Psychology Citations Revisited: Behavioral Research in the Age of Electronic Resources

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Available online 1 September 2004

This bibliometric study focused on the research needs of psychology faculty and quantified the availability throughout the library of articles cited recently by the faculty. More than social sciences faculty generally, psychology faculty report relying on the journal literature rather than on the monographic literature. Less than one- third of the articles cited were available online and 89% of these were found in Ebsco databases, Science Direct, JSTOR, or society publications with deep backfiles.

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Change has always been commonplace in academic libraries, but the changes experienced by academic librarians over the past decade remain unprecedented. The movement to a web-based environment has not only revolutionized workflow, but has also complicated negotiations with publishers, copyright compliance, and collection development policies. For many of the faculty served by academic librarians, web-based services provide a richness of resources and, at the same time, create heightened expectations for the acquisition and the delivery of journal literature. As a result, librarians are faced with the challenge of allocating funds to acquire both print and electronic resources. Like other academic libraries, the Texas A&M University Libraries have been allocating more money each year for electronic resources, especially journals. The need to justify these large expenditures for electronic journals has prompted the librarians who select materials to analyze usage statistics more carefully and to gather other data, such as that collected in the study described below.

This bibliometric study focuses on the research needs of psychology professors at Texas A&M University (TAMU). The study identifies the types of materials used by psychology faculty, quantifies the availability throughout the library of articles cited in recently refereed publications by TAMU psychology professors, and examines the need for additional electronic resources.

It should be noted that the author's goal was to determine whether the Libraries' collections could provide the cited articles at the time of this retrospective study. It would have been extremely difficult to determine whether the faculty actually obtained the sample articles from the Libraries' print or online collections, from their own collections, or elsewhere.

The Setting

Texas A&M University ranks fifth among North American universities in student enrollment.[1] While the University offers a broad curriculum and has substantial enrollment in its education and liberal arts colleges, the institution has historically emphasized research in the fields of engineering, agriculture, and the sciences.

Since June 2002, the library staff has delivered full-text electronic documents to student and faculty desktops through deliverEdocs, a service that utilizes ILIAD software. In May 2003, a new library Website was launched which utilizes Vignette Software to manage thousands of web pages.[2] A new interface, the Electronic Resource Locator, connects patrons to databases, e-journal titles, and e-books. In addition to subscribing to title-level aggregators like Ebsco, ABI/INFORM, and the Wilson Omnifile, the TAMU Libraries maintain a subscription to the most comprehensive psychology backfile in ScienceDirect.

Texas A&M's Psychology Department is one of the largest departments in the University's College of Liberal Arts. The Psychology Department faculty includes 35 professors and offers PhD. programs in Behavioral Neuroscience, Clinical Psychology, Cognitive Psychology, Developmental Psychology, Industrial/Organizational Psychology, Quantitative Psychology, and Social Psychology.

Review of the Literature

Wehmeyer and Wehmeyer repeat the axiom that social scientists are less dependent on monographs than scholars

in the humanities but more dependent on monographs than faculty in the physical sciences.[3] Several studies cited in their paper focus exclusively on the psychology literature. Articles that analyze citations from other social science disciplines, the sciences, or the humanities offer interesting comparisons to these studies.

Broadus examined all American and British citation studies in the social sciences to date. He compared ratios derived in each study for citations by subject, major language, form of publication, and age. In the studies reviewed by Broadus, 30.9% to 55.6% of the citations were to monographs. In the majority of the studies surveyed by Broadus, over half of all citations were published in the past 10 years, and over half of all citations were from other disciplines.[4] Devin and Kellogg identified over 50 citation studies in the social sciences, the sciences and the humanities published between 1940 and 1990. The authors matched each study to a class in the Library of Congress call number system and to a percentage that documented serial use. They calculated ranges of journal use from 10.9%–38.4% for the humanities, 29%–59% for the social sciences, and 76.8%–93.6% for the physical sciences.[5]

Two studies focused exclusively on psychology literature. Xhignesse and Osgood calculated that 65% of all citations found in 21 major psychology journals were from journal articles.[6] Shontz surveyed the use of psychology resources by the faculty of a single university. He calculated that 76% of the faculty's citations were from journal articles. His study also demonstrated that 65% of all citations were from works published in the previous ten years.[7]

More recently, several studies have analyzed citations from psychology theses and dissertations. Thomas examined master's theses published at the University of California at Santa Barbara (UCSB). She produced a list of the most frequently cited journals and calculated that 62.4% of citations were from journal articles. Thomas also discovered that only 37.4% of these citations came from psychology journals, and that 91.9% of all citations came from titles in UCSB collections.[8] Sylvia and Lesher also analyzed citations from theses published at a single university. They provided a list of most frequently cited journal titles and compared citation frequency to shelving counts.[9] Wehmeyer and Wehmeyer examined citations from ten years of graduate theses and dissertations at Wright State University. The authors compared citations from clinical psychology dissertations, nursing theses, and biomedical sciences theses and dissertations. They concluded that graduate students in the clinical psychology program were more dependent on monographs than those in the nursing or the biomedical sciences programs. The authors calculated that 62% of all citations from clinical psychology dissertations were from journal articles, 35% were from monographs, and 13% were from other types of publications.[10]

Fewer authors have analyzed citations from electronic sources. In a survey of citations from 74 electronic journals, Harter and Kim found that only 0.2% of all citations were from e-journals.[11] Zhang, analyzing citations found in 14 library and information science journals, calculated that 1.13% of all citations were from electronic journals. He also noted that less than 10% of the articles included in his study cited electronic journals.[12] Herring examined citations found in twelve electronic journals, each from a different social science or humanities discipline. She calculated that 8% of all citations came from some type of electronic source, and that 27% of all citations came from sources outside of the researchers' primary field of interest.[13]

Methodology

The researcher examined 11,279 citations found in the bibliographies of articles written by current members of the TAMU Psychology faculty from 2000–2002. Only English-language articles published in titles listed as refereed journals in *Ulrich's Periodicals Directory* (2003)[14] were included in the study. To ensure that articles published outside the field of psychology were included, the researcher used vitae and publication records posted by or obtained from the Department of Psychology. One hundred fifty-six articles were included in the study. Articles were printed from electronic resources available through the TAMU Libraries' Website, copied from bound volumes or print issues held in the Libraries' collections, or obtained through Interlibrary Services. The author was unable to obtain the publication record of one professor; therefore only articles that he coauthored with other TAMU psychology faculty were included in the study. A single article published in *Cognitive Processing* was not available through interlibrary loan. No library was willing to lend or transmit a copy of the article, so it was excluded from the study.

Articles were listed in alphabetical order by the last names of authors, then in descending chronological order. In cases where an article was written by two or more TAMU psychology professors, the article was placed in order by the name of the author that appeared first on the title page of the article. Within articles, citations that did not appear in periodicals were labeled by type of publication. Tallies of these publications were kept on sheets attached to each article. Article citations were highlighted and numbered concurrently. Since the majority of the articles utilized internal, parenthetical citations, it was usually necessary to read rather than to scan articles. The researcher did not limit the study to unique citations. Citations that repeated within articles or in articles written by different authors remained part of the study. Citations for unpublished articles were excluded from the study. The researcher numbered 8,903 article citations.

The RANDBETWEEN feature of Microsoft Excel was used to select a random sample of 368 citations from the 8,903 consecutively numbered article citations. The information from citations corresponding to random numbers was placed on an Excel spreadsheet; the individual columns of the sheet were sorted to produce the totals that appear in this study.

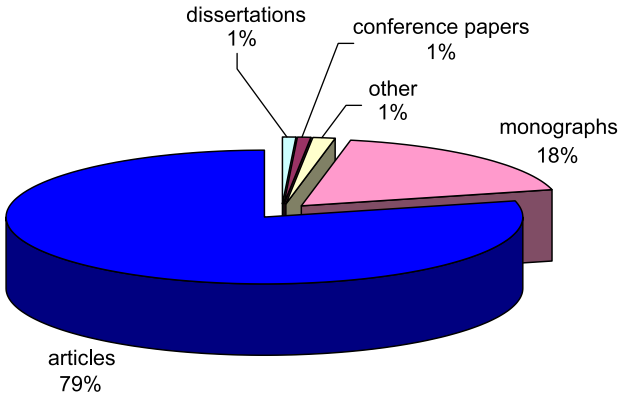
Findings

Publication Patterns

A total of 11,279 citations were referenced in the 156 articles published by TAMU psychology professors from 2000–2002. Twenty-four different types of publications were cited. In addition to books and monographs, works cited included court cases, archival papers, unpublished data, and United Nations, U.S. government, and foreign government documents.

Figure 1 compares total citations and percentages for different types of publications. Total citations included 8,903 (79%) article citations and 2,039 (18%) monograph citations, suggesting that professors were more than four times as likely to cite a journal article than a monograph. Conference papers which were not published as articles represented 1% (98) of the 11,279 total citations. Dissertations also repre-

Figure 1
Total Citations



sented 1% (85) of total citations, as did the sum of citations (154) from the twenty remaining types of publications.

Sample Citations

The author referred to "Determining Sample Size for Research Activities," by Kreijcie and Morgan to identify a valid statistical sample.[15] A sample of 368 citations was taken from the 8,903 article citations counted by the researcher. The sample included 341 unique citations from 182 different journal titles. Eleven citations appeared two or more times in the sample. Psychology faculty cited themselves 35 times, a figure that represented 10% of the sample.

Sample citations by subject

Figure 2 provides a breakdown of sample citations by subject. Class numbers for the journal sources of the citations were taken from bibliographic records in WorldCat, while Library of Congress class outlines from Gale's *Super LCSS* (2002)[16] served as the source of subject designations. The Texas A&M Libraries use classification numbers for subject identification in collection analysis, and the study conformed to this practice. In this sample, articles from psychology journals were cited more than twice as frequently as articles from neuroscience and psychiatry journals. Psychology (BF 1-900), neuroscience and psychiatry (RC 321–571), and neurophysiology and neuropsychology (QP 351–495) call numbers represented 64% of all sample citations. Twelve subjects represented at least 1% of the sample, with all remaining call number ranges accounting for 69 (19%) sample citations.

Most Frequently Cited Titles

Appendix A lists journal titles that accounted for at least three sample citations. Titles with the most sample citations generally possessed high impact factors. The total number of citations from these titles (180) represented 49% of the entire sample. The impact factors were taken from the Institute for Scientific Information's Journal Citation Reports. "The impact factor is calculated by dividing the number of current citations to articles published in the two previous years by the total number of articles published in the two previous years."[17] Eleven of the of the 32 titles ranked number one or number two in their ISI

Figure 2
Sample Citations by Subject

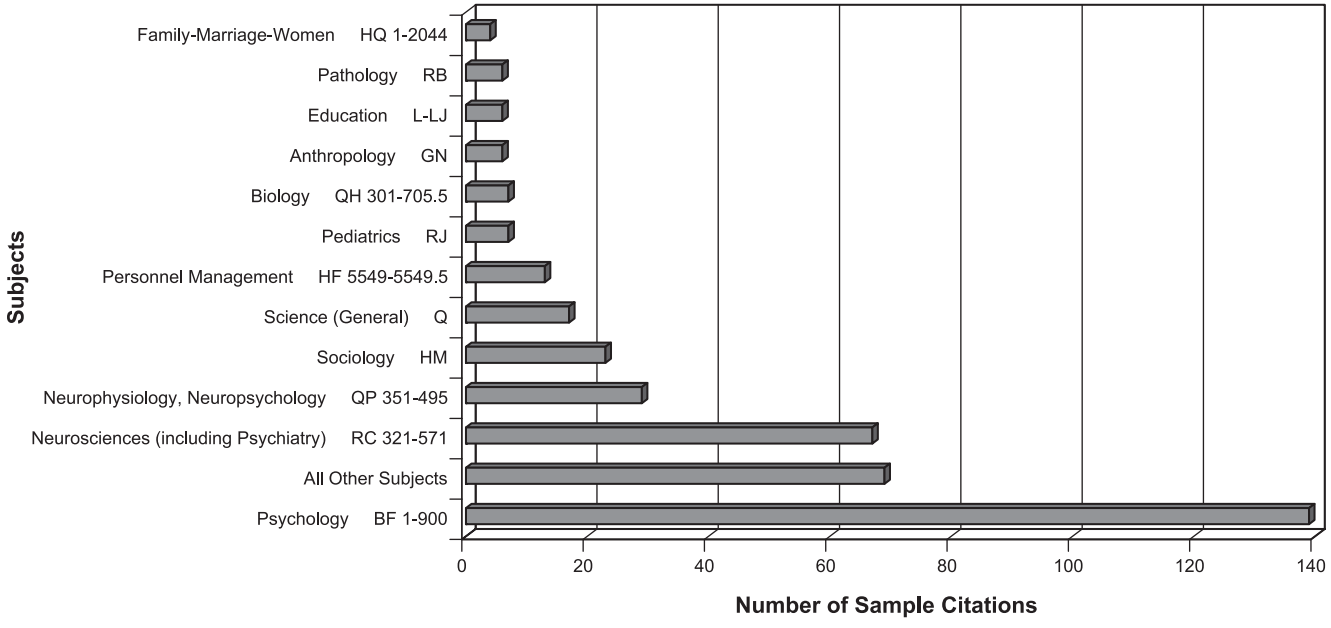


Figure 3
Sample Citations by Years

Years	Sample Citations	Percentage
1894-1979	41	11%
1980-1989	71	19%
1990-1994	100	27%
1995-1999	128	35%
2000-2002	28	8%

subject categories, and 21 of the titles possessed impact factors greater than 2.000. One of the 32 titles, *History of Psychology*, was not indexed by ISI. Nineteen of the 32 titles were available to A&M patrons in full-text databases or as electronic journals, while the remaining 13 titles were available in print only.

Thirty-eight titles accounted for two citations each and 112 titles accounted for a single citation each, so 150 additional titles were required to gain an additional 51% of the total sample. The distribution of sample citations generally conformed to Bradford's Law of Scattering. This distribution also highlights important implications for collection development, since it is more of a challenge to meet the needs of scholars when the literature is scattered among so many titles.

Age of Citations

Figure 3 groups sample citations according to date. The data reveal a need for deep backfiles in electronic resources, with 30% (112) of sample citations dated before 1990 and 57% (212) of sample citations dated before 1995. The oldest citation in the sample was from 1894, and the median date for all 368 sample citations was 1993.

Availability of Full-Text Articles

Figure 4 shows the availability of sample citations by format. In cases where the TAMU Libraries provided electronic access to the source of citations, the researcher checked a database or an electronic journal subscription to determine if the actual cited article was available in full-text. Citations from sources available only in print greatly outnumbered sources available electronically. Citations from electronic resources represented less than a third of the sample, and 17% (64) of sample citations were only available to TAMU patrons through interlibrary loan. Figure 4 also shows that the sources of 19 sample citations were available to TAMU patrons exclusively as a full-text electronic resource. Holdings information from the Libraries' catalog revealed that the sources of ten of these citations were available because of subscriptions to collections from aggregators or electronic publishers. A print subscription for eight of these sources had never existed, and the print subscription for two additional titles had lapsed decades earlier. In the case of the nine remaining sample citations, the Libraries' print subscription had been converted to an electronic source.

Figure 4
Means of Access

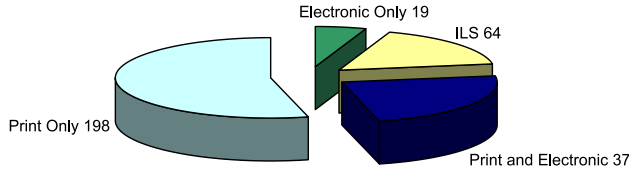


Figure 5
Sources of Full-Text Articles

Electronic Resource	Number of Sample Citations
Ebsco	38
Elsevier	31
JSTOR	10
American Psychiatric Association	7
ABI/Inform	6
Gale	6
Ingenta Select	5
Nature Journals	5
American Medical Association	4
Annual Reviews	4
Ebsco EJS	4
Highwire Press	4
American Physiology Association	2
Blackwell	2
Kluwer	2
University of Chicago Press	2
Wiley	2
Wilson Omnifile	2
American Chemistry Society	1
Erlbaum	1
MD Core	1
Metapress	1
National Academy of Sciences	1
Oxford University Press	1
PubMed Central	1
Springer-Verlag	1

Sources of Electronic Articles Cited by Faculty

Figure 5 provides a further breakdown of cited articles available in electronic resources. Almost half of all full-text articles were available from two sources. Sixty-nine (48%) full-text articles were available from Ebsco databases or from Elsevier's Science Direct. JSTOR provided the third highest total of full-text articles, highlighting the need for deep backfiles. Fifteen full-text articles were available in publications from societies or associations.

Four of the 26 electronic resources listed in Figure 5 (Ebsco, Gale, ABI/INFORM, and the Wilson Omnifile) are

often referred to as title level-aggregators. Considerable duplication existed among these resources. All of the full-text articles available from ABI/INFORM and from the Omnifile were also available from an Ebsco database, while five of the six full-text articles available from Gale databases were also available from Ebsco.

Conclusions

Wehmeyer and Wehmeyer assert that the social sciences lie between the humanities and the sciences in their need for monograph citations.[18] The current study suggests that, as a discipline, psychology lies between the other social sciences and the sciences in its emphasis on journal citations. The ratio of journal citations computed in the current study also bears a stronger resemblance to many of the science studies surveyed by Devin and Kellogg than to the social science studies analyzed by these authors.[19] The study included a higher percentage for article citations (79%) than Thomas' analysis of psychology theses (62.4%)[20] and Wehmeyer and Wehmeyer's analysis of clinical psychology dissertations (62%).[21] Article citations for the current study were closest to Shontz's (76%) analysis of faculty research at a single university.[22] The results of the present study suggest that, as a group, psychologists are less dependent on monographs and more dependent on journal literature than other social scientists.

Previous studies also suggested that psychologists depend heavily on research from other disciplines. The current study supports this hypothesis. The percentage of psychology citations in this study (37.7%) was virtually identical to the percentage calculated in Thomas' survey of psychology masters theses (37.4%).[23] More than one-third of all sample citations (36%) were from disciplines outside of psychology and its related fields, a larger percentage of citations outside of researchers' primary field of study than the percentage calculated in Herring's survey of social science journals (27%).[24]

Data concerning the age of citations corroborates data found in previous studies. Findings for the age of citations were comparable to findings in Shontz' study[25] and to the majority of the analyses listed by Broadus.[26] The researcher did demonstrate a significant need for older citations, however. Almost one-third (30%) of all citations were dated before 1990, and 89% of cited articles available from an online source were found in Ebsco databases, ScienceDirect journals, JSTOR, or society or association publications with deep backfiles.

This study also demonstrates that the Texas A&M Libraries' journal collections for psychology are still print-based, with electronic offerings being too recent to meet many researchers' needs. Less than one-third of all sample citations were available in electronic journals, and one-sixth of all sample citations were only available through interlibrary loan. Many of the most cited titles in the survey were not available electronically. The study indicates that a greater number of titles, and deeper backfiles, will be needed before Texas A&M University psychology faculty gain access to the majority of their research materials through their desktops.

This study provides a methodology for evaluating access to online articles. Applying the methodology to different disciplines would be a useful avenue for future research.

Appendix A
Most Frequently-Cited Journals

Title	Total Sample Citations	JCR Database	Impact Factor (2002)	Subject Category	Ranking in Subject Category	Available Full-Text at TAMU
Behavioral Neuroscience	16	Science	2.757	Behavioral Sciences Neurosciences	10 61	No
Journal of Personality and Social Psychology	14	Social Science	3.649	Social Psychology	2	No
Psychological Bulletin	12	Social Science	7.011	Multidisciplinary Psychology	2	No
Journal of Applied Psychology	11	Social Science	1.980	Applied Psychology	4	No
Archives of General Psychiatry	9	Social Science	11.622	Psychiatry	1	Yes
Memory & Cognition	8	Social Science	1.318	Experimental Psychology	33	Yes
Personnel Psychology	8	Social Science	2.377	Applied Psychology	1	Yes
American Psychologist	8	Social Science	5.981	Multidisciplinary Psychology	5	No
American Journal of Psychiatry	7	Social Science	6.458	Psychiatry	2	Yes
Journal of Abnormal Psychology	6	Social Science	3.215	Clinical Psychology Multidisciplinary Psychology	4 7	No
Psychological Assessment	6	Social Science	2.041	Clinical Psychology	12	No
Comprehensive Psychiatry	5	Social Science	1.562	Psychiatry	30	Yes
Journal of Personality	5	Social Science	1.867	Social Psychology	7	Yes
Nature	5	Science	30.432	Multidisciplinary Sciences	1	Yes
Annals of the New York Academy of Sciences	4	Science	1.682	Multidisciplinary Sciences	7	Yes
Cognitive Psychology	4	Social Science Science	4.059	Experimental Psychology Psychology	4 4	Yes
Journal of Consulting and Clinical Psychology	4	Social Science	3.613	Clinical Psychology	2	No
Journal of Experimental Psychology: Learning, Memory, and Cognition	4	Social Science	2.443	Experimental Psychology	11	No
Pain	4	Science	4.829	Anesthesiology Clinical Neurology Neurosciences	1 8 28	Yes
Science	4	Science	28.956	Multidisciplinary Sciences	2	Yes
Child Development	3	Social Science	3.272	Educational Psychology Developmental Psychology	1 4	Yes
History of Psychology	3	NA	NA	NA	NA	No
Human Performance	3	Social Science	0.781	Applied Psychology	31	Yes
Journal of Applied Social Psychology	3	Social Science	0.521	Social Psychology	31	No
Journal of Neuroscience	3	Science	8.045	Neurosciences	12	Yes
Journal of Personality Disorders	3	Social Science	1.718	Psychiatry	25	No
Journal of Pharmacology and Experimental Therapeutics	3	Science	3.991	Pharmacology and Pharmacy	23	Yes
Personality and Social Psychology Bulletin	3	Social Science	1.758	Social Psychology	9	Yes
Psychological Review	3	Science Social Science	6.750	Psychology Multidisciplinary Psychology	3 3	No
Psychological Science	3	Social Science	2.961	Multidisciplinary Psychology	8	Yes
Proceedings of the Royal Society of London Series B – Biological Sciences	3	Science	3.396	Biology	6	Yes
Psychonomic Bulletin & Review	3	Social Science	1.741	Mathematical Psychology Experimental Psychology	1 21	Yes

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