Complex and Varied: Factors Related to the Research Productivity of Academic Librarians in the United States

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Academic librarians face multiple barriers in conducting the research that is expected in their work, yet they still manage to successfully complete it. This study aimed to identify the factors that contribute to their success. Through an online survey sent via email to a random sample of academic librarians in the United States, we gathered and analyzed quantitative data about education and experience, demographics, success factor statements, and research productivity to determine which factors are related to increased research output. We found that three categories of factors—Individual Attributes, Peers and Community, and Institutional Structures and Supports—contribute positively to overall research output. We identified several elements that academic librarians may want to pursue to increase research productivity, with Peers and Community identified as a category for exploration. Overall, we found that academic librarians are highly motivated to conduct research, yet the factors leading to their success are complex and varied.

Introduction

Academic librarians conduct and share results of their research for many reasons: to develop and thrive as professionals, to improve services and collections, to document the value of their work for students' and faculty academic success, and to contribute to the body of knowledge in library and information science (LIS). Librarians and their academic institutions benefit from librarianship that is informed by research and by the development of evidence-based practice. Academic librarians derive well-established benefits from conducting research: progress toward gaining promotion, tenure, and higher salaries; advancement in the profession and recognition; receptivity to change; increased skill in managing complex library operations through systematic study; and better service to and empathy with faculty researchers. Librarians who have some form of faculty status are required to produce scholarship for promotion or tenure and, regard-

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less of faculty status, most librarians employed by academic research libraries are expected to conduct and communicate the results of their research.

More than two decades of LIS research reveals that academic librarians struggle to overcome major barriers to research success, frequently identified as lack of knowledge and time to conduct and report the results of their research. However, despite barriers and challenges, many academic librarians achieve research success, which is generally associated with productivity—that is, conducting research that culminates in sharing results and findings. This study addresses the factors that contribute to that success, emphasizing identification of the most important factors.

Literature Review

The current study builds on the work of several researchers, primarily in the United States and Canada, who have been studying research productivity among academic librarians for decades. Early on, researchers tended to focus on barriers to research productivity,[1] but more recently there has been a shift in focus to research success factors.[2] Most of this research has been carried out by librarian-researchers, who are likely motivated to encourage and support their fellow academic librarians and themselves to be successful and productive researchers.

Time has been one of the most cited barriers to research success.[3] Supports that provide or protect time, such as sabbaticals, research leaves, and scheduling time for research, have been cited as among the most beneficial for research success.[4] Unlike teaching faculty, most librarians do not have protected time in the summer to work on their research.[5] This work schedule means that it is critical to find time for research during the year. Sassen and Wahl surveyed Association of Research Libraries (ARL) deans and directors and found that 98 percent of libraries where research is required also have flexible policies on devoting work time to research and publication.[6] However, it is understood that full-time teaching faculty have time during the academic year to work on research between classes and while working from home. Librarians typically lack this flexibility.

Much has also been written about faculty status and research, since the conditions of faculty status usually include tenure and/or promotion, which are earned in part through research. Estimates of how many academic librarians have some form of faculty status vary, but it is believed to be between 40 percent and 50 percent.[7] Tenure-track librarians have produced more research than librarians at similar institutions,[8] and "conducting research can contribute to career advancement for librarians, especially academic librarians on tenure track."[9] Sassen and Wahl's 2014 study found that 85 percent of ARL members grant tenure and/or continuing appointments; nearly all require publication for tenure or continuing appointment, and expectations for productivity are increasing.[10] Walters confirmed that "the relationship between faculty status and librarians' [research] productivity is strong and consistent across all sizes of institutions."[11] Not only is there a link between faculty status and research productivity, but "faculty status may actually encourage publication in the most respected journals."[12]

There is evidence that the research requirements of faculty status call for strong institutional support.[13] In a recent study of occupational stress and tenure-track librarians, Cameron, Pierce, and Conroy found that factors related to research support produced the most stress, but these stressors could be alleviated by research training and mentoring.[14] Other researchers confirm that the need for research training and institutional support is especially acute for early-career librarians on the tenure track, including librarians of color.[15] However, Hollister

found that 50 percent of academic libraries who grant faculty status to librarians also have a post-tenure review policy with a research requirement, suggesting that post-tenure librarians may need ongoing institutional support.[16] Couture, Gerke, and Knievel affirmed that tenured librarians benefit from mentoring and other institutional supports to achieve promotion to the highest ranks.[17]

Most academic librarians enter the profession with scant knowledge of research methods and incomplete information about research expectations in academic libraries. Faculty who have completed a PhD program begin preparing for a research career early in their graduate programs, but students in an MLIS program do not receive the same research preparation. Consequently, most librarians enter the profession feeling unprepared to conduct research.[18] Although more than 63 percent of LIS degree programs require a research methods course,[19] one research course is likely insufficient preparation. Studies over nearly twenty years show a declining belief that MLIS programs have prepared librarians to conduct research, from 30 percent to 17 percent.[20] To develop research skills and knowledge, librarians have turned to self-education, formal research courses, and continuing education. In response to demand for more research training,[21] the Institute for Museum and Library Services (IMLS) has funded three research institutes for librarians since 2013: the Institute for Research Design in Librarianship (IRDL), the Research Institute for Public Libraries (RIPL), and the Research Training Institute (RTI) for Health Sciences Librarians.

Research output takes numerous forms—posters, conference presentations, articles, book chapters, and more. These forms of output may have different weights for the purposes of promotion, tenure, and annual merit increases, depending on institutional priorities. According to Hollister's survey of tenured and tenure-track librarians in all types of academic libraries, the forms of research output that were most important for professional advancement were peer-reviewed articles (89 percent choosing Important or Very Important), conference presentations (78 percent), book chapters (68 percent), and books (59 percent).[22] In their survey of ARL library deans and directors, Sassen and Wahl found that the forms of research output most valued for promotion, tenure, and continuing appointment were books and peer-reviewed journal articles, followed closely by conference presentations, workshops, panels, and posters. However, respondents rated a wide range of research output as "acceptable."[23]

Recent studies have examined the role that peers and community play in research success. This includes mentoring, collaboration, and peer support. Studies have found that research mentoring is beneficial to both early-career and tenured librarians.[24] Sassen and Brannon found that research collaboration is associated with productivity.[25] This may account for the increase in coauthorship among librarians; for the past twenty-five years, between 40 percent and 50 percent of research published in LIS journals has been coauthored, and the trend is increasing.[26] In a study of coauthorship in seven LIS research journals from 2005 to 2014, 54 percent of the articles were coauthored and received on average more citations than the singly-authored articles.[27]

Many forms of peer support have contributed to research productivity. Writing groups and writing retreats have numerous benefits, resulting in networking opportunities, writing feedback, and publications. Tysick and Babb's case study of a writing group for untenured librarians described how the group helped librarians meet publication goals and created "a foundation for new librarians to comfortably and productively assimilate into the academic culture."[28] Writing retreats can help librarians by providing "protected time" for their writing

and a peer support network for feedback on their writing.[29] Yet another form of peer support is a library research and publishing group, which begins earlier in the research process and creates a research community as a catalyst for writing and publication.[30]

Researchers have been unable to identify the single most important support category or one or two most important research success factors. Comprehensive studies that have examined numerous previously identified success factors suggest that an integrated suite of factors contributes to research success for librarian-researchers.[31]

Aims

The purposes of this study were to identify what factors contribute to the research success of academic librarians in the United States and compare those findings with a 2016 study of academic librarians in Canada.[32] Research success is generally aligned with productivity and output. As such, we used research outputs as a proxy for research success and examined the relationships between research outputs and an array of factors that may influence productivity. The factors we examined were drawn from Hoffmann, Berg, and Koufogiannakis's extensive literature review across disciplines,[33] which identified three categories of factors that influence research productivity, shown in table 1.

TABLE 1
Factors Influencing Research Productivity across the Disciplines

Individual Attributes	Peers and Community	Institutional Structures and Supports
Demographics	Collaboration	Extrinsic Motivations
Education and Experience	Community	Institutional Supports
Intrinsic Motivations	Mentoring	
Personal Commitment to Research	Peer Support	
Personality Traits		

A follow-up study by Hoffmann, Berg, and Koufogiannakis in 2016 found that factors in these three major categories all had a positive effect on the research productivity of academic librarians in Canada.[34]

This current study is a partnership between Hoffmann and Berg and researchers conducting similar studies in the United States,[35] merging the interests of the two groups and placing the 2016 study in an American setting.

The current study posed the following research questions:

1. What factors have a positive effect on research productivity?
2. Which of three categories of factors identified by Hoffmann, Berg, and Koufogiannakis—Peers and Community, Individual Attributes, and Institutional Structures and Supports—are most influential for librarians' research productivity?[36]
3. How do the results of this study compare to the findings from Hoffmann, Berg, and Koufogiannakis's study of academic librarians' research productivity?[37]

The aim was not to describe the research environment of academic librarians in the United States, but rather to identify relationships between their research output and the factors that may influence their productivity.

Methods

This quantitative study used an online survey to collect data from a random sample of academic research librarians working in the United States. It replicates the 2016 Canadian study in the United States and examines additional variables from Kennedy and Brancolini.[38]

Study Population

The original study surveyed librarians working in seventy-five academic libraries in Canada, which included the vast majority of academic librarians in the country. In an effort to identify a comparably broad study population, we drew our sample from the three categories of doctoral-granting institutions in the U.S., as listed by The Carnegie Classification of Institutions of Higher Education: R1: Doctoral Universities – Very high research activity; R2: Doctoral Universities – High research activity; D/PU: Doctoral/Professional Universities.

Potential participants were academic librarians and archivists employed at 198 American institutions randomly selected from the list of Carnegie R1, R2, and Doctoral/Professional institutions. We randomly selected half the institutions on each list and excluded two institutions for which we could not find a library. The institutions included in this study are listed in appendix B. To identify the librarians at each institution, two of us and a research assistant visited each library's online directory and recorded in a spreadsheet the 6,416 email addresses of all employees we could identify as librarians or archivists. This sampling method raised a challenge in that it was difficult to verify that the recruitment email recipients met the study criteria, so we can only estimate the number of potential participants.

Recruitment and Survey Dissemination

Recruitment began after receiving clearance from our institutions' Ethics Review Boards. In October 2020, we sent each participant an initial email invitation and two follow-up reminders to participate in the study, each with an attached Letter of Information for Consent to Participate in Research and a link to the online survey. We emailed the study invitation to 6,416 potential participants.

Survey Design and Measures

As noted above, our study's goal was to capture the factors that may influence productivity. Questions about the factors were designed with bivariate variables, Yes or No, that could easily be used to calculate statistical measures. We revised the original data collection tool, designed for Canadian academic librarians, to reflect the American context. Our changes were to alter language, expand response options, and add questions of interest. The survey again followed four areas of interest.

Education and Experience

Expanding on the survey tool from the Canadian study, we added four questions related to professional training and research environment. We added a question about the delivery mechanism of the respondent's MLIS program, whether in person, online, or a combination of in person and online; two questions about the respondent's belief about whether their MLIS program had prepared them to read and understand research-based literature, or to conduct original research; and a question about whether the respondent's current position is in library administration. The latter three questions had response options of Yes or No.

We also changed response options for three questions in this section. For the question about years since completing the MLIS degree, we expanded the response field to include month of completion. For the question about formal research training since completing the MLIS, we revised response options to give more general training mechanisms. For the question about promotion and tenure, we changed the response options to reflect the types of positions held by academic librarians in the United States.

Demographics

We posed a series of demographic questions to identify whether there is a relationship between those variables and research productivity. We revised the response options to the question about gender identity.

Success Factor Statements

We presented fifty-three statements, requesting that the participant consider whether each statement applied to them and reply Yes or No. The statements focused on attitudes or beliefs about the research process ("I do research for my personal interest") as well as the respondent's research practice ("I have participated in a writing group"). Each statement expresses an element of one of the factors identified in table 1.

Research Productivity

We asked the participant to think over the last five years (January 2015–December 2019) and indicate how many times they had shared their LIS-related research using a range of mechanisms. A drop-down arrow permitted responses from zero to thirty for each mechanism.

We concluded the survey with two questions for open-ended comments. One question asked participants to add other factors that they felt we had not addressed, since we anticipated that the Yes or No answers might leave participants feeling that the complexities of their situations were not captured. The other question invited participants to share other ways in which they had distributed their research.

The survey instrument is in appendix A.

Analysis

We calculated descriptive statistics (counts and percentages for categorical/nominal responses, means and standard deviations for continuous measures) for survey items. We also calculated a weighted output score for each participant, based on the data from the Research Productivity section of the survey. Because different research outputs vary in perceived value and effort and each participant reported different kinds of output, the weighted output score allowed us to represent all of a participant's research output with one number.

In the 2016 Canadian study, the authors used a paired comparison analysis to arrive at a weight for each type of output, shown in table 2. Paired comparison analysis is a simple and direct way to quantify attributes of items

TABLE 2
Weights for each Type of Research Output

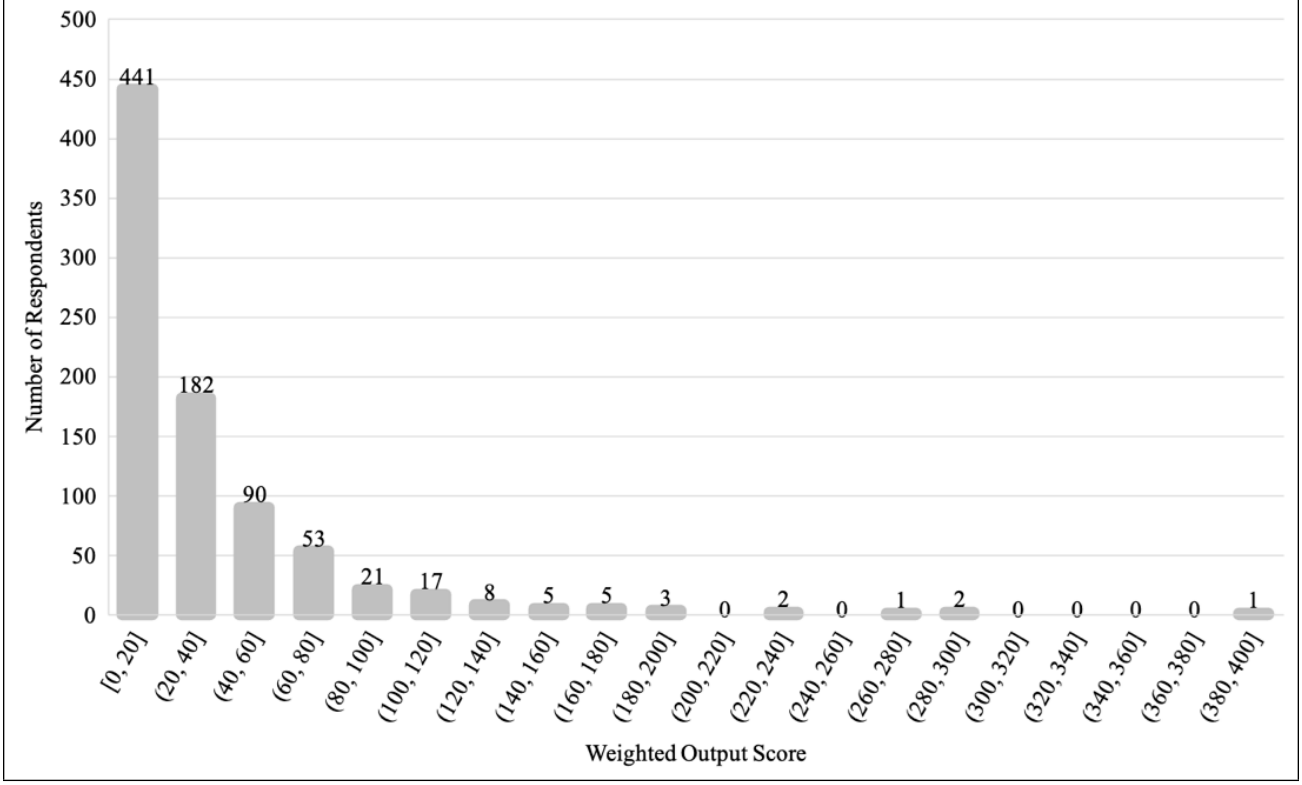
Output Type	Weight
Book review	0
Poster	0.5
Presentation	1
Conference proceeding	1
Non-peer-reviewed article	3
Book chapter	5
Edited book	6
Peer-reviewed article	9
Authored book	10

in comparison to one another. For this pairwise comparison, we created a table where each researcher compared the perceived value of each publication type to the other publication types and assigned the higher valued item a score from zero to three. Our scale: no difference in value = 0, slightly more value = 1, moderately more value = 2, a lot more value = 3. We then consolidated the results, and each publication type was assigned a final score.

We used the same weighting as in the Canadian study, to allow for comparison between the two studies' findings. We added book reviews as a type of output and conducted a paired comparison analysis to arrive at a weighting of zero for book reviews.

To determine how to analyze the survey results, we examined the distribution of weighted output scores for all participants, which is shown in figure 1. The mean weighted output over five years was 30.0, and sixty-eight participants reported no research output during that period.

FIGURE 1
Histogram of Participants' Weighted Output Scores (*n* = 831)



Since the weighted output scores do not approximate a normal distribution, we used non-parametric statistical tests to examine the relationship between weighted output score and the identified factors. For variables with two nominal groups, we used the Mann-Whitney U test. For variables with more than two groups, we used the Kruskal-Wallis ANOVA. For both tests, the null hypothesis is that there is no difference between the distributions; when the null hypothesis is rejected, the difference in the distributions is significant at the .05 level.

We used a stem and leaf plot in SPSS to identify extreme values. All weighted output scores above 95 were outliers and therefore were removed from analysis. We also decided to focus our analysis on participants who had demonstrated some regular engagement with

research, so we set a lower limit of three for weighted output score. We therefore analyzed the subset of responses where the weighted output score was between three and ninety five, inclusive. To ensure that we were not omitting a homogenous subset of participants (e.g., all those who are new to the profession) by excluding those with a weighted output score below three, we examined that set of participants and their responses to the variables for demographics, education, and work experience. There were some differences in the distribution of some variables (e.g., the ratio of participants with tenure was lower), but we are confident that all variables were well represented in the subset of responses with weighted output scores between three and ninety five.

The survey questions addressed eleven factors that are grouped into the three overarching categories shown in table 1. Each question mapped to one of the factors, as shown in appendix A. To determine whether the factors had an effect on research productivity, we tested variables at three levels: the three overarching categories, the factors within those categories*, and the individual statements or questions that formed the components of each factor. At all three levels, we tested against three measures of research productivity: weighted output score, number of peer-reviewed journal articles, and number of conference presentations. While the weighted output score is a single value that represents all of a librarian's output, and peer-reviewed articles are widely recognized as a standard of quality for scholarly output, our experience as professionals is that conference presentations are a common type of output for academic librarians.

Coding of Open-ended Questions

One of the final questions in the survey was, "Can you think of other factors that were not fully captured in the previous questions that have affected your research productivity?" We coded each response to identify the unique factors described. We then mapped the factors mentioned in the comments to the eleven factors we had already determined to see how respondents elaborated on those factors or if they described new factors. Finally, we reviewed and confirmed each other's assigned codes.

Results

We received 125 "mail undeliverable" messages, so 6,291 potential participants received the invitation. We received 1,125 survey responses for an 18 percent response rate, with respondents self-reporting their eligibility to meet our selection criteria. After removing incomplete responses, we had 831 responses for a usable response rate of 13 percent. As described in the Analysis section, we analyzed the subset of responses where the weighted output score was between three and ninety five, inclusive; there were 637 responses in this subset.

We reviewed four measures to see if our participants formed a representative sample of academic librarians: workplace category, gender, age, and years since completion of MLIS degree. Appendix C shows tables and charts of these measures. At 72 percent of respondents, women are likely overrepresented in our sample, but on measures of workplace category, age, and years since MLIS, we are confident that our participants comprise a representative sample.

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* We could not test Demographics or Education & Experience as factors, because the forms of these questions did not lend themselves to being combined in aggregate. We could only test the individual questions within these two factors.

Research Productivity

Participants reported a range of output mechanisms, both in type and amount. They reported producing over ten thousand items; some participants reported no research output and others reported distributing several dozen items. Conference presentations were 43.5 percent of the total reported output, followed by peer-reviewed articles (14.1 percent) and posters (12.9 percent), as shown in table 3. These three output types comprised 70.5 percent of the total reported output. This is similar to the Canadian study, where presentations were 48 percent of output and the top three types of output accounted for 72 percent of all reported publications. However, in that study, non-peer-reviewed articles were the second-most reported type of output and peer-reviewed articles were third. Authoring or editing a book was the least frequently reported type of output.

TABLE 3
Participants' Reported Research Output over the Past Five Years (January 2015–December 2019)

Output Type	N	Min	Max	Mean	Median	St. dev.	Total No. Reported	% of Output Reported
Presentation	821	0	30	5.4	4	6.1	4,415	43.5
Peer-reviewed article	802	0	30	1.8	1	3.1	1,426	14.1
Poster	810	0	20	1.6	1	2.4	1,312	12.9
Book review	789	0	30	1.2	0	3.8	938	9.3
Non-peer-reviewed article	776	0	30	.9	0	2.3	723	7.1
Book chapter	789	0	12	.7	0	1.2	575	5.7
Conference proceeding	785	0	13	.7	0	1.4	565	5.6
Edited book	771	0	30	.2	0	1.2	112	1.1
Authored book	771	0	4	.1	0	.4	77	0.8
Totals							10,143	100

In response to the open-ended question inviting participants to tell us other ways they shared research results, they mentioned mechanisms such as blogs, exhibitions, self-publication, social media, technical reports, and webinars or workshops.

Education and Experience

Within the factor of Education and Experience, five elements were significant: workplace category, tenure status, additional advanced degrees, years since MLIS (or equivalent), and whether respondents believed that their MLIS program prepared them to read research-based literature or to do research. The other elements of Education and Experience—delivery format of MLIS program, research training received either during or after their MLIS program, working on an additional advanced degree, and being in library administration—were not significantly related to research output.

Workplace category was significant in that participants at D/PU institutions produced significantly less weighted output or peer-reviewed articles than those at R1 or R2 institutions and reported significantly fewer conference presentations than those at R1 institutions, as shown in table 4. For tenure status, shown in table 5, those who have tenure or are eligible

TABLE 4
Mean Research Productivity for Workplace Category

		Weighted Output Score			Peer-reviewed Articles			Conference Presentations		
Workplace Category	**N**	**Min.**	**Max.**	**Mean**	**Min.**	**Max.**	**Mean**	**Min.**	**Max.**	**Mean**
R1	403	3	93	28.5	0	8	1.5	0	30	6.0
R2	143	3	94.5	31.5	0	7	1.7	0	30	5.6
D/PU	85	3	82	18.9	0	5	0.9	0	25	4.3

TABLE 5
Mean Research Productivity for Tenure Status

		Weighted Output Score			Peer-reviewed Articles			Conference Presentations		
Tenure Status	**N**	**Min.**	**Max.**	**Mean**	**Min.**	**Max.**	**Mean**	**Min.**	**Max.**	**Mean**
Tenured or eligible for tenure	310	3	94.5	31.3	0	8	1.8	0	30	5.8
Eligible for promotion only	206	3	92	25.4	0	8	1.2	0	30	5.5
Eligible for neither	120	3	87	23.6	0	7	1.1	0	30	5.4

for tenure produced significantly more weighted output and peer-reviewed articles than those who are only eligible for promotion or who aren't eligible for either. Tenure status was not significant for conference presentations.

Having an additional advanced thesis-based degree is positively significant for all three output variables tested ($n = 635$, weighted output $p = 0.000$, peer-reviewed articles $p = 0.018$, conference presentations $p = 0.007$). Having any additional advanced degree, thesis-based or not, is positively significant only for weighted output ($n = 635$, weighted output $p = 0.008$).*

* The complete statistical details are in appendix D.

TABLE 6
Mean Research Productivity for Years since MLIS

		Weighted Output Score			Peer-reviewed Articles			Conference Presentations		
Years Since MLIS	**N**	**Min.**	**Max.**	**Mean**	**Min.**	**Max.**	**Mean**	**Min.**	**Max.**	**Mean**
0 – 4	75	3	86.5	24.5	0	8	1.4	0	25	5.2
5 – 9	143	3	94.5	28.1	0	7	1.5	0	30	6.1
10 – 14	130	3	93	34.8	0	8	1.9	0	30	6.6
15 – 19	97	3	84	23.3	0	6	1.2	0	24	4.7
20 – 24	64	3	88.5	30.5	0	6	1.8	0	30	6.4
25 – 29	44	3.5	63	23.6	0	4	1.3	0	22	4.3
30 – 34	42	3	88	28.1	0	4	1.1	0	30	6.0
35 – 39	18	4	87	23.5	0	7	1.4	0	7	3.7
40 – 44	9	4	55	16.2	0	2	0.3	0	9	3.6
45 +	6	6	85	30.3	0	5	1.2	0	15	5.5

In terms of years since MLIS shown in table 6, participants who completed their MLIS between ten to fourteen years ago had significantly higher weighted output scores than participants who completed their MLIS zero to four years ago, and significantly higher scores than those who completed their degree fifteen to nineteen years ago. Time since MLIS was not significant for peer-reviewed articles or conference presentations.

Participants' belief that their MLIS degree prepared them to read research-based literature was positively significant only for peer-reviewed articles ($n = 636$, $p = 0.048$). Participants' belief that their degree prepared them to do research was positively significant only for conference presentations ($n = 637$, $p = 0.031$).

Demographics

Within the factor of Demographics, two elements were significantly related to research productivity: marital status and whether a respondent cared for dependents. Marital status was significant both for weighted output score and peer-reviewed articles, but not for conference presentations, as shown in table 7. Caring for dependents was positively significant for weighted output ($n = 611$, $p = 0.046$) and number of peer-reviewed articles ($n = 611$, $p = 0.017$); participants who cared for dependents produced more research. Caring for dependents was not significant for number of conference presentations ($n = 611$, $p = 0.616$).

TABLE 7
Mean Research Productivity for Marital Status

		Weighted Output Score			Peer-reviewed Articles			Conference Presentations		
Marital Status	**N**	**Min.**	**Max.**	**Mean**	**Min.**	**Max.**	**Mean**	**Min.**	**Max.**	**Mean**
Unpartnered	171	3	89	25.0	0	7	1.2	0	30	5.7
Partnered	436	3	94.5	29.6	0	8	1.6	0	30	5.7
Prefer not to answer	28	3	51	18.3	0	4	1.0	0	11	4.1

Success Factor Statements

At the level of the three overarching categories, we found that all three categories were significant for weighted output score and peer-reviewed articles; however, only the Peers and Community category was significant for conference presentations.

The nine factors other than Education and Experience and Demographics comprised the Yes or No questions, and so we could test both the factors and the individual components. When we tested the factors against the weighted output score and number of peer-reviewed articles, all were significant and almost all of the individual components were significant. However, when we tested the factors against the number of conference presentations, three factors were not significant: Extrinsic Motivations, Institutional Supports, and Personality Traits. Many more individual components also were not significant on their own.

Tables 8, 9, and 10 show the significant components for the factors within the categories of Individual Attributes, Peers and Community, and Institutional Structures and Supports, respectively. These tables also show how many participants responded Yes to each component. Detailed results of the Mann-Whitney tests are in appendix D.

Within the Individual Attributes category, all three factors were significant for weighted output score and number of peer-reviewed articles. All individual components were signifi-

TABLE 8
Components of the Individual Attributes Category, Their Significance as Determined by the Mann-Whitney U Test, Significant at the .05 Level, and the Percentage of Respondents Answering Yes to Each Component

Factors and Components	Weighted Output Score	Number of Peer-reviewed Articles	Number of Conference Presentations	Percent Answering Yes
Intrinsic Motivations				
I do research to contribute to more informed decision making in librarianship.	significant	significant	significant	77
I do research to contribute to better library services.	significant	significant	significant	79
I do research for my personal interest.	significant	–	significant	77
I do research for professional growth.	significant	significant	significant	88
I do research to contribute to greater library visibility on campus.	significant	significant	–	56
I do research to advance my career.	significant	significant	significant	76
I do research to build stronger relationships with faculty members.	significant	significant	–	45
I do research to build a professional reputation for myself.	significant	significant	significant	74
I do research to contribute to a stronger profession.	significant	significant	significant	79
Personal Commitment to Research				
I always have a research project that I'm working on.	significant	significant	significant	46
I schedule dedicated time for research.	significant	significant	significant	42
I am currently working on a research project.	significant	significant	significant	64
I have participated in activities that support LIS research (e.g. peer review, editor of a journal, providing writing assistance to a colleague, etc.).	significant	significant	–	76
I do research that is meaningful to my practice.	significant	significant	significant	84
I consider research to be a priority.	significant	significant	significant	49
I believe it is important for librarians to contribute to the profession via research.	significant	significant	significant	88
I read research literature on a regular basis.	significant	significant	–	56
I work on research outside of regular work hours.	significant	significant	significant	68
I have used personal funds to support my research and dissemination (e.g.: personal professional development funds or self-funded).	significant	significant	significant	52
Personality Traits				
I can achieve my research goals.	significant	significant	–	67
I am confident about my research abilities.	significant	significant	–	62
I finish the research projects that I start.	significant	significant	–	59
I can easily identify questions that could be answered through research.	significant	significant	significant	68

TABLE 8
Components of the Individual Attributes Category, Their Significance as Determined by the Mann-Whitney U Test, Significant at the .05 Level, and the Percentage of Respondents Answering Yes to Each Component

Factors and Components	Weighted Output Score	Number of Peer-reviewed Articles	Number of Conference Presentations	Percent Answering Yes
I enjoy speaking with colleagues about my research.	significant	significant	significant	87
I enjoy presenting at conferences.	significant	–	significant	81
I do research to satisfy my curiosity.	significant	–	–	81
Publishing gives me a personal sense of satisfaction.	significant	significant	–	86
I enjoy doing research.	significant	significant	significant	80
I enjoy writing for publication.	significant	significant	–	59

TABLE 9
Components of the Peers and Community Category and Their Significance as Determined by the Mann-Whitney U Test, Significant at the .05 Level, and the Percentage of Respondents answering Yes to Each Component

Factors and Components	Weighted Output Score	Number of Peer-reviewed Articles	Number of Conference Presentations	Percent Answering Yes
Collaboration				
I have done research with other people (co-researchers) at my institution.	significant	significant	significant	69
I have done research on my own.	significant	significant	significant	85
Community				
I feel like I belong to a research community.	significant	significant	significant	46
I have consulted with an expert to get help on a specific aspect of my research.	significant	significant	significant	49
I have a network of peers at my institution with whom I talk about research.	significant	significant	–	59
I know people who have similar research interests to mine.	significant	significant	significant	79
I attend conferences in order to connect with others who have similar research interests.	significant	–	significant	78
I have a network of peers from other institutions with whom I talk about research.	significant	significant	significant	58
Professional associations are a source of research community for me.	–	–	significant	64
Mentoring				
I have been mentored in relation to research activities.	significant	significant	–	35

TABLE 9
Components of the Peers and Community Category and Their Significance as Determined by the Mann-Whitney U Test, Significant at the .05 Level, and the Percentage of Respondents answering Yes to Each Component

Factors and Components	Weighted Output Score	Number of Peer-reviewed Articles	Number of Conference Presentations	Percent Answering Yes
I have mentored others in relation to their research activities.	significant	significant	significant	44
Peer Support				
I have participated in a peer support group related to research.	significant	significant	significant	42
I ask my colleagues for feedback on my research.	significant	significant	significant	71
I have participated in a journal club.	significant	significant	–	16
I have participated in a writing group.	significant	significant	significant	32

TABLE 10
Components of the Institutional Structures and Supports Category and Their Significance as Determined by the Mann-Whitney U Test, Significant at the .05 Level, and the Percentage of Respondents Answering Yes to Each Component

Factors and Components	Weighted Output Score	Number of Peer-reviewed Articles	Number of Conference Presentations	Percent Answering Yes
Extrinsic Motivations				
I have received merit increments or promotion due to my research activities.	significant	significant	significant	39
I am (formally or informally) expected to participate in research and scholarship.	significant	significant	–	76
I do research only because it is a requirement of my job.	–	–	–	23
Institutional Supports				
I have received funding for my research.	significant	significant	significant	33
I have hired a research assistant to help with research tasks.	significant	significant	significant	10
I have taken a sabbatical or other kind of leave to work on a research project.	significant	significant	–	17
I have space where I am able to work effectively on my research.	significant	significant	–	69
I have time to do research within my job.	significant	significant	–	52
I am encouraged and supported by my library to do research.	significant	significant	–	69

cant for weighted output score, but three of twenty-nine statements were not significant for peer-reviewed articles. For conference presentations, Personality Traits was not a significant factor, and fewer than half of that factor's individual components were significant. On average, 69 percent of participants responded Yes to the statements in this category, ranging from 42 percent for "I schedule dedicated time for research" to 88 percent for "I do research for professional growth."

Within the Peers and Community category, all four factors were significant for all three types of research output variables, and only a few individual components were not significant. On average, 55 percent of participants responded Yes to the statements in this category, ranging from 16 percent who said they had participated in a journal club to 85 percent who said they had done research on their own.

In the Institutional Structures and Supports category, both Extrinsic Motivations and Institutional Supports were significant for weighted output score and number of peer-reviewed articles, but neither factor was significant for number of conference presentations. For all three output variables, the component "I do research only because it is a requirement of my job" was not significant; this was the only component that was not significant for any of the three output variables. On average, 43 percent of participants responded Yes to the statements in this category, ranging from only 10 percent who have hired a research assistant to 76 percent who said they are formally or informally expected to participate in research.

Open-Ended Comments

In an open-ended question, we asked participants to describe other factors that had affected their research productivity, and 476 participants provided comments. Unlike the statistical analysis, which we conducted only for the subset of participants with weighted output between three and ninety, we analyzed all comments, independent of weighted output score. Most comments elaborated on an element of one of the eleven factors we had identified. The Institutional Supports factor received the most comments of the eleven factors and, unsurprisingly, many of these comments elaborated on time and workload, which are well-documented impediments to research productivity.

Respondents also commented on how changes in personal circumstances and professional context (including the COVID-19 pandemic, as we have described elsewhere[39]) affected their research productivity. Two other noteworthy themes in the comments were concern about the quality of research from academic librarians and the ambiguity of the definition of research in academic librarianship. Additional exploration of these concepts and their potential impact on research productivity may be helpful.

Discussion

Significance of Overall Categories

Our primary research question was: What factors and elements have a positive effect on librarians' research productivity? Our analysis shows that all three categories of factors—Individual Attributes, Peers and Community, and Institutional Structures and Supports—contribute positively to overall research output, as measured by the weighted output score and number of peer-reviewed journal articles.

However, an interesting difference appeared when we tested the factors and elements against number of conference presentations—for this measure of research output, only the

category of Peers and Community was significant. Within the Individual Attributes category, the factors of Intrinsic Motivations and Personal Commitment to Research were significant, but the overall category was not. Neither of the factors in the Institutional Structures and Supports category was significant. It is perhaps unsurprising that the Peers and Community category was significant, since conferences are a communal aspect of the profession; however, this finding raises additional questions about the nature and value of librarians' research output. What kinds of research outputs do librarians, administrators, and associations want to encourage, and do we need to emphasize different success factors for different research outputs?

In both the original Canadian study and this study of librarians in the United States, all three broad categories were significant when looking at weighted output and number of peer-reviewed articles. The Canadian study did not specifically examine conference presentation output, so we cannot compare those findings. In the current study, all nine factors were significant for weighted output and number of peer-reviewed articles, whereas in the Canadian study Intrinsic Motivation was not significant for number of peer-reviewed articles. As well, more elements within the Demographics and Education & Experience factors were significant in the current study. The fact that more factors and elements were significant may be due to this study's larger sample size, which had 831 responses compared to 556 responses to the Canadian survey.

Regardless of the type of output, no single main factor contributes to research productivity. Nuance and individual situations are important. Individual situations vary widely, as do the factors that help any one individual be a successful researcher.

Implications for Increasing Research Productivity

It is also instructive to examine how many participants responded Yes to the individual elements that comprise the factors we tested. When we tested the elements against weighted output scores and number of peer-reviewed articles, most of them were significantly related to research output, but there was much variation in how many participants responded Yes to each element, from 10 percent who said they had hired a research assistant to 88 percent who said they believe it is important for librarians to contribute to the profession via research.

One of our motivations for doing this study was to provide librarians and library administrators with data regarding how to better support librarians' research. Statements that were significant *and* where fewer participants answered Yes may point to changes in behavior, policy, or practice that could have a positive impact.

More participants answered Yes to the statements in the Individual Attributes category than in the other categories. This suggests that individual librarians already exhibit many behaviors and traits that contribute to research success. Indeed, the Intrinsic Motivations factor had the highest percentage of Yes responses to the individual elements. This is a positive sign that academic librarians are highly motivated to do research. Nevertheless, the elements that were significant for all output types and where fewer than half of respondents answered Yes may point to things that individuals can do to help themselves be productive researchers:

- I schedule dedicated time for research. (42 percent)
- I always have a research project that I'm working on. (46 percent)
- I consider research to be a priority. (49 percent)

The statements in the Institutional Structures and Supports category had, on average, the fewest participants answering Yes. We call on library administrators and others in positions

of power in libraries or associations to consider how they could provide supports that would allow more librarians to answer Yes to elements such as these:

- I have hired a research assistant to help with research tasks. (10 percent)
- I have received funding for my research. (33 percent)
- I have received merit increments or promotion due to my research activities. (39 percent)

The third category, Peers and Community, was the only category that was significant for all output types. Again, in this category it is likely not within an individual's power to effect change, but rather we need collective efforts as a profession and a community of researchers. Collective efforts addressing the following elements may hold the most potential for positively affecting librarians' research endeavors:

- I have participated in a writing group. (32 percent)
- I have participated in a peer support group related to research. (42 percent)
- I have mentored others in relation to their research activities. (44 percent)
- I feel like I belong to a research community. (46 percent)
- I have consulted with an expert to get help on a specific aspect of my research. (49 percent)

Limitations

Participants received the survey invitations in October 2020, during the COVID-19 pandemic. This may have lowered our response rate and may have also affected the way people answered the survey. It was evident from comments in open-ended questions that people were experiencing significant professional and personal impacts due to the pandemic.[40]

Our study reflects a self-selection bias: those who are engaged and interested in doing research may have been more likely to participate. Respondents also self-reported their eligibility to meet our selection criteria.

Using bivariate variables (Yes or No answers) facilitated our analysis, but also limited individuals' ability to express detail and variance in their responses and restricted the scope of statistical tests we could run.

Finally, quantitative research cannot fully represent individuals' experiences and environments. Respondents were asked to choose the *best* answer; however, standardized and preselected responses mean that surveys cannot capture the subtleties of an individual's situation.[41] We received comments that contradicted some of our quantitative findings; however, the nature of this study means that those comments are not sufficient to help us explore those contradictions. As such, this study is unable to reflect the complexity of the environment and the experiences of academic librarian researchers.

Conclusions

This quantitative research reaffirms the importance of all three categories of factors evaluated: Peers and Community, Individual Attributes, and Institutional Structures and Supports. Academic librarians' success in research requires personal commitment and action as well as organizational, institutional, and community support. It is noteworthy that many librarians have achieved high research productivity making use of various available supports at individual, community, and institutional levels. As such, librarians need practices, supports, and administrative policies that meet their individual needs.

Additional qualitative research is needed to better understand the experiences of librarian-researchers, since a quantitative approach is not able to capture the complexity of individual

situations and environments. In particular, our findings point to the need to investigate the impact of institutional culture and climate, the value placed on and the respect held for research within the profession, and ambiguities about the definition and role of research in academic librarianship. Overall, we find that many academic librarians are highly motivated to conduct research, yet the factors leading to their success are complex and varied.

Data availability: Kristin Hoffmann, Selinda Adelle Berg, Kristine R. Brancolini, and Marie R. Kennedy. "Factors Related to Research Productivity for Academic Librarians - Survey Instrument and Data." Scholars Portal Dataverse, V1, 2022. https://doi.org/10.5683/SP3/U5JAW8

Appendix A. Survey instrument

In the survey text below, each question is annotated with an abbreviation to indicate the factor to which it is mapped. These annotations are provided for this paper and were not included in the survey instrument.

D Demographics
EE Education and Experience
EM Extrinsic Motivations
IM Intrinsic Motivations
IS Institutional Supports
PCR Personal Commitment to Research
PT Personality Traits
COL Collaboration
COM Community
M Mentoring
PS Peer Support

Factors Influencing Research Productivity

We are inviting individuals working in *select* academic libraries who hold an MLIS or equivalent degree to participate in a research study examining the factors influencing the research productivity of academic librarians.

Please indicate if you identify as having an MLIS or equivalent degree.
If you identify as having an MLIS or equivalent degree, you will continue to the second eligibility question and then to the research study information and consent for participation.
If you identify that you do not hold an MLIS or equivalent degree, this will be the last question of the survey.

- □ Yes, I hold an MLIS or equivalent degree
- □ No, I do not hold an MLIS or equivalent degree

Where are you currently employed? EE
To select your university: Select the state and then select your University.
Please note that the sample for this research is limited to librarians at the 198 institutions within the list below. If you are not a member of one of these institutions, you are not invited to participate in this research.
Drill-down menu of the 198 randomly selected institutions (see appendix B for full list).

The survey is expected to take less than 20 minutes and includes questions related to: a) Education and Professional Experience; b) Factors Influencing Research Productivity; c) Demographic Information; d.) Research Outputs;

Some of the questions are simple yes or no questions and require you to choose the answer that best reflects your situation or your feelings.

The study seeks participation from academic librarians, who are and who are not active researchers, and who work at one of the 198 randomly selected institutions from the Carnegie

classifications lists of R1, R2, and Professional/Doctorate. For this study, we are defining research as "an undertaking intended to extend knowledge through a disciplined inquiry and/or systematic investigation" (TCPS, Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans, 2018).

The researchers are interested in academic librarians' contributions to library and information studies (LIS) research. While it is recognized that librarians may undertake research outside of LIS, the researchers are gathering information in this study only on LIS-related research.

By taking this online survey I am indicating that I have read the information letter and voluntarily agree to participate in the research study.

Please remember to print a copy of the information letter for your records.

What year and month did you complete your MLIS degree (or equivalent)? EE
Drop-down menus of years and months

How was your MLIS program delivered? EE

- □ In person
- □ Online
- □ Combination in person and online

Do you believe that your MLIS program (or equivalent) adequately prepared you to read and understand research-based literature? EE

- □ Yes
- □ No

Do you believe that your MLIS program (or equivalent) adequately prepared you to conduct original research? EE

- □ Yes
- □ No

During your MLIS program (or equivalent), did you complete any of the following: EE
Check all that apply.

- □ Research methods course
- □ Independent research study
- □ Thesis
- □ None of the above

Since completing your MLIS (or equivalent), have you taken any formal research training? EE
Check all that apply.

- □ Doctoral degree LIS course(s) (e.g., research methods, statistics)
- □ Master's degree non-LIS course(s) (e.g., courses in other departments)
- □ Doctoral degree non-LIS course(s) (e.g., courses in other departments)
- □ Continuing education program(s) outside your organization (e.g., courses, workshops, conference programs)

- □ Staff development program(s) provided by your organization
- □ None of the above
- □ Other, please specify…

Do you have an advanced degree in addition to your MLIS (or equivalent)? EE
Check all that apply.

- □ Yes, thesis-based Masters
- □ Yes, non-thesis-based Masters
- □ Yes, doctoral-level degree
- □ No additional degree
- □ Other, please specify…

Are you currently working towards an additional degree? EE
Check all that apply.

- □ Yes, thesis-based Masters
- □ Yes, non-thesis-based Masters
- □ Yes, doctoral-level degree
- □ No additional degree
- □ Other, please specify…

Do you have tenure or are you in a position eligible for promotion or tenure? EE

- □ I have tenure or am in a position eligible for promotion and tenure
- □ I am in a position eligible for promotion only
- □ I am not in a position eligible for promotion or tenure

Is your current position in library administration? EE

- □ Yes
- □ No

Please indicate whether or not each statement applies to you.
(Presented in random order)

PCR	I consider research to be a priority.	Yes | No
PCR	I am currently working on a research project.	Yes | No
PCR	I always have a research project that I'm working on.	Yes | No
PCR	I do research that is meaningful to my practice.	Yes | No
PCR	I believe it is important for librarians to contribute to the profession via research.	Yes | No
PCR	I work on research outside of regular work hours.	Yes | No
PCR	I schedule dedicated time for research.	Yes | No
PCR	I have participated in activities that support LIS research (e.g., peer review, editor of a journal, providing writing assistance to a colleague, etc.).	Yes | No
PCR	I have used personal funds to support my research and dissemination (e.g., personal professional development funds or self-funded).	Yes | No
PCR	I read research literature on a regular basis.	Yes | No
IS	I am encouraged and supported by my library to do research.	Yes | No

IS	I have time to do research within my job.	Yes | No
IS	I have space where I am able to work effectively on my research.	Yes | No
IS	I have taken a sabbatical or other kind of leave to work on a research project.	Yes | No
IS	I have hired a research assistant to help with research tasks.	Yes | No
IS	I have received funding for my research.	Yes | No
COM	I have a network of peers at my institution with whom I talk about research.	Yes | No
COM	I know people who have similar research interests to mine.	Yes | No
COM	Professional associations are a source of research community for me.	Yes | No
COM	I attend conferences in order to connect with others who have similar research interests.	Yes | No
COM	I feel like I belong to a research community.	Yes | No
COM	I have consulted with an expert to get help on a specific aspect of my research.	Yes | No
COM	I have a network of peers from other institutions with whom I talk about research.	Yes | No
COL	I have done research with other people (co-researchers) at my institution.	Yes | No
COL	I have done research on my own.	Yes | No
PS	I have participated in a peer support group related to research.	Yes | No

Please indicate whether or not each statement applies to you.
(Presented in random order)

PS	I have participated in a writing group.	Yes | No
PS	I have participated in a journal club.	Yes | No
PS	I ask my colleagues for feedback on my research.	Yes | No
EM	I have received merit increments or promotion due to my research activities.	Yes | No
EM	I am (formally or informally) expected to participate in research and scholarship.	Yes | No
EM	I do research only because it is a requirement of my job.	Yes | No
PT	I enjoy doing research.	Yes | No
PT	I enjoy writing for publication.	Yes | No
PT	I am confident about my research abilities.	Yes | No
PT	I can achieve my research goals.	Yes | No
PT	I enjoy presenting at conferences.	Yes | No
PT	I enjoy speaking with colleagues about my research.	Yes | No
PT	Publishing gives me a personal sense of satisfaction.	Yes | No
PT	I can easily identify questions that could be answered through research.	Yes | No
PT	I do research to satisfy my curiosity.	Yes | No
PT	I finish the research projects that I start.	Yes | No
IM	I do research to advance my career.	Yes | No
IM	I do research for my personal interest.	Yes | No
IM	I do research to contribute to better library services.	Yes | No
IM	I do research for professional growth.	Yes | No
IM	I do research to build a professional reputation for myself.	Yes | No
IM	I do research to contribute to more informed decision-making in librarianship.	Yes | No
IM	I do research to contribute to greater library visibility on campus.	Yes | No
IM	I do research to build stronger relationships with faculty members.	Yes | No

IM	I do research to contribute to a stronger profession.	Yes | No
M	I have been mentored in relation to research activities.	Yes | No
M	I have mentored others in relation to their research activities.	Yes | No

We are asking a series of demographic questions to try to understand whether or not there is a relationship between these factors and research productivity. There is research outside of the profession of librarianship that indicates that there is a relationship between some personal factors and research productivity.

What month and year were you born? D
[Prefer not to answer]
Drop downs for month and year

How would you describe your marital status? D
- □ Single
- □ Married
- □ Living with partner
- □ Divorced
- □ Separated
- □ Widowed
- □ Other, please specify…
- □ Prefer not to answer

Do you have children or adults who depend on you for care? D
Check all that apply.
- □ Child(ren) under 18 years of age
- □ Child(ren) over 18 years of age
- □ Other adult dependent upon me for care
- □ No children or dependent adult
- □ Prefer not to answer

To which gender identity do you most identify? D
- □ Female
- □ Male
- □ Other
- □ Prefer not to answer

Thinking back over the last five years (January 2015 – December 2019), please indicate how many times you have disseminated your LIS-related research in each of the following venues. Choose 0 (zero) if you have not disseminated in a venue.
The researchers are interested in academic librarians' participation in research related to library and information studies (LIS). While it is recognized that librarians may undertake research outside of LIS, do research that is not disseminated, or disseminate research in non-traditional formats, in this question the researchers are gathering information about specific ways of disseminating LIS-related research.

Published a book review	Drop-down 0-30
Presented a poster at a conference (both peer reviewed and not)	Drop-down 0-30
Gave an oral presentation at a conference (both peer reviewed and not)	Drop-down 0-30
Published in conference proceedings	Drop-down 0-30
Published a non-peer-reviewed journal article	Drop-down 0-30
Published a peer-reviewed journal article	Drop-down 0-30
Published a chapter in a book (contributed chapter)	Drop-down 0-30
Authored a book (solo or coauthor)	Drop-down 0-30
Edited a book (collection of contributed chapters)	Drop-down 0-30

Can you think of other factors that were not fully captured in the previous questions that have affected your research productivity? If so, please share them here.
Open text box

The scholarly landscape is changing, and researchers are disseminating their research outputs in new ways. Please list any ways that you have disseminated your research that were not included in the previous question.
Open text box

Appendix B. Selected Institutions for Recruitment in this Study, by Type of Carnegie Class

R1	R2	Professional/Doctoral
Arizona State University-Tempe	Azusa Pacific University	Adelphi University
Binghamton University	Baylor University	Augusta University
Boston College	Brigham Young University-Provo	Aurora University
Boston University	Catholic University of America	Baker University
Brandeis University	Clark Atlanta University	Belmont University
Carnegie Mellon University	Clark University	Bethel University
Case Western Reserve University	College of William and Mary	Brandman University
Columbia University in the City of New York	CUNY City College	Campbell University
Cornell University	Delaware State University	Concordia University-Portland
Dartmouth College	DePaul University	D'Youville College
Drexel University	East Tennessee State University	Daemen College
George Washington University	Eastern Michigan University	Dallas Baptist University
Georgia Institute of Technology-Main Campus	Florida Agricultural and Mechanical University	Drake University
Georgia State University	Florida Institute of Technology	Elon University
Indiana University-Bloomington	Fordham University	Ferris State University
Johns Hopkins University	Howard University	Fielding Graduate University
Mississippi State University	Illinois State University	Gannon University
Montana State University	Jackson State University	Gardner-Webb University
New York University	Kent State University at Kent	George Fox University
Northwestern University	Lehigh University	Hofstra University
Oklahoma State University-Main Campus	Loyola University Chicago	Immaculata University
Oregon State University	Marquette University	Indiana State University
Princeton University	Marshall University	Lamar University
Rensselaer Polytechnic Institute	Michigan Technological University	Lincoln Memorial University
Stanford University	Missouri University of Science and Technology	Lindenwood University
Stony Brook University	Montclair State University	Loyola University New Orleans
SUNY at Albany	New Mexico State University-Main Campus	Mary Baldwin University
Syracuse University	Northern Arizona University	Maryville University of Saint Louis
Temple University	Northern Illinois University	Misericordia University
Texas A & M University-College Station	Oakland University	Mississippi College
Texas Tech University	Old Dominion University	National Louis University

R1	R2	Professional/Doctoral
The University of Texas at Arlington	Rutgers University-Newark	Our Lady of the Lake University
The University of Texas at Austin	Saint Louis University	Palm Beach Atlantic University
The University of Texas at Dallas	San Diego State University	Pepperdine University
University at Buffalo	Seton Hall University	Samford University
University of Alabama at Birmingham	Southern Illinois University-Carbondale	Seattle Pacific University
University of Arizona	Stevens Institute of Technology	Shenandoah University
University of California-Irvine	SUNY College of Environmental Science and Forestry	Simmons University
University of California-San Diego	Texas A & M University-Corpus Christi	Southern Illinois University-Edwardsville
University of California-Santa Barbara	Texas Christian University	St Catherine University
University of Colorado Denver/ Anschutz Medical Campus	Texas Southern University	St John's University-New York
University of Georgia	The University of Texas at San Antonio	Texas A & M University-Commerce
University of Hawaii at Manoa	The University of Texas Rio Grande Valley	Texas Woman's University
University of Louisville	University of Akron Main Campus	The College of Saint Scholastica
University of Massachusetts-Amherst	University of Colorado, Colorado Springs	The Sage Colleges
University of Miami	University of Denver	The University of Findlay
University of Michigan-Ann Arbor	University of Idaho	The University of Texas at Tyler
University of Missouri-Columbia	University of Louisiana at Lafayette	Touro College
University of Nevada-Las Vegas	University of Maryland Eastern Shore	Towson University
University of New Hampshire-Main Campus	University of Maryland-Baltimore County	Trinity International University-Illinois
University of North Carolina at Chapel Hill	University of Massachusetts-Boston	Union Institute & University
University of North Texas	University of Massachusetts-Dartmouth	Union University
University of Oklahoma-Norman Campus	University of Massachusetts-Lowell	University of Central Arkansas
University of Oregon	University of Missouri-Kansas City	University of Hartford
University of Pennsylvania	University of Missouri-St Louis	University of Indianapolis
University of Rochester	University of Nebraska at Omaha	University of Michigan-Flint
University of South Carolina-Columbia	University of New Orleans	University of Northern Colorado

R1	R2	Professional/Doctoral
University of Southern Mississippi	University of North Carolina at Charlotte	University of Saint Joseph
University of Virginia-Main Campus	University of Rhode Island	University of San Francisco
University of Washington-Seattle Campus	University of San Diego	University of St Thomas
University of Wisconsin-Milwaukee	University of South Dakota	University of the Pacific
Vanderbilt University	University of Tulsa	Valdosta State University
Washington State University	Western Michigan University	Valparaiso University
Wayne State University	Wright State University-Main Campus	Washburn University
West Virginia University	Yeshiva University	Western Kentucky University
Yale University		Widener University
		Wilkes University

Appendix C. Demographic Measures of Representativeness

TABLE 1
Workplace Categories of Participants (*n* = 824)

Workplace Category	Number of Participants	Percentage of Participants	Percentage of Potential Participants
R1	512	62.1	57.8
R2	188	22.8	30.2
D/PU	124	15.0	11.9

TABLE 2
Gender Identity of Participants (*n* = 826)

Gender Identity	Number of Participants	Percentage of Participants
Women	595	72.0
Men	179	21.7
Other	24	2.9
Prefer not to answer	28	3.4

FIGURE 1
Age Ranges of Participants (*n* = 764)

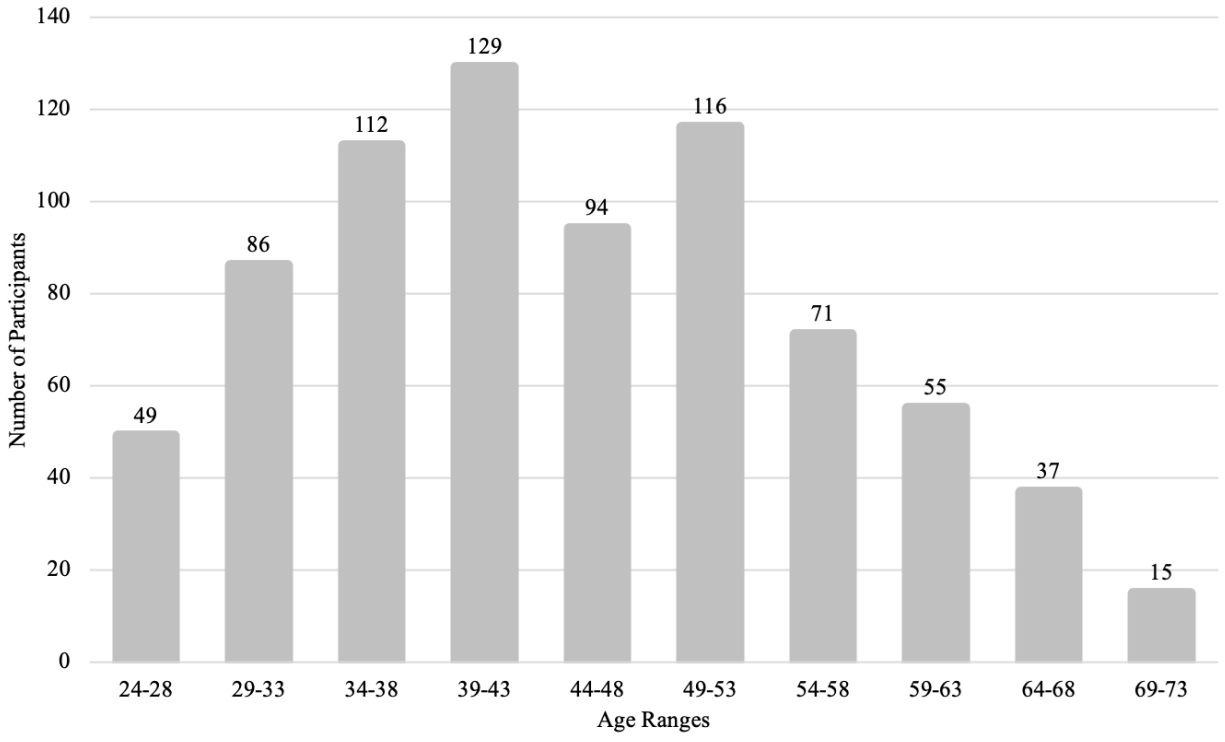
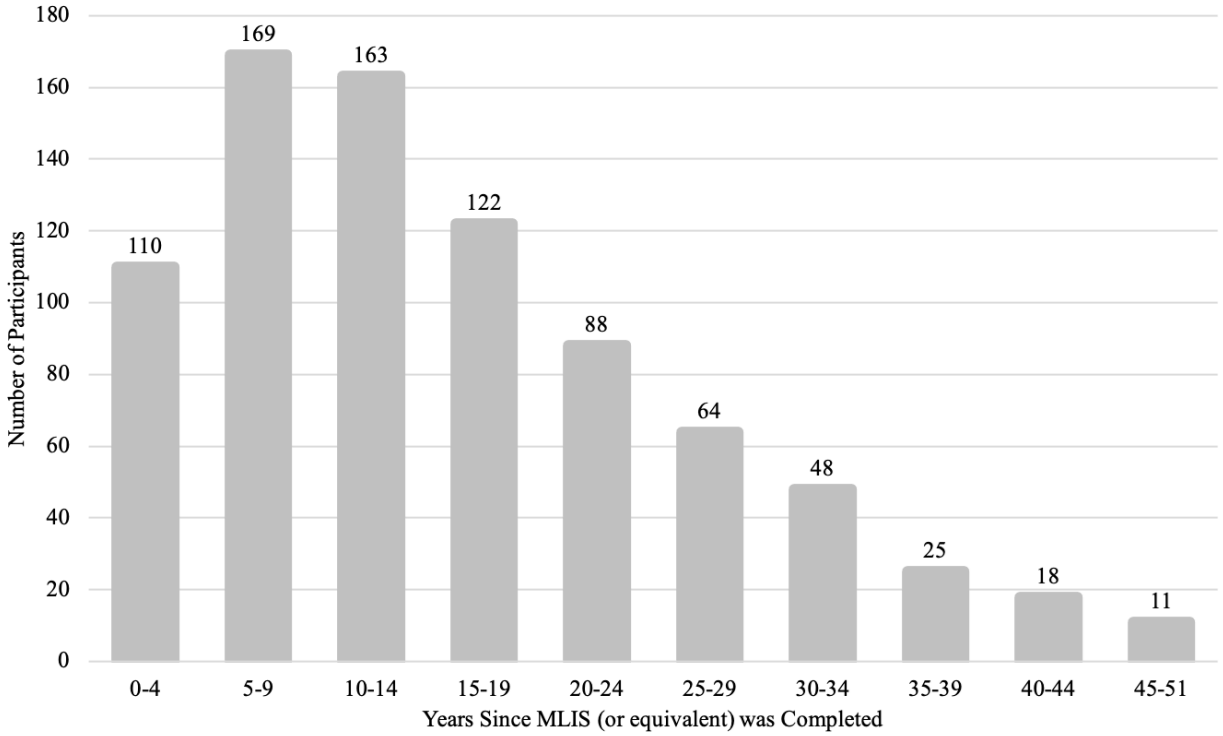


FIGURE 2
Number of Years since Participants Completed Their MLIS (or Equivalent) (*n* = 818)



Appendix D. Detailed Statistical Results

The following tables show the number responding to each statement (n) and the p-value obtained from the non-parametric Mann-Whitney U test. Statements are significant at the .05 level.

As described in the paper, when we ran the Mann-Whitney U test we decided to focus our analysis on those participants who had demonstrated some regular engagement with research, and we therefore set a lower limit of three for weighted output score. The analysis presented here was therefore done with the subset of 637 responses, where the weighted output score was between three and ninety five, inclusive. Not all participants answered each Yes or No statement; n ranged from 629 to 637.

TABLE 1
Components of the Individual Attributes Category and Their Significance as Determined by the Mann-Whitney U Test, Significant at the .05 Level

Factors and Components	N	Weighted Output Score	Number of Peer-Reviewed Articles	Number of Conference Presentations
Intrinsic Motivations				
I do research to contribute to more informed decision-making in librarianship.	634	p=0.000	p=0.000	p=0.005
I do research to contribute to better library services.	633	p=0.003	p=0.030	p=0.001
I do research for my personal interest.	633	p=0.000	p=0.219	p=0.007
I do research for professional growth.	633	p=0.000	p=0.001	p=0.000
I do research to contribute to greater library visibility on campus.	634	p=0.005	p=0.003	p=0.214
I do research to advance my career.	633	p=0.000	p=0.000	p=0.000
I do research to build stronger relationships with faculty members.	634	p=0.005	p=0.020	p=0.220
I do research to build a professional reputation for myself.	630	p=0.000	p=0.000	p=0.000
I do research to contribute to a stronger profession.	632	p=0.000	p=0.000	p=0.003
Personal Commitment to Research				
I always have a research project that I'm working on.	635	p=0.000	p=0.000	p=0.000
I schedule dedicated time for research.	633	p=0.000	p=0.000	p=0.002
I am currently working on a research project.	633	p=0.000	p=0.000	p=0.000
I have participated in activities that support LIS research (e.g., peer review, editor of a journal, providing writing assistance to a colleague, etc.).	636	p=0.000	p=0.000	p=0.075
I do research that is meaningful to my practice.	632	p=0.000	p=0.000	p=0.001
I consider research to be a priority.	632	p=0.000	p=0.000	p=0.000
I believe it is important for librarians to contribute to the profession via research.	634	p=0.006	p=0.036	p=0.038

TABLE 1
Components of the Individual Attributes Category and Their Significance as Determined by the Mann-Whitney U Test, Significant at the .05 Level

Factors and Components	N	Weighted Output Score	Number of Peer-Reviewed Articles	Number of Conference Presentations
I read research literature on a regular basis.	634	p=0.003	p=0.040	p=0.358
I work on research outside of regular work hours.	635	p=0.000	p=0.014	p=0.002
I have used personal funds to support my research and dissemination (e.g., personal professional development funds or self- funded).	635	p=0.000	p=0.009	p=0.000
Personality Traits				
I can achieve my research goals.	632	p=0.000	p=0.000	p=0.421
I am confident about my research abilities.	634	p=0.000	p=0.000	p=0.169
I finish the research projects that I start.	633	p=0.000	p=0.000	p=0.368
I can easily identify questions that could be answered through research.	636	p=0.000	p=0.009	p=0.001
I enjoy speaking with colleagues about my research.	634	p=0.000	p=0.006	p=0.000
I enjoy presenting at conferences.	636	p=0.020	p=0.978	p=0.000
I do research to satisfy my curiosity.	635	p=0.008	p=0.484	p=0.274
Publishing gives me a personal sense of satisfaction.	634	p=0.000	p=0.000	p=0.104
I enjoy doing research.	634	p=0.000	p=0.009	p=0.035
I enjoy writing for publication.	629	p=0.000	p=0.001	p=0.349

TABLE 2
Components of the Peers and Community Category and Their Significance as Determined by the Mann-Whitney U Test, Significant at the .05 Level

Factors and Components	N	Weighted Output Score	Number Of Peer-Reviewed Articles	Number Of Conference Presentations
Collaboration				
I have done research with other people (co-researchers) at my institution.	637	p=0.000	p=0.000	p=0.021
I have done research on my own.	635	p=0.000	p=0.000	p=0.007
Community				
I feel like I belong to a research community.	634	p=0.000	p=0.000	p=0.024
I have consulted with an expert to get help on a specific aspect of my research.	635	p=0.000	p=0.002	p=0.044
I have a network of peers at my institution with whom I talk about research.	634	p=0.000	p=0.000	p=0.140
I know people who have similar research interests to mine.	633	p=0.000	p=0.000	p=0.001

TABLE 2
Components of the Peers and Community Category and Their Significance as Determined by the Mann-Whitney U Test, Significant at the .05 Level

Factors and Components	N	Weighted Output Score	Number Of Peer-Reviewed Articles	Number Of Conference Presentations
I attend conferences in order to connect with others who have similar research interests.	634	p=0.005	p=0.296	p=0.000
I have a network of peers from other institutions with whom I talk about research.	636	p=0.000	p=0.000	p=0.000
Professional associations are a source of research community for me.	634	p=0.323	p=0.694	p=0.002
Mentoring				
I have been mentored in relation to research activities.	636	p=0.000	p=0.000	p=0.082
I have mentored others in relation to their research activities.	632	p=0.000	p=0.000	p=0.029
Peer Support				
I have participated in a peer support group related to research.	632	p=0.000	p=0.000	p=0.000
I ask my colleagues for feedback on my research.	634	p=0.002	p=0.003	p=0.030
I have participated in a journal club.	633	p=0.000	p=0.000	p=0.520
I have participated in a writing group.	637	p=0.000	p=0.000	p=0.000

TABLE 3
Components of the Institutional Structures and Supports Category and Their Significance as Determined by the Mann-Whitney U Test, Significant at the .05 Level

Factors and Components	N	Weighted Output Score	Number of Peer-Reviewed Articles	Number of Conference Presentations
Extrinsic Motivations				
I have received merit increments or promotion due to my research activities.	633	p=0.000	p=0.000	p=0.002
I am (formally or informally) expected to participate in research and scholarship.	634	p=0.000	p=0.000	p=0.090
I do research only because it is a requirement of my job.	630	p=0.718	p=0.059	p=0.236
Institutional Supports				
I have received funding for my research.	633	p=0.000	p=0.000	p=0.000
I have hired a research assistant to help with research tasks.	636	p=0.001	p=0.007	p=0.010
I have taken a sabbatical or other kind of leave to work on a research project.	636	p=0.001	p=0.000	p=0.157
I have space where I am able to work effectively on my research.	634	p=0.001	p=0.000	p=0.936

TABLE 3
Components of the Institutional Structures and Supports Category and Their Significance as Determined by the Mann-Whitney U Test, Significant at the .05 Level

Factors and Components	N	Weighted Output Score	Number of Peer-Reviewed Articles	Number of Conference Presentations
I have time to do research within my job.	636	p=0.000	p=0.000	p=0.620
I am encouraged and supported by my library to do research.	635	p=0.001	p=0.000	p=0.738

TABLE 4
Elements within the Demographics and Education and Experience Factors and Their Significance as Determined by the Mann-Whitney U Test, Significant at the .05 Level

Factors and Components	n	Weighted Output Score	Number of Peer-Reviewed Articles	Number of Conference Presentations	Percent Answering Yes
Demographics					
Do you have children or adults who depend on your for care? (Responses combined to compare those who have no dependents with those who replied that they have any dependent(s).)	611	p=0.046	p=0.017	p=0.616	39
Education and Experience					
Is your current position in library administration?	636	p=0.081	p=0.343	p=0.812	21
Do you have an advanced degree in addition to your MLS or equivalent? (Responses combined to compare those with any advanced degree and those who have none.)	635	p=0.000	p=0.062	p=0.112	53
Do you have an advanced degree in addition to your MLS or equivalent? (Responses combined to compare those with a thesis-based advanced degree and those who have none or a non-thesis-based degree.)	635	p=0.018	p=0.018	p=0.007	32
Are you currently working toward an advanced degree? (Responses combined to compare those with any advanced degree and those who have none.)	632	p=0.484	p=0.468	p=0.798	8
Do you believe that your LIS master's degree adequately prepared you to read and understand research-based literature?	636	p=0.132	p=0.048	p=0.577	64
Do you believe that your LIS master's degree adequately prepared you to conduct original research?	637	p=0.064	p=0.051	p=0.031	32

TABLE 4
Elements within the Demographics and Education and Experience Factors and Their Significance as Determined by the Mann-Whitney U Test, Significant at the .05 Level

Factors and Components	n	Weighted Output Score	Number of Peer-Reviewed Articles	Number of Conference Presentations	Percent Answering Yes
During your MLS program (or equivalent), did you complete any of the following:… (Responses combined to compare those who completed any of these with those who did none.)	637	p=0.831	p=0.947	p=0.805	68
Since completing your MLS (or equivalent), have you taken any formal research training? (Responses combined to compare those who completed any training with those who did none.)	630	p=0.900	p=0.378	p=0.271	74

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