

Hu, Bo; Lu, Chang; Yang, Jianxun

**Working Paper**

## Replication of Chan and Albarracín (2023) "A meta-analysis of correction effects in sciencerelevant misinformation"

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No. 276

DISCUSSION PAPER SERIES

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**December 2025**

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# Replication of Chan and Albarracín (2023) “A meta-analysis of correction effects in science-relevant misinformation”

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## Abstract

Chan M.-P.S. and Albarracín D. (2023) examined the impact of correction strategies on mitigating science-relevant misinformation, and found debunking effect was not significant. We replicated their study using the provided replication package, including raw data and analysis code. Our computational reproducibility confirmed the main results. However, our RoBMA analysis showed BF10 values of 1.422 with outliers and 1.437 without outliers, differing from the original study, suggesting lower publication bias. In our robustness reproducibility checks, we found discrepancies. While the misinformation correction effect became significant with different meta-analytic methods, cumulative meta-analysis showed no significant changes over time or with increasing sample sizes. Additionally, the WAAP-WLS analysis indicated no publication bias. These results suggest that while some findings align, the robustness of the debunking effect varies with analytical methods.

## 1. Introduction

The study titled "A meta-analysis of correction effects in science-relevant misinformation" by Chan M.-P.S. and Albarracín D. aims to investigate the impact of correction strategies on mitigating the effects of misinformation in science-related topics<sup>1</sup>. The original study utilizes a meta-analytic approach to synthesize findings from various experiments and observational studies, focusing on how corrections influence belief in misinformation, attitude change, and behavioral intentions across different populations and contexts.

The primary data sources for this study include published articles, Working paper, dissertation/thesis, and unpublished data that examine the correction of science-relevant misinformation. The original study claims that the misinformation effect was large ( $d = 1.10$ ,  $P < 0.001$ , 95% CI = 0.72 to 1.48), and the debunking effect was not significant ( $d = 0.19$ ,  $P = 0.131$ , 95% CI  $-0.06$  to 0.43).

In the present report prepared as part of a collaboration between the *Institute for Replication and Nature Human Behaviour*<sup>2</sup>, we investigate whether their analytical results are computationally reproducible and further test their robustness reproducibility by: (1) adding more meta-analytic estimators, (2) adding cumulative meta-analysis with publication year and sample size, and (3) adding publication bias methods. Table 1 summarizes the main results.

In terms of computational reproducibility, we based our replication on the authors' provided code and successfully reproduced most results from the primary tables in the paper (Tables 1, 2, 3, and 4). However, for RoBMA (in Table 2), the authors did not provide the JASP analysis file, and our analysis using the default settings yielded significantly different results, with  $Bf_{10}$  changing from 9.668 to 1.422, showing no evidence of the presence of bias.

In terms of robustness reproducibility, first, using different meta-analytic methods, the debunking effect became significant. Second, cumulative meta-analysis did not reveal significant changes in the debunking effect or misinformation effect with increasing

publication year or sample size. Finally, the supplementary publication bias (WAAP-WLS) showed no evidence of the presence of bias.

Our codes and analysis files are available here:

[https://osf.io/6xj9g/?view\\_only=e5c18f5dc99f44ddb705ec7ada0bbd79](https://osf.io/6xj9g/?view_only=e5c18f5dc99f44ddb705ec7ada0bbd79).

## **2. Computational Reproducibility**

We used the replication package available here: <https://osf.io/vkygw/>. The authors provided raw data, cleaning code, analysis data, and analysis code. We successfully computationally reproduced all the main results (Tables 1, 2, 3, and 4) from the raw data.

For Robust Bayesian Meta-Analysis (RoBMA, in Table 2), the authors did not provide the JASP analysis file. We used JASP 18.0.2 to perform RoBMA analysis on the data both with and without outliers. Under the default settings, the results showed  $BF_{10} = 1.422$  with outliers and  $BF_{10} = 1.437$  without outliers. These results differ from the authors' reported values of  $BF_{10} = 9.668$  with outliers and  $BF_{10} = 9.863$  without outliers, indicating a lower likelihood of publication bias.

## **3. Robustness Reproduction and Replication**

We validated the robustness reproducibility of the original study to test the reliability of results under different analytical strategies. Specifically, we focused on: (1) adding more meta-analytic estimators, (2) adding cumulative meta-analysis with publication year and sample size, and (3) adding publication bias methods.

### **3.1 Meta-analytic Estimator**

We first analyzed the misinformation effect and correction effect using different meta-analytic evaluation methods. Effect sizes were summarized using Empirical Bayes (EB) with Restricted Maximum Likelihood (REML) estimator due to the large heterogeneity of study results<sup>3,4</sup>. The analysis was conducted using metafor version 3.8.1, and the results are shown in Table 2.

For the misinformation effect, the results using the empirical Bayes method were consistent with the original study ( $d = 1.10$ ,  $P < 0.001$ , 95% CI = 0.72 to 1.48).

For the correction effect, using REML ( $d = 0.22$ ,  $P = 0.021$ , 95% CI = 0.34 to 0.41) and EB ( $d = 0.22$ ,  $P = 0.029$ , 95% CI = 0.24 to 0.42) both yielded significant results. This contrasts with the non-significant result reported in the original study ( $d = 0.19$ ,  $P = 0.131$ , 95% CI  $-0.06$  to 0.43).

### **3.2 Cumulative Meta-analysis**

We aimed to explore whether the misinformation effect or correction effect changes with increasing publication years and sample sizes through cumulative meta-analysis 5. The analysis was conducted using metafor version 3.8.1, and the results are shown in Figures 1, 2, 3, and 4. We did not find any significant impact of publication year or sample size on the main effects.

### **3.3 Publication Bias**

We further analyzed the publication bias issue in the original paper using WAAP-WLS. WAAP-WLS is a meta-analytic estimator that specifies WAAP (weighted average of adequately powered studies) and WLS (weighted least squares) models 6. Based on 177 adequately powered studies (>80%), the WAAP model provided a significant effect ( $d = 0.20$ , 95% CI [0.16, 0.24]). Based on the sensitivity analysis in the original paper, removing four outliers with  $d < -7.00$  or  $d > 4.67$ , the results were consistent with those including outliers.

## **4. Conclusion**

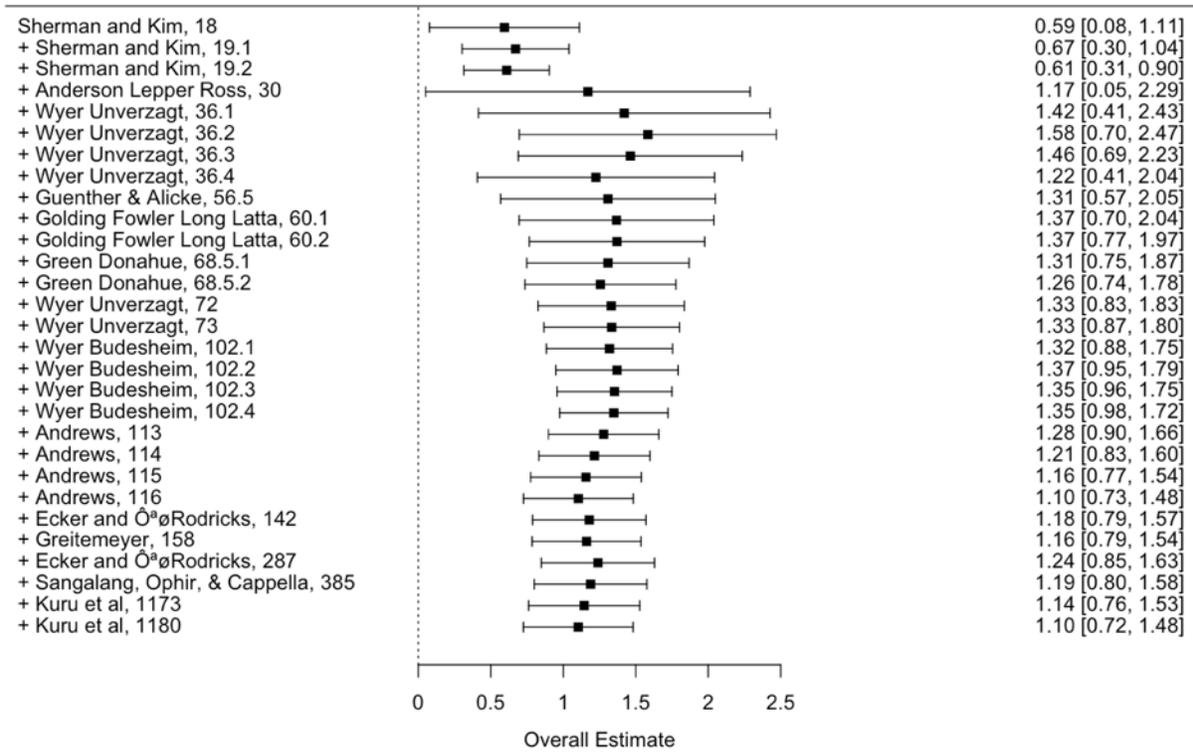
The data and code provided by the original paper's authors are fully computationally reproducible. The robustness reproducibility, however, yielded different results. For the debunking effect, although the result became significant using random effects model estimators, the authors stated that the REV provides more robustness 7. As the other papers compared by the authors also used similar evaluation methods, differences in statistical methods may be one reason for the discrepancies highlighted in the Discussion section. Additionally, publication year and sample size did not impact the stability of the results. Analyzing only high-powered studies also did not affect the study outcomes.

## References

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Figures

Figure 1 - Cumulative meta-analysis based sample size (misinformation effect)



**Figure 2 - Cumulative meta-analysis based publication year (misinformation effect)**

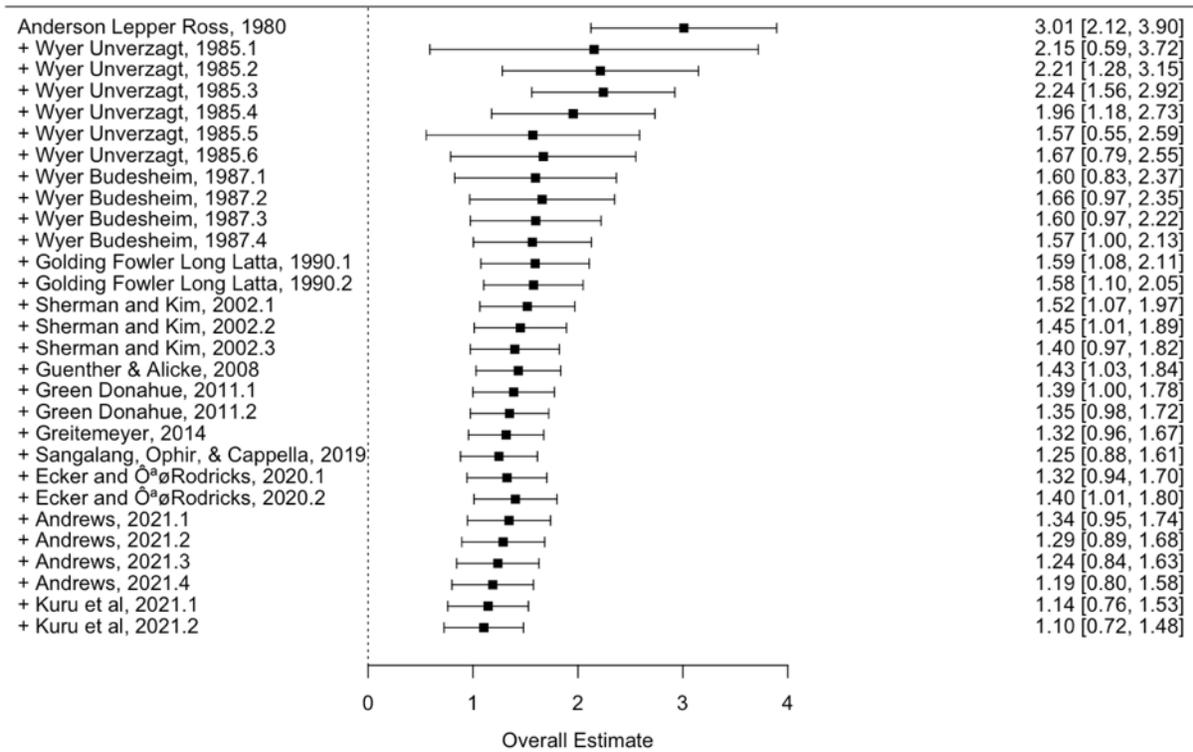


Figure 3 - Cumulative meta-analysis based sample size (debunking effect)





**Tables****Table 1 - Summary of Replication Results**

	<b>Fully</b>	<b>Partial</b>	<b>No</b>
Raw data provided	x		
Cleaning code provided	x		
Analysis data provided	x		
Analysis code provided		x	
Reproducible from raw data	x		
Reproducible from analysis data		x	

**Table 2 - Main results based on the meta-analysis estimator**

Method	Variable	d	P	95%CI
REML	Debunking effect	0.22	0.021	0.34 to 0.41
EB	Debunking effect	0.22	0.029	0.24 to 0.42
RVE (Original)	Debunking effect	0.19	0.131	-0.06 to 0.43
REML(Original)	Misinformation effect	1.10	0.001	0.72 to 1.48
EB	Misinformation effect	1.10	0.001	0.72 to 1.48

Note: REML means Restricted Maximum Likelihood ; EB means Empirical Bayes; RVE means Robust variance estimation.

**Appendix: Computational Reproduction of the main tables (Tables 1, 2 ,3, and 4) from the original study.**

**Table 1 - Descriptive statistics of the included reports**

	Mean (s.d.)	k
Sample size	174.1 (225.02)	205
Percentage of females	59.09 (11.1)	116
Percentage of males	40.24 (11.64)	105
Age	36.1 (11.26)	86
Country		
United States (%)	69%	141
Other countries (%)	31%	62

**Table 2 - Summary of bias analyses**

Bias analysis	Result with the outliers	Result without the outliers	Indication of bias
Contoured-enhanced funnel plot with the trim-and-fill method	LO: 0 estimated records filled on the right RO: 0 estimated records filled on the right	LO: 0 estimated records filled on the right RO: 0 estimated records filled on the right	LO: no RO: no
Rank correlation test	LO: $b=0.22$ , $SE = 0.10$ , $P=0.021$ RO: $b=0.22$ , $SE = 0.10$ , $P=0.021$	LO: $b=0.21$ , $SE = 0.08$ , $P=0.010$ RO: $b=0.21$ , $SE = 0.08$ , $P=0.010$	LO: yes RO: yes
Precision-effect test—precision-effect estimate with standard error	Small difference between the PEESE and the RVE estimate, $d\_diff=0.06$	Small difference between the PEESE and the RVE estimate, $d\_diff=0.06$	No
P-uniform test with the default 'P' method set	$L.pb = -11.35$ , $P=1.000$	$L.pb = -11.10$ , $P=1.000$	No
Three-parameter selection model	$b=0.12$ , $SE = 0.16$ , $P=0.459$	$b=0.09$ , $SE = 0.13$ , $P=0.487$	No
Meta-regression test of publication type	Working paper: $b=0.26$ , $SE = 0.23$ , $P=0.259$ Dissertation/thesis: $b=-0.02$ , $SE = 0.15$ , $P=0.901$ Unpublished data: $b=0.22$ , $SE = 0.18$ , $P=0.211$	Working paper: $b=0.25$ , $SE = 0.22$ , $P=0.263$ Dissertation/thesis: $b=-0.03$ , $SE = 0.14$ , $P=0.851$ Unpublished data: $b=0.21$ , $SE = 0.16$ , $P=0.185$	No
Weight-function models	Log-likelihood ratio was significant $\chi^2(df = 3)=16.38$ , $P=0.001$	Log-likelihood ratio was significant $\chi^2(df = 3)=12.97$ , $P=0.005$	Yes
RoBMA(Original)	$BF_{10}=9.668$	$BF_{10}=9.863$	Yes
RoBMA(Present)	$BF_{10}=1.422$	$BF_{10}=1.437$	No

**Table 3 - Meta-regression results**

Variable	Debunking effect			Misinformation effect			Debunking effect controlling for the misinformation effect		
	k=203			k=29			k=54		
	b (SE)	P	95% CI	b (SE)	P	95% CI	b (SE)	P	95% CI
Intercept	-1.1 (0.45)	0.017	-1.99 to -0.21	0.43 (0.80)	0.591	-1.14 to 2	-0.05 (0.55)	0.925	-1.35 to 1.25
Nature of the misinformation									
Negative misinformation <sup>^</sup>	0.8 (0.3)	0.011	0.19 to 1.4	0.42 (0.58)	0.468	-0.71 to 1.55	0.47 (0.53)	0.412	-0.8 to 1.73
Nature of the correction									
Detailed correction <sup>^</sup>	0.64 (0.27)	0.020	0.1 to 1.18	0.00 (0.59)	0.997	-1.15 to 1.14	-0.15 (0.25)	0.568	-0.73 to 0.44
Recipients of the misinformation									
Attitudinal congeniality of the correction <sup>^</sup>	1.68 (0.9)	0.066	-0.12 to 3.47						
Issue polarization <sup>^</sup>	-0.76 (0.37)	0.046	-1.51 to -0.02	-0.35 (0.95)	0.713	-2.21 to 1.51	-0.6 (0.53)	0.295	-1.85 to 0.66
Control factor:									
Domain of misinformation: political <sup>^</sup>	0.57 (0.76)	0.459	-0.95 to 2.09						
Domain of misinformation: health <sup>^</sup>	-1.34 (0.44)	0.003	-2.22 to -0.47						
Domain of misinformation: environment <sup>^</sup>	-0.46 (0.53)	0.395	-1.52 to 0.61						
Fictitious issue <sup>^</sup>	0.73 (0.37)	0.053	-0.01 to 1.47	0.78 (0.82)	0.342	-0.83 to 2.39	-0.14 (0.65)	0.834	-1.69 to 1.4
Likely familiarity with the topic <sup>^</sup>	1.2 (0.39)	0.003	0.42 to 1.98	-1.30 (0.96)	0.175	-3.18 to 0.58	0.55 (0.74)	0.480	-1.2 to 2.3
In-person correction <sup>^</sup>	0.7 (0.43)	0.106	-0.15 to 1.55	0.26 (0.4)	0.522	-0.53 to 1.05	1.14 (0.45)	0.037	0.09 to 2.2
Report and methodological characteristics									
Study sample <sup>^</sup>	-0.14 (0.27)	0.604	-0.67 to 0.39	1.34 (0.74)	0.073	-0.12 to 2.79	1.82 (0.65)	0.027	0.28 to 3.35
Lab context <sup>^</sup>	0.89 (0.39)	0.026	0.11 to 1.68						
Method of the effect-size calculation <sup>^</sup>	-0.32 (0.24)	0.185	-0.8 to 0.16						
Misinformation effects							-0.13(0.37)	0.728	-1 to 0.73

Note: A caret indicates a categorical variable.

**Table 4- Predicted estimated mean effect sizes for levels of categorical moderators**

Variable	df	d (SE)	P	95% CI
Negativity of the misinformation				
Negative	18.83	0.74 (0.27)	0.012	0.19 to 1.3
Neutral	31.7	-0.05 (-0.13)	0.688	-0.32 to 0.21
The correction				
Detailed correction				
Detailed	28.29	0.65 (0.2)	0.003	0.23 to 1.06
Succinct	30.81	0.01 (0.16)	0.968	-0.33 to 0.34
The recipient				
Attitudinal congeniality of the correction				
Congenial	2.01	1.85 (1.03)	0.215	-2.57 to 6.26
Mixed/uncongenial	30.48	0.17 (0.11)	0.130	-0.05 to 0.39
Polarizing issue				
Yes	24.09	-0.23 (-0.26)	0.394	-0.77 to 0.31
No	14.74	0.53 (0.18)	0.011	0.15 to 0.92
Control factor				
Domain of the misinformation				
Political	2.71	0.75 (0.88)	0.482	-2.22 to 3.73
Health	16.62	-0.65 (-0.34)	0.071	-1.36 to 0.06
Environment	24.79	-0.18 (-0.5)	0.716	-1.22 to 0.85
Others	17.54	0.71 (0.21)	0.003	0.27 to 1.15
Fictitious issue				
Fictitious	33.21	0.44 (0.14)	0.004	0.15 to 0.72
Real	20.49	-0.29 (-0.31)	0.363	-0.95 to 0.36
Likely familiarity with the topic				
Yes	9.67	0.75 (0.19)	0.003	0.33 to 1.17
No	16.05	-0.45 (-0.28)	0.128	-1.04 to 0.14
In-person correction				
Yes	7.48	0.81 (0.41)	0.090	-0.15 to 1.78
No	44.92	0.11 (0.12)	0.363	-0.14 to 0.36
Report and methodological characteristics				
Study sample				
United States	23.79	0.12 (0.23)	0.592	-0.35 to 0.59

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Rest of the world	34.7	0.26 (0.14)	0.070	-0.02 to 0.54
Lab context				
Lab	21.4	0.64 (0.21)	0.007	0.2 to 1.08
Online	21.69	-0.26 (-0.26)	0.338	-0.8 to 0.29
Method of effect-size calculation				
Between subjects	33.88	0.03 (0.15)	0.860	-0.28 to 0.34
Within subjects	30.95	0.35 (0.18)	0.058	-0.01 to 0.71

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