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How to conduct a reproducible meta-analysis from open templates

Adrien Fillon

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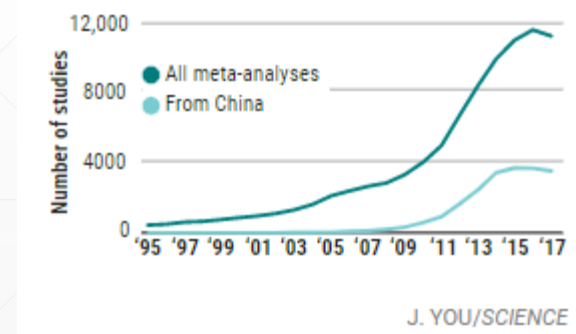
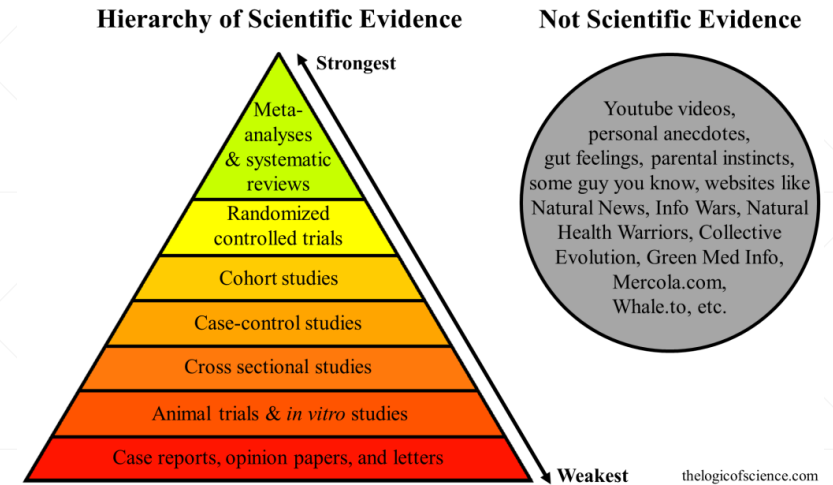
How to conduct a reproducible meta-analysis from open templates

Adrien Fillon
Université Aix-Marseille

@adfillon
20.10.21

Meta-analysis

- Belongs to cumulative science
- For some, is the highest level of scientific evidence
- Allows recommendations to be made (Example: Cochrane)
- Allows assessment of differences between individual studies (heterogeneity)
- Meta-analyses are trendy
- The best practices of conducting meta-analysis are constantly being updated





Evidence Synthesis Hackathon @eshackathon · 19 oct.



We have dates for [#ESMARConf2022!](#)

February 22nd to 24th for the core programme, with satellite events on the 21st and 25th!

Don't forget to submit your abstracts by 31st October - tell us how you do [#EvidenceSynthesis](#) and [#MetaAnalysis](#) in [#Rstats](#)!

eshackathon.org/events/2022-01...

The banner features a logo on the left consisting of a large teal hexagon with the text "Evidence Synthesis Hackathon" and "eshackathon.org" below it, surrounded by several smaller hexagons in shades of blue and green. To the right of the logo, the text "CALL FOR ABSTRACTS" is written in teal, "THE EVIDENCE SYNTHESIS & META-ANALYSIS IN R CONFERENCE" is written in blue, and "FEBRUARY 2022" is written in teal at the bottom.

Methodological quality of meta-analyses indexed in PsycINFO: leads for enhancements: a meta-epidemiological study

Victoria Leclercq¹, Charlotte Beaudart², Sara Ajamieh², Ezio Tirelli³, Olivier Bruyère²

Results: According to AMSTAR2 criteria, 95% of the 206 MAs were rated as critically low quality. Statistical methods were appropriate and publication bias was well evaluated in 87% and 70% of the MAs, respectively. However, much improvement is needed in data collection and analysis: only 11% of MAs published a research protocol, 44% had a comprehensive literature search strategy, 37% assessed and 29% interpreted the risk of bias in the individual included studies, and 11% presented a list of excluded studies. Interestingly, the explicit mentioning of PRISMA suggested a positive influence on the methodological quality of MAs.

An Empirical Review of Research and Reporting Practices in Psychological Meta-Analyses

Richard E. Hohn , Kathleen L. Slaney, Donna Tafreshi

First Published May 21, 2020 | Research Article |  Check for updates

Abstract

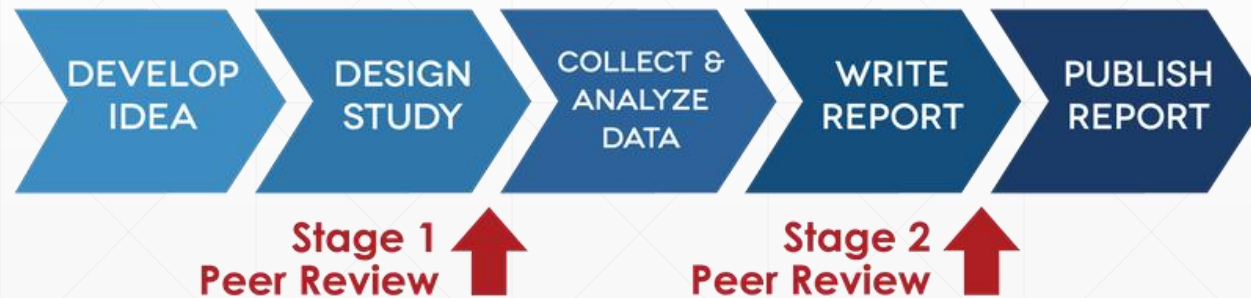
As meta-analytic studies have come to occupy a sizable contingent of published work in the psychological sciences, clarity in the research and reporting practices of such work is crucial to the interpretability and reproducibility of research findings. The present study examines the state of research and reporting practices within a random sample of 384 published psychological meta-analyses across several important dimensions (e.g., search methods, exclusion criteria, statistical techniques). In addition, we surveyed the first authors of the meta-analyses in our sample to ask them directly about the research practices employed and reporting decisions made in their studies, including the assessments and procedures they conducted and the guidelines or materials they relied on. Upon cross-validating the first author responses with what was reported in their published meta-analyses, we identified numerous potential gaps in reporting and research practices. In addition to providing a survey of recent reporting practices, our findings suggest that (a) there are several research practices conducted by meta-analysts that are ultimately not reported; (b) some aspects of meta-analysis research appear to be conducted at disappointingly low rates; and (c) the adoption of the reporting standards, including the Meta-Analytic Reporting Standards (MARS), has been slow to nonexistent within psychological meta-analytic research.

Features of a high quality meta-analysis (for me)

- Follow the standard reporting guides
 - Are transparent and reproducible from start to the end
 - Seek to reduce and examine publication bias
 - Are not themselves victims of publication bias
-

Meta-analysis templates in registered report format

- 1 manuscript in the form of introduction/method/results/discussion
- 1 supplementary with email templates, checklists, diagrams and additional resources
- 1 Excel template to code the data
- 1 R code template to analyze the data and automatically create a PDF result sheet



Introduction

In the past [duration of time, e.g., number of decades], there has been a growing interest of research in [construct m]. [construct m] refers to [description of the construct] and has been associated with [descriptions of its associates]. [construct m] is important to our understanding of [describe the impact and implications of the construct], and particularly, has been linked to [construct n or relation with this construct], [brief description of the construct and why such connection is important and interesting].

Studies so far have provided preliminary evidence regarding the relationship between [construct m] and [construct n]. For example, [describe studies that investigated the correlation between the constructs of your interest]. Nonetheless, the relative strength and direction of these associations tended to vary across [sub-construct, operationalization, sample demographics, etc.]. For example, [describe inconsistent findings in the literature]. So far, there have been no systematic mappings of the association between [construct m] and [construct n] to help form a unified framework connecting these two constructs and reconcile conflicts in concepts and empirical findings.

The present investigation aims to contribute to the literature on the association between [construct m] and [construct n]. We begin with the theoretical accounts of these two constructs and our hypotheses on why and how the two may be connected. We proceed to report the methods and findings of this registered correlational meta-analysis.

[construct m]

[construct m] was firstly proposed by [pioneer conceptualizations and studies on this

In plain text, proposed for writing

Highlighted in square brackets, to be adapted

Tables and figures are provided

Table 2

All studies/datasets included in the meta-analysis

No.	Article	N	construct m	Scale and reliability	construct n	Scale and reliability	Publication status	Country
1	Joe & Jane (2020)	100	construct m.1		construct n.2		Yes/No	

Coding

Data extraction from the included studies was recorded in the “main coding sheet” tab. When available, the main correlations between [construct m] and [construct n] were recorded, along with intercorrelations between [construct m, construct n, or both], the type of scale used, sample demographics, and publication information [Add or modify relevant moderator]. During the coding process, if the correlation between [construct m] and [construct n] were reported both as a single correlation and also as a result when split by a moderator, the results will be listed as separate rows. Moderator variables will be coded for each study where identified as present and analyzed using a meta-regression.

Analysis

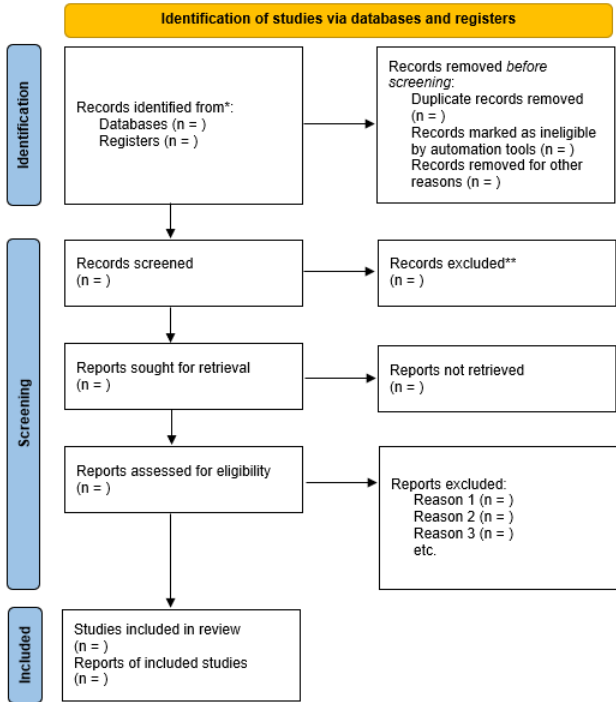
[Note: You may use more than one method for main effect and moderator analyses. In any case, please justify your choice(s) transparently and reasonably, as different analytical choices sometimes lead to different results. In cases if two or more methods are used for analyses, please explain the possible reasons behind the results differences in the Discussion section]

We used a Rmarkdown Script for statistical analyses. The packages used are indicated

In a smaller font, indications on how to use the model

Section and Topic	Item #	Checklist Item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	Last Modified by: Author, date		In Orange is the non-necessary columns that can be left blank during Stage 1 and/or for simulation																		
2	Article Information										Paper Info										Demographic
3	Article	Study	Sample	Coder	Date started coding	Date ended coding	Verified by	Verification on date	General Notes	Pre-Registered (Y/N)	Data Shared? (Y/N)	Any Manipulation used in this study? (Y/N)	Interrelations	Setting of Study (1=Lab/2=Online/3=Field)	Country	N.before	N.post	Reasons for exclusion	Age	Age SD	
4	Article 1	1	1	Adrien			Joe					Y		France	714	714			68	8	
5	Article 1	2	1	Adrien			Joe					Y		France	447	447			31	2	
6	Article 2	1	1	Adrien			Joe					N		France	182	182			55	7	
7	Article 2	1	2	Adrien			Joe					N			69	69			28	4	
8	Article 3	1	1	Adrien			Joe					N			249	249			34	3	
9	Article 4	1	1	Adrien			Joe					N			865	865			49	2	
10	Article 4	2	1	Adrien			Joe					N			469	469			69	6	



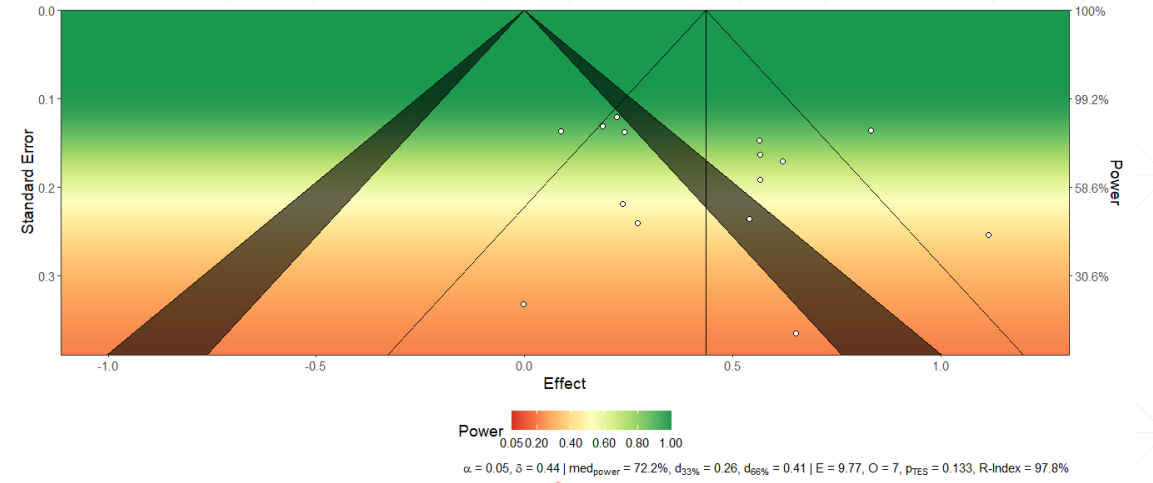
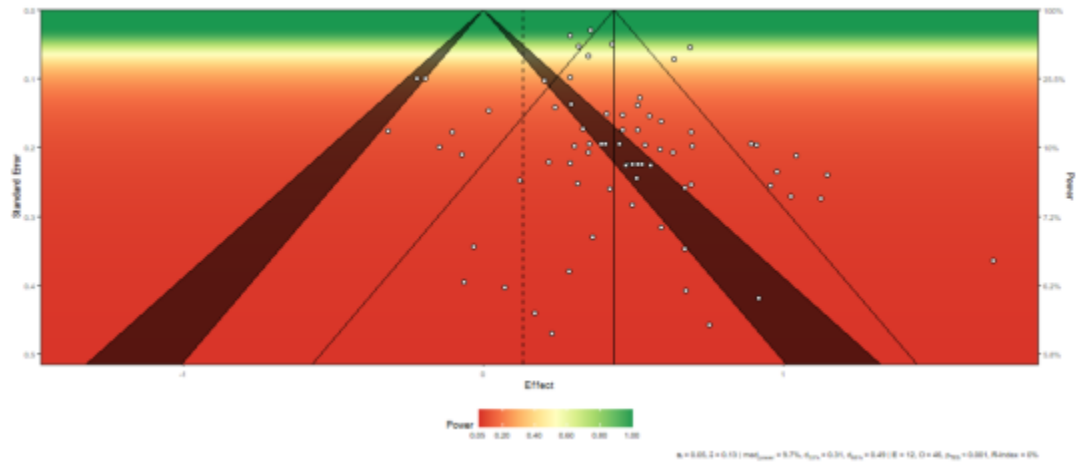
Checklist
 Transparent diagram on inclusion/exclusion criteria
 Data sharing
 Reproducible analyses
 Testing for publication bias



Publication biases analyses results

Publication bias analysis method	Results and adjusted models
Three-parameter selection model	Likelihood Ratio Test: 9.22, $p = .002$ Adjusted Model: $g = 0.60$, 95% CI [0.41, 0.79]
PET	$b = 0.59$ [0.21, 0.96], $p < .01$
PEESE	$b = 0.55$ [0.31, 0.80], $p < .001$
Puniform	Adjusted Model: $g = 0.81$, 95% CI [0.67, 0.93], 26 significant
Henmi & Copas (2010)	Adjusted Model: $g = 0.60$, 95% CI [0.41, 0.79]
Trim and fill funnel plot asymmetry	Eight studies missing on the left side.
Rank correlation test (Begg & Mazumdar, 1994)	Kendall's tau = 0.14, $p = .24$
Egger's regression test	$z = 1.06$, $p = .288$

Note. Values in parentheses indicate 95% confidence intervals [lower bound, upper bound]. We ran publication bias analyses on collapsed effect sizes by study, leading to one effect size per study.



Sufficient statistical power,
Publication of non-significant
studies

SUBJECT: Requesting data for a meta-analysis [Name of the constructs involved]

Dear Prof./Dr./Ms./Mr. <<Contact Name>>

<<We are a team of researchers at the University of XXXX / I am a XXXX at the University of XXXX>>, and <<we are / I am>> conducting a correlational meta-analysis on the relationship between <<Construct Name>> and <<Construct Name>>. The <<Stage 1 Registered Report protocol / pre-registered protocol>> for this meta-analysis is publicly available on the Open Science Framework (OSF) at <<link>>; it is also attached as a PDF file to this email.

Your article[s] <<was / were>> found in a comprehensive search of the literature and selected as a study for inclusion. The reference[s] for the <<study / studies>> that you coauthored to be included <<are / is>>:

<<Citations>>

We would like to ask for your help with the process of this meta-analysis.

Two meta-analysis templates in Registered reports format

1. Experimental meta-analysis template

- Compares the difference between two groups
- The aim is to find the effect of the experiment
- Based on Hedge's g

2. Correlational or psychometric meta-analysis template

- Measures the relationship between two constructs
 - Based on Pearson's r
 - Can assess interrelationships between sub-constructs
 - Takes into account the reliability of measurement scales in measuring the relationship between constructs (Cronbach's α)
-

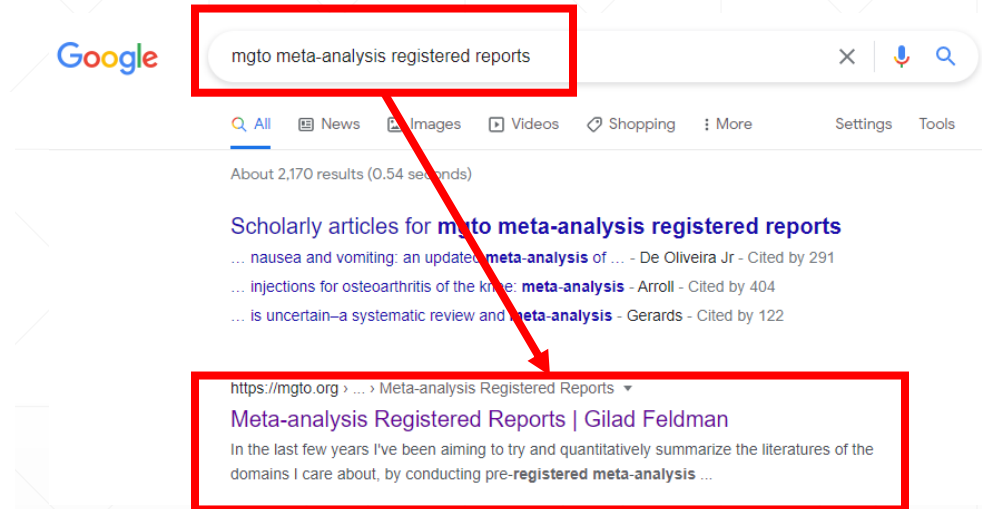
Available at this link:

<https://mgto.org/meta-analysis-registered-reports/>

We've developed the following resources to support doing meta analyses as Registered Reports:

- [Experimental Meta-Analysis Registered Report Template: Main manuscript](#)
- [Experimental Meta-Analysis Registered Report Template: Supplementary](#)
- [Experimental Meta-Analysis Registered Report Template: Coding sheet](#)
- [Experimental Meta-Analysis Registered Report Template: Cloud folder](#)
- [Correlational Meta-Analysis Registered Report Template: Main manuscript](#)
- [Correlational Meta-Analysis Registered Report Template: Supplementary](#)
- [Correlational Meta-Analysis Registered Report Template: Coding sheet](#)
- [Correlational Meta-Analysis Registered Report Template: Cloud folder](#)

See [this list](#) (column 6 – “offered for meta-analysis”) for the journals willing to accept meta-analysis registered reports.





Peer Community In

Registered Reports

Free and transparent pre- and post-study recommendations across research fields

A COMMUNITY, NOT A JOURNAL >

PCI RR doesn't publish Registered Reports but instead manages peer review of Registered Report preprints across STEM, medicine, the social sciences and humanities

ESTABLISHED BENEFITS >

Rigorous and constructive pre-study review at a point in time where it helps the most, with in-principle acceptance to neutralise publication bias and reporting bias

TRUST >

Led by the architects of Registered Reports, with the review process managed by accredited recommenders

INDEPENDENCE >

Peer review independent of journals but endorsed by a growing list of journals that accept PCI RR recommendations

POWER TO AUTHORS >

Once a submission is recommended by PCI RR, authors can choose any eligible PCI RR-friendly journal to publish the article without further peer review

FLEXIBILITY >

No need for authors to decide which journal to publish in – or any journal at all – until after a final Stage 2 recommendation

TRANSPARENCY >

Recommended preprint remains citable on a preprint server, with peer reviews published under a DOI by PCI RR and reviewers having the option to sign

INNOVATION >

Unique policy features including Scheduled Review and Programmatic Registered Reports to accelerate peer review and widen access to different modes of research

ZERO COST >

PCI RR is a non-profit, non-commercial platform that is free to use for all, including authors, readers, and supporting journals

Meta-analyses based on these templates

Published

- Fillon, A., Kutscher, L., & Feldman, G. (2020). [Impact of past behavior normality on regret: Meta-analysis of exceptionality effect](https://doi.org/10.1080/02699931.2020.1816910). *Cognition and Emotion*. DOI: [10.1080/02699931.2020.1816910](https://doi.org/10.1080/02699931.2020.1816910)
- Yeung, S. K., Yay, T., & Feldman, G. (2021). Action and Inaction in Moral Judgments and Decisions: Meta-Analysis of Omission Bias Omission-Commission Asymmetries. In *Personality and Social Psychology Bulletin* (p. 014616722110423). SAGE Publications. <https://doi.org/10.1177/01461672211042315>
- Lim, V., & Feldman, G. (2022). [Values and the dark side: Meta-analysis of links between Dark Triad traits and personal values](#). *Journal of Research in Personality*. [Registered Report Stage 1 in-principle acceptance]
- Nanakdewa, K., et al., Savani, K., & Feldman, G. (2022). [Outcomes associated with believing in free will: Meta-analysis](#). *Journal of Research in Personality*. [Registered Report Stage 1 in-principle acceptance]

In preparation

- Bialek, M., Gao, Y., Yao, D., & Feldman, G. [Owning leads to valuing: Meta-analysis of the Mere Ownership Effect](#). DOI: [10.13140/RG.2.2.13568.33287/1](https://doi.org/10.13140/RG.2.2.13568.33287/1)
 - Fillon, A. A., Souchet, L., Pascual, A., & Girandola, F. (2020). The effectiveness of the “But-you-are-free” technique: Meta-analysis and re-examination of the technique. Center for Open Science. <https://doi.org/10.31234/osf.io/3ds26>
 - Jaubert, S., Fillon, A. A., Souchet, L., & Girandola, F. (2020). Vicarious Dissonance : Meta-analysis registered report. Center for Open Science. <https://doi.org/10.31234/osf.io/hc2n3>
-

You can participate !

Contributors

If you contributed to this template, please add your details

1. [Format (example)] Gilad Feldman, giladfel@gmail.com, University of Hong Kong, [@giladfeldman](https://giladfeldman.github.io), <http://giladfeldman.org>
 2. John Protzko, protzko@gmail.com, UCSB, [@JProtzko](https://twitter.com/JProtzko), <http://johnprotzko.com>
 - a. Section Contributed to: General comments throughout, possible larger contribution to the section on publication bias if needed
 - b. Contribution: edits, formatting, databases, publication bias, suggestions about funnel plot requirement
 3. Adrien Fillon, adrienfillon@hotmail.fr; University of Aix-Marseille, [@adfillon](https://twitter.com/adfillon)
 - a. Section contributed to: General comments throughout
 - b. Contribution: edit and formatting
 4. Mahmoud Medhat Elsherif, mahmoud.medhat.elsherif@gmail.com; University of Birmingham, [@Mams_Elsherif](https://twitter.com/Mams_Elsherif)
 - a. Section contribution to General comments throughout, references, supplementary. Rmarkdown
 - b. Contribution: edit and formatting, minor suggested changes
 5. David Moreau, d.moreau@auckland.ac.nz; University of Auckland, [@davidwmoreau](https://twitter.com/davidwmoreau)
 - a. Section contributed to: General comments throughout
 - b. Contribution: edit and formatting
 6. NEW CONTRIBUTOR? ADD YOUR NAME AND DETAILS HERE
 - a. Section contributed to: <choose one>
 - b. Contribution:
 7. NEW CONTRIBUTOR? ADD YOUR NAME AND DETAILS HERE
 - a. Section contributed to: <choose one>
 - b. Contribution:
 8. NEW CONTRIBUTOR? ADD YOUR NAME AND DETAILS HERE
 - a. Section contributed to: <choose one>
 - b. Contribution:
 9. NEW CONTRIBUTOR? ADD YOUR NAME AND DETAILS HERE
 - a. Section contributed to: <choose one>
 - b. Contribution:
 10. NEW CONTRIBUTOR? ADD YOUR NAME AND DETAILS HERE
 - a. Section contributed to: <choose one>
 - b. Contribution:
-

https://twitter.com/K_Sheldrick/status/1440626445013774345



Kyle Sheldrick
@K_Sheldrick

I want to talk about this piece we just published in [@NatureMedicine](#):

Multiple major meta-analyses concluded that [#ivermectin](#) reduced the rate of death from Covid by half to two-thirds.

This was in part based on simply fabricated data.

We ask "How did this happen?"



Kyle Sheldrick @K_Sheldrick · 22 sept.

En réponse à [@K_Sheldrick](#)

When authors of meta-analyses combine studies, they apply tools that examine whether studies are at "risk of bias": is the research the authors describe a good way of answering the scientific question.

These tools do basically nothing to examine if the authors are lying.

2/8



1



12



84



Kyle Sheldrick @K_Sheldrick · 22 sept.

It's uncomfortable to consider that other medical researchers might be publishing straight-up fake, fraudulent research.

But we have examined dozens of ivermectin trials and many are indisputably fake, including virtually all "miracle" claims.

3/8



Kyle Sheldrick @K_Sheldrick · 22 sept.

This is important not just because of ivermectin (though that is important, millions were treated based substantially on fake research).

It's important because it could happen again.

So we propose a solution:

5/8



2



4



71



Kyle Sheldrick @K_Sheldrick · 22 sept.

The days of the traditional meta-analysis are dead.

Future meta-analyses should review raw data for every trial, even if IPD techniques are not used.

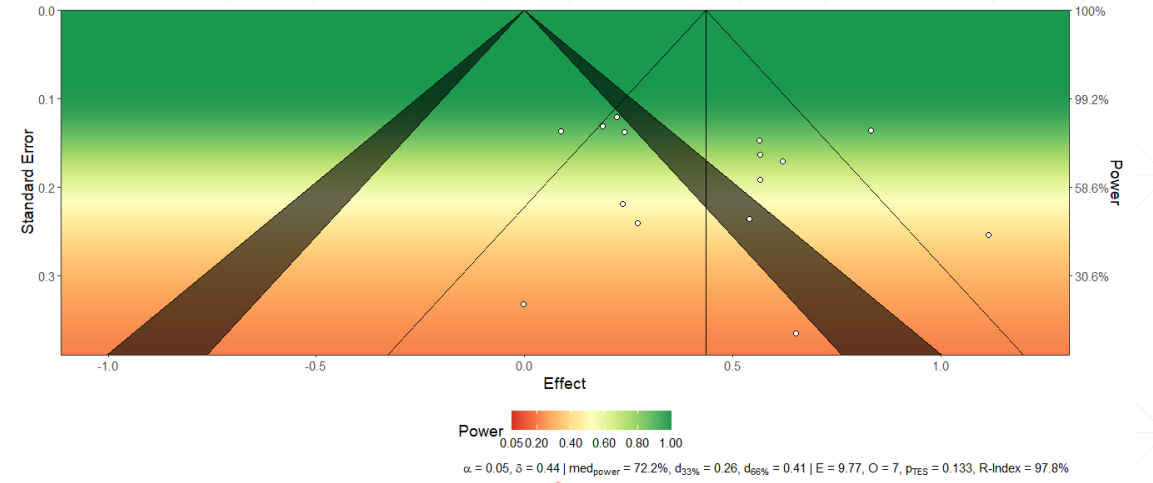
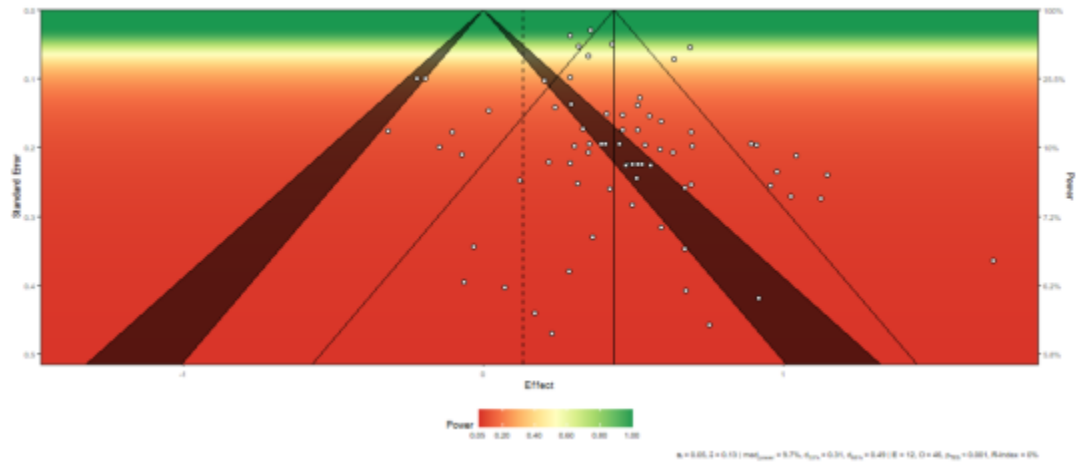
MAs amplify trials impact on treatment. They shouldn't include fake data.

Checklist
Transparent diagram on
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Reproducible analyses
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Publication biases analyses results

Publication bias analysis method	Results and adjusted models
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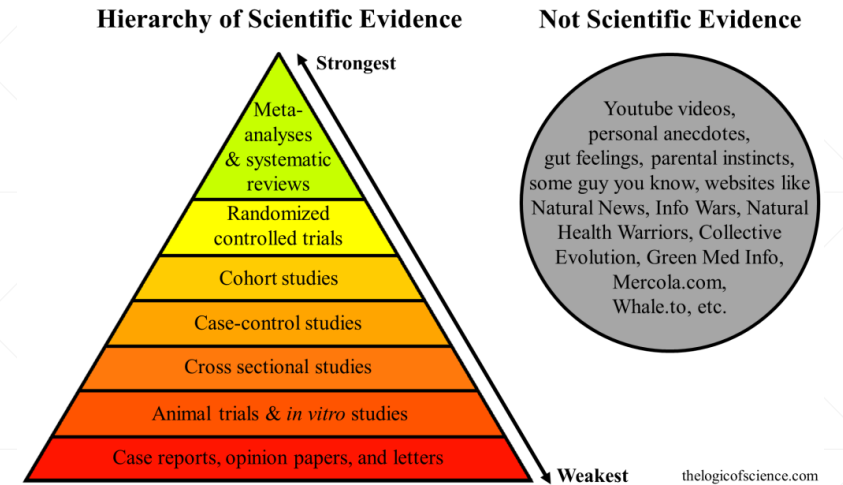
Your article[s] <<was / were>> found in a comprehensive search of the literature and selected as a study for inclusion. The reference[s] for the <<study / studies>> that you coauthored to be included <<are / is>>:

<<Citations>>

We would like to ask for your help with the process of this meta-analysis.

Meta-analysis

- For some, is the highest level of scientific evidence
- Allows recommendations to be made (Example: Cochrane)



Thank you !

Fillon, A., Xiao, Q., Elsherif, M., Yeung, S.K., Nanakdewa, K., Protzko, J., Brick, C., Moreau, D., Feldman, G. (2021). Correlational Meta-Analysis Registered Report Template [In preparation]

Yeung, S. K., Feldman, G., Fillon, A., Protzko, J., Elsherif, M. M., Xiao, Q., & Pickering, J. (2021). Experimental Studies Meta-Analysis Registered Report Templates [In Preparation]



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