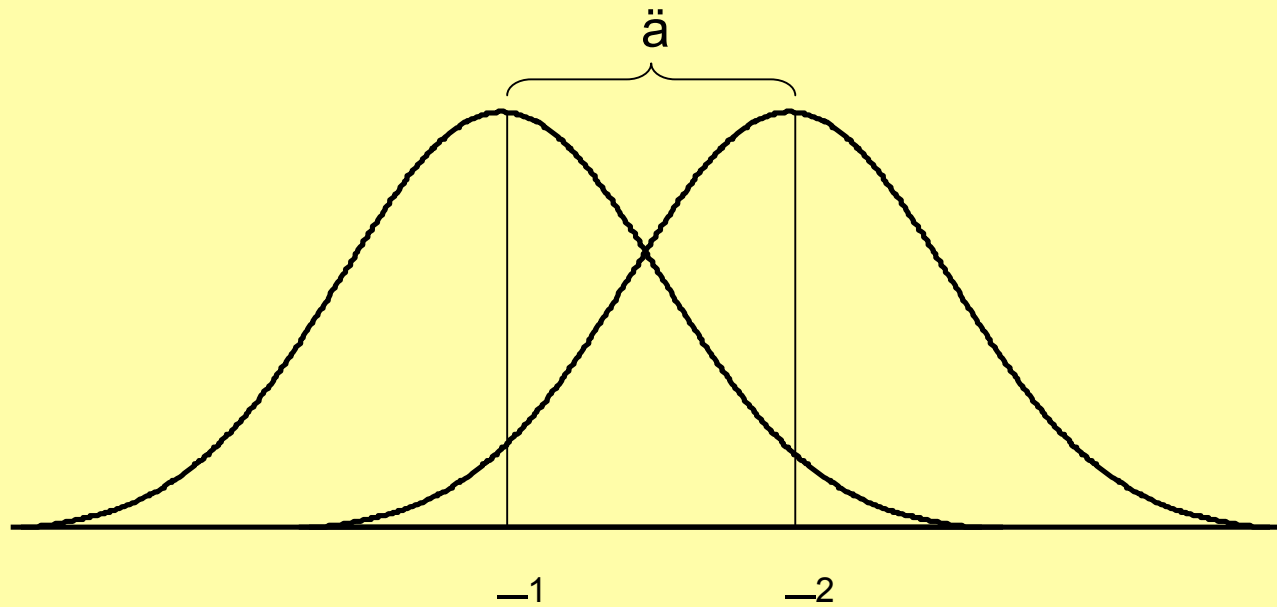
- **We can calculate a combined significance level of K studies**
- **Problem: 'p' is not always being informed (only  $>$  or  $> _$ )**
- **It does not give information about the relevance of the association**

## Effect Size:

- 
- The effect size makes meta-analysis possible
  - Represents the magnitude and direction of the relationship of interest
  - Is independent of sample size
  - Different meta-analyses, different effect size indexes

# EFFECT SIZE

Standardized mean  
difference ( $d$ )

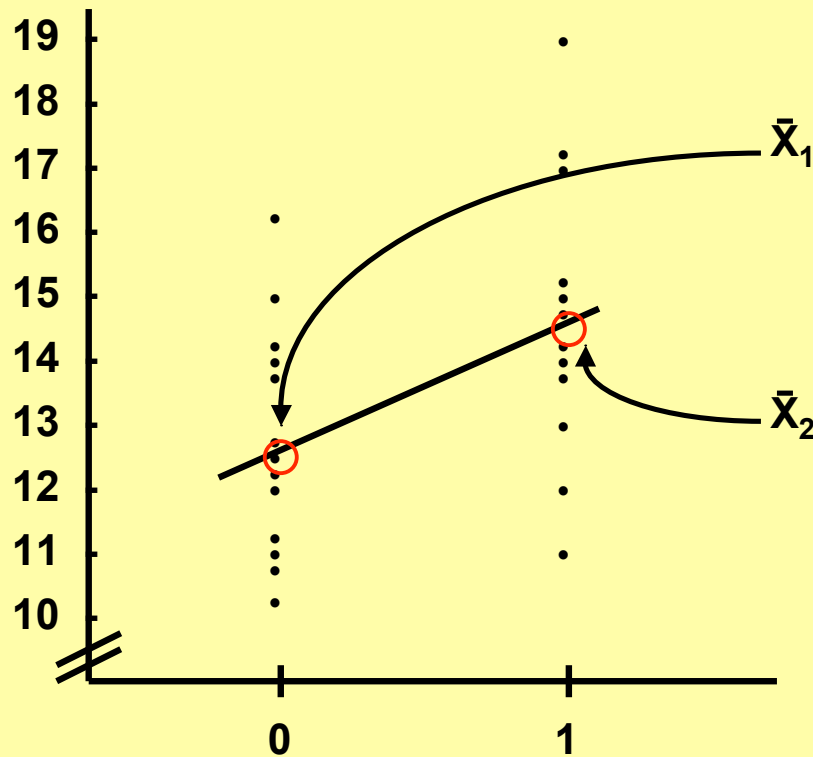


$$\delta = \frac{\mu_1 - \mu_2}{\sigma}$$

$$d = \frac{\bar{X}_1 - \bar{X}_2}{S}$$

# EFFECT SIZE

## Pearson Correlation (r)



$$r = \frac{d}{\sqrt{d^2 + 4}} = \frac{d}{\sqrt{d^2 + 4}}$$

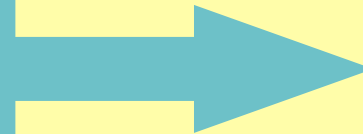
$$d = \frac{2 \cdot r}{\sqrt{1 - r^2}}$$

# DATABASE

STUDIES	CHARACTERISTICS									RESULTS			
	SUBSTANTIVES			METHODOLOGIES			EXTRINSICS			N <sub>E</sub>	N <sub>C</sub>	d r	p
SOURCE	Treat. indiv/group	Medication	...	TYPE DESIGN	TYPE CONTROL GROUP	...	PUBLICATION YEAR	TYPE PUBLICATI ON	...				
1													
2													
...													
k													

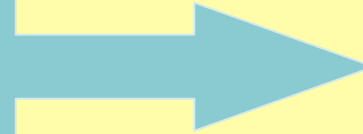
# DATA ANALYSIS

1.- What would be the result of a null contrast with the K studies retrieved?



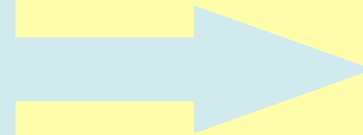
Combined significance test

2.- What is the estimated effect size for the K studies?



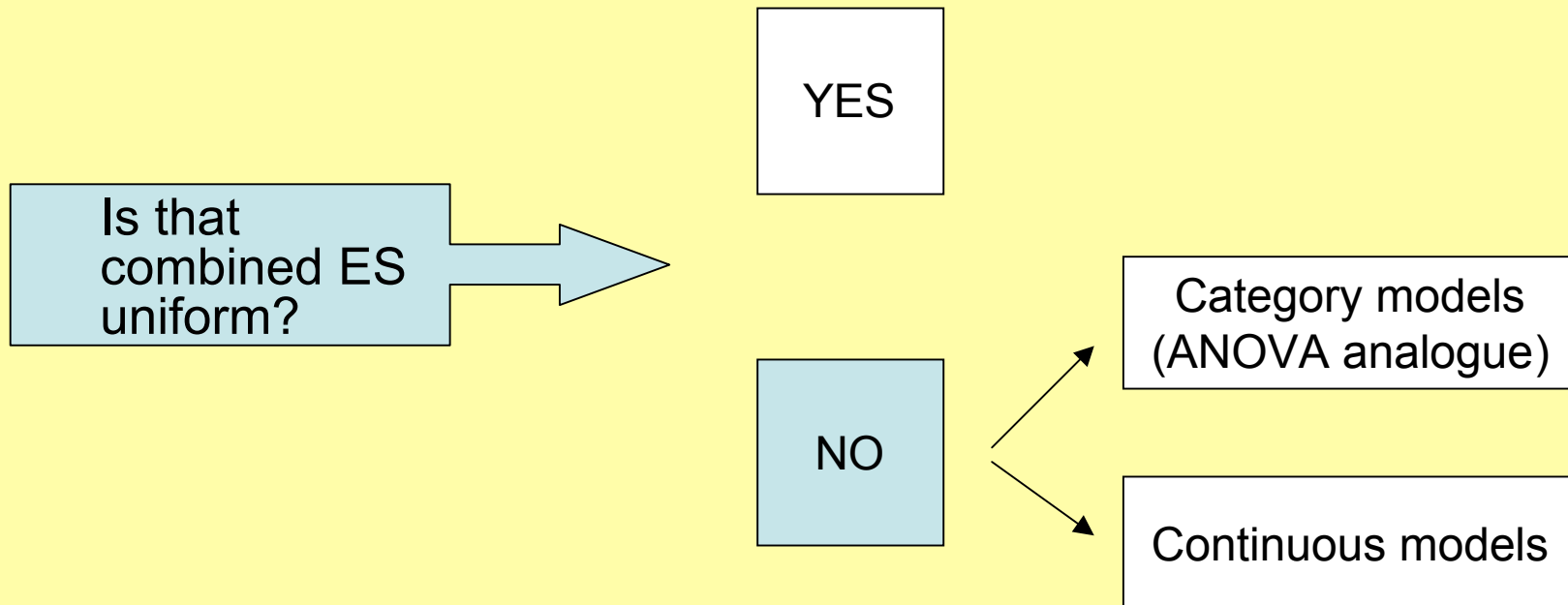
Global estimated Effect Size

3.- Is the Effect size uniform?



homogeneity test

# Homogeneity test



## An example

Studies	Number of Participants	n <sup>2</sup>	p	z	n <sub>i</sub> ·z
1	48	2304	.025	1.96	94.08
2	28	784	.50	0	0
3	32	1024	.33	.44	14.08
4	24	576	.90	-1.28	-30.72
5	64	4096	.01	2.33	149.12
6	40	1600	.39	.28	11.20
7	20	400	.50	0	0
8	30	900	.15	1.04	31.20
Σ	286	11684		4.77	268.96

Simple procedure,

$$z = \frac{4.77}{\sqrt{8}} = 1.69, p < .0461$$

Weighted procedure,

$$z = \frac{268.96}{\sqrt{11684}} = 2.49, p < .0064$$

## 2.- What is the combined Effect Size?

- We have a set of Effect Sizes (an ES per study or an ES per subsample within study)
- Studies with bigger samples (N) are more precise, so they should have more weight.
- For this reason each ES is weighted by its inverse variance

An **Example** (taken from Lipsey and Wilson, 2001)

10 Effect size (ES) and their weights (w)

Study	ES	w
1	-0.33	11.91
2	0.32	28.57
3	0.39	58.82
4	0.31	29.41
5	0.17	13.89
6	0.64	8.55
7	-0.33	9.80
8	0.15	10.75
9	-0.02	83.33
10	0.00	14.93

$$\overline{ES} = \frac{\sum (w \times ES)}{\sum w}$$

$$\overline{ES} = \frac{\sum (w \times ES)}{\sum w} = \frac{41.82}{269.96} = 0.15$$

## Interpreting Effect Size Results

### Cohen's "Rules-of-Thumb"

standardized mean difference effect size

small = 0.20

medium = 0.50

Large = 0.80

But, take into account the context of the intervention

Correspond to the distribution of effects across meta-analyses found by Lipsey and Wilson (1993)

# The Analog to the ANOVA

Example taken from Lipsey and Wilson (2001)

Study	Grp	ES	w	w*ES	w*ES <sup>2</sup>
1	1	-0.33	11.91	-3.93	1.30
2	1	0.32	28.57	9.14	2.93
3	1	0.39	58.82	22.94	8.95
4	1	0.31	29.41	9.12	2.83
5	1	0.17	13.89	2.36	0.40
6	1	0.64	8.55	5.47	3.50
			151.15	45.10	19.90
7	2	-0.33	9.80	-3.24	1.07
8	2	0.15	10.75	1.61	0.24
9	2	-0.02	83.33	-1.67	0.03
10	2	0.00	14.93	0.00	0.00
			118.82	-3.29	1.34

→ A grouping variable

# Homogeneity Analysis

- Homogeneity analysis tests whether all effect sizes are estimating the same population.
- If homogeneity is rejected, the distribution of effect sizes is assumed to be heterogeneous.

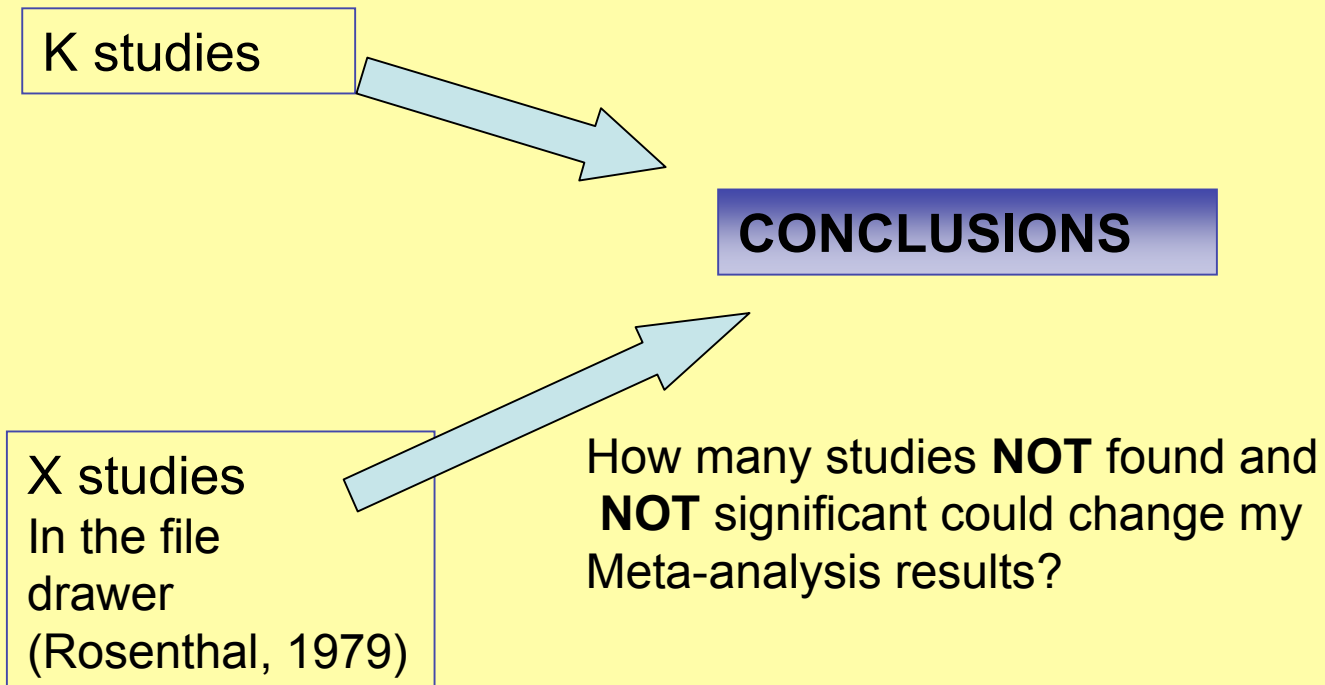
## The Analog to the ANOVA

Partition the overall Q into two pieces, a within groups Q and a between groups Q.

$Q_B = 7.69$	$df_B = 1$	$Q_{CV_{.05}}(1) = 3.84$	$p_B < .05$
$Q_W = 7.07$	$df_W = 8$	$Q_{CV_{.05}}(8) = 15.51$	$p_W > .05$
<hr/>			
$Q_T = 14.76$	$df_T = 9$	$Q_{CV_{.05}}(9) = 16.92$	$p_T > .05$

(taken from Lipsey and Wilson, 2001)

## The problem of the publication bias



## Fail-Safe number, Rosenthal (1979)

$$N_S = \left( \frac{\sum_{i=1}^k z_i}{1,64} \right)^2 - k$$

Criteria: **5•k + 10**

Example: if K=10

Ns=40

Ns =250

# THE REPORT

## 1. INTRODUCTION

## 2. METHOD

- Research searching and inclusion criteria
- Codification
- Analysis procedure

## 3. RESULTS

Descriptive analysis of the research searching  
Integration results for the K studies:

- Descriptive analysis
- Inferential analysis (category models, regression...)

## 4. DISCUSSION

## 5. REFERENCES\*

## 6. APPENDIX

# Weaknesses of Meta-analysis

- Requires a good deal of effort
- Mechanical aspects are not suitable to capture more qualitative distinctions between studies
- “Apples and oranges” criticism

# Strengths of Meta-analysis

- Imposes a discipline on the process of summing up research findings
- Represents findings in a more differentiated and precise manner than conventional reviews
- Capable of finding relationships across studies that are obscured in other approaches
- Can handle a large number of studies (this would overwhelm traditional approaches to review)

# Present and future of Meta-analysis: the “collaborations”

## Objectives

- Avoid duplicity
- Support MA
- Make scientific evidence  
closer to professional practice

- **Cochrane Collaboration**

([www.cochrane.es](http://www.cochrane.es))

- **Campbell Collaboration**

([www.campbellcollaboration.org](http://www.campbellcollaboration.org))

# Basic References

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