Complementary Medicine Has Reached the Centre of Scientific Interest: Some Thoughts on Ioannidis' Citation Database

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One hears, now and again, especially at times of medical-political campaigning, that complementary medicine is “unscientific.” Mostly, this verdict is used by journalists who are referring to so-called “authorities,” or by the “authorities” themselves, referring to an otherwise unspecified mainstream consensus. I would like to disentangle the meaning behind this statement and offer a simple fact to prove it wrong.

Not long ago, John P.A. Ioannidis, probably one of the most frequently cited and visible medical methodologists and public health researchers, published a database of the 100,000 most frequently cited scientists worldwide [1]. This database ranks researchers and authors according to their impact in terms of citations, i.e., the extent to which other researchers and authors are making use of their work. This has become a standard way of measuring scientific impact, because it provides us with standardized metrics across disciplines. The database uses the so-called Hirsch index or *h*-index [2]. This is an index that places the output of a researcher, in terms of numbers of publications, into a relationship with the number of citations of their papers that appear in other publications. Thus, a researcher who has an *h*-index of 1 has written as many papers as are cited once or, put differently, whose papers are cited, on average, once. A researcher with an *h*-index of 100 has had each of their papers cited by, on average, 100 other researchers. The *h*-index therefore provides a measure of “usefulness” or “visibility” within the community at large.

Now, obviously, there are a couple of pitfalls. If researchers get away with citing their own work a lot and at the same time publish a lot, they artificially enhance their *h*-index, because perhaps 40 or 50% of the citations are not made by other authors but appear in work by the researchers themselves. In addition, areas where there is a lot of active research, such as clinical medicine or cell biology, will automatically produce more citations of important papers than smaller areas like philosophy or social sciences. Ioannidis tried to avoid such pitfalls by various means, e.g., purging the *h*-index of self-citations and adjusting the ranking to the relative importance in a field. The ranking in the database is therefore the relative ranking of each author with potential distortions having been eliminated. However, there are 2 generic distortions germane to the science metric. First, heavy-handed monographs, that might be central to a field, are not normally taken into account. This is often the case for philosophy, theology, history, and social science. The reason for this is that such monographs are not normally cited in the citation databases used to calculate the index, such as Scopus. The other distortion is, of course, the content. No majority vote can define the value of content, and no numerical index can reflect this value. The *h*-index is a formal measure. How often something is cited is not necessarily indicative of quality. Sometimes canonical texts are cited because authors think they need to do this to get published. Science is prone to fashion as well. Sometimes only established authorities are cited, because younger

Table 1. Part of the full citation database [1] (CAM authors only)

Author	Institution	Country of activity	Papers ¹ , <i>n</i>	First ² year	Last ³ year	Rank ⁴ absolute	Citations ⁵ , <i>n</i>	<i>h</i> -factor
Ernst, E.	University of Exeter	UK	2,253	1975	2018	104	49,553	91
Davidson, Jonathan R.T.	Duke University	USA	426	1972	2017	1.394	23,184	78
Kaptchuk, Ted J.	Harvard University	USA	245	1993	2018	6.545	11,914	58
Eisenberg, David M.	Harvard University	USA	127	1991	2018	8.641	17,583	52
White, Adrian	University of Plymouth	UK	294	1990	2016	16.714	7,113	49
Lundeberg, Thomas		Sweden	340	1983	2016	17.199	8,822	51
Linde, Klaus	Technische Universität München	Germany	276	1993	2018	19.488	9,659	49
Astin, John A.	California Pacific Medical Center	USA	50	1994	2014	21.379	6,123	25
Schwartz, Gary E.	University of Arizona	USA	264	1967	2018	21.893	10,831	50
Eloff, J.N.	University of Pretoria	South Africa	204	1997	2018	23.830	3,990	31
Kelly, Gregory S.			37	1985	2011	31.037	2,133	23
Walach, Harald	University of Medical Sciences Poznan	Poland	246	1996	2018	31.716	5,419	35
Birch, Stephen	McMaster University	Canada	244	1985	2018	31.925	3,919	33
Berman, Brian M.	University of Maryland School of Medicine	USA	211	1986	2018	34.022	8,322	49
Lewith, George	University of Southampton	UK	380	1980	2018	34.830	6,576	40
Kidd, Parris M.	University of California at Berkeley	USA	38	1976	2011	36.571	2,340	19
Wilson, Kenneth H.	Duke University	USA	76	1976	2017	40.760	5,466	34
Jonas, Wayne B.	Samueli Institute	USA	187	1992	2018	42.445	4,273	30
Kemper, Kathi J.	Ohio State University	USA	181	1988	2017	45.193	3,503	33
MacPherson, Hugh	University of York	UK	143	1996	2018	49.923	3,934	31
Bell, Iris R.	University of Arizona	USA	142	1984	2015	51.016	3,686	33
Oken, Barry S.	Oregon Health and Science University	USA	121	1974	2018	51.325	4,495	34
Pittler, M.H.		UK	155	1997	2016	53.183	5,646	43
Patrick, Lyn			21	1999	2018	57.086	1,560	18
Postuma, Ronald B.	McGill University	Canada	159	1998	2018	61.018	5,408	42
Ritenbaugh, Cheryl	University of Arizona	USA	172	1981	2018	63.248	6,947	45
Patwardhan, Bhushan	University of Pune	India	144	1989	2018	64.465	3,127	28
Krucoff, Mitchell W.	Duke University	USA	261	1986	2016	66.028	12,212	47
Boon, Heather	University of Toronto	Canada	188	1988	2017	69.066	4,850	35
Aickin, Mikel	University of Arizona	USA	149	1996	2014	72.040	6,082	32
Lee, Myeong Soo		Korea	430	1996	2018	72.358	4,904	34
Lao, Lixing	University of Hong Kong.	Hongkong	247	1990	2018	74.896	6,057	40
Witt, Claudia M.	Charité – Universitätsmedizin Berlin	Germany	238	2001	2018	78.849	4,591	30
Chiesa, Alberto		Italy	87	1973	2017	82.390	2,663	23
Sherman, Karen J.	Kaiser-Permanente	USA	136	1984	2017	82.542	5,349	36
Baliga, Manjeshwar Shrinath		India	142	2002	2018	83.030	2,798	30
Verhoef, Marja J.	University of Calgary	Canada	190	1989	2016	84.314	4,490	38
Mischoulon, David	Harvard University	USA	194	1992	2018	91.705	4,245	35
Smith, Caroline A.	University of Western Sydney	Australia	135	1979	2018	94.130	3,110	29
Miller, Alan L.			30	1980	2016	94.421	1,262	14
Paterson, Charlotte	University of Bristol	UK	71	1995	2017	95.130	1,498	20
Büssing, Arndt	University of Witten/Herdecke	Germany	207	1980	2018	95.907	2,181	22
Langevin, Helene M.	Harvard University	USA	67	1999	2018	98.290	2,371	25
Creath, Katherine			84	1984	2017	99.709	1,672	13

The institution and country of activity are given according to the original table, which extracted this information from the last available publication and might not always reflect current affiliations. Small institutions were not listed and so I added these when I could. I also added the country where the original table had been left blank.

¹ As of 2017; ² the first year from which publications were counted; ³ the last year taken into account; ⁴ the absolute rank within the group of the 100,000 most cited authors, purged by self-citations and standardized by field; ⁵ the number of citations the author got from others, excluding self-citations, ⁶ excluding self-citations.

authors want to make sure to not offend such authorities. There are many other reasons, apart from usefulness and content, for which papers get cited.

The original publication, available online [1], offers a link to supplementary files that contain the original datasets that can be filtered and searched. It is instructive to do this for the field of complementary and alternative medicine (CAM), which is in fact its own professional

discipline within the database. If we do this, we find that altogether 44 authors of CAM articles are among the 100,000 most influential authors worldwide. To understand this better, it is important to recognize that altogether there are more than 6.8 million authors out there, i.e., this database of the 100,000 most frequently cited authors represents only about 1.5% of all scientifically active researchers. I was quite surprised by this finding, consid-

ering the comparatively small field of CAM research within the larger field of medical and scientific research. Estimating that perhaps 5,000 authors are active in CAM research worldwide, 1% of these are among these 100,000 most influential writers in this database.

An extract from the database representing those CAM authors is presented in Table 1. There are several observations to be made here. All fields of CAM research are represented, with comparatively high rankings, namely, acupuncture (e.g., Adrian White, Klaus Linde, Brian Berman, and Hugh MacPherson), to homeopathy (e.g., Jonathan Davidson, Harald Walach, and Iris Bell), energy research (e.g., Gary Schwartz and Mitch Krucoff), methodology (e.g., Mikel Aickin and Charlotte Paterson), systematic reviews (e.g., Edzard Ernst, Klaus Linde, and Max Pittler), phytotherapy (e.g., Heather Boon), spirituality and mind-body medicine (e.g., John Astin and Arndt Büssing), placebo research (Ted Kaptchuk), surveys, and nutrition research (David Eisenberg).

It could be helpful to use this database to gauge the “scientific impact” of CAM and CAM researchers against those who would publicly denounce CAM research as unscientific. Anyone can download the original table and search for the names of these people. The prominent skeptics often don’t even show up among the 100,000 most important researchers and, if they do, they are perhaps less prominent than they would like others to believe. Daniel Dennett, for example, prominent skeptic and self-declared solver of the mystery of consciousness, ranks 73,779th. Richard Dawkins does not even appear in the Table. Of the 12 members on the scientific board of the association of German skeptics frequently called upon by the press to issue statements regarding the scientific viability of CAM treatments and other supposedly unscientific areas, only 3 appear in the table. This will surely not change the public discourse as this is more about politics than about data and evidence, but it may help to keep it centered.

Now, what does this actually mean? It is worthwhile to remind ourselves that science is, first and foremost, a so-

cial enterprise [3–6]. Sure, it involves trying to discover facts about the real world and it does this with a methodology that helps avoid errors and pitfalls. But science cannot be conceived without its social dimension, and the way scientific information is used is the outward reflection of this. After all, which papers are cited? Those that others find useful. Those that can help move thinking and research forward. And those that make a new and unique contribution to a particular scientific field, usually, at least.

Another thought: performing CAM research was an uphill battle for those who started it. The funding streams are far scarcer and narrower than for conventional research. It was difficult, initially, to publish CAM research in mainstream journals, and it took a while for dedicated journals such as *Complementary Medicine Research*, one of the oldest in the field, to be established. It is a success worth celebrating that CAM research has not stayed in the niche of the small community citing its own findings, otherwise the researchers in this field would have never made it to rank within the 100,000 most frequently cited worldwide. For most of the time, our research findings have not been to the liking of the mainstream community, and they are somewhat begrudgingly accepted and published. Some of the authors who fed into the mainstream narrative of CAM being useless and ineffective were of course welcomed more warmly and quoted more widely, but, by and large, this is not the reason for the success of CAM research.

Some of these researchers have been active for 20 years or more. We show here, in Table 1, that CAM has indeed become mainstream, and it would be unscientific to deny or overlook this fact. It would be wise for everyone claiming that CAM research is unscientific to first take a potentially sobering look into this database to gauge their own standing before they speak on behalf of a community who has possibly not even taken much notice of their own research so far.

References

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