

Current Comments

Journal Citation Studies. 34. The Literature of Dental Science vs. the Literature Used by Dental Researchers

Number 3

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For many years, I've stressed an important semantic and real distinction between the literature of a field and the literature used by research workers in that discipline. Perhaps the most important example of that was the study we did on the literature of agriculture.¹

In this essay, I want to examine and emphasize this distinction for the field of dentistry. By examining the citation patterns of the key dental journals, I also want to show how dental science is related to research in other fields. And in the process, I can provide you with insight as to how we select journals for *Current Contents*® (CC®) and other ISI® services.

Dentistry has been practiced at least since the sixteenth century. But it hasn't always enjoyed the status of a recognized profession. In colonial America, for example, dentistry was regarded as a craft, like shoeing horses. It was mostly limited to pulling teeth. There were no training institutions and no standards of practice. Charlatans were common.² (p. 1-4)

During the nineteenth century, dentistry steadily became more professional and scientifically rigorous. Wesley O. Young, University of Alabama School of Dentistry, explains in an historical overview³ that the now separate professions of dentistry and medicine were linked in those early years. This link stemmed from the belief that the mouth, particularly the recesses beneath dental fillings, was the point of entry for a variety of diseases from kidney disorders to mental depression. This belief steadily lost ground over the years. Finally, in

1951, a special report to the Council on Dental Health of the American Dental Association (ADA) conclusively stated: "The evidence is extremely poor in support of an etiological relationship between oral foci and joint disease, heart disease . . . renal disease, ocular disease, and skin diseases."⁴ By this time, dentistry had evolved into the autonomous profession it is today. Incidentally, dentistry is considered a medical specialty in the Soviet Union. It is practiced by stomatologists, whose area of concern includes the teeth, mouth, and throat.

In 1840, the first dental college in the world, Baltimore College of Dental Surgery, was founded by Horace H. Hayden and Chapen A. Harris. The ADA was formed in 1859, and established its journal in 1913. The 30 core journals examined in this study are listed in Table 1, along with the date that each began publication. The oldest journal in the core is the *British Dental Journal*, established in 1880.

As we've done in past journal citation studies, we treat the entire group of core dentistry journals included in the *Science Citation Index*® (SCI®) data base as a single "Macro Journal of Dentistry." In this way, we can determine which journals are frequently cited by the core dentistry journals, and which journals cite them. Data for this study were taken from the *Journal Citation Reports*® (JCR™) volume of the 1980 SCI.

I have explained on several occasions how we select journals for inclusion in our data base.⁵ In evaluating journals for coverage in CC, we rely heavily upon

Table 1: Dentistry core journals indexed by the *Science Citation Index**, including the date that each began publication.

Acta Odontologica Scandinavica—1942
American Journal of Orthodontics—1915
Angle Orthodontist—1931
Archives of Oral Biology—1959
Australian Dental Journal—1956
British Dental Journal—1880
British Journal of Oral Surgery—1963
Caries Research—1967
Cleft Palate Journal—1964
Community Dentistry and Oral Epidemiology—1973
Dental Clinics of North America—1957
International Dental Journal—1950
International Journal of Oral Surgery—1972
Journal de Biologie Buccale—1973
Journal of Clinical Periodontology—1974
Journal of Dental Research—1919
Journal of Dentistry—1972
Journal of Dentistry for Children—1933
Journal of Maxillofacial Surgery—1973
Journal of Oral Pathology—1972
Journal of Oral Rehabilitation—1974
Journal of Oral Surgery—1943
Journal of Periodontal Research—1966
Journal of Periodontology—1930
Journal of Prosthetic Dentistry—1951
Journal of Public Health Dentistry—1966
Journal of the American Dental Association—1913
Oral Surgery, Oral Medicine and Oral Pathology—1948
Scandinavian Journal of Dental Research—1893
Swedish Dental Journal—1979
(Formerly Odontologisk Revy—1908)

citation data. Journals that are frequently cited and/or journals with the greatest impact are given the highest priority. In the case of new journals where citation analysis is not feasible, we rely upon many subjective factors, including recommendations by our editorial advisory board. Suggestions can come from any source, but we are particularly responsive to requests from researchers in the field.

As in so many other fields, there are a large number of low-impact dentistry journals. However, it's safe to say that we cover all the major journals of dentistry and much more. It should be emphasized, however, that much of the important literature used by dental research workers appears in the non-dental journals.

Together, the core journals published 2,401 articles in 1980. This represents .5 percent of the 495,000 articles included in the 1980 *JCR*. The total number of source items in *SCI* in 1980 was about 520,000. But *JCR* omits such *SCI* items as abstracts, letters, and editorials.

The 1980 *JCR* included about 7,000,000 references. Of these, 42,488, or .6 percent, were contained as references in articles published in core dentistry journals—an average of 17 references per article. This is higher than the 14.5 preferences contained in the average *JCR* source item, but much lower than other categories in the life sciences. Biochemistry articles average 23.4 references.⁶

Articles published in the core dentistry journals received 25,689 citations from all journals in 1980. This is about .5 percent of the 5,000,000 citations received by all *JCR* journals. The ten most-cited dental journals account for 74 percent of all citations to the dental core. They are: *Journal of Dental Research*; *Archives of Oral Biology*; *Oral Surgery, Oral Medicine and Oral Pathology*; *Journal of Periodontology*; *Journal of the American Dental Association*; *Journal of Prosthetic Dentistry*; *British Dental Journal*; *Journal of Oral Surgery*; *American Journal of Orthodontics*; and *Journal of Periodontal Research*. These same journals published 64 percent of the articles in the core group.

Table 2 lists the journals most frequently cited by the core dentistry journals. They are ranked according to the number of citations they received from the dentistry core in 1980. The table also shows how often each journal was cited by all *SCI* journals. Self-citation and impact data are also included. The impact tells you how often the average article published in 1978-1979 was cited in 1980.

The most frequently cited of the core journals is the *Journal of Dental Research*. Furthermore, only 16 percent of the 4,101 citations it received were

Table 2: Journals most-cited by dentistry core journals. A = citations received from all journals. B = citations received from dentistry journals. C = self-citations. D = % of total citations which are dentistry citations (B/A). E = % of total citations which are self-citations (self-cited rate, C/A). F = % of dental citations which are self-citations (C/B). G = impact factor. Asterisks in the list below indicate core dentistry journals.

	A	B	C	D	E	F	G
*J. Dent. Res.	4101	2693	642	.657	.156	.238	1.51
*J. Periodontol.	1901	1730	540	.910	.284	.312	1.18
*Oral Surg. Oral Med. Oral Pathol.	2457	1722	537	.701	.218	.312	.52
*Arch. Oral Biol.	2729	1517	335	.556	.123	.221	.96
*J. Amer. Dent. Ass.	1850	1496	270	.809	.146	.180	.77
*J. Prosthet. Dent.	1446	1348	752	.932	.520	.558	.57
*Brit. Dent. J.	1333	1094	231	.821	.173	.211	.78
*Amer. J. Orthodont.	1020	886	466	.869	.457	.526	.67
*J. Oral Surg.	1102	816	312	.740	.283	.382	.42
*J. Period. Res.	928	749	213	.807	.229	.284	1.74
*Acta Odontol. Scand.	888	713	59	.803	.066	.083	.81
*Caries Res.	791	568	152	.718	.192	.268	1.79
*Scand. J. Dent. Res.	641	501	100	.782	.156	.200	.90
*J. Clin. Periodontol.	424	397	164	.936	.387	.413	2.06
*Angle Orthodont.	461	392	118	.850	.256	.301	.32
*J. Dent. Child.	313	258	54	.824	.172	.209	.30
Cancer	24,252	239	—	.010	—	—	2.96
Plast. Reconstr. Surg.	3028	238	—	.079	—	—	1.10
*Odontol. Revy (Swed. Dent. J.)	296	222	—	.750	—	—	—
*Int. Dent. J.	263	220	40	.837	.153	.182	.52
J. Biol. Chem.	113,670	213	—	.002	—	—	5.71
*J. Oral Rehabil.	233	206	63	.884	.270	.306	.90
Infec. Immunity	9864	204	—	.021	—	—	2.66
Lancet	51,436	203	—	.004	—	—	8.69
*Aust. Dent. J.	245	201	33	.820	.135	.164	.19
*Dent. Clin. N. Amer.	209	197	31	.942	.148	.157	.10
Calcified Tissue Int.	1741	195	—	.112	—	—	1.40
*Community Dent. Oral Epidemiol.	198	188	59	.949	.298	.314	.50
N. Engl. J. Med.	45,790	180	—	.004	—	—	14.21
Science	62,929	175	—	.003	—	—	5.70
*Brit. J. Oral Surg.	241	169	35	.701	.145	.207	.53
Nature	92,968	169	—	.002	—	—	6.49
J. Cell Biol.	27,378	168	—	.006	—	—	9.74
J. Amer. Med. Assn.	21,480	159	—	.007	—	—	2.43
*Int. J. Oral Surg.	197	157	58	.797	.294	.369	.21
Helv. Odontol. Acta	—	139	—	—	—	—	—
*J. Oral Pathol.	226	131	33	.580	.146	.252	.68
Periodontics	—	125	—	—	—	—	—
Biochim. Biophys. Acta	67,641	124	—	.002	—	—	2.86
Anat. Rec.	5871	122	—	.080	—	—	3.31
*Cleft Palate J.	362	120	92	.331	.254	.767	.68
Deut. Zahnärztl. Z.	—	118	—	—	—	—	—
Amer. J. Phys. Anthropol.	1528	112	—	.073	—	—	1.05
*J. Public Health Dent.	132	111	38	.841	.288	.342	.46
Dent. Pract.	—	110	—	—	—	—	—
*J. Dent.	125	109	35	.872	.28	.321	.30
Proc. Soc. Exp. Biol. Med.	15,414	107	—	.007	—	—	1.35
J. Bacteriol.	20,812	104	—	.005	—	—	2.60
J. Biomed. Mater. Res.	790	102	—	.129	—	—	.87
Brit. Med. J.	27,126	101	—	.004	—	—	2.97
J. Can. Dent. Assn.	—	101	—	—	—	—	—

self-citations. This is quite low for a specialty journal, but seems to be characteristic of dentistry journals. However, 28 percent of the citations to the *Journal of Periodontology* were self-citations. And the self-citation rate for the *American Journal of Orthodontics* was 46 percent.

The *Journal of Dental Research* received 2,693 citations from the dental core, more than any other journal. This is about 66 percent of its total citations. But it is not unusual for dentistry journals to receive more than 80 percent of their citations from core journals. In fact, five journals in Table 2 received more than 90 percent of their citations from core journals. The use and impact of this journal outside the dental literature is significant.

The dental journal with the highest impact factor is the *Journal of Clinical Periodontology*—2.06. *Caries Research* had an impact of 1.79, while the *Journal of Periodontal Research* had an impact of 1.74. The average impact for all *SCI* journals was 1.22 in 1980. We have recently begun considering the question of whether our impact criteria correspond to the peak period for citations in certain fields. In mathematics, for example, higher 1980 impact factors might be found by using 1977–1978 as the base years, instead of 1978–1979. Applying this notion to dentistry journals yields some interesting results. The impact for the *Journal of Clinical Periodontology* increases slightly to 2.10. But the *Archives of Oral Biology* achieves a substantial increase—1.35, compared to its “normal” impact of .96. Not all dentistry journals would gain by changing the base years for calculating impact. The *Journal of Dental Research* would actually decrease from 1.51 to 1.44. How to best calculate impact for different fields is a subject for future discussion.⁷

The non-dentistry journal that received the greatest percentage of its citations from the dentistry core is *Journal of Biomedical Materials Research*. Thirteen percent of that journal's citations

were from the dentistry core. *Calcified Tissue International* received 11 percent. The non-dentistry journal most cited in terms of absolute numbers by the dentistry core is *Cancer*, which received 239 citations in 1980.

Table 3 lists the 50 journals that most frequently cited the dentistry core. The *Journal of Prosthetic Dentistry* tops the list, giving more citations to the dental core than any other journal. However, the *Journal of Clinical Periodontology* gave the greatest percentage of citations, 74 percent, to the core literature.

Of the top 30 journals citing the dental core, 28 are themselves dental journals. *Infection and Immunity* cited the dental core 409 times, more than any other non-dental journal. This figure, however, represents only three percent of the citations it gave to all journals in 1980. The *Journal of Biomedical Materials Research*, on the other hand, gave about nine percent of its citations to the dental core.

The *British Dental Journal* had the highest immediacy index, .395, of any core journal. The immediacy index shows how often the average article was cited during the same year it was published. Second was *Journal de Biologie Buccale*, .321, followed by *Acta Odontologica Scandinavica* with .311. To provide a sense of scale, the average immediacy index for all journals in the 1980 *JCR* was .261.

The data show that the core journals cite non-dental journals more than these journals cite them. But Irving Shapiro, University of Pennsylvania School of Dental Medicine, confirms that many dental researchers publish their results in non-dental journals. “Much research in dentistry,” says Shapiro, “is simply basic biomedical research. So my colleagues who work on *Streptococcus mutans*, an important organism associated with dental caries, publish much of their work in *Infection and Immunity*, or other biochemistry journals. It's been a long time since I published in a dental journal.”⁸ Shapiro is involved in bone research and he publishes his

Table 3: The 50 journals which most frequently cited core dentistry journals. A = citations to all journals. B = citations to dentistry journals. C = self-citations. D = % of total citations which are citations to dentistry core journals (B/A). E = % of total citations which are self-citations (self-citing rate, C/A). F = % of dental citations which are self-citations. G = impact factor. H = immediacy index. I = number of articles published in 1980. Asterisks in the list below indicate core dentistry journals.

	A	B	C	D	E	F	G	H	I
*J. Prosthet. Dent.	3056	1845	752	.604	.246	.408	.57	.037	241
*J. Dent. Res.	3961	1577	642	.398	.162	.407	1.51	.106	255
*J. Periodontol.	2274	1238	540	.544	.237	.436	1.18	.096	104
*Oral Surg. Oral Med. Oral Pathol.	3214	1160	537	.361	.167	.463	.52	.095	222
*Amer. J. Orthodont.	1984	1059	466	.534	.235	.440	.63	.120	92
*J. Amer. Dent. Ass.	2210	964	270	.436	.122	.280	.77	.268	149
*J. Clin. Periodontol.	1238	919	164	.742	.132	.178	2.06	.292	48
*Arch. Oral Biol.	2691	881	335	.327	.124	.380	.96	.069	131
*J. Oral Surg.	2155	826	312	.383	.145	.378	.42	.068	147
*J. Period. Res.	1669	773	213	.463	.128	.276	1.74	.145	69
*Brit. Dent. J.	1412	641	231	.454	.163	.360	.78	.395	114
*Caries Res.	1860	592	152	.318	.143	.257	1.79	.211	57
*Scand. J. Dent. Res.	1262	582	100	.461	.079	.472	.90	.147	68
*Dent. Clin. N. Amer.	865	555	31	.642	.036	.056	.10	.113	53
*Int. Dent. J.	990	552	40	.558	.040	.072	.52	.032	31
*Community Dent. Oral Epidemiol.	1170	546	59	.467	.050	.108	.50	.068	59
*J. Dent.	746	533	35	.714	.047	.066	.30	.029	34
*J. Oral Rehabil.	828	452	63	.543	.076	.139	.90	.164	55
*Acta Odontol. Scand.	973	424	69	.436	.061	.139	.81	.311	45
Infect. Immunity	15,687	409	—	.026	—	—	2.66	.333	627
*Int. J. Oral Surg.	1059	359	58	.339	.055	.162	.21	.038	52
*Angle Orthodont.	568	326	118	.574	.208	.362	.32	.086	35
*J. Oral Pathol.	1014	314	33	.310	.032	.105	.68	.091	33
*J. Biol. Buccale	753	291	18	.386	.024	.062	.83	.321	28
*J. Dent. Child.	626	285	54	.455	.086	.189	.30	.023	43
*Aust. Dent. J.	727	275	33	.378	.045	.120	.19	.184	49
*Brit. J. Oral Surg.	710	269	35	.379	.049	.130	.33	.041	49
Microbiol. Rev.	5669	242	—	.043	—	—	9.02	.931	23
*J. Public Health Dent.	652	183	38	.281	.058	.208	.46	.273	22
*J. Maxillofac. Surg.	791	179	29	.226	.037	.162	.36	.041	49
Amer. J. Phys. Anthropol.	3366	174	—	.052	—	—	1.05	.219	114
*Swed. Dent. J.	372	150	7	.403	.019	.047	—	—	27
*Cleft Palate J.	658	145	92	.220	.140	.634	.68	.050	40
Calcified Tissue Int.	2409	113	—	.047	—	—	1.40	.152	92
J. Biomed. Mater. Res.	1254	108	—	.086	—	—	.87	.174	69
Pathol. Res. Pract.	4290	108	—	.025	—	—	.58	.096	135
J. Roy. Soc. Med.	3025	84	—	.028	—	—	.62	.344	154
Plast. Reconstr. Surg.	3014	82	—	.027	—	—	1.10	.138	247
Cancer	22,306	73	—	.003	—	—	2.96	.284	944
Anat. Rec.	3521	66	—	.019	—	—	3.31	.388	98
J. Anat.	3317	66	—	.020	—	—	1.30	.198	126
J. Hum. Evol.	1630	65	—	.040	—	—	.40	.039	51
Union Med. Can.	3108	62	—	.019	—	—	.11	.326	276
Immunology	6959	59	—	.008	—	—	2.36	.113	257
Laryngoscope	4157	59	—	.014	—	—	.73	.113	29
J. Histochem. Cytochem.	5578	51	—	.009	—	—	2.55	.597	176
J. Clin. Microbiol.	5313	50	—	.009	—	—	2.13	.249	349
Teratology	2556	46	—	.018	—	—	1.56	.203	79
CRC Crit. R. Clin. Lab. Sci.	1847	45	—	.024	—	—	.88	.222	9
Progr. Neurobiol.	3760	45	—	.012	—	—	5.66	.111	18

results in *Calcified Tissue International* and other biomedical journals. This is another reflection of the important distinction between the literature of den-

tistry and the literature of interest to dental research workers.

In Table 4, we have listed the most-cited paper from each core journal, pro-

Table 4: The most-cited papers from the dental core journals. The number of papers receiving 50 or more citations from each journal is shown in parentheses.

Total Citations	Bibliographic Data
1961-80	
74 (2)	Bell W H. Revascularization and bone healing after anterior maxillary osteotomy: a study using adult rhesus monkeys. <i>J. Oral Surg.</i> 27:249-55, 1969.
230 (10)	Bratthall D. Demonstration of five serological groups of streptococcal strains resembling <i>Streptococcus mutans</i> . <i>Odontol. Revy</i> 21:143-52, 1970.
129 (6)	Broadbent B H. A new X-ray technique and its application to orthodontia. <i>Angle Orthodont.</i> 1:46-66, 1931.
115 (11)	Chaudry A P, Vickers R A & Gorlin R J. Intraoral minor salivary gland tumors. <i>Oral Surg. Oral Med. Oral Pathol.</i> 14:1194-226, 1961.
136 (16)	Downs W B. Variations in facial relationships: their significance in treatment and prognosis. <i>Amer. J. Orthodont.</i> 34:812-40, 1948.
277 (27)	Fitzgerald R J & Keyes P H. Demonstration of the etiologic role of streptococci in experimental caries in the hamster. <i>J. Amer. Dent. Ass.</i> 61:9-19, 1960.
64 (3)	Flotra L, Gjerme P, Rølla G & Waerhaug J. Side effects of chlorhexidine mouth washes. <i>Scand. J. Dent. Res.</i> 79:119-25, 1971.
237 (70)	Gibbons R J, Berman K S, Knoettner P & Kapsimalis B. Dental caries and alveolar bone loss in gnotobiotic rats infected with capsule forming streptococci of human origin. <i>Arch. Oral Biol.</i> 11:549-59, 1966.
68 (2)	Guggenheim B. Extracellular polysaccharides and microbial plaque. <i>Int. Dent. J.</i> 20:657-78, 1970.
151 (14)	Guggenheim B. Streptococci of dental plaques. <i>Caries Res.</i> 2:147-63, 1968.
398 (13)	Löe H & Silness J. Periodontal disease in pregnancy. I. Prevalence and severity. <i>Acta Odontol. Scand.</i> 21:533-51, 1963.
400 (27)	Löe H, Theilade E & Jensen S B. Experimental gingivitis in man. <i>J. Periodontol.</i> 36:177-87, 1965.
233 (33)	Russell A L. A system of classification and scoring for prevalence surveys of periodontal disease. <i>J. Dent. Res.</i> 35:350-9, 1956.
90 (8)	Smith D C. A new dental cement. <i>Brit. Dent. J.</i> 125:381-4, 1968.
181 (13)	Theilade E, Wright W H, Jensen S B & Löe H. Experimental gingivitis in man. II. A longitudinal clinical and bacteriological investigation. <i>J. Period. Res.</i> 1:1-13, 1966.
60 (3)	Travell J. Temporomandibular joint pain referred from muscles of the head and neck. <i>J. Prosthet. Dent.</i> 10:745-63, 1960.

vided that the paper received 50 or more citations. This criterion eliminated 14 journals. Also shown, in parentheses, are the number of papers from each journal that have been cited 50 or more times. Interestingly, Harald A. Löe, University of Connecticut, School of Dental Medicine, appears as first author on the two most-cited papers. The paper he published with E. Theilade and S. B. Jensen discussed gingivitis, or inflammation of the gums. The paper by Löe and J. Silness concerns periodontal disease in pregnancy. Periodontal refers to the supporting structures of the teeth, including the gums. Incidentally, Löe has recently published an historical sketch of major breakthroughs in dentistry in a special issue of the *Journal of Dental Research*.⁹ Among the milestones he discusses is the discovery by Paul

Keyes,¹⁰ National Institutes of Health, National Institute of Dental Research, Bethesda, Maryland, that some caries are infectious and transmissible. The paper in Table 4 which Keyes coauthored with Robert J. Fitzgerald, Veterans Administration Hospital, Miami, Florida, has become a *Citation Classic*.¹¹ In this week's issue of *CC/Clinical Practice*, we present another *Citation Classic* in the field of dentistry,¹² by Jan Carlsson, University of Umeå, Sweden, which discusses various types of bacteria found in the human mouth.¹³ That paper appeared in *Odontologisk Revy*, which became the *Swedish Dental Journal* in 1979.

Lest there be any doubt about the dentistry-medicine connection, let me point out that there are many research fronts identified in the *ISI/BIOMED™*

system which are directly related to dentistry—some of them to these highly cited papers. For example, there is a research front listed under “gingivitis,” five fronts listed under “*Streptococcus mutans*,” and several fronts under variants of the term “periodontal.”

There are no review journals in the dentistry core. However, a number of core journals occasionally publish review articles. Both the *Journal of Oral Pathology* and the *Journal of Clinical Periodontology* publish a review article in nearly every issue.

In former years, we regularly published comparable journal citation studies. Since the publication of *JCR*, these have been de-emphasized in *CC*. The subject matter may even be dull if it is not your particular area of research. In fact, it is more than a year since we took a look at botany journals.^{14,15} In the near future, we plan to examine the veterinary literature. Those of you who are interested in other fields should examine the *JCR* volumes of the *SCI*. In-

centally, we are planning to put that data base online so that statistical compilations of this kind can be more readily performed on demand. This should not only help librarians and scientists determine the core literature of any field but also enable one to conduct specialized scientometric studies of various kinds.

It would be interesting, for example, to determine how many different articles or authors from the non-dental literature were cited by dental researchers. Counting citations gives one view of the situation. But remember that a single article in dentistry, or any other field, may cite a dozen or more articles in the same journals, but the most significant reference may be to the one published outside of the leading journal in the field.

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13. ----- . Presence of various types of non-haemolytic streptococci in dental plaque and in other sites of the oral cavity in man. *Odontol. Revy* 18:55-74, 1967.
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15. ----- . Journal citation studies. 33. Botany journals, part 2: growth of botanical literature and highly cited items. *Current Contents* (32):5-15, 11 August 1980.*

*Reprinted in: Garfield E. *Essays of an information scientist*. Philadelphia: ISI Press, 1981. 4 vols.