R for Psychologists

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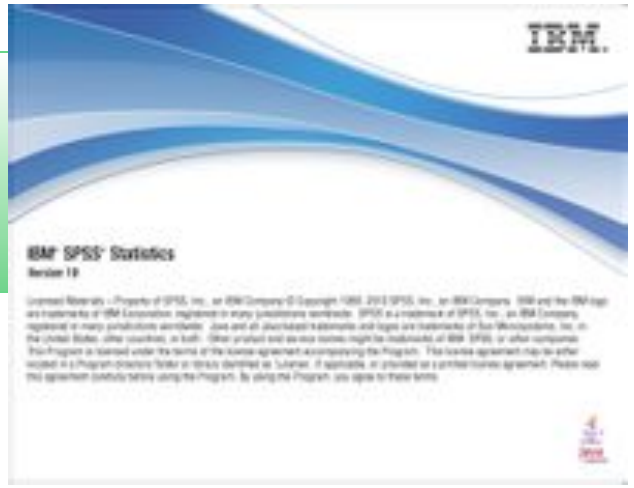
心理统计软件

- SPSS--- 目前国内几乎所有的心理学专业授予的统计软件。
- SAS
- Minitab
- R

SPSS



* **SPSS**（Statistical Product and Service Solutions），“统计产品与服务解决方案”软件。最初软件全称为“社会科学统计软件包”（Solutions Statistical Package for the Social Sciences）
* SPSS for Windows由于其操作简单，已经在我国的社会科学、自然科学的各个领域发挥了巨大作用。该软件还可以应用于经济学、数学、统计学、物流管理、生物学、心理学、地理学、医疗卫生、体育、农业、林业、商业等各个领域。

* IBM SPSS Statistics 22.0 - 2013年8月
* IBM SPSS Statistics 23.0 - 2015年8月
* IBM SPSS Statistics 24.0 - 2016年8月
* 从被IBM收购之后，SPSS的更新都是一年一个版本，每年的8月中旬，总能见到。

R

* https://www.r-project.org/
* R是用于统计分析、绘图的语言和操作环境。R是属于GNU系统的一个自由、免费、源代码开放的软件，它是一个用于统计计算和统计制图的优秀工具。

* R-studio
  * R-studio是个IDE，代码编写的集成环境，没有R的话，R-studio没法正常运行。R studio改善了R原生的那种比较粗糙的编写环境，让你用R的时候更方便，更高效。

Why R?

SPSS

- 商业软件
- 无法与合作者分享数据进程，存在版本兼容问题
- SPSS制作的图形相对美感不足
- 深度分析需要借助于别的软件，比如meta-analysis, power analysis

R

- 免费开源
- 可直接通过邮件发送相应分析script，可直接修改，增加了国际合作的可能性
- 方便直接制作出相对美观的图片，灵活性强
- 可直接下载相应的packages

R在心理学中可以做什么？

- Empirical Studies

- Systematic Review and Meta-analysis

(American Psychological Association. 2010)

Empirical Studies

- **Assisting Experimental Design**
  - Power analysis
- **Data Analysis**
  - Descriptive statistics
  - Inferential statistics
- **Data Visualization**

Field, A. P., Miles, J., & Field, Z. (2012). *Discovering statistics using R*. London: SAGE.

Example

* FC001E2: inequality on dyadic cooperation in 2-player public goods game
* Hypothesis 1: The inequality of initial endowment will be more likely to reduce the cooperative behavior. Inequality negatively influenced cooperation.

* 实验设计：单因素被试间实验设计

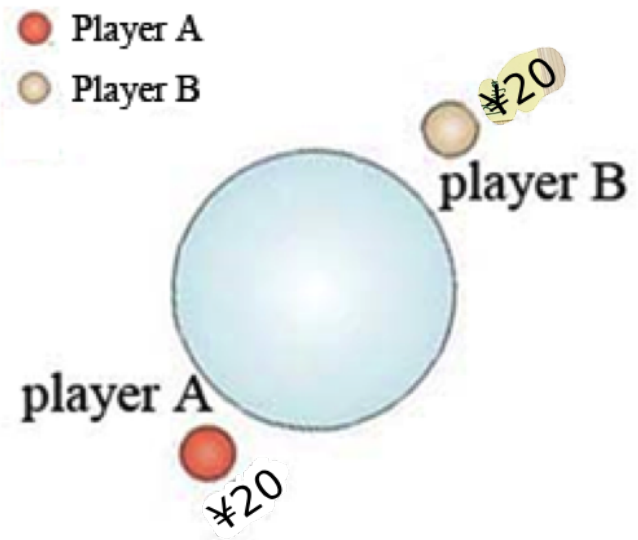
Sample Size ?
pwr package

(Lv, & Osman, in preparation, *Can empathy promote dyadic cooperation when there is inequality involved?*)

Experimental design

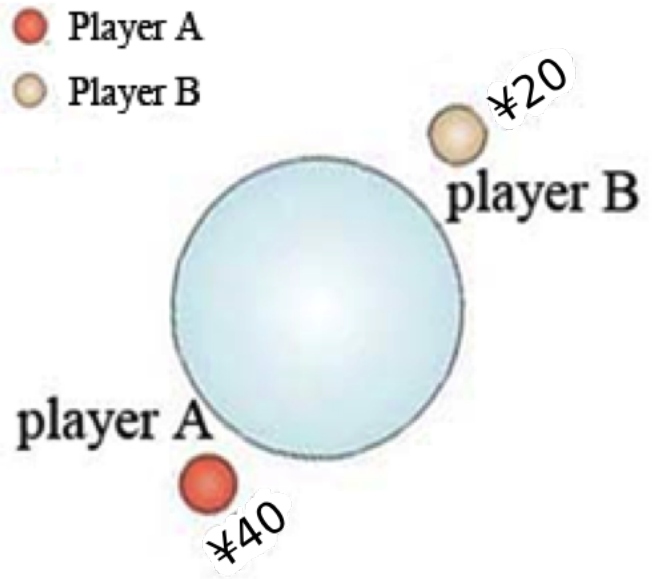
2020 Condition

* Player A is given to 20 tokens each round. (light green)
* Player B is given to 20 tokens each round. (dark green)



4020 Condition

* Player A is given to 40 tokens each round. (red)
* Player B is given to 20 tokens each round. (blue)



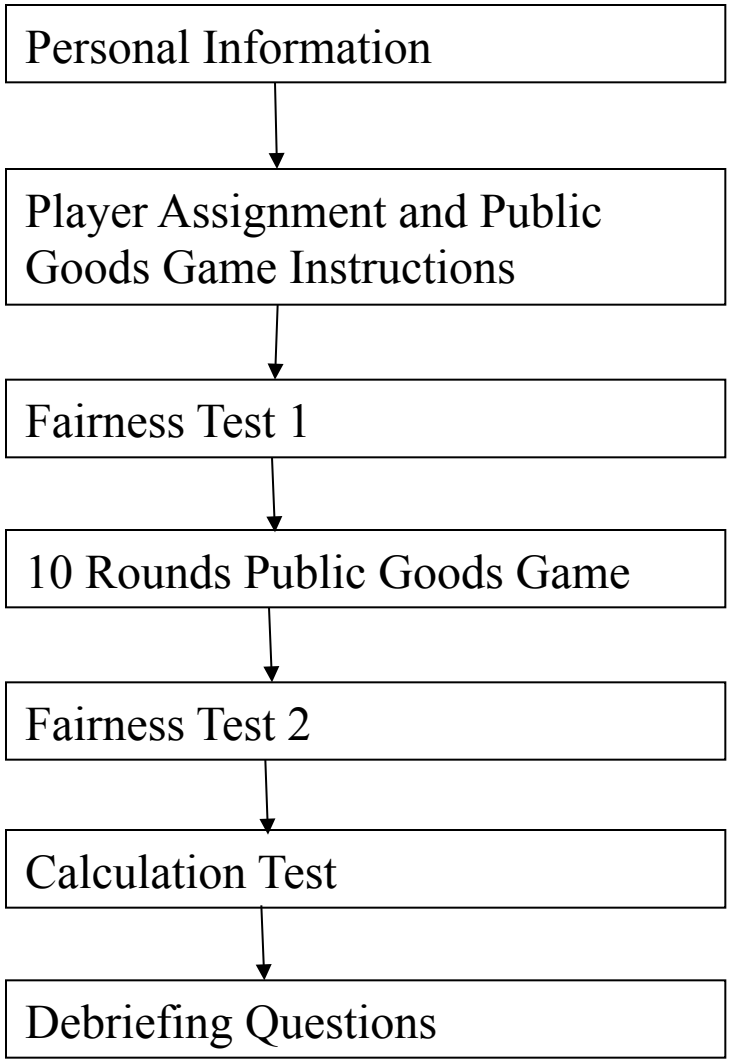


Figure 4. Details procedure of Experiment 2

Data

Data Import

Study_data14March2018.csv

	S	T	U	V	W	X	Y	Z	AA	AB	AC
-9	C01	C02	C03	C04	C05	C06	C07	C08	C09	C10	fairTes
6	10	10	18	10	10	1	15	5	10	4	
7	15	15	10	3	10	7	6	1	6	20	
6	18	16	20	14	15	16	12	15	16	18	
4	15	20	15	18	14	15	18	12	12	12	
5	18	10	18	20	20	20	20	20	20	20	

wide format

Descriptive statistics

"pastecs" package or "psych" package

Table 4

The Mean Proportion of Contribution (meanPoC) in Two Conditions in Experiment 2

Inequality Condition	*n*	*M (SD)*	95%CI
unequal4020 Player A	21	.500 (.239)	[.391, .608]
equal2020 Player A	22	.730 (.177)	[.651, .808]
unequal4020 Player B	21	.649 (.234)	[.543, .755]
equal2020 Player B	22	.743 (.193)	[.657, .829]

Note. 95%CI = 95% confidence interval

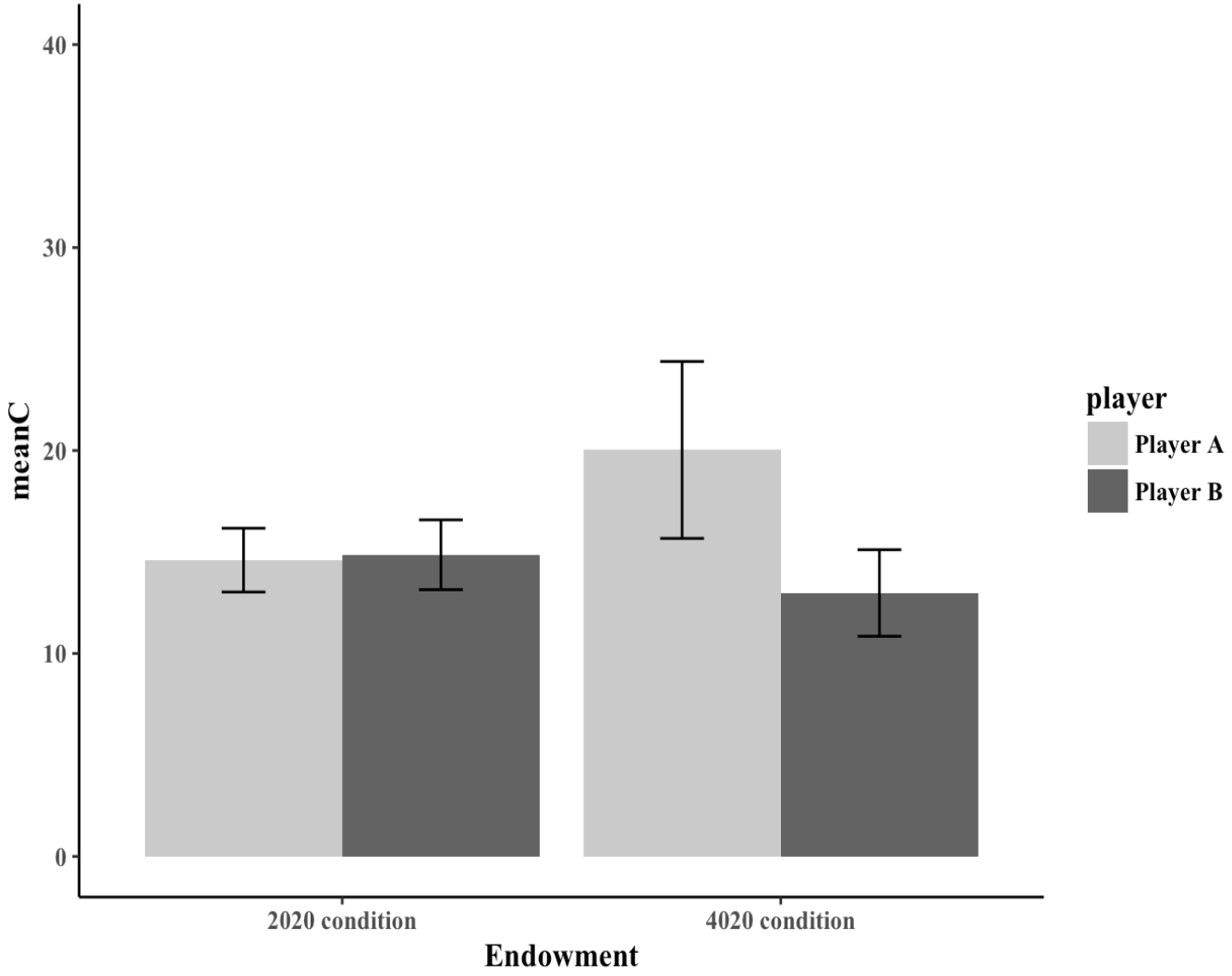
Inferential statistics

data visualization

* the most common charts in psychological paper
* line chart and bar chart

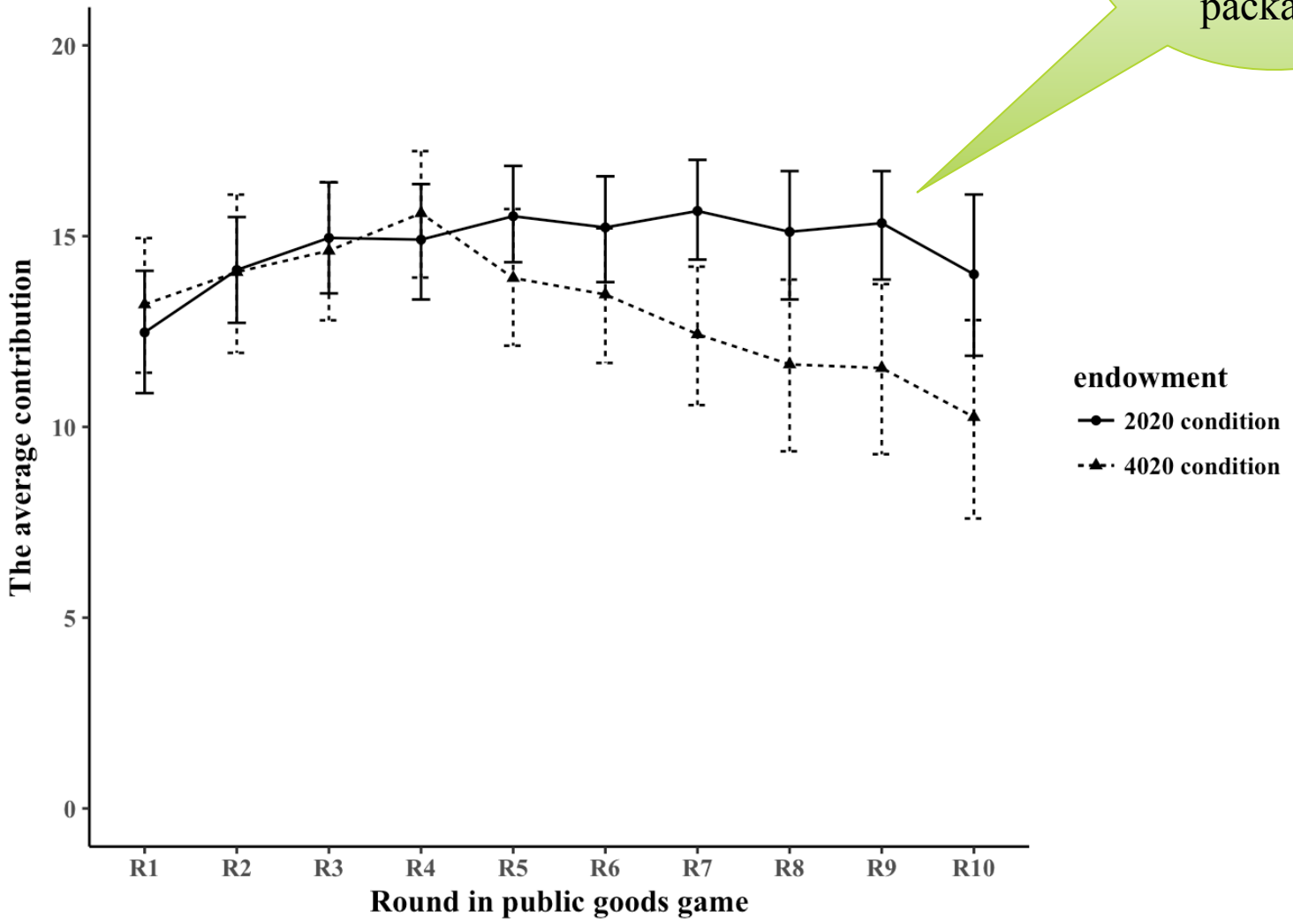
Data visualization
“ggplot2” package

bar chart


40
30
20
10
0
meanC
2020 condition
4020 condition
Endowment
player
Player A
Player B

Line chart

long format "tidyr" or "reshape2" package



Conducting meta-analysis in R

Viechtbauer, W. (2010). Conducting meta-analysis in R with the metafor package. *Journal of Statistical Software, 36*(3), 1-48.

* MEC: The relationship between empathy and cooperation: A meta-analytic study

* Research Questions:
* What is relationship between empathy and cooperation?

Lv, Osman, & Proulx, A meta-analysis of the relationship between empathy and cooperation, in revision

publication bias

circumstances and social context

changes in the population over time

Replication Crisis

insufficient power

questionable research practices e.g., rounding down p-values, falsifying data

problems with the design, implementation, or analysis of the original or replication study

- Replicated Studies

Systematic Review

Literature Review

* Narrative review
  * develop or evaluate a new theory
* systematic reviews (sometimes referred to a research syntheses or research reviews) (Siddaway, Wood, & Hedges, 2019)
  * meta-analysis
* methodical, replicable, and transparent

Siddaway, A. P., Wood, A. M., & Hedges, L. V. (2019). How to do a systematic review: A best practice guide for conducting and reporting narrative reviews, meta-analyses, and meta-syntheses. *Annual Review of Psychology, 70*(9), 1-24.

Why do I need to conduct this meta-analysis?

* to synthesize a body of evidence on a topic in order to achieve robust and broad conclusions and implications (Baumeister, 2013)
  * More powerful and valuable than one single study
* Indicate your knowledge of a research topic and evidence of reflection and critical thinking
* It has been 30 years since last systematic review concerning this topic (Eisenberg & Miller, 1987)

Eisenberg, N., & Miller, P. A. (1987). The relation of empathy to prosocial and related behaviors. *Psychological Bulletin, 101*(1), 91-119. doi:10.1037/0033-2909.101.1.91

* Research Questions:
* What is the relationship between empathy and cooperation?

- Question 1
- Correlation:
- empathy is positively correlated with cooperation.

- Question 2
- Causality: Effects of Empathy on Cooperation

- Question3
- Causality: Effects of Cooperation on Empathy
- Cooperative context leads to enhanced empathic response.

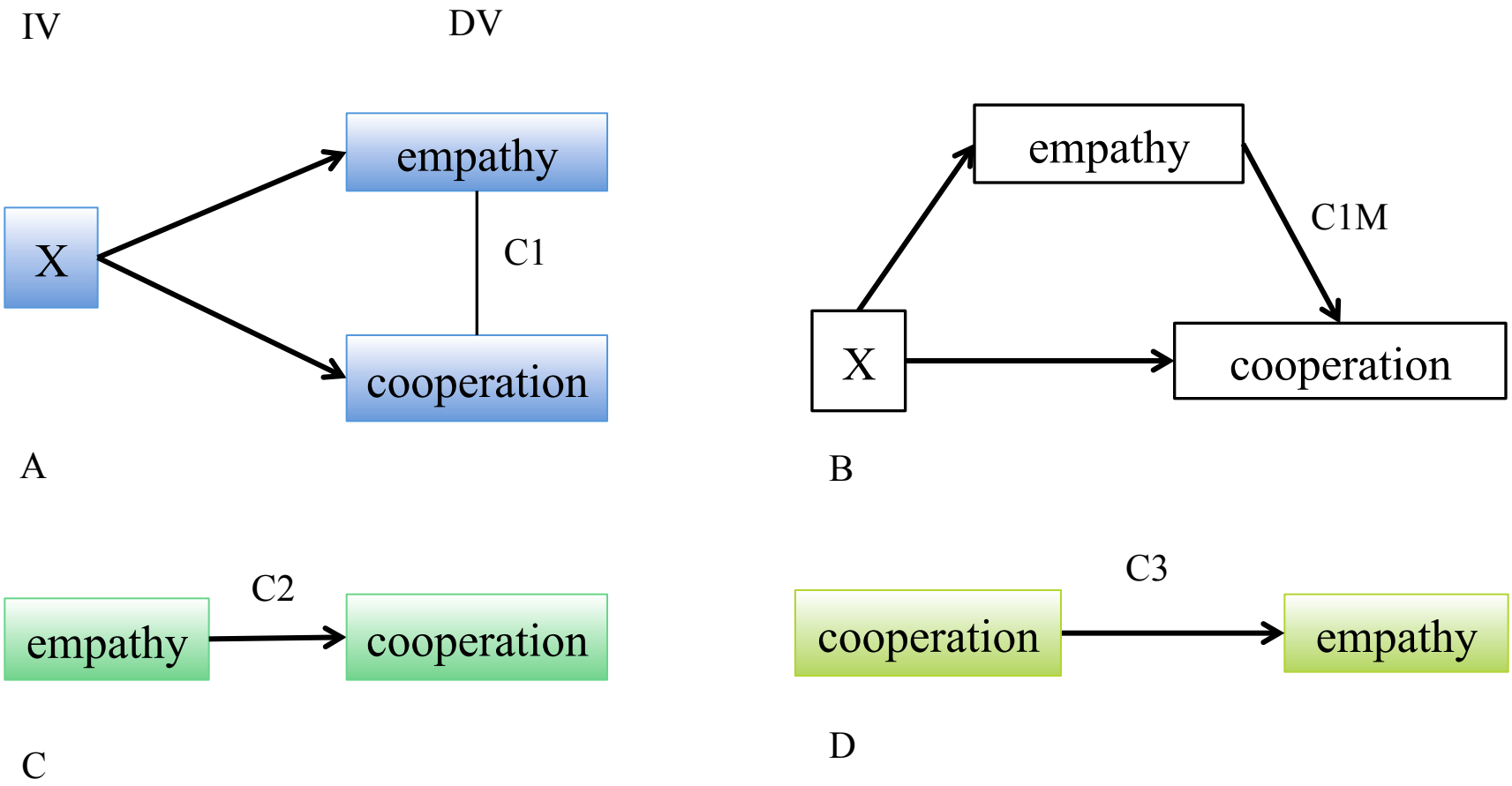


Figure 2. The graphical representation for A. the correlation between two dependent variables (empathy and cooperation); B. the indirect effect of the independent variable on the dependent variable (cooperation) through the mediator variable (empathy); C. the total effect of the independent variable (empathy) on the dependent variable (cooperation); D. the total effect of the independent variable (cooperation) on the dependent variable (empathy), partially based on figures from (Fritz & MacKinnon, 2008; MacKinnon et al., 2007, p. 595)

Method:
Search Strategy

* The Boolean operator “AND” was used to search for the conjunction of both key words “empathy” and “cooperation”.
* synonyms of empathy: (e.g., sympathy, perspective taking, theory of mind, compassion)
  * “sympathy AND cooperation”
  * “perspective taking AND cooperation”
  * “theory of mind AND cooperation”
  * “compassion AND cooperation”
* synonyms of cooperation: (e.g., prosociality, prosocial behavio(u)r)
  * “empathy AND prosociality”
  * “empathy AND prosocial behavio(u)r”

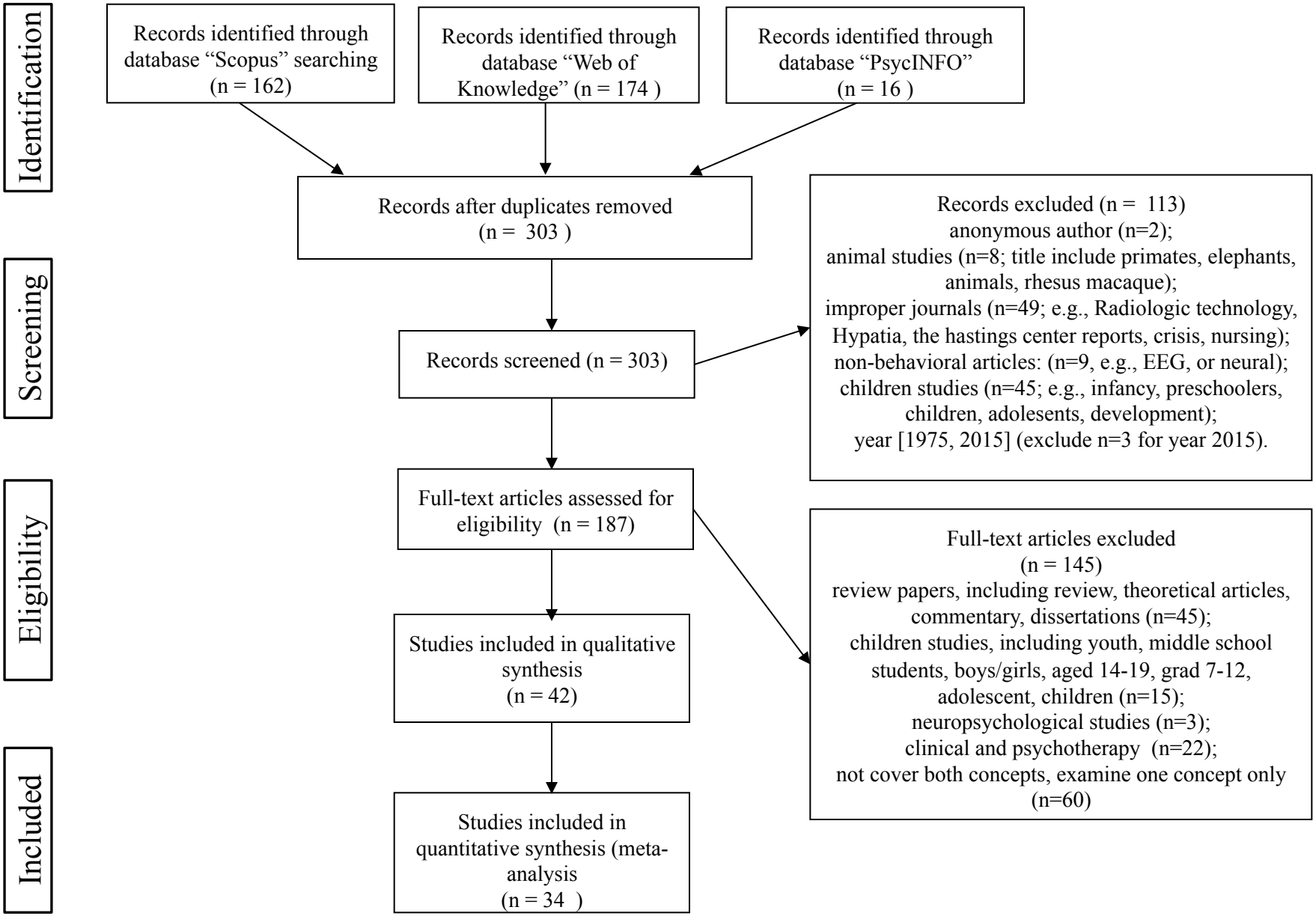


Figure 1. Flow diagram of searches for articles included in meta-analysis conducted on 24th March 2015 (PRISMA2015)

* Table Category 1
* Table Category 2
* Table Category 3

Tools for conducting meta-analysis

* Comprehensive meta-analysis

* R
  * “meta” package
  * “metafor” package

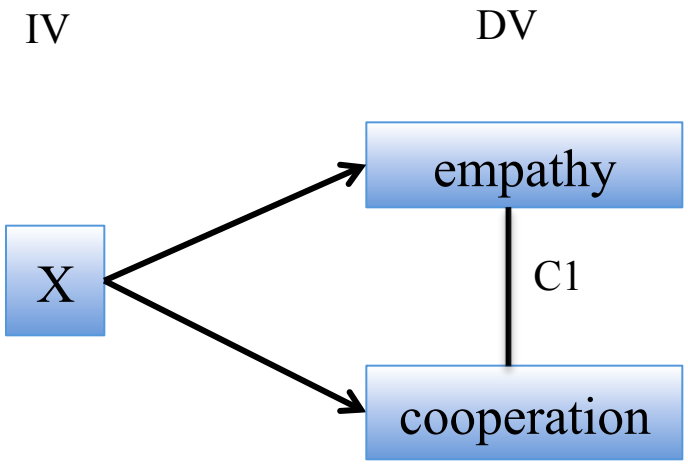
Polanin, J. R., Hennessy, E. A., & Tanner-Smith, E. E. (2016). A review of meta-analysis packages in R. *Journal of Educational and Behavioral Statistics, 42*(2), 206-242. doi: 10.3102/1076998616674315

Publications using “metafor” package conducting meta-analysis

* Shariff, A. F., Willard, A. K., Andersen, T., & Norenzayan, A. (2016). Religious priming: A meta-analysis with a focus on prosociality. *Personality and Social Psychology Review, 20*(1), 27-48. doi: 10.1177/1088868314568811

“metafor” package

* Question 1
* Correlation:
* empathy is positively correlated with cooperation.



* correlation
* effect size: correlation coefficient
* Fisher's r-to-z transformation

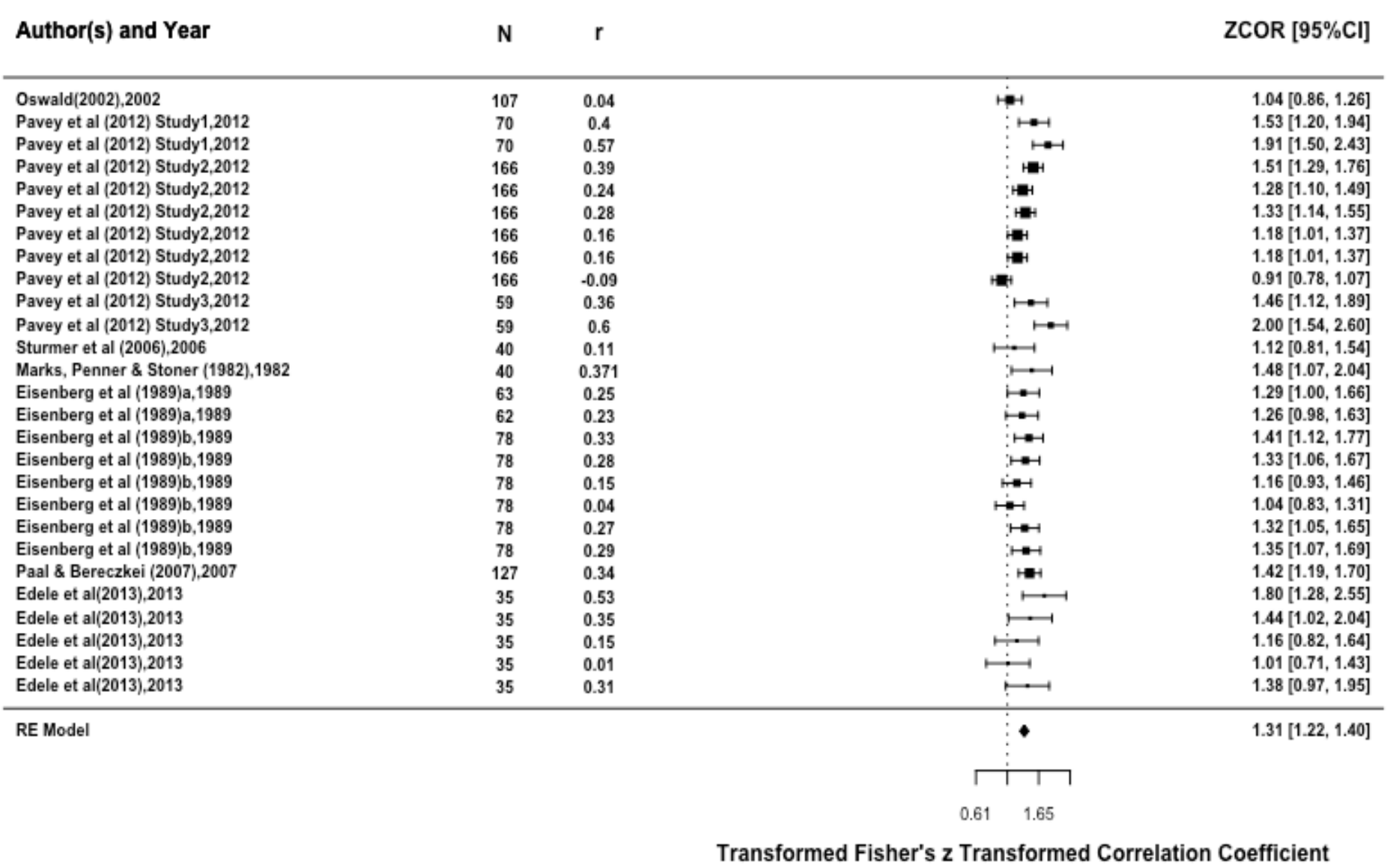


Figure 3. Forest plot of Correlation between Empathy and Cooperation in Category 1, with effect size and 95% confidence interval

Note. Mean effect size is r = 0.27, 95%CI [0.20, 0.33], p<0.0001.

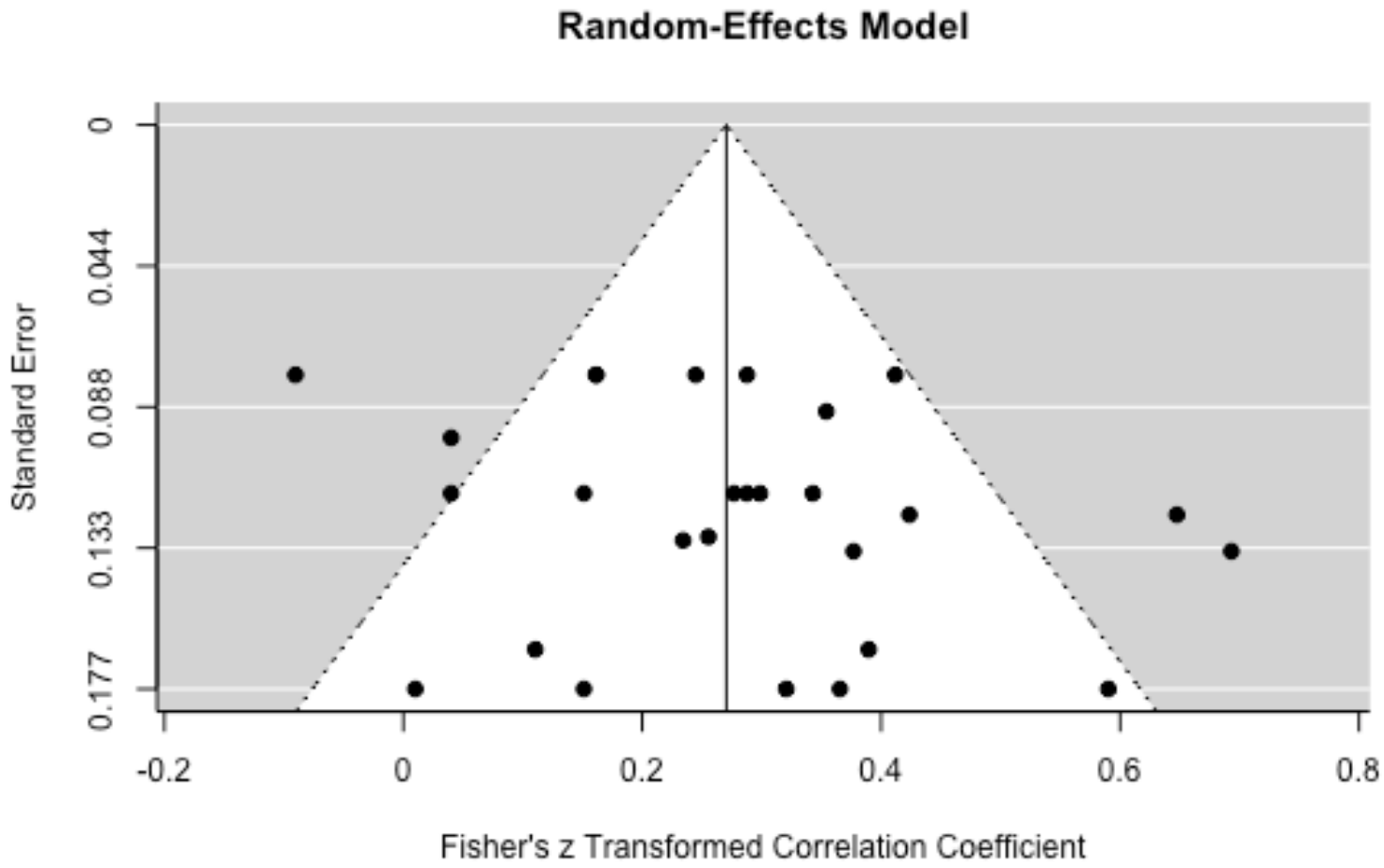
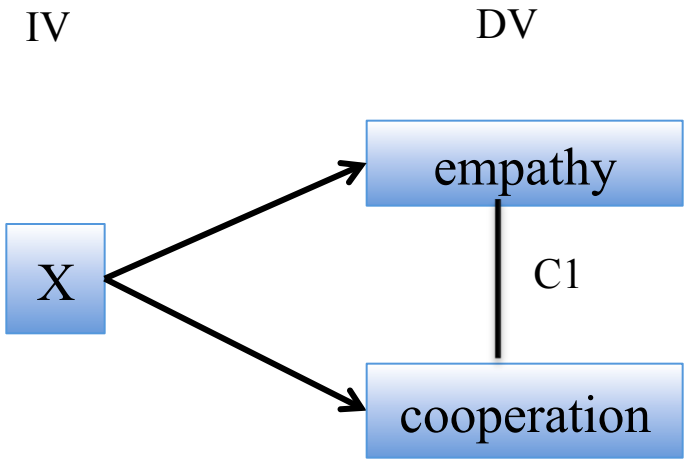
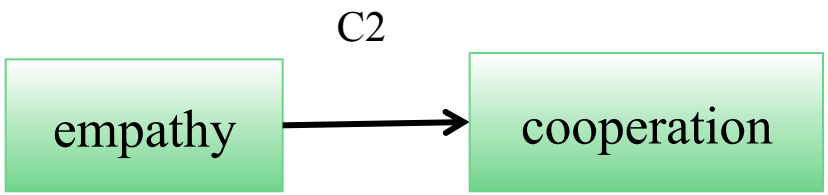


Figure 4. Funnel Plot for Category 1

* C1:
* r = 0.27, 95%CI [0.20, 0.33], p<0.0001.



- Question 2
- Causality: Effects of Empathy on Cooperation
- 2a: Hot empathy (irrespective of altruistic or egoistic motivations) will promote cooperation;
- 2b: Cold empathy is unlikely to promote cooperative behavior.



* Research Question 2a
* Hot empathy will promote cooperation
* Research Question 2b
* Cold empathy (i.e. perspective taking) is unlikely to promote cooperative behaviour

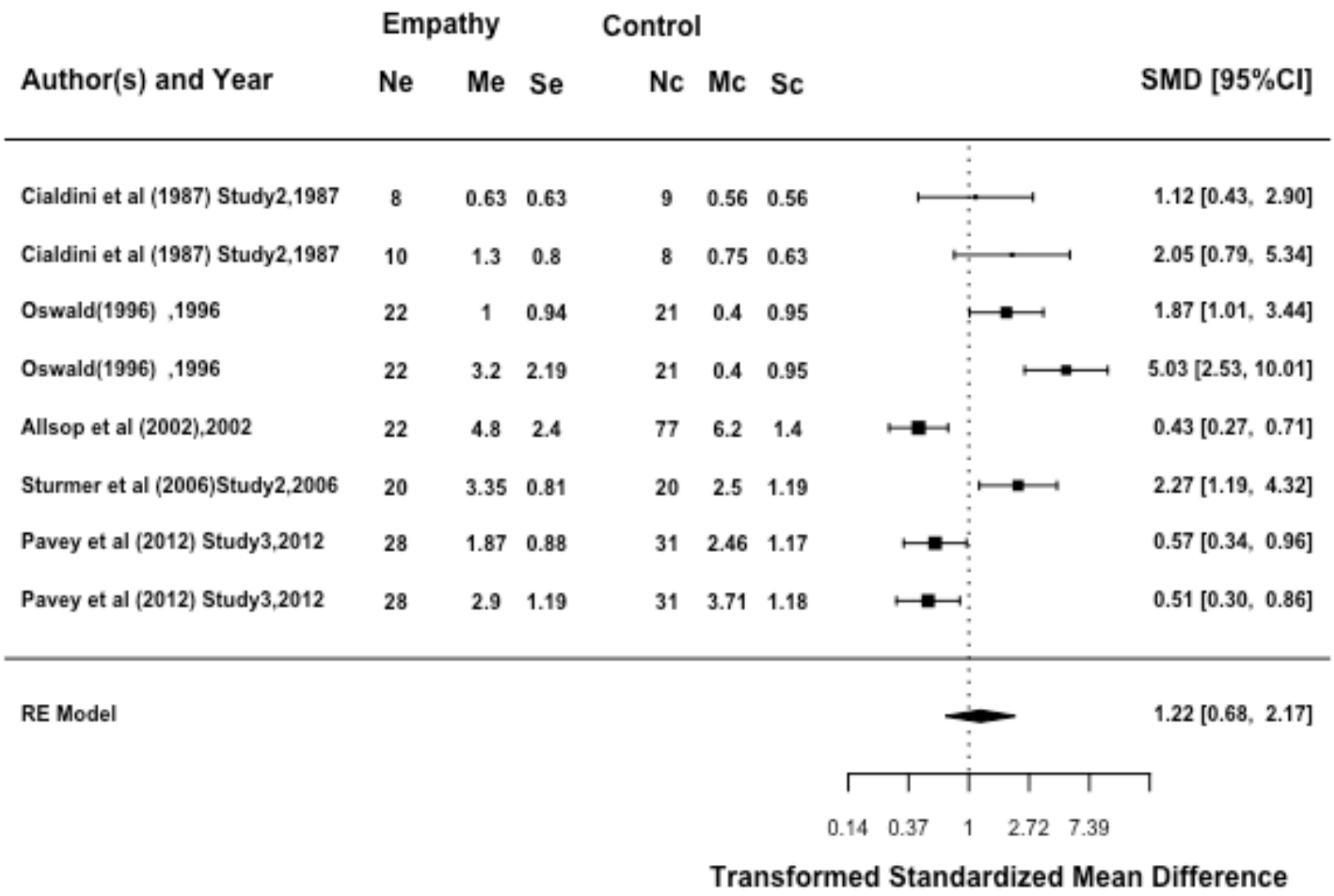


Figure 5. Forest plot of 17 Empathy Induction studies in Category 2, with effect size and 95% confidence interval

Note. Mean effect size is Hedges's g = 0.39, 95%CI[-0.38, 0.77], p = .50.

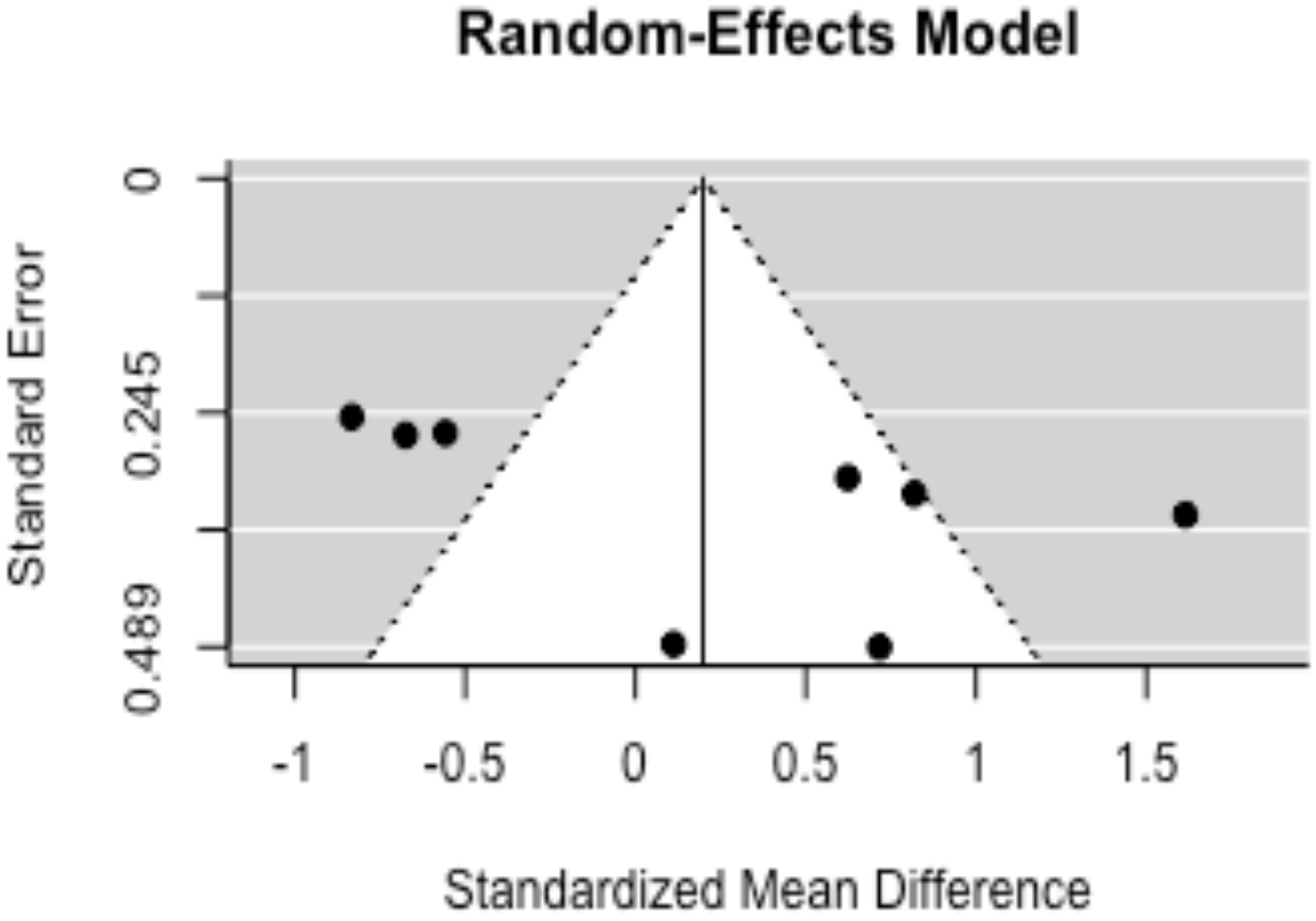
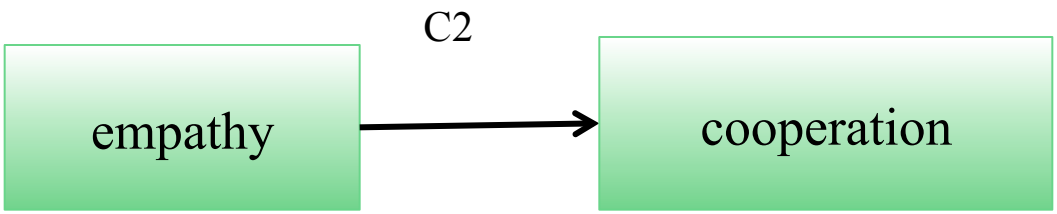


Figure 6. Funnel plot for Category 2

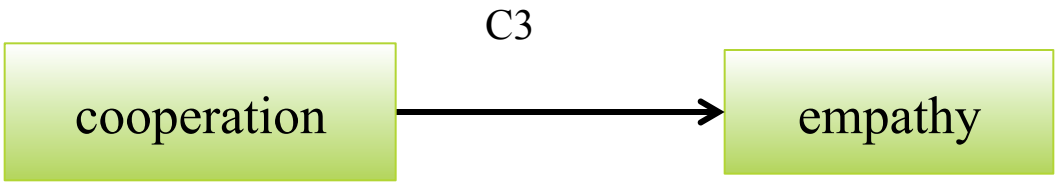
* C2:
* Hedges's g = 0.39, 95%CI[-0.38, 0.77], p = .50.



* hot empathy– cooperation
* Hedges's g = 1.61, 95%CI[0.92, 2.30], p < .0001.

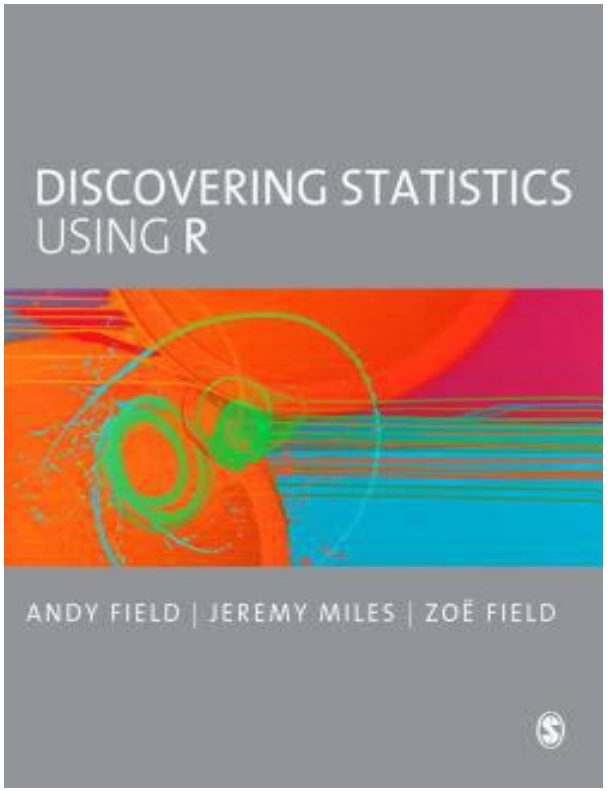
* cold empathy – cooperation
* Hedges's g = -0.02, 95%CI[-0.52, 0.48], p = .92.

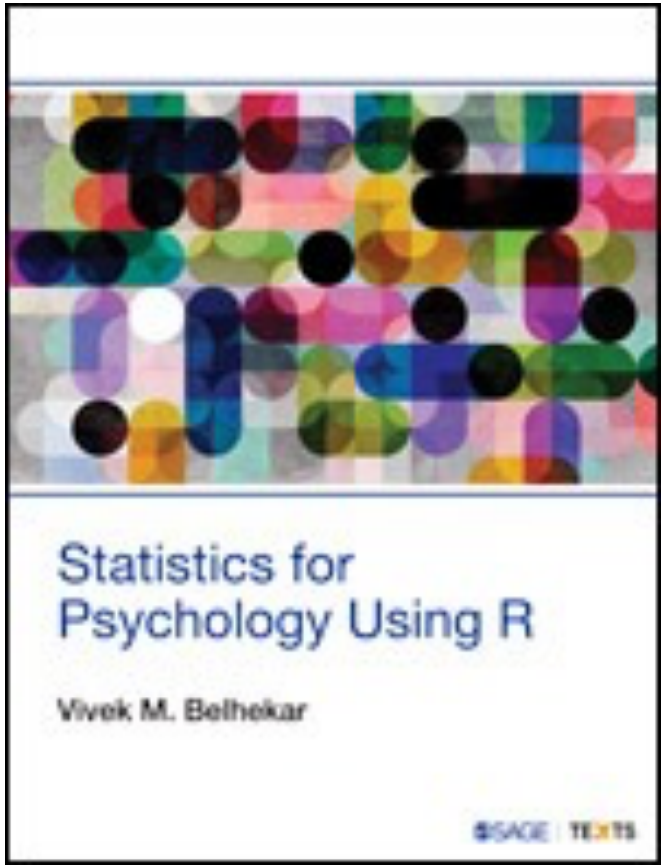
- Question3
- Causality: Effects of Cooperation on Empathy
- Cooperative context leads to enhanced empathic responses



* Still working…..

推荐书目


DISCOVERING STATISTICS
USING R
ANDY FIELD | JEREMY MILES | ZOË FIELD


Statistics for
Psychology Using R
Vivek M. Belhekar
SAGE TEXTS

* Thank you for your attention.

* 欢迎交流！
* 吕杰妤
* 中央财经大学心理学系
* For more information, please contact
* lvjieyu515@cufe.edu.cn

Meta-analysis in R

R组2-元分析

R for psychology

R组1-Psychology

Valid until 5/31 and will update upon joining group

Valid until 5/31 and will update upon joining group