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Ellen A. Sexton

John Jay College of Criminal Justice

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Abstract

Citation analyses were carried out on master's thesis in three disciplines, forensic psychology, forensic science and criminal justice, completed and deposited in John Jay library from 1991 to 2004. The aim was to determine the effect of availability of electronic journals on students' choice of references. The number of journal citations and the ratio of journal articles to all citations was assessed. Criminal justice theses listed more citations than either science of psychology theses, but relatively fewer journal articles. An increase over time was seen in the number of journal articles cited and in the ratio of journal articles to all citations only for the psychology theses. Few students identified whether the work cited was consulted in electronic or print format.

Introduction

Over the past decade, tremendous changes have taken place in the information environment. A researcher at a computer can perform unintermediated searches of a great many databases of scholarly and unscholarly materials and the World Wide Web, retrieving the full text of many of the identified items at a keystroke. Librarians constantly tell students and faculty “not everything is on the web” and “not everything is full text on the computer” but are they listening? Are students choosing convenience over appropriateness? Anecdotal evidence tells us that the World Wide Web is a major source of information for term papers, but what is happening at the level of the most research-oriented and information sophisticated students? In an attempt to find out, sources cited in master’s theses deposited at the library between 1991 and 2004 were examined.

Review

i). Journal use.

Journal articles have long been considered the primary depository and means of communication of new scholarship. The responsibilities of librarians have traditionally included identifying and choosing those journals needed by specific user populations, and educating students about scholarly communication. The ability of librarians to choose freely which journals are subscribed to is being threatened by the bundling of journal titles by

database vendors. One researcher fears this bundle creates artificial “cores” of journal titles, to the detriment of intellectual exchange (Guedon 2004). The concept of journal articles, those conveyors of scholarly research, as physical pages published in issues that appear at predictable intervals accompanied by ever-increasing annual subscription bills is being challenged by new paradigms. The Open Access Publishing movement is encouraging journals to publish on the web, with access for all unhindered by subscriptions.

Prepublication on institutional and private web sites of research results is becoming more acceptable. The physics community have been disseminating non-peer reviewed pre publication research results online since 1991, on the arXiv site (<http://arxiv.org>) The scholarly communication environment is becoming more chaotic. An optimistic vision of this chaos sees control over intellectual activity being returned to academia, and away from profit driven publishers (Guedon 2004). But where does all of this leave librarians? Already, students are coming to the library with instructions from faculty to use only print materials, and not anything found “on the web”, leaving the librarian with the challenge of explaining the virtues on online subscription databases. How much more difficult, but interesting, it will be to attempt to convey the complexity of the newly evolving information world. The social sciences tends to lag behind the natural sciences in terms of technology adaptation, so for now, at the John Jay College library, librarians are teaching students about the traditional scholarly communication vehicle, the journal, now available in print and electronic formats. One method of assessing journal use is by analyzing citations in published works, and unpublished theses and student papers. Typical analysis have included counting the number of journal articles cited, percentage of total citations made up of journal articles, age of the citations, and the number of journal titles from which the citations were drawn. A citation analysis of clinical psychology doctoral dissertations found that 67% of the citations were to

journal articles (Wehmeyer and Wehmeyer 1999). An analysis of 342 psychology masters' theses dating from 1981 through 1990 found the average number of citations to be 36.6, and 62.4% of all citations were to journal articles (Thomas 1993). These graduate students cited journals in their masters' theses almost twice as frequently as did professional psychologists (Thomas 1993). A total of 1050 journal titles were cited in the master's theses, 47.6 % of them only once. The four most cited titles were, in order, the *Journal of Applied Psychology*, the *Journal of Personality and Social Psychology*, the *Journal of Consulting and Clinical Psychology* and the *Journal of Abnormal and Social Psychology* (Thomas 1993). Reynolds (1987) looked at citations from 646 master's theses for a range of disciplines, completed between 1950 and 1981. The average number of citations for the biology, social science and psychology theses was 48.6, 102.2 and 40.5 respectively, of which 34.8, 35.4 and 25.7 were to journal articles.

An analysis of citations from undergraduate and graduate student research papers in psychology identified 70 percent of the article citations as published in journals owned by the library (Sylvia 1998). The four most cited journals in Sylvia's study were the *Journal of Personality and Social Psychology*, *Psychological Reports*, *American Psychologist*, and the *Journal of Experimental Psychology*. Sixty six percent of the citations came from 23% of the journal titles (Sylvia 1998). Peritz and Sor (1990) examined 180 psychology theses completed from 1983 through 1987, and found the mean number of citations to be 76.9. 56% of the citations were to journal articles, citing 831 journal titles in all, with about half of the article citations referring to only 32 journal titles.

Kushkowski, Parsons and Wiese (2003) found that the number of citations, the age of citations, and the proportion of journal citations in doctoral and masters theses completed between 1973 and 1992 varied according to discipline. The largest proportion of journal citations, 78.6% were in biology theses, while arts and humanities theses had the smallest

proportion of journal articles, at 29%. The library owned 85% of all of the works cited. The mean citation age was 12 years, with half being ten years old or less. The average number of citations per 100 pages for master's theses in the social sciences and biological sciences were 52.1 and 86.4, respectively, with the thesis averaging 112.9 and 92.8 pages respectively.

ii). Effect of electronic availability on journal use.

De Groote and Dorsch reported significantly reduced use of print journals following the introduction of online journals, including decreased use of print journals for which there was no online equivalent (2001). Following the introduction of ScienceDirect, use of print journals at the Duke University Chemistry Library halved (Vaughan 2003). A survey at the University of Illinois at Urbana-Champaign reported increased overall journal use with the addition of electronic journals, along with a decline in the use of some, but not all print titles (Chrzastowski 2003). One survey reported that students prefer to use electronic journals while faculty prefer the print format, with ease of access and access from home among the reasons given for preferring electronic format (Sathe, Grady and Giuse 2002). Medical faculty, regardless of age, prefer to read primarily print format journals, though most of these are private, rather than institutional, subscriptions (Tenopir, King and Bush 2004). Davis and Cohen (2001) report that undergraduate term papers in economics increased their number of web site citations from 1996 to 1999, and decreased the number of total scholarly citations. Over half of the URLs provided were incorrect. The number of journal citations decreased, but not significantly (Davis and Cohen 2001). In a follow-up paper, Davis reported that scholarly citations increased, as did URL accuracy, when the professor provided "clear and enforceable guidelines" (Davis 2003), with a particularly large increase

seen in the number of journal articles cited. Davis identifies student time, rather than access to information, as the limiting factor encouraging use of web sites rather than traditional library resources.

Hypotheses:

Previous studies have shown a bias towards citing journals owned by the theses writers' libraries (Kushkoski, Parsons & Wiese 2003; Sylvia 1998). This may merely reflect the appropriateness of the libraries' collections, or it may indicate a bias towards convenience. To test whether a convenience bias exists in the masters theses at John Jay College, it is hypothesized that students would cite those journal articles available electronically in preference to any others, including those in print format, or available only through interlibrary loan or from another library. This preference would result in a bias in their citations, which would be portrayed as follows:

- The ratio of journal citations to all citations would show an increase over time, reflecting the greater ease of access to journal articles in full-text databases.
- More of the journals cited in 2003 and 2004 forensic psychology theses would be available in electronic format than those journal titles cited in 1991 theses.

Methods

All theses:

All masters' theses deposited in the library from 1991 through June 2004 were examined. Photocopies were made of the bibliographies. The thesis number (or student name, for the uncatalogued 2004 thesis), discipline, and year of graduation were noted for each, and the citations examined. A count was made of the total number of citations, and the number of journal citations for each.

Theses were from four different disciplines: forensic psychology, forensic science, criminal justice and fire science. Only three fire science theses found, and of these three, one had been bound without its bibliography. Because this meant that citations from only two fire science theses were available, it was decided to omit the fire science theses altogether from the study. This left a total of 135 theses; 46 forensic psychology, 63 forensic science and 26 criminal justice theses.

Forensic psychology theses:

Forensic psychology theses for 1991, 2003 and 2004 were more closely examined. 2003 and 2004 were chosen as the electronic environment remained stable over those years. In 2002, the library had started subscribing to PsycARTICLES, which provide access to the full text of journals from the American Psychological Association, while in 2001, the library changed to accessing the psychology index through PsycINFO interface, which allowed linking to the full text of any journal articles subscribed to independently of PsycINFO. 1991 was chosen, as the number of theses that year was similar to 2003 and 2004, yet predated any significant electronic availability.

The title and year of each journal citation was noted. Whether or not articles cited in the 2003 and 2004 theses were available to students in electronic format during 2003 and 2004 was ascertained, using the library's list of full text journals. This list changes as the library

adds new database and online journal subscriptions to its collections. For the 2004 theses, the June 2004 list was used. For the 2003 theses, the list used was one archived on the website of the Internet Archive Wayback Machine dated June 8, 2003. The URL for the Internet Archive Wayback Machine is <http://www.archive.org/web/web.php>, and the URL for the John Jay journal listing, is <http://web.archive.org/web/20030608115552/http://www.lib.jjay.cuny.edu/journals/>. None of the 1991 theses journal citations would have been available electronically to students at the time of citing. But a note was made as to whether any volumes of the journal titles cited are available in electronic format to students now.

Results

i). All theses:

The 135 theses examined cited a total of 7,050 references, of which 3,484 were journal articles. No discernable pattern was apparent when the number of total citations, journal article citations and ratio of journal articles to total citations was graphed over time, from 1991 to 2004.

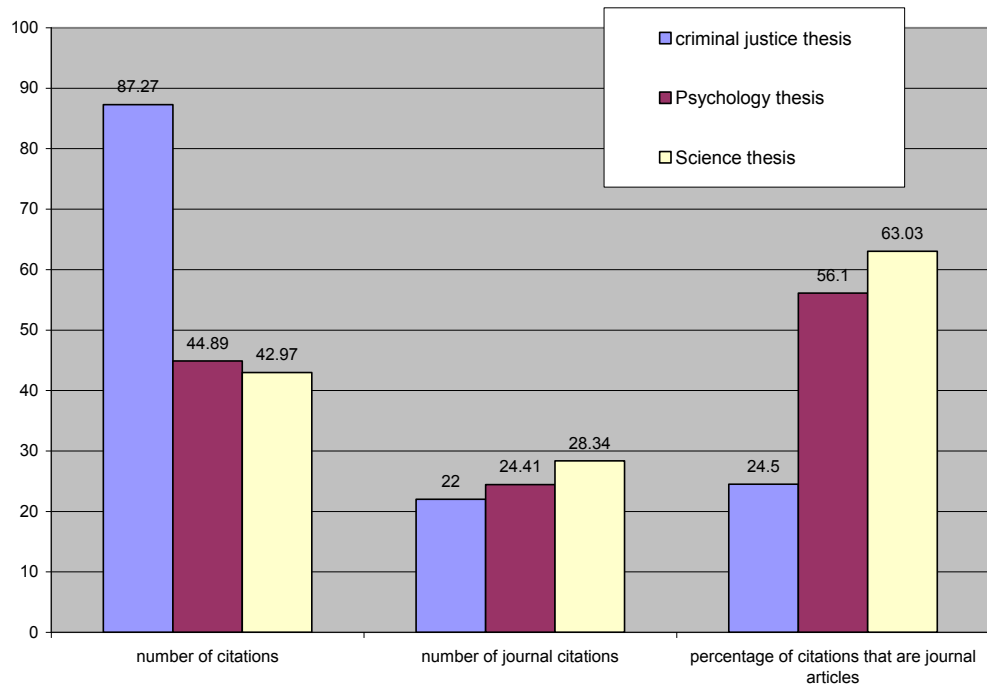
The criminal justice MA theses had an arithmetic mean of 87.3 total citations and 22 journal article citations. The ratio of journal articles to total citations was .245. Forensic psychology theses had an arithmetic mean of 44.9 total citations, 24.4 journal citations, and the ratio of journal articles to total citations was .561. Forensic science theses had an arithmetic mean of 43 total citations, 28.3 journal citations and the ratio of journal articles to total citations was .63. The criminal justice theses thus cited more references than either the psychology or science theses, but proportionally fewer of those references were to journal articles. The

science theses cited fewest references, but those citations included the greatest proportion of journal articles. (Table 1). Student's t-test was used to compare the number of total citations in the three groups. First, the number of total citations in the psychology theses were compared to the number in the science thesis. The means were not found to be significantly different. ($t=.59$, 108 df, $P>.10$). However, when the psychology theses were compared to the criminal justice theses, ($t=-4.122$, 70 df, $P<.001$), a significant difference was found between the mean number of total citations in each group. In conclusion, the mean number of citations in the psychology and science theses is similar, but the mean number of citations in the criminal justice theses is significantly greater. (Chart 1).

Table 1. Mean number of citations and journal citations in theses.

	Mean number citations	Mean number journal articles	Percentage journal citations
Criminal justice theses	87.3	22	24.5
Psychology theses	44.9	24.4	56.1
Science theses	43	28.3	63

Chart 1. All thesis citations, 1991-2004



Trends from 1991 -2000, and 2001 – 2004:

The data was then grouped into two time periods, 1991 to 2000, and 2001 to 2004. These time periods were selected as 2001 saw substantial improvements in electronic journal accessibility – specifically, the acquisition of interfaces to PsycINFO and Sociological Abstracts that allowed linking from journal citations to the full text of the articles, if the full text was available to the library through another vendor/subscription. In addition, in 2002 a proxy server was set up allowing access to library subscribed electronic materials from off-campus. And breaking the data down into those two time periods gave a reasonably even numbers of theses into the two parts.

The averages (arithmetic means) plotted, for the total number of citations, number of journal articles, and ratio of journal articles to total citations, for each of the three thesis categories.

Bar graphs were drawn to represent the mean number of all citations (Chart 2) and the mean

number of journal articles (Chart 3), while bar and whisker charts were drawn to illustrate the ratio of journal articles to total citations (Charts 4, 5 and 6).

The bar and whisker charts show a trend for an increase in the number of journal articles relative to the number of all citations, for the psychology theses (Chart 4), while the science (Chart 5) and criminal justice (Chart 6) theses show a decrease.

Chart 2. Mean number of all citations, 1991-2000 and 2001-2004

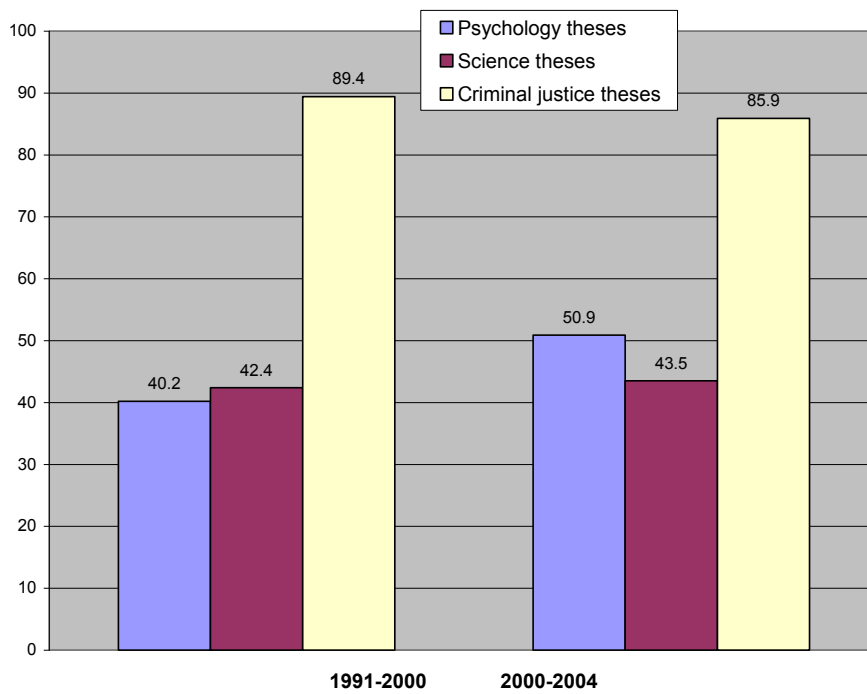


Chart 3. Mean number journal articles, 1991-2000 and 2001-2004

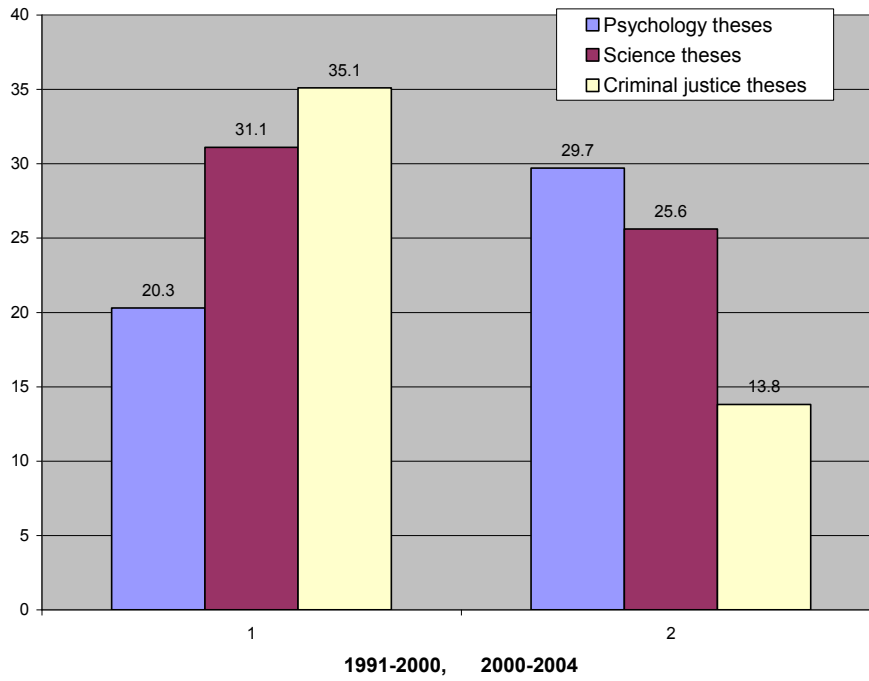
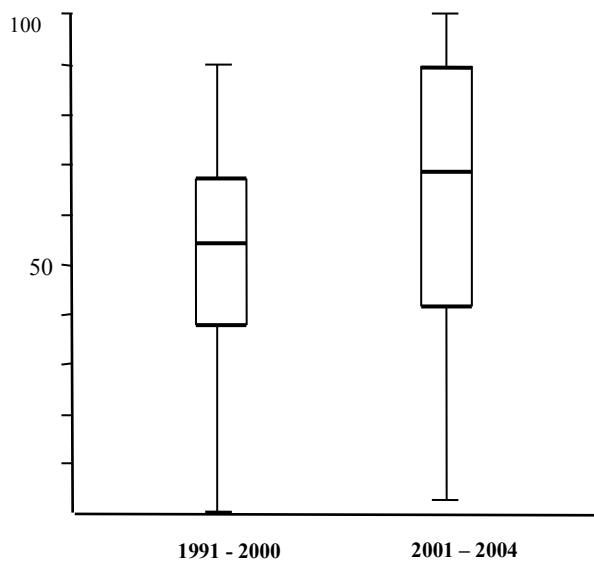


Chart 4.

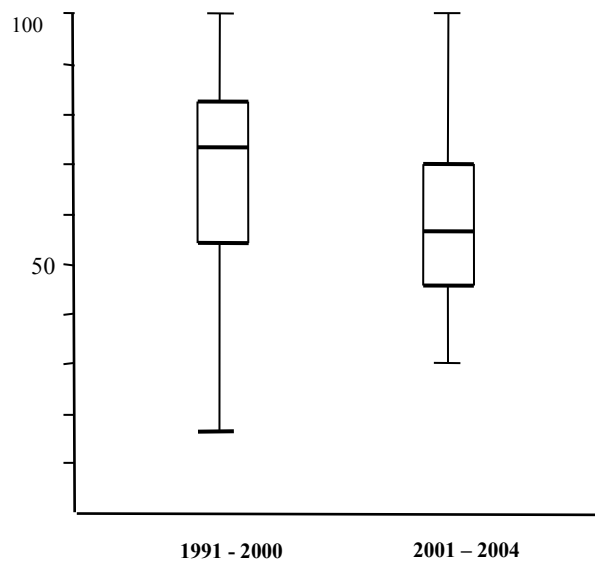
Mean number of journal articles as percentage of total citations, in psychology theses, shown as bar and whisker chart.



	1991-2000	2001-2004
mean	52.2	61.2
median	54.2	69.5
max	90	100
min	0	2.2
1st quartile	38.4	42.5
3rd quartile	67.9	79.6
number of theses	26	20

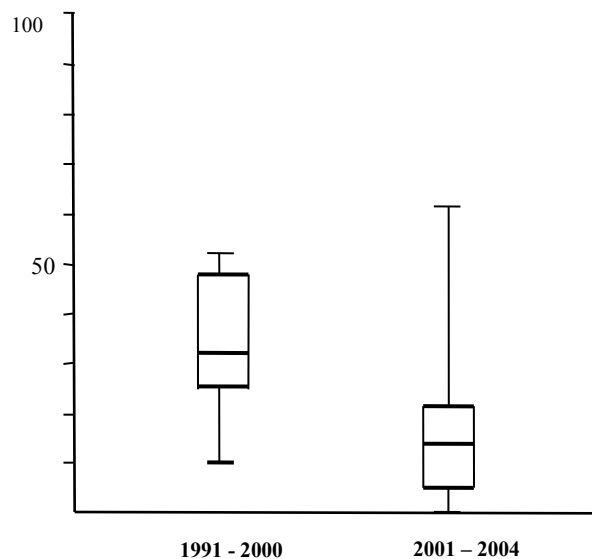
Chart 5.

Mean number of journal articles as percentage of total citations, in science theses, shown as a bar and whisker chart.



	1991-2000	2001-2004
mean	67.4	58.3
median	73.5	55.4
max	100	100
min	15.4	30.8
1st quartile	54.7	46.2
3rd quartile	84	71
number of theses	31	32

Chart 6.
 Mean number of journal articles as percentage of total citations,
 in criminal justice theses, shown as a bar and whisker chart.



	1991-2000	2001-2004
mean	35.4	17.7
median	33.5	14.8
max	52.5	62
min	11.6	0
1st quartile	25.2	5.6
3rd quartile	49.8	21.1
number of theses	10	16

Chart 3 shows that the absolute number of journal articles increased by about a third for the psychology theses, decreased a little for the science theses, and decreased dramatically, by about 60% - for the criminal justice theses. Chart 2 shows the total number of citations increased by 25% for the psychology theses, but remained much the same for the science and criminal justice theses.

These charts indicate that psychology students have increased both the total number of citations used in their theses as well as their use of journal articles, while science and criminal

justice students appear to have decreased their use of journal articles, while maintaining the number of resources they cite in their theses.

ii).. Journal articles cited in psychology theses.

Six, 5 and 6 psychology theses from 1991, 2003 and 2004 respectively were deposited in the library. These 17 theses listed a total of 789 references, of which 442 were to journal articles from 225 different journal titles.

Table 4. Ten most cited journals in psychology theses completed in 1991, 2003 and 2004.

Journal title	Times cited
<i>Criminal Justice and Behavior</i>	23
<i>Journal of Interpersonal Violence</i>	19
<i>American Journal of Psychiatry</i>	16
<i>Law and Human Behavior</i>	16
<i>Journal of Personality and Social Psychology</i>	15
<i>Behavioral Sciences and the Law</i>	12
<i>Journal of Consulting and Clinical Psychology</i>	10
<i>Journal of Social Issues</i>	10
<i>Psychological Reports</i>	9
<i>Violence and Victims</i>	9

Considering all 17 theses as a single group, the ten most cited journal titles are shown in table 4. Sixty four titles were cited more than once; 32 titles were cited 3 or more times, 161 titles were cited only once. One hundred and thirty nine, or 47.7% of all articles cited came from 10 journal titles, with these 10 titles comprising 22.5% of the all of the journal titles cited. i.e. almost half of the articles came from about a fifth of the journal titles cited. The

students citing behavior appears to be in accord with Bradford’s Law of Scattering, which describes how a substantial amount of the articles in any subject area will be published in a small core group of journals (Garfield 1980, p 477).

Of the ten most cited titles, eight are now available in electronic form, at least in part, to students at John Jay College, but 2 are not: *Psychological Reports*, and *Violence and Victims*.

Of the 225 total cited journal titles, 183 titles are now available in electronic format, at least in part, to students (though not necessarily the actual cited articles). Of the 42 cited journal titles that are not now available in electronic format to students, only 7 titles were cited 3 or more times, while 32 of them were cited only once (table 2).

Table 2. Number of journal articles and journal titles cited in psychology theses.

Psychology theses year	Number of journal articles cited	Number of journal titles cited	Number of journal titles cited now available electronically (at least partially)
1991	130	73	52 (71.2%)
2003	150	68	40 (58.8%)
2004	162	84	50 (59.5%)
All 3 years	442	225	183 (81.3%)

1991 theses:

Of the 73 journal titles cited in the 1991 psychology theses, 52 (71.2%) of them are available in electronic format, at least in part, to students in 2004.

2003 theses:

Of the 68 journal titles cited in the 2003 psychology theses, 40 (58.8%) of them are available, at least in part, to students in 2004. Of the 150 journal article citations in the 2003 psychology theses, 103 (68.7%) of them were available in electronic format to students in 2003.

2004 theses:

Of the 84 journal titles cited in the 2004 psychology theses, 50 (59.5%) of them are available, at least in part, to students in 2004. Of the 162 journal article citations in the 2004 psychology theses, 85 (52.5%) of them were available in electronic format to students in 2004.

Of the ten most cited journal titles from 1991 theses, all but three were also cited in 2003 or 2004. Two of the three not cited in 2003 or 2004 were available in electronic format in 2004; *Child Welfare* and the *American Journal of Psychotherapy*. Only one was not available in electronic format in 2004; the *Journal of Police Science and Administration*.

Thus, the hypothesis that more of the journal titles cited in 2003 and 2004 than in 1991 would be available in electronic format does not appear to be supported, by this limited data.

Even if the hypothesis had been supported but the data, it would not have been conclusive but merely indicative of a possible trend. The electronic availability of some volumes of the journal title does not mean that the actual cited article is now available electronically. But given the age bias in citing – ie younger articles are more likely to be cited than older articles – students in 2000 are not necessarily going to cite the same articles used by students in 1990

that are now ten or more years old, regardless of ease of access. Chart 7 indicates the age of citations at the time of citing. Fifty percent (indicated in chart 7 as range q3-1, i.e. 2nd and 3rd quartile) of all citations in theses completed in 2004 were 13 years old or less; for 2003 theses, 9 years old or less; and for 1991 theses 10 years old or less.

iii). Electronic citations.

38 theses cited electronic sources as electronic. Thirty seven of these cited web sites, giving a URL, while the remaining thesis cited the Lexis-Nexis database. Three students cited documents in library databases – Lexis-Nexis, Lexis, ScienceDirect, an unspecified EBSCOhost database, a cd-rom entitled “Polling the nations” (cited in 2001). One student indicated that journal articles had been retrieved in electronic format by putting the work “online” before the title, e.g. *Online Journal of Marriage and Family*, *Online Journal of Clinical Child Psychology*. Of these 38 theses, the mean number of electronic sources cited was 13.5. All 38 theses had been completed in 2000 or later. 7 were forensic psychology, 15 were forensic science and 16 were criminal justice. Eighty two theses had been completed in 2000 or later - the 38 theses that cited electronic sources composed 46% of these. (Table 3).

Table 3. Number of theses completed in 2000 or later, citing electronic resources.

	Total theses	Theses with electronic citations	Percentage of theses with electronic citations
Criminal justice theses	17	16	94%
Psychology theses	25	7	28%
Science theses	40	15	37%
All theses	82	38	46%

Chart 7.
Psychology thesis for 1991, 2003 and 2004.

Age and year of publication of journal cites, at time of citing, shown as a bar and whisker chart.

(vertical axis refers to year of citation, horizontal axis refers to year thesis was completed)



thesis year	max	min	median	1st quartile	3rd quartile	range	range q3-1
1991	1990	1956	1981	1976	1985	35	10
2003	2003	1971	1998	1993	2001	33	9
2004	2003	1968	1993	1985	1997	36	13

Discussion

Relatively few master's students complete theses at John Jay College. Most choose an alternate option, generally, either a comprehensive examination, or an externship. Students interested in working on a thesis must first convince a faculty member and potential adviser that they are capable of carrying out research, and writing it up. Some faculty members insist that the work results in a publishable journal article. Theses research is generally

carried out under the close supervision of the thesis adviser. The resulting theses tend to be representative of the work of stronger, and more research-oriented students.

Less than half of the theses completed in 2000 or later cited electronic sources. Most of these sources were web sites - very few students indicated that they had used electronic journals. Other resources cited as print resources that could have been accessed in electronic format included newspapers, census data, court reports and other government documents.

Clearly, the majority of students did not distinguish between the formats of journal articles - those retrieved in electronic format are being cited in the same way as those obtained in hardcopy. This is in agreement with Malone and Videon's (1997) finding that student bibliographies rarely cite sources as electronic, although at that time there was considerable confusion regarding citation formats for electronic materials. The citation style of the American Psychological Association is recommended for students to use at John Jay College, and most of the students' theses did follow this style. In 2001, with the 5th edition of its publication manual, the APA issued clear and straightforward guidelines as to how to cite electronic journals, significantly simplifying their previous recommendation. So from 2001, citing electronic citations APA style should not have presented students with any significant difficulty. The question remains as to why students are not specifying resources as electronic in their citations. Is it to simplify citations, making it easier for them to write out, or are they genuinely not seeing a difference between print and electronic formats? Or are they deliberately disguising the electronic resources, for fear that their supervisor will disprove of all materials found "on the web"?

When the first full text database came out, there were significant differences between the documents as they appeared in the database compared with the printed versions. The text of the article was generally reproduced, but not graphs, photographs, tables and other non-text information. This is still the case some databases, including Lexis-Nexis. But other database providers, such as EBSCO, have started to include image files of the pages, portraying the articles as they appear in their printed form. On-line journal subscriptions, such as those offered by Sage, now provide access to image files, again, showing in PDF files, exact images of the printed pages. This raises the question as to whether the scholarly community needs to be concerned anymore with whether the PDF file or the printed page is cited, as both look identical. The original concerns were with typographical errors made in copying text from the printed page into electronic documents, and with citing from text not supported by graphical or other non-text data. However, electronic documents are controlled by whoever controls the computer on which they are stored. Printed journals on the library shelves are beyond the reach of the publisher, but electronic documents stored on the publisher's server may be removed, altered and replaced at any time. While it is unlikely that any publisher wishing to remain credible would engage in post-publication changes, it is not impossible. And for this reason alone, it may be important that sources are cited as electronic, when it is in that format that they are consulted. However, it appears unlikely that many scholars will define their source formats in their citations. If students are not doing so, it indicates that teaching faculty may not consider it important. A quick random browse through recent APA journal issues indicates that few authors are citing electronic journals - which almost certainly is not an indication that they read the print version.

Conclusion

This study shows some evidence for a change in journal citation behavior by masters' theses students from 1991 through 2004, possibly due to the dramatically changed information environment. The number of journals cited in criminal justice theses decreased, as did the number of journal articles relative to the total number of citations, while both number of journal articles cited and the proportion relative to all citations increased for in the psychology theses. This may reflect the greater ease of access to journal articles for psychology students, due to library subscriptions to the PsycINFO and PsycARTICLES databases, and possibly, a greater preponderance of web-based resources for appropriate for criminal justice theses – eg government reports, National Institute of Justice publications, etc. More work would have to be done to test the latter speculation. A contributing factor, not tested here, may be the role of the faculty supervising the theses – the composition of student bibliographies is affected by professors (Robinson & Schlegel 2004).

The ratio of journal citations to all citations shows an increase over time only for the psychology theses. Comparing the journal titles cited in 2003 and 2004 psychology theses with those cited in 1991 does not show a bias towards those available electronically.

Thus there is limited evidence to support the hypothesis that students are experiencing a convenience bias towards electronic rather than print journals. This limited evidence comes only from the psychology theses, and is not conclusive.

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Appendix:

TIMELINE for acquisitions of electronic full-text resources at John Jay College library.

(adapted from Egan 2005).

1995	Proquest, on multiple cd-roms
1997	Project Muse Information Access Seachbank
1998	LexisNexis Universe
1999	Link from library homepage to list of full text journals available in CUN databases, on Baruch College library homepage.

- 2000 Proxy server service initiated.
 Jstor
 Netlibrary
- 2001 EbscoHOST Academic (Information Access Seachbank dropped)
 New interface to PsycINFO and Sociological Abstracts allows linking to full
 text available through other services/products.
- 2002 Hein Online
 PsycARTICLES
 ScienceDirect
- 2003 Kluwer Online
 Sage Criminology and Sociology.