

Do local citation patterns support use of the impact factor for collection development?

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INTRODUCTION

The Impact Factor and Collection Development

The journal impact factor (IF) is reported by the Institute for Scientific Information in *Journal Citation Reports (JCR)*. “A journal’s impact factor is based on 2 elements: the numerator, which is the number of citations in the current year to any items published in a journal in the previous 2 years, and the denominator, which is the number of substantive articles (source items) published in the same 2 years.” [1]

Much research has been done on IF as a measure of local journal use for collection development. Blečić [2] used a comparison of three methods: in-house use, circulation, and citation to determine journal use, finding a “significant correlation” between the three methods and arguing that because of this correlation, only one type of data is necessary to make retention decisions. MacDonald’s study of online journal usage in relation to citation analysis examined whether online journal use (as measured by an academic library) and a library’s publisher-reported full text downloads predict citations; the study found that “citation is clearly related to usage” [3]. Using *Biosis Previews*, Davis identified core journals in the life sciences by analyzing the journals in which Cornell University authors published [4]. Davis concluded that the “...generic metrics of the *JCR* simply cannot provide the campus-level data crucial to making informed decisions about the local importance of individual titles,” as argued earlier by Pan [5] and Chrzastowski [6].

Collection development at the Indiana University School of Medicine

The Indiana University School of Medicine (IUSM) has nine campuses across the state and is the second largest US medical school. IUSM expects library collection development to support funded research. Traditionally, the IUSM Library’s collection development policy has

been based on an analysis of online and print cost/use ratios [7, 8], IF, and interlibrary loan requests. The purpose of this study was two-fold: to determine whether a journal's IF rank reflects its citation frequency among local researchers, and to evaluate whether current methods of journal selection and deselection are meeting the needs of IUSM-sponsored researchers.

The authors approached the problem from a unique perspective: analyzing references in published articles by funded researchers in the small but highly grant-productive Psychiatry department in the IUSM. The authors hypothesized that given the specialized nature of research conducted by grant recipients, the journals they cited might not be identified by a high IF. Psychiatry was ranked fourth in grants awarded out of 26 IUSM departments, and considering its size (70 full-time faculty), the department's efforts have been significant. The 65 psychiatry grants active during the study period of Fiscal Year 2004/2005 are delineated by subject area in Table 1. Grants in the areas of alcoholism, schizophrenia and Alzheimer's disease accounted for half of the grants both in terms of quantity and dollars awarded. The department's output provided a manageable data set to investigate the citation patterns of the grant recipients, which could then be compared with the IUSM Library's local holdings and the IF of the journals cited.

METHODS

Study Sample

Principal investigators (n=22) on grants active in fiscal year 2004/2005 (the most current year available) from the IUSM Department of Psychiatry were identified by the university's Department of Research and Sponsored Programs. Searches for publications of faculty members

identified were conducted by librarians experienced in using Thomson Scientific's *Web of Science (WOS)*, which includes *Science Citation Index*, *Social Science Citation Index* and *Arts & Humanities Citation Index*. To ensure comprehensive search results, each psychiatry faculty member was identified by research interests, alternate names, previous affiliations, and any other useful information which could be obtained from the IUSM Website. Articles published by faculty members when they were at other institutions were included. The searches were limited to publication years 2000-2004, the period immediately preceding the active grant report, and included all publication types indexed in the database. All articles by an author were included regardless of author list position (e.g. first author, last author, etc.).

Data Collection

The complete bibliographic record and cited references for each publication were saved as a tab-delimited file and imported into a Microsoft Access database table. Since some publications were authored by multiple faculty members in the study, records for duplicate publications were removed from the table. After removing duplicates, 429 unique publications by the 22 faculty members remained. Out of those 429 publications, 405 had cited references (CR). The CR field from each bibliographic record was then stripped and put into one table. The five main data elements from each cited reference (Author, Date, Source, Volume and First Page) were parsed into separate fields in the table to facilitate analysis.

Data Analysis

Data analysis focused on the 77 titles in the Psychiatry subject category of *JCR* for all years from 2000-2004. This list of titles along with impact factors for 2000-2004 was imported into the Access database. To address the year-to-year fluctuation in IF identified by Altmann [9], an average IF for the five-year period was calculated. Although Nisonger [10] has identified a bias in using average IF, he concluded that for practicing librarians the degree of inaccuracy likely does not justify the effort to correct it.

A database query was written to match the journal titles in the CR with the journal titles in the *JCR* Psychiatry list. The titles were then ranked by number of CR and the five-year average IF. The ranks of titles with equal numbers of CR were averaged. For example, *Australian and New Zealand Journal of Psychiatry* and *Schizophrenia Bulletin* were both cited ten times, ranking them 36th and 37th. Since it would not be accurate to rank one higher than the other, the ranks were both averaged to 36.5.

After ranking all of the titles, a rank difference was calculated by subtracting the IF rank from the rank by number of CR. The final data element added was an indication of whether the IUSM Library subscribed to the title. Only titles subscribed to for the entire five-year period were counted to maintain consistency across all titles. The results are shown in Table 2 ranked by number of CR.

RESULTS

Impact Factor Compared to IUSM Psychiatry Faculty Cited References

The authors found a strong positive rank correlation between IF and number of CR as shown by the Spearman rank correlation coefficient of $r = 0.788$ (Figure 1). The difference in rank ranged from 0-41.5 with an average difference of 11.16 and median of 3.75. Only fifteen titles had a difference in rank greater than twenty (Table 3). Nine of those titles ranked higher by IF and six ranked higher by number of CR.

The average IF for *JCR* Psychiatry category journals not cited by IUSM Psychiatry researchers in their publications was 0.8121 (range=0.2412 to 1.7198). These journals were all in the bottom 50% of the *JCR* Psychiatry category as ranked by IF. The average IF for *JCR* Psychiatry journals cited by IUSM researchers was 2.6221 (range=0.5966 to 11.4214).

IUSM Library Holdings compared to IUSM Psychiatry Cited References

The IUSM Libraries subscribed to 47 (61%) of the 77 *JCR* Psychiatry category journals. Ninety-five percent (n=3,083/3,232) of the CR in IUSM Psychiatry faculty publications were titles to which the library subscribed. Of the 77 titles in the *JCR* Psychiatry category, 61 (79%) were cited by the IUSM Psychiatry Faculty. Of those 61 titles, seventeen (28%) were not current library subscriptions during the study period. The average IF for these seventeen titles was 1.8832 (range=0.358 to 3.7134). Eight of the seventeen titles not held ranked in the top 50% by IF, and three ranked in the top 50% by CR. Only one of the seventeen titles not subscribed to, *Schizophrenia Research*, was in the top 50% in both rankings.

DISCUSSION

The authors found that a strong positive rank correlation existed between the *JCR* Psychiatry category journals ranked by IF and CR. In this case, IF effectively captured local psychiatry research emphases. However, some specialized titles outside the research areas of grant-funded psychiatry faculty ranked significantly higher by IF than they ranked by CR.

Most of the titles that ranked higher by IF were somewhat specialized. The title with the highest difference in rank was *Sleep*. Although IUSM has a Center for Sleep Disorders, it is managed by the Department of Medicine, which may explain why *Sleep* has a high IF but was not highly cited by IUSM Psychiatry Department faculty. The journal may indeed be highly cited by IUSM Department of Medicine Faculty.

Three of the six titles that ranked higher by CR than IF were related to biological psychiatry (*Encephale*, *Neuropsychobiology* and *Progress in Neuro-Psychopharmacology & Biological Psychiatry*). An analysis of the articles citing these three titles showed that 33% (n=19/57) of the cited references were by one researcher studying autism. The other authors citing these three titles were working primarily in the areas of alcoholism, schizophrenia and Alzheimer's disease, all areas receiving large amounts of grant funding. While the importance of these titles to IUSM psychiatry faculty working in these areas was not reflected in the impact factor, there was also no obvious reason why the other three titles (*Comprehensive Psychiatry*, *Psychiatry Research* and *Journal of Nervous and Mental Disease*) ranked higher by CR. None of the citing authors in the study were found on editorial boards of these three journals.

The IUSM psychiatry faculty clearly are most often citing journals held by the library. Only 28% (n=17) of the journal titles cited were not currently held by the library, and only 5%

(n=149) of cited references were to journal titles that were not current library subscriptions. While none of those seventeen titles are freely accessible, seven of them became accessible at IUSM during the study period through consortial agreements. It is impossible to say whether this finding shows that researchers only cite the journals available to them in the library or that the library's collection supports the research of the Psychiatry department well. However, since this study included a small number of publications by IUSM Psychiatry faculty when they may have been at other institutions (18%; n=79/429), their cited references were not completely based on the collections of the IUSM libraries.

Limitations

Since this study relied exclusively on *WOS*, any publications by the authors in the study that were not indexed in that database were excluded from the study. The authors studied were also from only one department in the IUSM, so the results may not be generally applicable to all IUSM researchers or to researchers at other institutions. In addition, impact factors can only be compared within a journal category (in this case, psychiatry). Thus inferences drawn from the data are necessarily limited to the area under study.

CONCLUSIONS

This limited, "proof of concept" study suggests that IF is a fairly accurate reflection of local psychiatry research emphases as measured by the cited references in the publications of local authors. The results also provide evidence that the IUSM Libraries collection is meeting up to 95% of the research needs of IUSM's psychiatry researchers. Since IF is not used in isolation, and the process of local citation analysis is quite time-consuming, the authors recommend the

continued use of IF as one selection criterion in library collection development. Further research could examine correlations between IF, cited references and collection adequacy in other areas of the biosciences or investigate techniques for facilitating the labor intensive process of local citation analysis.

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Table 2*JCR Psychiatry category journals ranked by impact factor and cited references, 2000-2004*

Title	IUSM Cited References	5 yr. Average Impact Factor	IUSM Cited Reference Rank	Impact Factor Rank	Rank Difference	Current IUSM Library Subscription
Archives of General Psychiatry	513	11.4214	1	1	0	Yes
American Journal of Psychiatry	463	6.9438	2	2	0	Yes
Psychopharmacology	336	3.158	3	15	-12	Yes
Biological Psychiatry	270	5.5774	4	4	0	Yes
Journal of the American Academy of Child and Adolescent Psychiatry	224	3.5506	5	12	-7	Yes
Neuropsychopharmacology	123	4.7866	6	5	1	Yes
Journal of Clinical Psychiatry	122	4.6612	7	6	1	Yes
British Journal of Psychiatry	121	4.388	8	8	0	Yes
Molecular Psychiatry	89	6.6312	9	3	6	Yes
Journal of Clinical Psychopharmacology	82	4.4242	10	7	3	Yes
Psychiatry Research	72	1.801	11	42	-31	Yes
Journal of Affective	66	2.2618	12	30	-18	Yes

Disorders						
Journal of Child and Adolescent Psychopharmacology	65	2.2494	13	31	-18	Yes
Acta Psychiatrica Scandinavica	56	2.1568	14	34	-20	Yes
Psychological Medicine	52	3.0782	15	17	-2	Yes
Addiction	45	2.8226	16	21	-5	Yes
Drug and Alcohol Dependence	44	2.6474	17	24	-7	Yes
Journal of Psychiatric Research	34	2.8362	18	20	-2	Yes
Schizophrenia Research	31	3.6474	19	11	8	No
Psychosomatic Medicine	30	3.279	20.5	14	6.5	Yes
Journal of Nervous and Mental Disease	30	1.497	20.5	52	-31.5	Yes
International Clinical Psychopharmacology	27	2.6496	23	23	0	Yes
Neuropsychobiology	27	1.675	23	47	-24	Yes
Progress In Neuro-Psychopharmacology & Biological Psychiatry	27	1.509	23	50	-27	No
International Journal of	23	1.8498	25	41	-16	No

Geriatric Psychiatry						
Journal of Neurology						
Neurosurgery and Psychiatry	19	2.9908	26	18	8	Yes
Psychosomatics	18	1.8862	27	39	-12	Yes
Pharmacopsychiatry	17	2.286	28.5	29	-0.5	Yes
Comprehensive Psychiatry	17	1.503	28.5	51	-22.5	Yes
Journal of Neuropsychiatry and Clinical Neurosciences	16	1.9508	30.5	37	-6.5	Yes
Canadian Journal of Psychiatry-Revue Canadienne de Psychiatrie	16	1.8606	30.5	40	-9.5	Yes
Psychiatry Research- Neuroimaging	15	2.2412	32	32	0	Yes
General Hospital Psychiatry	14	1.7056	33	44	-11	Yes
European Neuropsychopharmacology	11	2.6722	34.5	22	12.5	No
Dementia and Geriatric Cognitive Disorders	11	2.3594	34.5	27	7.5	Yes
Schizophrenia Bulletin	10	3.7134	36.5	10	26.5	No
Australian and New Zealand Journal of Psychiatry	10	1.2496	36.5	56	-19.5	No
Psychotherapy and Psychosomatics	6	3.385	40.5	13	27.5	Yes

International Journal of Neuropsychopharmacology	6	3.1142	40.5	16	24.5	No
American Journal of Geriatric Psychiatry	6	2.9316	40.5	19	21.5	No
Journal of Psychopharmacology	6	2.5482	40.5	25	15.5	Yes
Journal of Psychiatry & Neuroscience	6	2.491	40.5	26	14.5	Yes
Psychiatric Services	6	1.9644	40.5	35	5.5	Yes
Journal of the International Neuropsychological Society	5	2.3222	45	28	17	No
Neuropsychiatry						
Neuropsychology and Behavioral Neurology	5	1.3404	45	54	-9	Yes
European Psychiatry	5	1.1334	45	58	-13	No
Journal of Psychosomatic Research	4	1.9604	47.5	36	11.5	Yes
Journal of Geriatric Psychiatry and Neurology	4	1.1202	47.5	59	-11.5	Yes
Sleep	3	3.9214	50.5	9	41.5	Yes
European Archives of Psychiatry and Clinical Neuroscience	3	1.8906	50.5	38	12.5	No

Human Psychopharmacology- Clinical and Experimental	3	1.184	50.5	57	-6.5	No
Encephale-Revue de Psychiatrie Clinique Biologique et therapeutique	3	0.358	50.5	74	-23.5	No
Mental Retardation and Developmental Disabilities Research Reviews	2	2.2178	55.5	33	22.5	No
Experimental and Clinical Psychopharmacology	2	1.6762	55.5	46	9.5	Yes
American Journal of Orthopsychiatry	2	1.5718	55.5	48	7.5	Yes
Psychiatry-Interpersonal and Biological Processes	2	1.3476	55.5	53	2.5	Yes
International Journal of Psychiatry in Medicine	2	0.7312	55.5	63	-7.5	Yes
Psychiatry and Clinical Neurosciences	2	0.6584	55.5	68	-12.5	No
Nervenarzt	1	0.8542	60	62	-2	No
Psychopathology	1	0.7096	60	65	-5	No
Child Psychiatry & Human Development	1	0.5966	60	70	-10	Yes

International Journal of Eating Disorders	0	1.7198	69.5	43	26.5	No
Journal of ECT	0	1.6764	69.5	45	24.5	No
Neurocase	0	1.5628	69.5	49	20.5	No
Journal of Intellectual Disability Research	0	1.3298	69.5	55	14.5	Yes
Zeitschrift fur Psychosomatische Medizin und Psychotherapie	0	0.9692	69.5	60	9.5	No
Behavioral Medicine	0	0.9226	69.5	61	8.5	Yes
Substance Use & Misuse	0	0.7154	69.5	64	5.5	Yes
Journal of Psychosomatic Obstetrics and Gynecology	0	0.7052	69.5	66	3.5	No
Fortschritte der Neurologie Psychiatrie	0	0.6724	69.5	67	2.5	No
Neuropsychiatrie	0	0.5996	69.5	69	0.5	No
Verhaltenstherapie	0	0.4558	69.5	71	-1.5	No
Perspectives in Psychiatric Care	0	0.443	69.5	72	-2.5	No
Psychopharmakotherapie	0	0.3816	69.5	73	-3.5	No
Nervenheilkunde	0	0.3188	69.5	75	-5.5	No
Arquivos de Neuro-Psiquiatria	0	0.2798	69.5	76	-6.5	No

Actas Espanolas de Psiquiatria	0	0.2412	69.5	77	-7.5	No
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