

The Impact of Open Science Practices on Research Methodology: A Case Study for Research in Judgment and Decision Making

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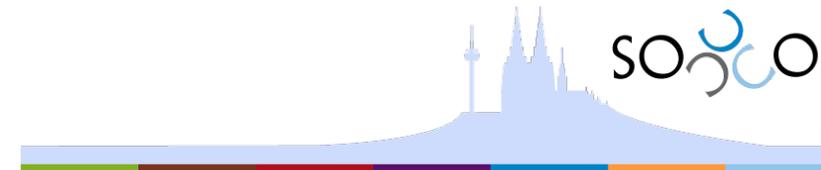
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Psychology's Renaissance

(Nelson et al., 2018, Annual Review of Psychology)

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Feeling the Future: Experimental Evidence for Anomalous Retroactive Influences on Cognition and Affect

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False-Positive Psychology: Undisclosed Flexibility in Data Collection and Analysis Allows Presenting Anything as Significant

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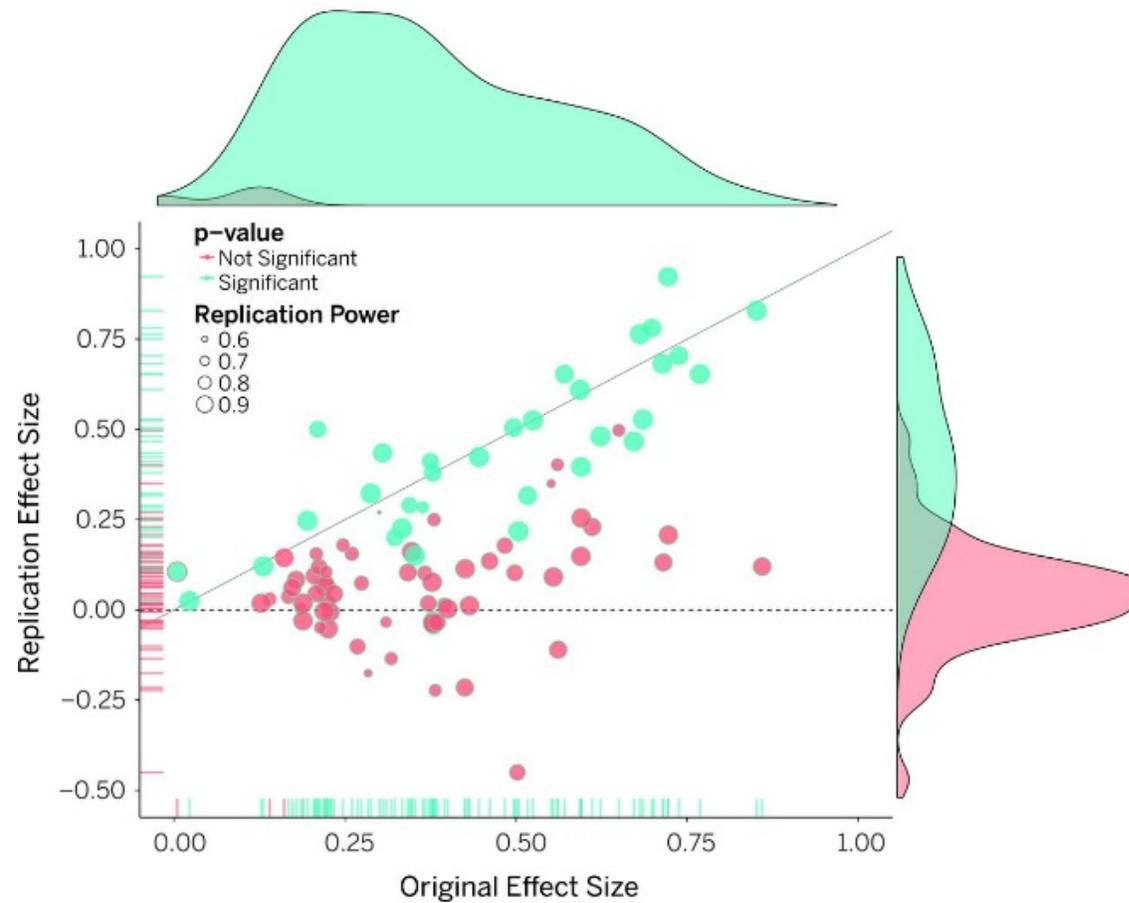
Measuring the Prevalence of Questionable Research Practices With Incentives for Truth Telling

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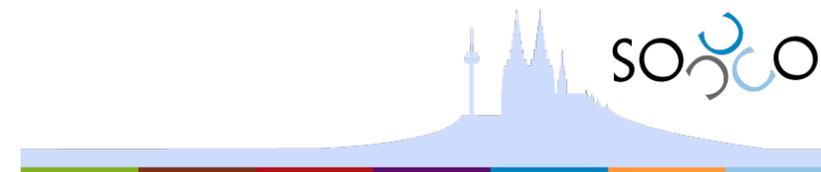


Open Science Collaboration (2015, Sci)



Suggested Measures

- more strictly applying
 - standards for transparency and openness in science
 - other commonly accepted methodological standards
- recommendations
 - 1) sharing data and materials
 - 2) pre-registration of hypotheses / more pre-registered reports
 - 3) conducting a-priori power analyses for sufficiently powered studies
 - 4) conducting more replications / requires original authors responsiveness to respective requests for cooperation (e.g., providing materials, explanations)



Open Data

VIEW THE **BADGES:**

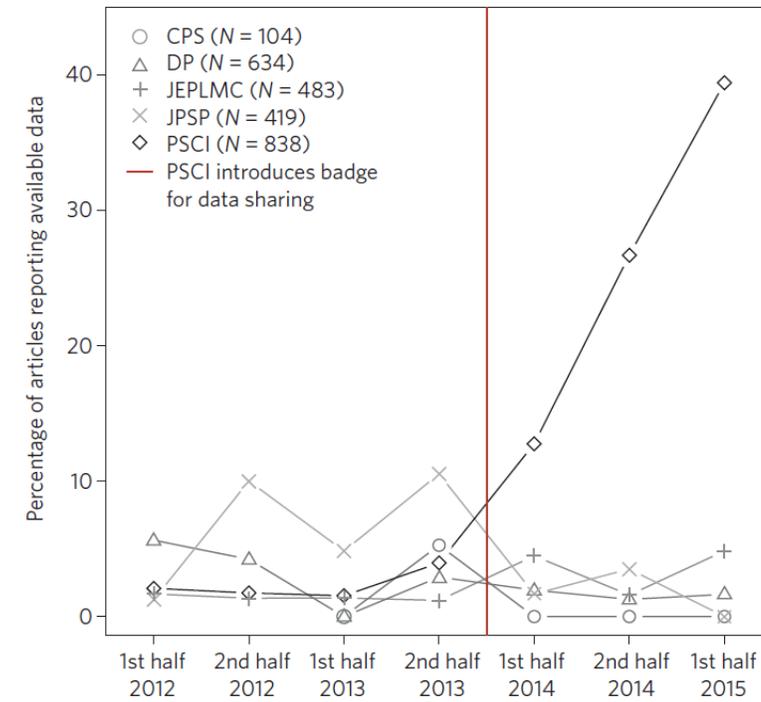


Figure 2 | The impact of introducing badges for data sharing. In January 2014, the journal *Psychological Science* (PSCI) introduced badges for articles with open data. Immediately afterwards, the proportion of articles with open data increased steeply, and by October 2015, 38% of articles in *Psychological Science* had open data. For comparison journals (*Clinical Psychological Science* (CPS), *Developmental Psychology* (DP), *Journal of Experimental Psychology: Learning, Memory and Cognition* (JEPLMC) and *Journal of Personality and Social Psychology* (JPSP)) the proportion of articles with open data remained uniformly low. Figure adapted from ref. 75, PLoS.

Munafò, M. R., Nosek, B. A., . . . Ioannidis, J. P. A. (2017). A manifesto for reproducible science. *Nature Human Behaviour*, 1, 0021.



Hagen Cumulative Science Project 1

- replication of (so far) 71 articles in Bachelor- and Master-theses
 - published in the journal *Judgment and Decision Making* 2012 – 2018
- open data policy since 2011
- research question
 - application of Open Science practices & responsiveness
 - indicators (p -curve, sample sizes)
 - development over time

Table 1. Number of articles published in *Judgment and Decision Making* (JDM) and how many of them were included in the current analysis.

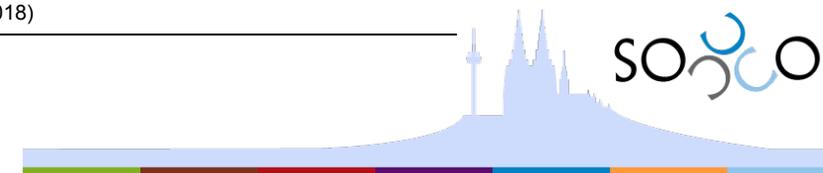
publication year	# of articles published	# of articles included	proportion of articles included
2012	35	6	0.17
2013	61	4	0.07
2014	47	12	0.26
2015	50	12	0.24
2016	52	17	0.33
2017	49	18	0.37
2018	17	2	0.12

HCSP1: Authors

Table 2. List of articles included in the analysis.

Volume / issue	articles
7 / 4	Ettlin & Hertwig (2012), Huang & Zeelenberg (2012)
7 / 5	Choshen-Hillel & Yaniv (2012), Gong & Meding (2012), Passerini, Mac & Bagassi (2012)
7 / 6	Nieuwenstein & van Rijn (2012)
8 / 1	Colby & Chapman (2013)
8 / 3	Stone, Choi, Bruine de Bruin, & Mandel (2013)
8 / 4	Du, Liu, Xu, Rao, Jiang, & Li (2013)
8 / 5	Miron-Shatz, Diener, Doniger, Moore, & Sapphire-Bernstein (2013)
9 / 1	Ghazal, Cokely, & Garcia-Retamero (2014), Hu, Jiang, Xie, Ma, & Xu (2014)
9 / 3	Choplin & Wedell (2014), Poon, Koehler, & Buehler (2014), Royzman, Landy, & Goodwin (2014), Shevchenko, von Helversen, & Scheibeheni (2014)
9 / 4	Caviola, Faulmüller, Everett, Savulescu, & Kahane (2014), Mata & Almeida (2014)
9 / 5	Cornwell & Krantz (2014), Eriksson, & Strimling (2014), Yeung (2014)
9 / 6	Wieland, Sundali, Kimmelmeier, & Sarin (2014)

10 / 1	Cheek, Coe-Odess, & Schwartz (2015), Rozin, Haddad, Nemeroff, & Slovic (2015), Rubaltelli, Lotto, Ritov, & Rumiati (2015)
10 / 2	Michaelson (2015)
10 / 3	Sirota & Juanchich (2015)
10 / 4	Deppe, Gonzalez, Neiman, Jacobs, Pahlke, Smith, & Hibbing (2015)
10 / 5	Heintz, Celse, Giardini, & Max (2015), Hohle & Teigen (2015), Krijnen, Zeelenberg, & Breugelmans (2015), Weisberg, Taylor, & Hopkins (2015), Wiss, Andersson, Slovic, Vastfjäll, & Tinghög (2015)
10 / 6	Pennycook, Cheyne, Barr, Koehler, & Fugelsang (2015)
11 / 1	Bahník & Strack (2016), Davidai & Gilovich (2016), McGraw, Davis, So & Tetlock (2016), Noori (2016), Peetz, Simmons, Chen, & Buehler (2016)
11 / 2	Rubinstein & Salant (2016)
11 / 3	Basehore & Anderson (2016), Buchanan, Summerville, Lehmann, & Re (2016), Eriksson & Jansson (2016)
11 / 4	Hütter & Ache (2016), Lu, Liu, & Fang (2016), Millar, Starmans, Fugelsang, & Friedman (2016)
11 / 5	Landy (2016), Newall (2016), Schneider, Kauffman, & Ranieri (2016)
11 / 6	Stavrova, Newman, Kulemann, & Fetchenhauer (2016), Wang, Geng, Qin, & Yao (2016)
12 / 1	Erlandsson, Björklund, & Bäckström (2017), Mukherjee, Sahay, Chandrasekhar Pammi, & Srinivasan (2017), Shenhav, Rand, & Green (2017), Szrek (2017)
12 / 2	Spälti, Brandt, & Zeelenberg (2017), Yilmaz & Saribay (2017)
12 / 3	Aktas, Yilmaz, & Bahçekapili (2017), Barak-Corren & Bazerman (2017), Shaw & Choshen-Hillel (2017)
12 / 4	Eriksson, Andersson, & Strimling (2017), Webb & Shu (2017)
12 / 5	Juanchich, Gourdon-Kanhukamwe, & Sirota (2017), Kim & Miller (2017), Maaravi & Levy (2017), Shou & Song (2017)
12 / 6	Klein, Thielmann, Hilbig, & Zettler (2017), Scott & Rozin (2017), Shrivastava, Jain, Nayakankuppam, Gaeth, & Levin (2017)
13 / 2	Galesic, Walkyria Goode, Wallsten, & Norman (2018)
13 / 3	Fedotova & Rozin (2018)



Responsiveness

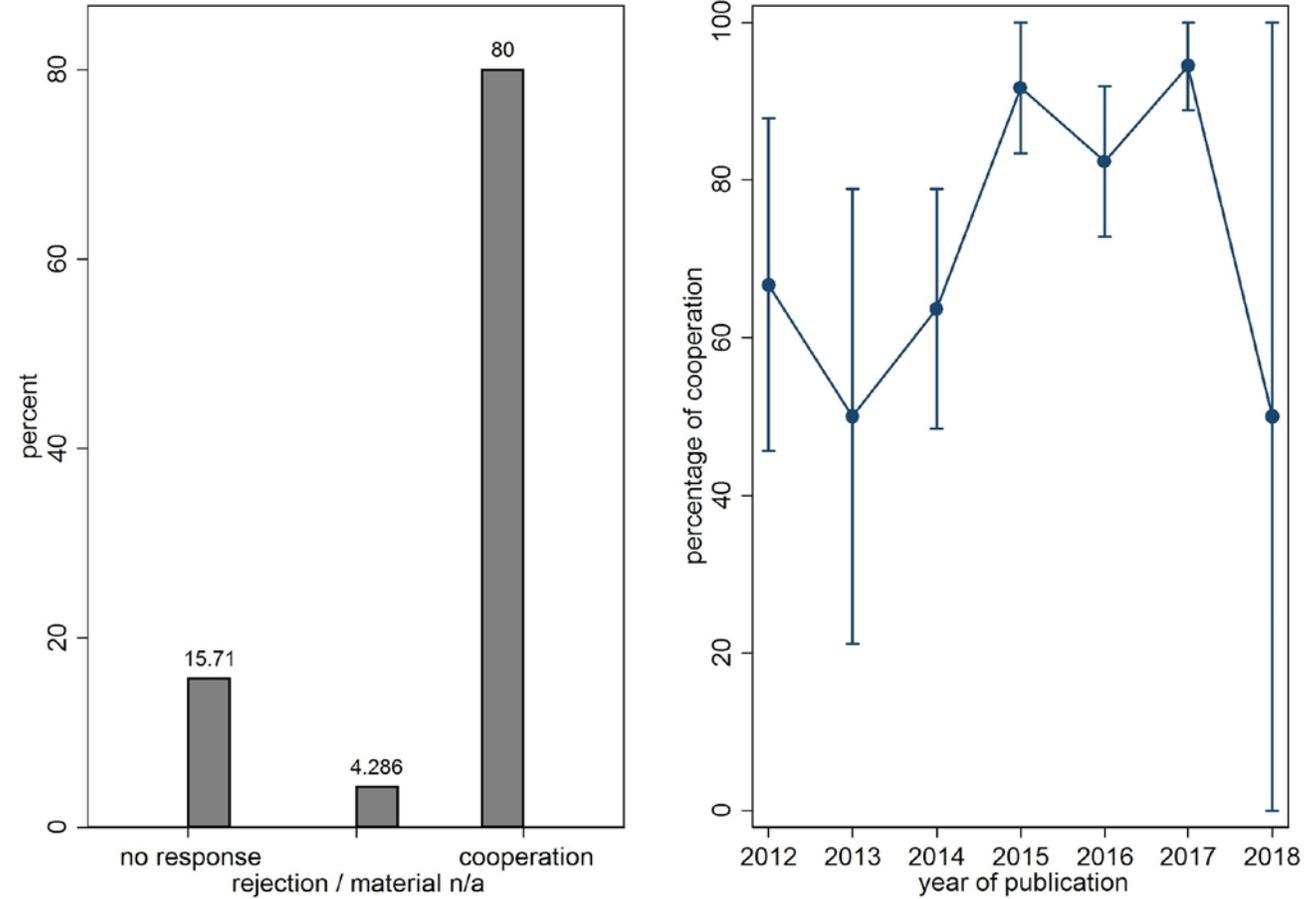
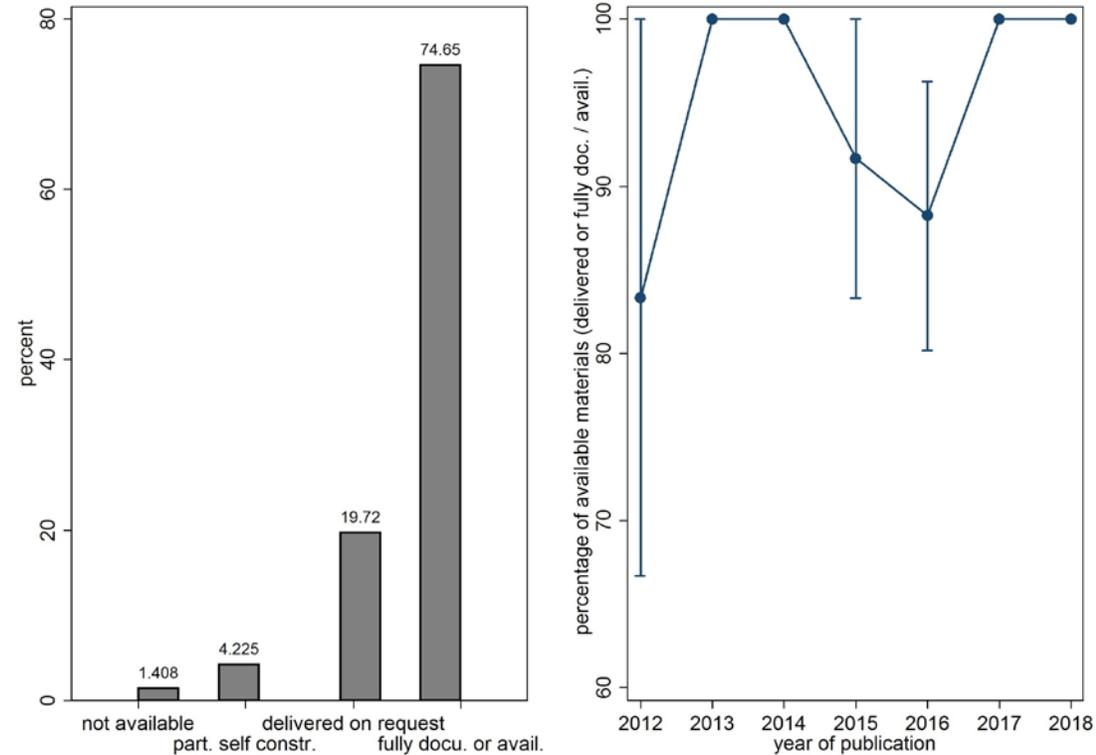


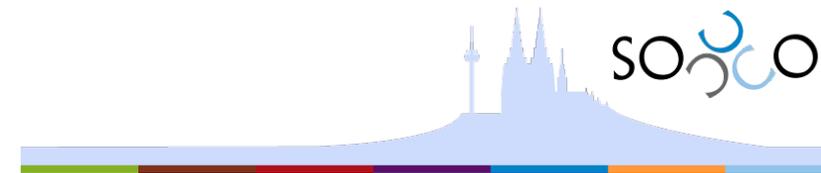
Figure 1. Responsiveness of authors overall (left) and percentage of the category cooperation over time (right). Error bars indicate standard errors.

Availability of Materials & Data



Data: 100% available
(Wichert et al., 2006: 26%)

Figure 2. Availability of materials (left) and development of the percentage of available materials (either delivered on request, fully documented or available) over time (right).



A-priori Power Analysis & Reporting of Effect Sizes

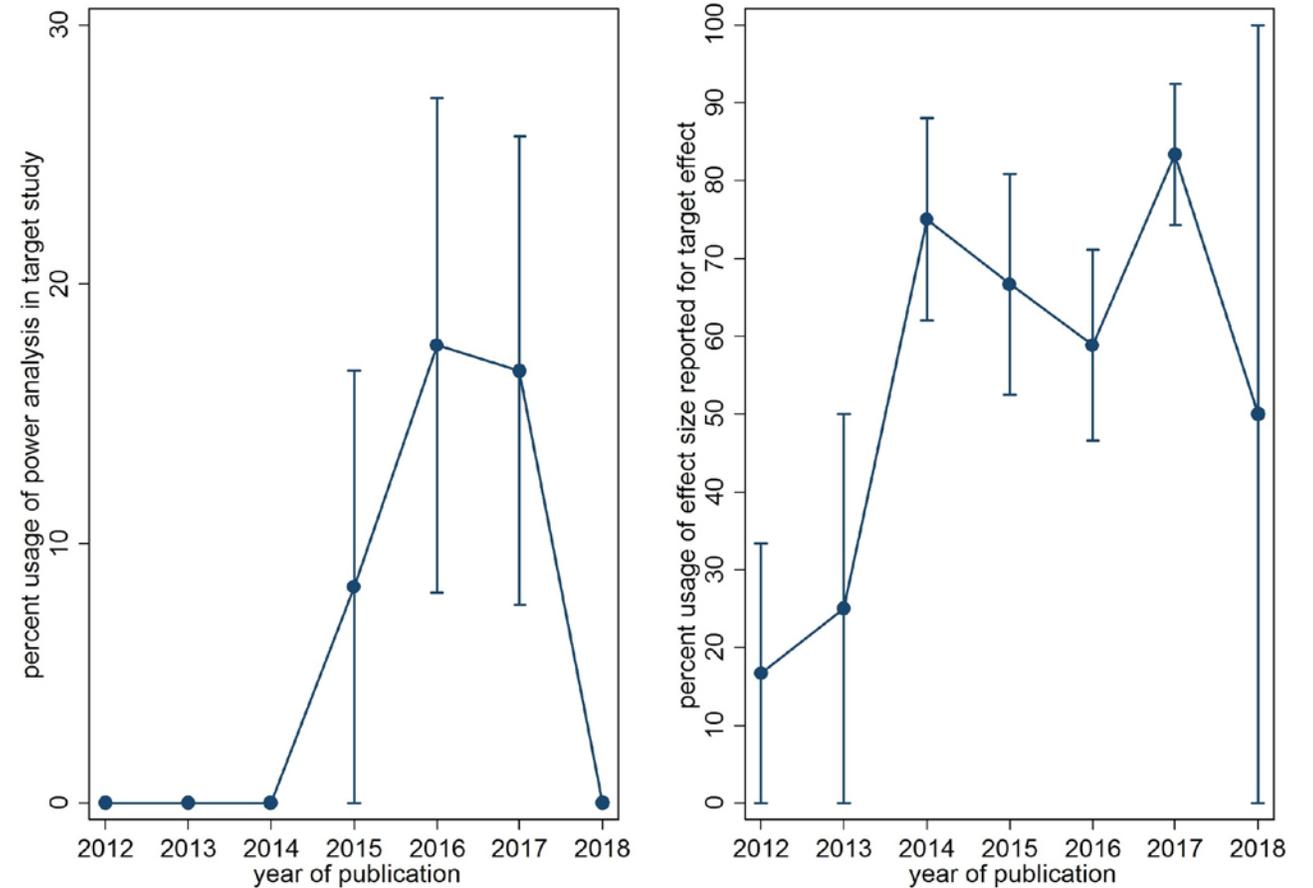
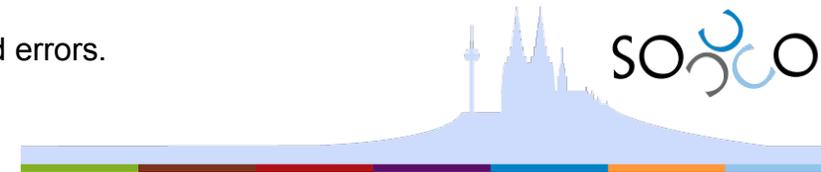


Figure 3. Usage of a-priori power analysis (left) and reporting of effect sizes (right) for the target effect. Error bars indicate standard errors.



p-Values

Distribution of *p*-values deviates from a uniform distribution ($Z = -13.84$; $p < .001$).

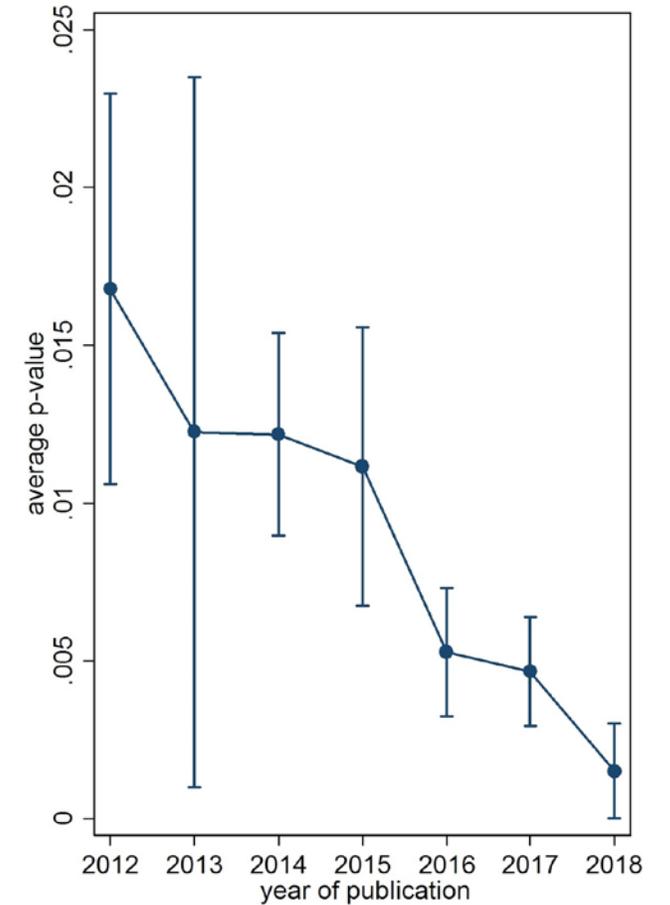
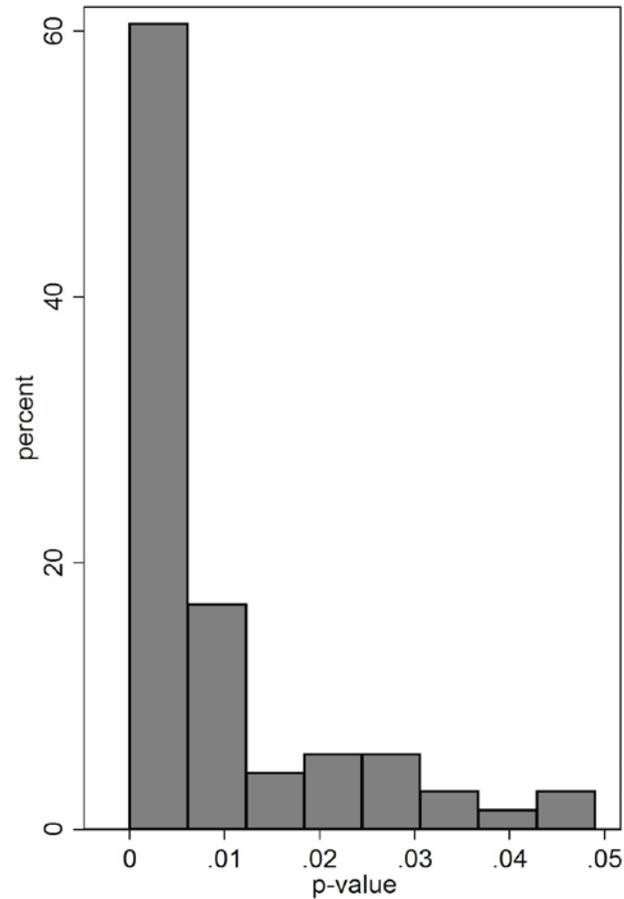
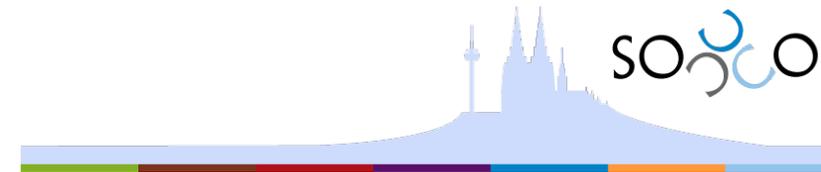


Figure 4. Distribution of *p*-values (left) and development over time (right). Error bars indicate standard errors.



Sample Sizes

Median = 193

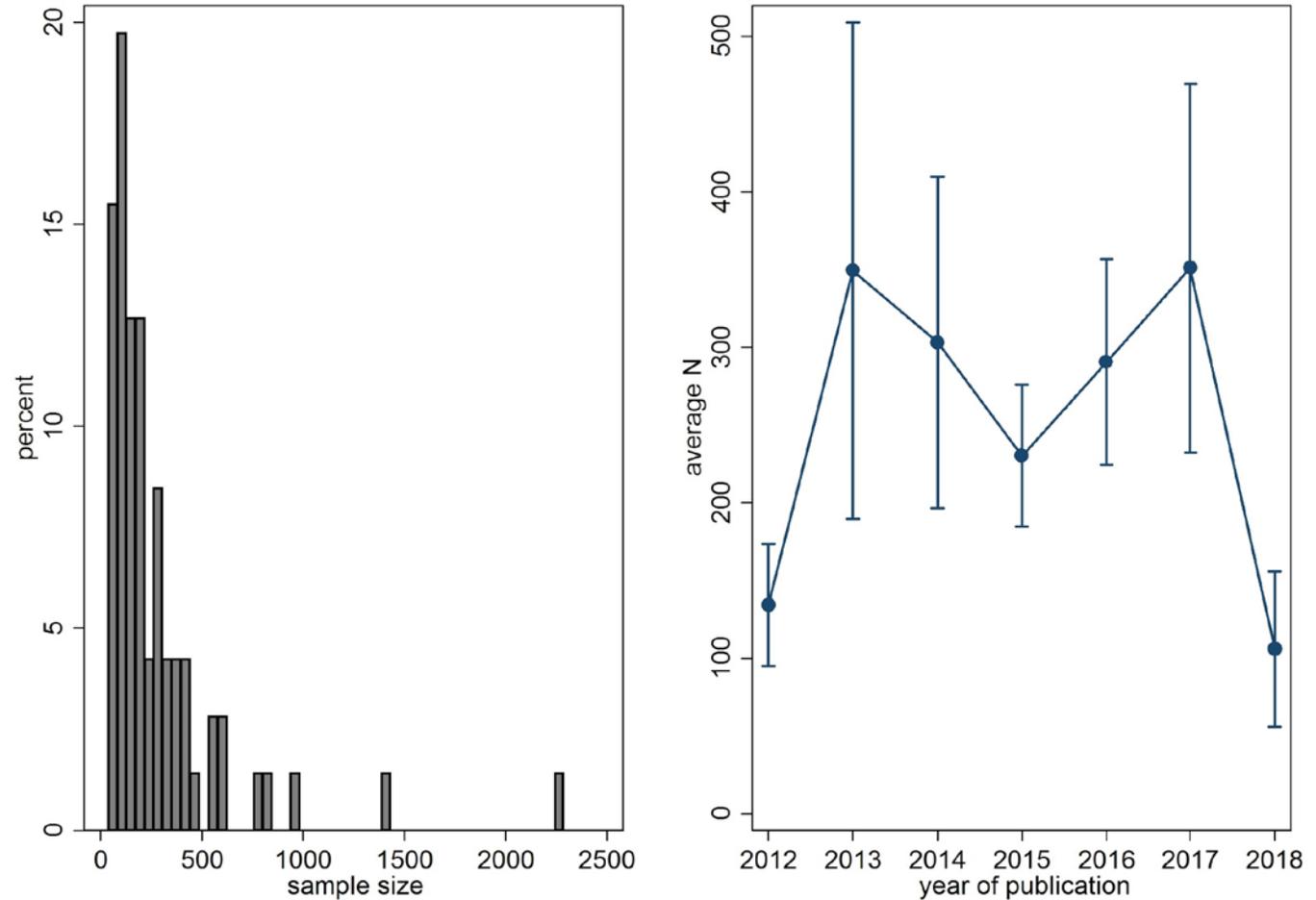
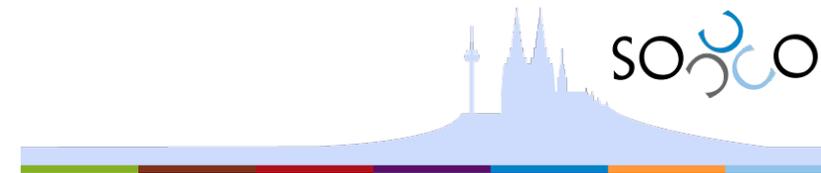


Figure 5. Distribution of sample sizes to test the target effect (left) and development over time (right). Error bars indicate standard errors.



Effect Sizes

Mean Pearson $r = .29$

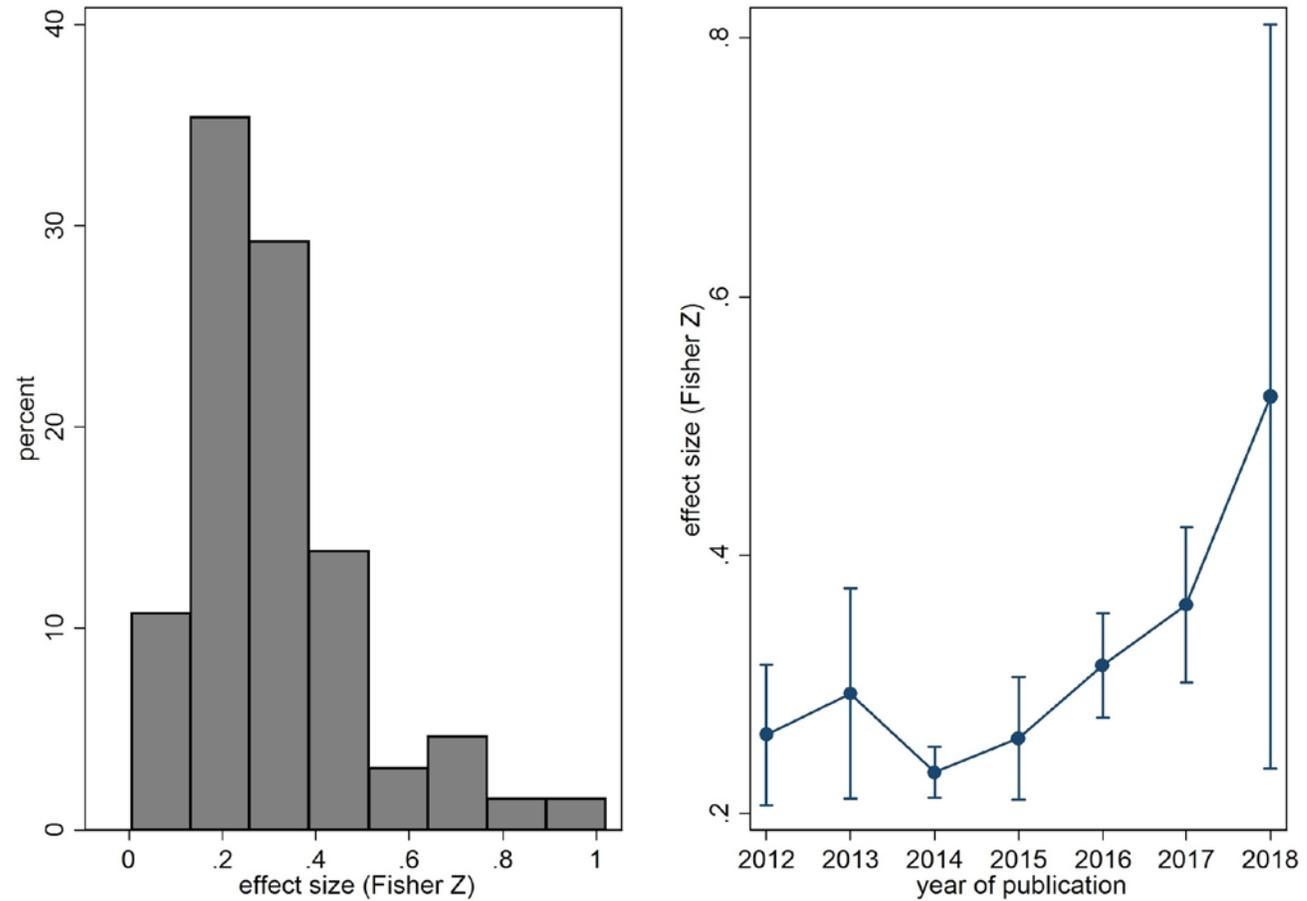
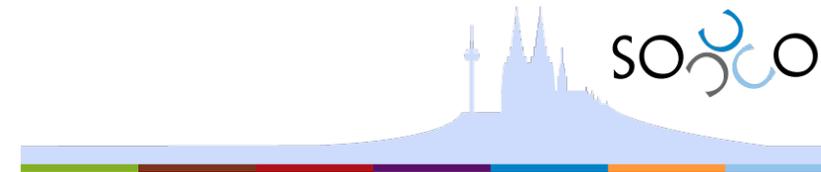
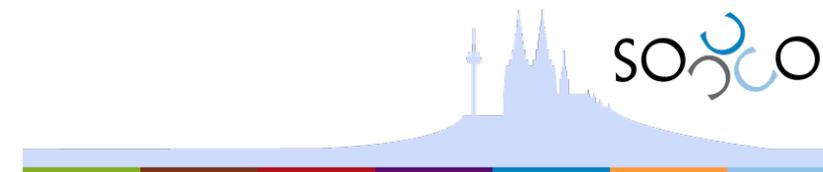


Figure 6. Distribution of effect sizes (Fisher Z) to test the target effect (left) and development over time (right). Error bars indicate standard errors.



Reproducibility of Original Analyses

- missing values
- 96% (44/46) of effects in principle reproducible
 - 30% of them (14/46) with minor deviations (e.g., rounding errors) or after further clarifications from the authors (e.g., exclusion of participants, further specification of the model used)
- 2 target effects substantial deviations detected
 - authors accepted the deviations → 1 erratum, in the other case a correction was promised.
- comparison: not reproducible analyses
 - economics journals
 - 31% of articles (9/29; Chang & Li, 2015, see also Christensen & Miguel, 2018)
 - Cognition
 - 37% of articles published in Cognition even after introducing an open data policy (Hardwicke et al., 2018)



Discussion

- high degree of adoption of core indicators of open science practices
 - a) in all investigated articles (100%) data was available
 - b) a large majority (80%) of the authors responded positively to requests for materials or cooperation in conducting replications of their publications
 - c) for most of the articles, materials were available or shared on request (94%)
 - d) most of the original analyses were in principle reproducible (96%) except for minor deviations or requirements for further consultation
 - e) no problems with p -curve bunching, small samples, small effects (average $r = .29$)
- low adoption for further indicators
 - a) some studies (10%) reported a priori-power analyses for the target effect,
 - b) effect sizes (66%),
 - c) provided analysis scripts (4%).
 - d) no pre-registered hypotheses 0%
 - e) 0% of the articles were pre-registered reports.

