THE HISTORY OF OPTOMETRY JOURNALS FROM A BIBLIOMETRIC PERSPECTIVE

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ABSTRACT

The rich history of optometric journal publications has been well documented, but the scientific impact of all optometry journals over all time has not been published. This work aims to determine the most impactful papers, authors, institutions and countries publishing in optometry journals. A h-index for "optometry journal publications" (the "h_{OJP}-index") was derived for each constituent of each category to serve as a measure of impact. The h_{OJP}-index for the 34,565 papers published in all optometry journals is 136; these papers have been cited 294,239 times. Optometry and Vision Science is the most impactful and prolific journal (h_{OJP}=118; n=13,095 papers). The most highly cited paper, by Richard Armstrong, is entitled "When to use the Bonferroni correction" (1,172 citations). Australian optometrist Nathan Efron is the most impactful and prolific author (h_{OJP}=41; n=273). UNSW Sydney and the University of California, Berkeley are the most impactful institutions (both h_{OJP}=58), and UNSW Sydney is the most prolific (n=963). The most impactful and prolific nation is the United States (h_{OJP}=109; n=12,050). This quantitative bibliometric analysis demonstrates an impactful optometric research base enshrined in optometry journals.

KEYWORDS

Optometry, Journals, Impact factor, h-index, Publications

INTRODUCTION

Optometry journals have been in existence for more than a century,[1] in parallel with numerous ophthalmology and (non-optometric) vision science journals. The United States has an especially rich history of optometric periodicals and journals, which has been recounted by Goss.[2-4] In these historical accounts, Goss described the organizational development of optometry journals, associated timelines, and key figures involved in instigating and editing these journals.[2-4] We wish to build upon the foundations laid down by Goss by undertaking a bibliometric analysis of the impact of all optometry journals published world-wide, throughout their entire history.

A number of citation databases are available for searching and analyzing the peer-reviewed literature, including Scopus, Web of Science, Microsoft Academic and Google Scholar. Sophisticated analytical tools are also available for more detailed analyses.[5] Using these databases and tools, the most highly cited papers in the field can be identified, as well as the impact of the most prominent journals, authors, institutions and countries involved in the publication of articles. Impact can be evaluated by calculating the h-index[6]–a single metric that combines productivity (number of papers) and quality (number of citations). The h-index of an author is defined as the maximum value of h, whereby an author has published h papers that have each been cited at least h times.[6]

In recent years, editors of prominent optometry journals have written editorials about the citation performance of their own journals[7-10] and have facilitated publication in their journals of numerous bibliometric analyses of vision science sub-disciplines,[11-13] as well as national[14-16] and international[17,18] rankings of academic optometrists. Notwithstanding these informative works, a global bibliometric analysis of all optometry journals throughout the entire history of their production has not been published.

The aim of this paper is to use the Scopus bibliometric database and search tools to (a) identify all optometry journals; and (b) determine the overall volume and impact of papers published in optometry journals, the most impactful papers published therein, as well as the most impactful journals, authors, institutions

and countries. In his way, it will be possible to extend beyond previous accounts of the historical and organizational history of optometry journal publication[2-4] and to evaluate the academic impact of optometry journals by quantifying their contribution to the advancement of vision science and eye care over more than a century.

SEARCH PROTOCOL

The initial challenge in this work was to identify all optometry journals on the Scopus database (Elsevier). This database was chosen for expedience, in that all four authors of this paper had ready access to Scopus. Although the various bibliometric databases available today would yield slightly different metrics, the broad picture being constructed here is unlikely to be affected by choice of database.

A preliminary search of the Scopus database was undertaken to identify journals with 'optometry,' 'optometric' or 'optometrist' in the title. This search revealed 33 journal names. A supplementary search was conducted to identify names of optometry journals that might not include the stem 'optom' in the title but are principally organized by the optometry profession or a primarily optometric organization. This was achieved by extensively cross-checking against on-line listings of optometry journals (such as the Index of NLM Serial Titles[19]), and catalogues of libraries in universities housing optometry schools, and in optometric institutions or associations.

Three additional journal titles lacking the title stem 'optom' were found: Ophthalmic and Physiological Optics, the journal of the British College of Optometrists; Contact Lens & Anterior Eye, the journal of the British Contact Lens Association, of which most members are optometrists and all editors have been optometrists; and Hindsight, a journal concerned with the history of optometry, published under the auspices of the American Optometric Association. These three journals were found to be included in the Scopus database.

Thus, a total of 36 optometry-related journals were identified on Scopus; however, many of these journal names were found to be previous names of a given journal, so such names were combined, resulting in 18 unique journal names (Table 1).

A search term was derived to further interrogate the Scopus database and was used to find all papers that were published in these 18 journals in English through September 13, 2022. This search term used journal International Standard Serial Numbers (ISSN) or source titles. The search term was refined through several iterations to exclude irrelevant titles, resulting in the following equation being derived:

(ISSN(1040-5488) OR ISSN(0275-5408) OR ISSN(0816-4622) OR (0003-0244) OR ISSN(0817-881x) OR ISSN(1888-4296) OR ISSN(1705-4850) OR ISSN(1050-6918) OR ISSN(1529-1839) OR ISSN(0141-7037) OR ISSN(1444-0938) OR ISSN(0093-7002) OR ISSN(13670484) OR ISSN(0007-1218)) OR SRCTITLE(optomet*) OR SRCTITLE(Hindsight Saint Louis MO) OR SRCTITLE(International Contact Lens Clinic) AND (EXCLUDE (SRCTYPE, "b") OR EXCLUDE (SRCTYPE, "Undefined")) AND (EXCLUDE (DOCTYPE, "ch") OR EXCLUDE (DOCTYPE, "bk")) AND (LIMIT-TO (LANGUAGE, "English")) AND (EXCLUDE (EXACTSRCTITLE, "Journal Of Geotechnical And Geoenvironmental Engineering"))

ASSESSING IMPACT

An h-index for "optometry journal publications" (the "h_{OJP}-index") was derived to serve as a measure of the impact of the search result across journals, authors, institutions and countries. This technique has been used extensively by the current authors.[20-23] In brief, the h_{OJP}-index of a given author was determined by sorting the optometry journal papers published by that author by rank order of citations (from highest to lowest) and working down the list, starting with the paper that had the highest number of citations, to determine the first paper with a paper rank number that was larger than its number of citations. The h_{OJP}-index for that author was identified as the number of the entry above the identified paper. This was repeated for each of the 50 most prolific authors; from this list, the top 20 were then identified and ranked in order of h_{OJP}-index. A similar approach was applied to identify the most impactful optometry journals, institutions and countries.

The 18 optometry journals have published a total of 34,565 papers which have been cited 294,239 times. The combined h_{OJP}-index of this body of work is 136. A total of 46.4% of these papers received no citations. The time course of publications of these papers–from the first papers included in the Scopus database published in 1920 up until September 13, 2022–is shown in Figure 1. It is evident from this graph that there has been a gradual increase in the output of papers published in optometry journals to around 600 papers per year at the present time.

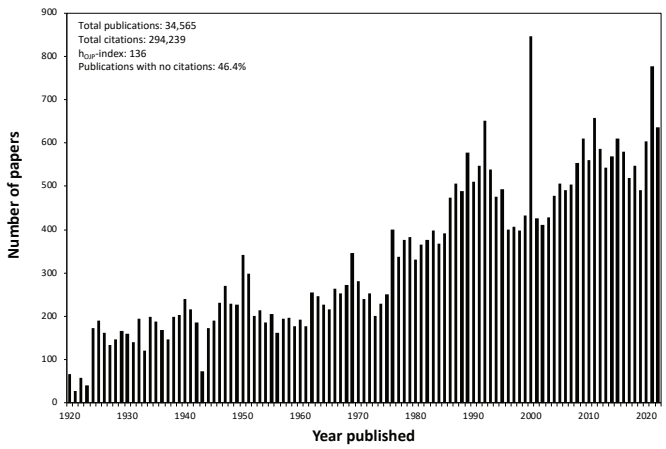

FIGURE 1. Number of papers published in optometry journals each year between 1920 and 2022.

Year 2000 is an anomaly, with well over 300 more papers than the immediately preceding or subsequent years. This is because, in that year (but no other year), a large number of meeting abstracts (422) from the journal Optometry and Vision Science were inexplicably included in the Scopus database. Since these abstracts are technically part of an issue of that journal, and are citable, they have been retained in the search output.

The increase in number of papers published in optometry journals over the past century is commensurate with the growing recognition of optometry; expansion of the scope of practice of optometry; the increase in the number of optometry schools world-wide; and broadening of the scientific base of optometry, fueled by general and targeted funding for vision science from

government agencies, universities, optometry organizations, philanthropic entities and the ophthalmic and pharmaceutical industries. Currently, approximately two refereed scientific papers per day are published in optometry journals, as can be seen from Figure 1.

Impactful Journals According to h_{OJP}-index

The 18 optometry journals in the Scopus database are listed in Table 1 in rank order of h_{OJP}-index, which ranges from 118 to 0. The most impactful journal is Optometry and Vision Science (h_{OJP}=118), separated by a large gap from second-ranked Ophthalmic and Physiological Optics (h_{OJP}=87).

The top 6 journals listed in Table 1 have h_{OJP}-indices ranging from 118 to 32. By contrast, those journals ranked 7 to 18 have relatively low h_{OJP}-indices, ranging from 15 to 0, and have thus contributed little to the collective impact of optometry journals. There are indeed many other journals that have not been included in the Scopus database; for example, in 1984 the National Institutes of Health (NIH) published a list of 61 optometry journal titles.[19] However, it appears that many of these, such as Rocky Mountain Optometrist, were local magazines that published news items, commentaries and anecdotal clinical material which has never been cited. As well, some clinical optometry journals such as Journal of Optometric Education, Optometry & Vision Development, and Optometry & Visual Performance have not been included in the Scopus database (possible reasons for this are discussed below). As can be seen from Table 1, the vast majority of papers published in optometry journals included in the Scopus database (95%) have been published in the top six most impactful journals.

The total number of papers published in a given journal included in the Scopus database ranges from 12,673 in Optometry and Vision Science to one in the Southern Journal of Optometry. The years of publication included in the Scopus database for most journals does not cover all years of publication. One rational reason for this is that Scopus applies a set of exacting criteria for including journals and papers in its database,[24] and in many cases, journals have apparently been judged as not meeting criteria for inclusion in the formative years of publication. Similarly, existing journals on the database that have subsequently failed to meet these criteria have ceased to be included. In some cases, brief runs of lesser-known journals have been included for unknown reasons.

Impactful Journals According to 'Journal Impact Factor'

The optometry journals listed in Table 1 essentially represent a ranking that relates to the span of years of publication of optometry journals that are included in Scopus. A popular current measure of the extent to which journals are cited is the 'journal impact factor,' which indicates the extent to which papers in a given journal have been cited over the previous two years.

Strict standards are applied by Clarivate Analytics for inclusion of journals that comprise the Journal Citation Reports.[25] Only five optometry journals have been included in the Journal Citation Reports, which are the first five listed in Table 1. At the time of writing, the 2021 Journal Citation Reports, which were published in 2022, are the most recent. The optometry journal with the highest impact factor is Ophthalmic and Physiological Optics (impact factor=3.992). This title must be therefore considered as the most impactful optometry journal at the present time, whereas according to the current analysis, Optometry and Vision

Table 1. Optometry journals found in the Scopus database, ranked by journal h_{OJP}-index.

Rank	Journal	Year Range†	Professional Publisher	Production Publisher	h_{OJP}-index	# of Papers	Impact Factor‡
1	Optometry and Vision Science§	1924-2022	American Academy of Optometry	Lippincott Williams & Wilkins	118	13,095	2.106
2	Ophthalmic and Physiological Optics¶	1950-2022	College of Optometrists	Wiley	87	3,769	3.992
3	Clinical and Experimental Optometry††	1920-2022	Optometry Australia	Taylor & Francis	63	7,742	3.143
4	Contact Lens & Anterior Eye‡‡	1978-2022	British Contact Lens Association	Elsevier	58	2,615	3.946
5	Optometry§§	1949-2012	American Optometric Association	American Optometric Association	55	5,039	0.833
6	Journal of Optometry	2008-2022	Spanish General Council of Optometry	Elsevier	32	538	NR
7	Clinical Optometry	2014-2022	None	Dove Medical Press	15	170	NR
8	Optometry Clinics	1991-1996	Prentice Society	Appleton And Lange	11	178	NR
9	Optometric Weekly	1945-1964	None	Professional Press	4	323	NR
10	Advances in Ophthalmology & Optometry	2016-2022	None	Elsevier	4	178	NR
11	Clinical and Refractive Optometry	2003-2016	None	VuePoint IDS Inc	3	421	NR
12	Practical Optometry	1999-2003	None	Mediaconcept, Inc	3	159	NR
13	Optical Journal and Review of Optometry	1946-1951	None	Optical Publishing Company	2	222	NR
14	Hindsight	1997-2016	Optometric Historical Society	American Optometric Association	2	79	NR
15	Archives of the Americana Society of Ophthalmology and Optometry	1972-1984	Americana Society of Ophthalmology and Optometry	Americana Society of Ophthalmology and Optometry	2	27	NR
16	Columbia Optometrist	1945-1948	Columbia Optometry Student Association	Columbia Optometry Student Association	0	7	NR
17	Florida Optometrist	1947-1947	Florida Optometric Association	Florida Optometric Association	0	2	NR
18	Southern Journal of Optometry	1962-1962	Southern Council of Optometrists	Southern Council of Optometrists	0	1	NR
					Total	34,565	

†Range of years of papers for each journal included in the Scopus database, which in many instances is less than the full year range for the journal.
‡Calculated for year 2021, except for the journal 'Optometry', which is calculated for year 2012 (final year of publication).
§Includes Northwest Journal of Optometry; American Journal of Optometry and Physiological Optics; American Journal of Optometry and Archives of American Academy of Optometry.
¶Includes British Journal of Physiological Optics.
††Includes Australasian Journal of Optometry; Australian Journal of Optometry.
‡‡Includes Journal of the British Contact Lens Association; International Contact Lens Clinic.
§§Includes Journal of the American Optometric Association.
NR = not ranked.

Science (h_{OJP}=118) must be considered the most impactful optometry journal of all time.

Although the journal Optometry is ranked #5, its last assigned impact factor was 0.833 (for year 2012), which is considerably lower than the journals ranked #1 to #4 by h_{OJP}-index in Table 1. Optometry ceased publication in 2012, with the then-president of the American Optometric Association (publisher of Optometry) citing "... the realities of publishing costs and financial priorities" as a major reason for its discontinuance.[26] The low impact factor of this journal clearly indicated that it was struggling to attract impactful papers at the time of its demise.

The #6-ranked Journal of Optometry does not have an assigned impact factor; however, the editor of this journal has announced that it will have its first impact factor assigned in 2023.[27] Journal of Optometry is a relatively recent optometry journal, having only commenced publication in 2008. It takes time to acquire an impact factor through Clarivate, which explains why this journal has not previously had an impact factor. Nevertheless, it is impressive that Journal of Optometry has attained a strong h_{OJP}-index in only 15 years, with much fewer published papers (538) compared to the five higher-ranked and more long-standing optometry journals (12,673 to 2,615 papers).

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Table 2. Most highly cited papers published in optometry journals.

Rank	Title	First Author	Journal	Year, Volume and Pages	Citations
1	When to use the Bonferroni correction?	Richard Armstrong	Ophthalmic and Physiological Optics	2014 34; 502-8	1,172
2	New design principles for visual acuity letter charts	Ian Bailey	Optometry and Vision Science	1976 53; 740-45	1,146
3	Power vectors: An application of Fourier analysis to the description and statistical analysis of refractive error	Larry Thibos	Optometry and Vision Science	1997 74; 367-75	851
4	The Freiburg Visual Acuity Test – Automatic measurement of visual acuity	Michael Bach	Optometry and Vision Science	1996 73; 49-53	700
5	Myopia and associated pathological complications	Seang Saw	Ophthalmic and Physiological Optics	2005 25; 381-97	676
6	Worldwide prevalence and risk factors for myopia	Chenwei Pan	Ophthalmic and Physiological Optics	2012 32; 3-16	529
7	Double-masked, placebo-controlled, randomized trial of lutein and antioxidant supplementation in the intervention of atrophic age-related macular degeneration: The Veterans LAST study (Lutein Antioxidant Supplementation Trial)	Stuart Richer	Optometry	2004 75; 216-29	475
8	Keratoconus: A review	Miguel Jimenez-Romero	Contact Lens & Anterior Eye	2010 33; 157-66	421
9	Importance of the lipid layer in human tear film stability and evaporation	Jennifer Craig	Optometry and Vision Science	1997 74; 8-13	397
10	The useful field of view test: a new technique evaluating age-related declines in visual function	Cynthia Owsley	Journal of the American Optometric Association	1993 64; 71-9	387
11	Epidemiologic study of ocular refraction among schoolchildren in Taiwan in 1995	Luke Lin	Optometry and Vision Science	1999 76: 275-81	375
12	The impact of contact angle on the biocompatibility of biomaterials	Kara Menzies	Optometry and Vision Science	2010 87: 387-99	356
13	Visual requirements for reading	Stephen Whittaker	Optometry and Vision Science	1993 70: 54-65	323
14	Computer vision syndrome: A review of ocular causes and potential treatments	Mark Rosenfield	Ophthalmic and Physiological Optics	2011 31; 5-2-15	313
15	Statistical methods for conducting agreement (comparison of clinical tests) and precision (repeatability or reproducibility) studies in optometry and ophthalmology	Colm McAlinden	Ophthalmic and Physiological Optics	2011 31; 330-8	298
16	Does education explain ethnic differences in myopia prevalence? A population-based study of young adult males in Singapore	Hui-Min Wu	Optometry and Vision Science	2001 78; 234-9	290
17	Repeatability and reproducibility of central corneal thickness measurement with Pentacam, Orbscan, and ultrasound	Birgit Lackner	Optometry and Vision Science	2005 82; 892-9	289
18	Occurrence of oculomotor dysfunctions in acquired brain injury: A retrospective analysis	Kenneth Ciufreda	Optometry	2007 78; 155-61	283
19	Psychophysics of reading. VIII. The Minnesota low- vision reading test	Gordon Legge	Optometry and Vision Science	1989 66; 843-53	282
20	Active emmetropization - Evidence for its existence and ramifications for clinical practice	Christine Wildsoet	Ophthalmic and Physiological Optics	1997 17; 279-90	281

Highly Cited Papers

The top 20 most cited papers published in optometry journals are shown in Table 2. These papers have been cited between 1,172 and 281 times. The subject matter of the 20 most cited optometry papers can be broadly categorized as follows: refractive error–six papers; measuring vision function–four; anterior eye–three; statistics–two; and one each on age-related macular degeneration, contact lenses, computer vision, oculomotor dysfunction and psychophysics of reading. Refractive error and measurement of visual function are core activities of clinical optometry, which is consistent with papers relating to such topics representing half of the top 20 papers in Table 2.

The #1 ranked paper by Armstrong (1,172 citations) concerns an important aspect of statistical analysis although it does not specifically relate to optometric science. The paper is entitled "When to use the Bonferroni correction." If multiple hypotheses are tested, the probability of observing a rare event increases; therefore, the likelihood of incorrectly rejecting a null hypothesis (i.e., making a Type I error) increases. The Bonferroni correction counteracts this problem, and Armstrong explains when to apply this correction.

The Armstrong paper addresses an important issue that arises extensively not only in optometric research, but any other hypothesis-driven research; hence the broad popularity of this paper, as indicated by the high citation rate. To illustrate the general appeal of this work, further sub-analysis within Scopus revealed that the paper by Armstrong has been cited by papers from 27 disciplines. The 10 fields citing this paper the most were: medicine (28.3% of all citations), psychology (7.9%), social sciences (7.2%), biochemistry, genetics and molecular biology (7.2%), neuroscience (6.3%), computer science (5.6%), agricultural and biological sciences (5.5%), engineering (4.8%), health professions (4.0%) and environmental science (3.2%).

The #2-ranked paper by Bailey and Lovie (1,146 citations) describes the novel logMAR chart, which heralded a revolution in the clinical measurement of visual acuity, especially in those with low vision. Further sub-analysis within Scopus revealed that this work also has been cited by papers from 27 disciplines. The 10 fields citing this paper the most were: medicine (49.6% of all citations), health professions (16.7%), neuroscience (15.8%), engineering (3.4%), biochemistry, genetics and molecular biology (2.4%), psychology (2.1%), computer science (2.0%), multidisciplinary (1.2%), physics and astronomy (1.2%) and social sciences (1.2%). That the top three fields–which are all health related–comprise 82.1% of all citations to the Bailey-Lovie paper, compared with the Armstrong paper for which the top three papers comprise 43.4% of citations, points to the more specific appeal of the Bailey-Lovie vision assessment paper to the health professions, versus the broader scientific appeal of the Armstrong statistical paper.

It is interesting to observe that while the Bailey-Lovie paper has been cited 1,146 times, the first use of a logMAR chart in a major study was the 'Photocoagulation for Diabetic Macular Edema: Early Treatment Diabetic Retinopathy Study Report Number 1,,'[28] published in 1985; this paper has attracted 2,524 citations. It seems that when authors wish to refer to the logMAR chart, they prefer to cite the more impactful ophthalmology journal (Archives of Ophthalmology) than the lower impact optometry journal (Optometry and Vision Science).

Of the 20 most cited papers, 10 have been published in Optometry and Vision Science; six in Ophthalmic and Physiological Optics; three in Optometry and its predecessor name, Journal of the American Optometric Association; and one in Contact Lens & Anterior Eye.

The percentage of optometry publications that have received no citations (46.1%) is high when compared to, say, the field of dry eye,[20] for which only 18.1% of the relevant literature has not been cited. One reason for the high rate of papers in optometry journals with no citations may be that many articles, especially during the earlier years of publication of optometry journals (say, up until the 1960s), were editorials or clinical reports. The field of dry eye is a more contemporary research construct, devoid of a long 'historical tail' of non-cited works. Dry eye is also a 'hot' field of research, and is more likely to attract citations than less active research areas. While uncited communications can be important and highly instructive for clinical optometrists (and therefore a necessary component of optometry journals), they typically have minimal scientific content and are thus less impactful.

Impactful Authors

The 20 most impactful authors of papers published in the optometry literature are listed in Table 3 and have h_{OJP}-indices ranging from 28 to 41. As a comparator, the 20 most impactful authors (from any discipline) of papers published in any journal (not just optometry journals) relating the field of dry eye disease[20] ranges from 25 to 56.

The most impactful author is Australian optometrist Nathan Efron (h_{OJP} = 41), followed by British optical physicist Neil Charman (h_{OJP}=38) and Canadian optometrist Lyndon Jones (h_{OJP}=36).

Total counts of papers published in optometry journals of the top 20 authors range from 111 to 273. The most prolific of the top 20 authors of papers in optometry journals are Nathan Efron (n=273 papers), David Atchison (n=168) and Brien Holden (n=164), all of whom are Australian. The top 20 authors who have published the highest percentage of their total paper output in optometry journals are optometrists Mark Rosenfield (88%), Pauline Cho (77%) and Philip Morgan (70%).

Three (15%) of the top 20 authors are female; these are optometrists Pauline Cho and Karla Zadnik (both h_{OJP}=32), and biostatistician Gladys Mitchell (h_{OJP}=31).

As an interesting aside, the top two ranked authors–Professors Efron and Charman–worked in adjacent offices at the University of Manchester from 1990 to 2005, although they never co-authored any papers.

To understand all things ophthalmic, optometric researchers have found it necessary to interact with scientists from other disciplines, often publishing jointly in optometry journals. A consequence of such cross-disciplinary collaboration is the appointment of non-optometric scientists by optometry schools. Four (20%) of the top 20 authors of papers in the optometry journals listed in Table 3 are not optometrists, being either employed by schools of optometry or working in other departments in the same universities. The scientific background of these individuals can be broadly characterized as: optical physicist–two, biostatistician–one and microbiologist–one.

The corollary of authors from other disciplines publishing in optometry journals is optometrists publishing in non-optometry journals. In this regard, it is pertinent to note that some highly impactful and prolific optometrists[17,18] are not featured in Table

3, because they seldom publish in optometry journals, so it is important to acknowledge their important contributions here. Those optometrists listed in Table 4 have h-indices ranging from 49 to 67, yet their h_{OJP}-indices range from only 0 to 14. The percentage of their total output of papers that have appeared in optometry journals ranges from 0% to 17%. The research directions of these optometrists have resulted in them primarily publishing in the journals of other disciplines, such as psychology, neurology, ophthalmology and medical epidemiology (ipso facto seldom in optometry journals).

The above scenarios of non-optometrists publishing in optometry journals and optometrists publishing in non-optometry journals represent an important 'cross-pollination' of science that enriches the optometric research landscape (as well as that of other disciplines) and is critically important to the advancement of vision science in general.

Table 3. Most impactful and prolific authors publishing in optometry journals.

Rank	Author†	Institution	Country	h_{OJP}-index	# Papers In Optometry Journals	Total Papers	% Total Papers in Optometry Journals
1	Nathan Efron	Queensland University of Technology	Australia	41	273	442	62
2	Neil Charman†	University of Manchester	United Kingdom	38	157	262	60
3	Lyndon Jones	University of Waterloo	Canada	36	163	359	45
4	Brien Holden	UNSW Sydney	Australia	35	164	346	47
5	Bernard Gilmartin	Aston University	United Kingdom	33	125	180	69
6	Pauline Cho	Hong Kong Polytechnic University	Hong Kong	32	160	207	77
7	Kenneth Ciuffreda	State University of New York	United States	32	141	308	46
8	Brian Brown	Queensland University of Technology	Australia	32	110	159	69
9	Karla Zadnik	Ohio State University	United States	32	89	221	40
10	David Atchison	Queensland University of Technology	Australia	31	168	313	54
11	James Wolffsohn	Aston University	United Kingdom	31	161	304	53
12	Mark Willcox†	UNSW Sydney	Australia	31	102	538	19
13	Gladys Mitchell†	Ohio State University	United States	31	81	135	60
14	Desmond Fonn	University of Waterloo	Canada	31	70	174	40
15	Mark Rosenfield	State University of New York	United States	29	96	109	88
16	Larry Thibos†	Indiana University	United States	29	79	224	35
17	Donald Mutti	Ohio State University	United States	29	77	170	45
18	Philip Morgan	University of Manchester	United Kingdom	28	135	194	70
19	Michael Collins	Queensland University of Technology	Australia	28	116	270	43
20	Mark Bullimore	University of Houston	United States	28	111	170	65

†Not an optometrist

Table 4. Highly impactful and prolific optometrists publishing infrequently in optometry journals.

T-200 Rank†	Author	h-index	Total Papers	h_{OJP} index	# Papers in Optometry Journals	% Total Papers in Optometry Journals
2	Robert Hess	67	459	14	35	8
3	Dennis Levi	64	349	11	26	7
7	Gerald Westheimer	58	261	10	42	16
8	Debra Schaumberg	57	139	2	3	2
10	Balwantray Chauhan	56	212	3	5	2
11	William Christen	55	168	0	0	0
13	Ralph Freeman	54	177	3	6	3
14	Christopher Owen	53	171	7	11	6
17	Alicja Rudnicka	51	179	6	6	3
21	Kelly Nichols	49	132	11	23	17

†www.optomrankings.com. Captured on September 13, 2022.

Table 5. Most impactful and prolific institutions from where papers in optometry journals were published.

Rank	Institution	Country	h_{OJP}-index	# of Papers
1	UNSW Sydney	Australia	58	963
2	University of California, Berkeley	United States	58	935
3	Queensland University of Technology	Australia	57	824
4	Ohio State University	United States	54	848
5	University of Waterloo	Canada	54	848
6	Aston University	United Kingdom	54	619
7	University of Manchester	United Kingdom	53	485
8	University of Houston	United States	51	721
9	University of Melbourne	Australia	48	808
10	State University of New York	United States	48	619
11	Indiana University	United States	47	603
12	Glasgow Caledonia University	United Kingdom	45	260
13	Hong Kong Polytechnic University	Hong Kong	44	409
14	Marshall B Ketchum University†	United States	43	511
15	Brien Holden Vision Institute‡	Australia	42	270
16	University of Bradford	United Kingdom	39	299
17	Cardiff University	United Kingdom	39	256
18	University of Auckland	New Zealand	38	285
19	University of Alabama at Birmingham	United States	37	547
20	Johns Hopkins University§	United States	34	125

†Includes Southern California College of Optometry; Los Angeles College of Optometry
‡Includes Vision Cooperative Research Centre
§Includes Wilmer Eye Hospital

Impactful Institutions

The top 20 institutions from where papers in optometry journals were published are listed in Table 5. The h_{OJP}-indices of the top 20 institutions range from 34 to 58. The top-ranking institutions are UNSW Sydney, Australia and the University of California, Berkeley, United States (both h_{OJP}=58), closely followed by the Queensland University of Technology, Australia (h_{OJP}=57).

UNSW Sydney, Australia has produced the highest number of papers in optometry journals (n=963), followed by the University of California, Berkeley, United States (n=935), with the Ohio State University, United States and University of Waterloo, Canada, ranked equal third (n=848 each).

It is not surprising that most of the top 20 institutions from which papers have been published in optometry journals house well-established schools/departments of optometry. However, one of the top 20 (5%) does not have an optometry school–Johns Hopkins University, United States (h_{OJP}= 34; n = 125 papers). Almost all of the papers generated from Johns Hopkins University are from its ophthalmology department.

The number of institutions from the various countries represented in Table 5 are: United States–eight; United Kingdom–five; Australia–four; Canada–one; Hong Kong–one and New Zealand–one.

Impactful Countries

The 10 most impactful countries are listed in Table 6. The h_{OJP}-indices of the countries listed range from 34 to 109, and the paper count from 211 to 12,050. The United States is the most impactful and prolific nation publishing papers in optometry journals (h_{OJP}=109; n=12,050).

The United States, United Kingdom, Australia and Spain are the home countries of the eight top-ranked journals listed in Table 1. Prior to the digital age (i.e., up until the late 20th century), optometrists (and indeed the majority of scientists from other disciplines) tended to be parochial in their publication behavior, preferring to submit work to their national journals. This perhaps reflected national pride, but also the path to publication was more expedient and less expensive than submitting to an overseas journal. This century, the internet has minimized time/cost barriers to publication, so national barriers no longer exist. Nevertheless, the historical preference for an author to publish in a national journal can partly explain the leading positions of the United States, United Kingdom, Australia and Spain in Table 1.

Table 6. Most impactful and prolific countries from where papers in optometry journals were published.

Rank	Country	h_{OJP}-index	# of Papers
1	United States	109	12,050
2	United Kingdom	91	3,488
3	Australia	84	3,515
4	Canada	60	1,454
5	Hong Kong	46	467
6	Spain	45	794
7	China	41	410
8	New Zealand	38	463
9	Germany	34	292
10	Netherlands	34	211

Comparisons with Ophthalmology

It is possible to place the overall metrics described in this paper in a broader context by drawing comparisons with ophthalmology. A simple search for ophthalmology journals was conducted in Scopus (also on September 13, 2022) using the crude search term: SRCTITLE(OPHTHALMOL*). An important caveat is that this search only includes ophthalmology journal titles with the stem 'ophthalmol,' therefore underestimating the total number of ophthalmology journals; nevertheless, 202 non-disambiguated journal names were found (compared to 36 non-disambiguated optometry journal names) that have produced 303,259 papers with a collective a h-index of 427. By contrast, 34,143 papers have been published in optometry journals, with a h_{OJP}-index of 136.

From this search, the top 20 articles published in ophthalmology journals were found to have been cited between 5,280 and 1,903 times, compared to between 1,172 and 281 citations for the top 20 papers in optometry journals. The higher h-index and related metrics of ophthalmology journals compared to optometry journals is consistent with the greater number of ophthalmology journals, and stronger academic ophthalmology departments–as a result of the long-standing medical foundations and broad, highly funded medical research base of ophthalmology–despite there being far fewer ophthalmologists[29] than optometrists[30] world-wide.

It is also of interest to compare impact factors of the four currently published optometry journals with those of the top four currently published ophthalmology journals and vision science journals, as an indication of their relative research excellence. As can be seen in Table 1, the impact factors of the four currently published optometry journals range from 3.992 (Ophthalmic and Physiological Optics) to 2.106 (Optometry and Vision Science). Impact factors of the top four currently published ophthalmology journals range from 19.704 (Progress in Retinal and Eye Research) to 6.197 (Survey of Ophthalmology), and impact factors of the top four currently published vision science journals range from 3.770 (Experimental Eye Research) to 1.984 (Vision Research). Thus, the range of impact factors of the top four optometry journals is slightly greater than that of vision science journals, but considerably less than that of ophthalmology journals.

CONCLUSIONS

An analysis of the collective output of all optometry journals is presented here, facilitating an appreciation of the extent and impact of papers published therein, over more than a century of optometric journal publishing.

This bibliometric analysis reveals that of the 18 optometry journals, eight are especially impactful. A total of 34,565 papers have been published in optometry journals, which have been extensively cited (294,239 times), resulting in a h_{OJP}-index of 136. The most highly cited papers in optometry journals have been identified, as well as the most impactful optometry journals, and the most impactful authors, institutions and countries publishing in optometry journals.

The world-wide optometric fraternity can be justly proud of its forefathers who had the prescience to launch optometry journals over a century ago, and equally thankful for the subsequent generations of individual optometrists and international optometric organizations that have nurtured, enhanced and expanded the portfolio of quality optometry journals, as previously described by Goss.[2-4] A strong and vibrant journal base, such as has been demonstratedin this paper to exist today, underpins the optometric profession by providing a scientific rationale for all matters clinical, thus serving to enhance the ocular well-being of humankind. Optometrists can be proud of the rich history of impactful research enshrined in the published archive of their profession.

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