The Growth of Psychology and its Corrective Mechanisms

A Bibliometric Analysis (1963-2012)

- Proposed Independent Comment -

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A search in PsycINFO learns that the psychological literature anno 2012 covered 141,102 articles published in 2,523 peer-reviewed journals. Specific searches show that in the last year, 1265 psychological articles used the term meta-analysis in the abstract, 684 were corrigenda/errata, 41 were retraction notices, and 835 involved comments or critiques. Moreover, 557 articles contained the term replication in their abstract, while the abstracts of 62 articles featured the term reanalysis. Another 167 articles appear to concern disconfirmations as they included "falsify/falsifies'", "contradict(s)", or "disconfirm(s)" in the abstract. To put these numbers in historical perspective, we repeated these searches for the last 50 years. The resulting data shed light on the growth of the psychological literature and trends in corrective mechanisms therein. We used unambiguous search-strings related to common corrective mechanisms (i.e., avoiding terms compounded by substance) to shed light on the appearance of relevant articles. Counts per year are depicted in Figure 1 for total number of articles and journals, publications related to meta-analysis, critiques/comments, disconfirmations, errata/corrigenda, retractions, replications, and re-analyses. The data, search strings, and database limits are given in the appendix.

The number of articles (Panel A) has grown sharply from 5907 in 1963 to 141,102 in 2012. This aligns with the increasing number of journals listed in PsycINFO (line in Panel A), which went from 182 to 2523. Increases in specific types of articles should be viewed relative to the total number of articles by year, so Panels B-H include both the raw counts as bars and the percentages as lines. We tested for trends using standard logistic regressions of records/articles with year and the square of year as predictors, and additionally with period (1963-

1987 vs. 1988-2012) as dichotomous predictor. All trends mentioned below were significant (α=.05).

Panel B shows an increasing number of articles with "meta-analysis" in the abstract, starting with the development of meta-analysis in the late 1970s. The increase in meta-analytic articles is disproportionate in the sense that their relative occurrence went up from 0.2% in the 1980s to 0.9% in the last years.

Panel C reports the number of articles with critique or comment in the title. Despite the rising numbers of such critical articles in PsycINFO, their relative appearance is quite constant, with a slight drop since 1987.

Panel D includes the number of articles with "disconfirm(s)", "falsify/falsifies'", or "contradict(s)" in the abstract. Despite the growing count per year, the relative appearance of articles that appear to fit Popper's philosophy was higher in the period 1973-1985 (around 0.2%) than in the last 25 years (around 0.1%).

Panel E depicts the trend line and the number of articles with erratum or corrigendum in the title (we did not search with "correction" because of its substantive meaning). Results show a near-absence of errata/corrigenda in most of the 1980s and a disproportionate increase in (self-)corrections since 1987.

Papers may be retracted because of gross errors, failures to replicate, or scientific misconduct. Panel F highlights a sharp increase in the number and relative frequency of retracted papers in the last decade. The increase is disproportionate even if we exclude the year 2012, which features many retractions by Diederik Stapel. In psychology, the yearly retraction rate of published articles is currently around 0.02%, which aligns with the recent (increasing) rate documented across the whole of science (Van Noorden, 2011).

Replication concerns a core corrective mechanism of science (Asendorpf et al., 2013). Panel G depicts the number and rate of articles that contained the word replication in their abstract. Only few such (apparent) failures to replicate get published (cf. Makel, Plucker, & Hegarty, 2012). The rate of these articles was around 0.50% in the period 1963-1979 and slightly lower at around 0.33% in the last two decades.

Another corrective mechanism concerns (independent) re-analyses of the data. Although the number of articles with the term reanalysis in the abstract (Panel H) has increased over the years, the relative frequency dropped steadily since 1987. This is striking given that sharing electronic data for re-analysis should have become easier in the last decades.

Assuming that the search terms reflect articles' content and that types of articles in PsycINFO have remained comparable in relevant aspects, our results highlight the following publication trends. The strong growth of the psychological literature is coupled with a sharp increase in the (relative) number of meta-analytic articles, which suggests an increasing demand for meta-analyses to collate the expanding number of empirical results. Retractions have been on the rise in psychology, as they have in other fields. Similarly, the (relative) number of errata/corrigenda has increased since 1989. These trends may be due to growing scrutiny by readers in the online era and rising awareness of misconduct (Van Noorden, 2011). The relative number of articles that concern comments, replications, re-analyses of data, or disconfirmations was lower in the last 25 years as compared to earlier periods, reflecting perhaps a growth in journals' emphasis on publishing novel results. Also, the drop in relative frequency in published re-analyses since the 1980s may reflect the

common failure to share data for reanalysis due to substandard documentation and archiving of data (Wicherts, Bakker, & Molenaar, 2011; Wicherts, Borsboom, Kats, & Molenaar, 2006).

References

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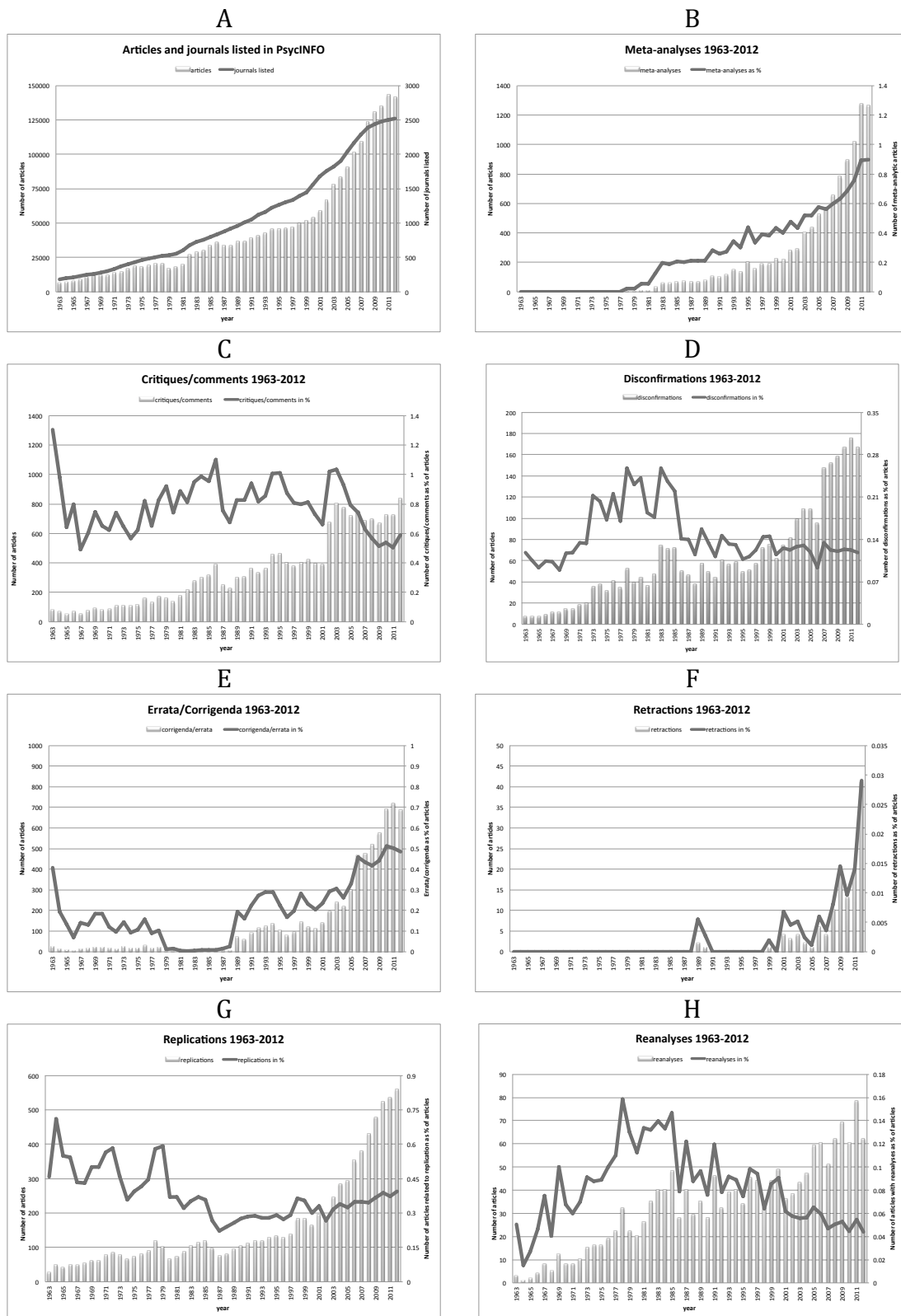
Figure 1. Absolute yearly frequencies (bars) and yearly percentages (lines) of articles in peer-reviewed journals in PsycINFO from 1963-2012 concerning meta-analysis (Panel B), comments/critiques (Panel C), disconfirmations (Panel D), errata/corrigenda (Panel E), retractions (Panel F), replications (Panel G), and re-analyses (Panel H). Panel A gives the total number of articles (bars) and the number of journals (line) listed in PsycINFO.

Appendix

Table A1. Data table for the counts in Figure 1

Year	articles	journals	meta-analyses	critiques	retractions	errata	reanalyses	replications	discon firms
1963	5907	182	0	77	0	24	3	27	7
1964	6627	198	0	65	0	13	1	47	7
1965	7478	208	0	48	0	10	2	41	7
1966	8654	234	0	69	0	6	4	47	9
1967	10603	249	0	52	0	15	8	46	11
1968	12278	263	0	74	0	16	5	53	11
1969	11955	284	0	89	0	22	12	60	14
1970	11814	303	0	77	0	22	8	59	14
1971	13315	333	0	83	0	16	8	75	18
1972	14272	368	0	106	0	14	10	83	19
1973	16489	405	0	107	0	24	15	76	35
1974	18223	432	0	103	0	17	16	65	37
1975	17950	459	0	112	0	19	16	71	31
1976	19030	478	0	156	0	30	19	79	41
1977	19944	504	0	130	0	18	22	89	34
1978	20163	519	4	167	0	21	32	117	52
1979	16903	537	4	156	0	2	22	100	39
1980	17782	559	10	132	0	3	20	66	43
1981	19471	607	11	173	0	1	26	72	36
1982	26511	676	34	215	0	1	35	85	47
1983	28692	726	56	273	0	2	40	101	74
1984	30046	760	57	297	0	3	40	111	71
1985	32772	796	67	312	0	3	48	117	72
1986	35452	840	71	390	0	3	28	95	50
1987	32876	878	69	249	0	5	40	73	46
1988	32978	916	69	223	0	8	29	79	38
1989	36227	962	77	300	2	71	35	93	57
1990	36804	1007	103	304	1	59	28	101	49
1991	38468	1051	99	361	0	87	46	109	43
1992	40805	1119	112	333	0	111	32	117	60
1993	42369	1167	146	362	0	122	39	118	56
1994	45055	1218	135	453	0	131	40	125	59
1995	45421	1261	200	460	0	102	34	132	49
1996	45687	1302	153	398	0	77	45	125	51
1997	46580	1337	183	375	0	92	44	136	57
1998	49832	1397	190	398	0	141	32	182	72
1999	51411	1450	223	417	1	120	44	182	75
2000	54002	1553	216	395	0	110	49	162	62
2001	58591	1682	280	388	4	138	36	194	74
2002	66077	1761	287	673	3	194	38	176	81

(table continues on next page)

Table 1 (continued)

Year	articles	journals	meta-analyses	critiques	retractions	errata	reanalyses	replications	disconfirms
2003	77422	1818	402	800	4	237	43	244	99
2004	83056	1902	431	772	2	218	47	282	108
2005	90412	2040	521	717	1	297	59	292	108
2006	100929	2162	568	748	6	463	60	351	95
2007	109010	2290	655	682	4	474	51	380	147
2008	123485	2389	780	698	10	517	62	428	152
2009	130483	2442	892	668	19	575	69	477	158
2010	134512	2477	1019	722	13	690	60	521	166
2011	142797	2501	1273	722	20	717	78	534	175
2012	141102	2523	1265	835	41	684	62	557	167

Table A2
Search terms used in PsycINFO

Category	Boolean/Phrase:
articles	PY 1963
meta-analysis	PY 2012 AND AB meta-analysis
retraction*	PY 2012 AND TI retraction
corrigenda	PY 1963 AND (TI corrigendum or TI erratum)
critique	PY 2012 AND (TI critique OR TI comment)
reanalysis	PY 2012 AND (AB reanalysis)
replication	PY 2012 AND (AB replication)
disconfirms	PY 1963 AND (AB falsifies OR AB contradicts OR AB disconfirms)

Note: Searches conducted between 12/8/13 and 15/8/13 with the limiter "Publication Type: Peer Reviewed Journal"; *For retractions, we used a manual search to avoid inclusion of irrelevant papers