# Comparative Analysis of High and Low Performers' Behavior from Research Topic Exploration to Research Outreach

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#### **Abstract**

This study presents findings from an exploration into the practices of active researchers, encompassing the entire process from collecting research information to presenting their findings. Participants were researchers from universities, national research and development corporations, and independent administrative agency research institutes in Japan. We asked 486 organizations and received 1442 responses. The findings indicate that high-performing researchers prioritize sharing their work widely. Additionally, the way they gathered information differed highly among different fields of study.

Keywords: research information retrieval, research outreach, questionnaires, institutional research

## 1 Introduction

Recent years have seen a diversification in research-related activities, with many components of the research process, including collaboration and dissemination, moving online. Researchers now face the challenge of navigating tools and methods to discover new information, organize their work, and share their findings. This study explores the strategic choices that high-performing researchers in Japan make to navigate this landscape. It aims to understand how these researchers collect information, select research topics, conduct their studies, publish their findings, and how their work is referenced by others through different stages. This study is a further development of the work presented in [1].

# 2 Survey

## 2.1 Questionnaires

The survey was administered through an online questionnaire, which included questions on how researchers select their research topics, conduct their studies, and publish their findings. A summary of the questions asked was as follows:

- · Attributes of the respondents (organization, position, job level, age, and field of study)
- Information collection (search objects, collection, and management methods)
- Methods of information acquisition (financial)
- Methods of publication (open access and research publicity)
- Frequency of paper submissions, research presentations, and book publications.

This survey was partly designed to align with PlumX metrics [2], facilitating analysis in conjunction with the altmetrics survey initiated two years prior [1][3]. The research fields of

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respondents were classified according to the All Science Journal Classification (ASJC) [4] by Elsevier. Other attributes were defined based on the criteria used in researchmap.

## 2.2 Targets

A list was compiled of Japanese universities with more than 90 faculty members, and in addition, public and private research institutions and museums that have received Grants-in-Aid for Scientific Research in the past 10 years were also listed. Responses were requested by mail. Since the responses must be made by researchers, we addressed the letter to the person in charge of general affairs at the administrative office, enclosed a document explaining the purpose of the questionnaire and the URL for responses, and asked them to disseminate the information within their organizations. Responses were collected anonymously using Google Forms. A total of 486 letters were sent out in June 2023, resulting in 1442 responses during the two-month collection period. After excluding two invalid responses, 1440 responses were analyzed. Table 1 shows the attributes of the respondents.

Table 1: Attributes of survey respondents

		1 uoic	1. Thursday of sarvey respondent	,				
Academic field	No.	%	Organization	No.	%	Age	No.	%
Multidisciplinary	24	1.7	National universities	623	43.3	20s	72	5.0
Physical Sciences	512	35.6	R&D Agency, Public Research Institutions, etc.	365	25.3	30s	397	27.6
Health Sciences	250	17.4	Private universities	302	21.0	40s	433	30.1
Life Sciences	257	17.8	Public universities	139	9.7	50s	374	26.0
Social Sciences & Humanities	397	27.6	Junior colleges, technical colleges, etc.	6	0.4	60s	161	11.2
Total	1440	100.0	Corporation	4	0.3	70s	3	0.2
			Others	1	0.1	Total	1440	100.0
			Total	1440	100.0			

Note that the response rate cannot be calculated because the survey was requested through the general affairs departments of each organization and not directly from the respondents.

#### 2.3 Methods

The respondents were categorized as either high performers or low performers based on their academic field, and we analyzed the differences between these groups. The criteria for classifying someone as a high performer included their frequency of submitting papers, presenting research, and publishing books. Specifically, individuals in the top 20% for these activities within their field were considered high performers. We excluded the Multidisciplinary field from our analysis due to its limited number of respondents (24) and focused on the four remaining fields. The results are shown in Table 2. High performers are highlighted in green and low performers in orange.

Table 2: Categorized high and low performer groups

Academic	Physical Sciences						Health Sciences								Life Sc	iences		Social Sciences & Humanities						
field	Pa	per	Rese	arch	Во	ok	Paj	Paper		earch	Во	ok	Paj	per	Rese	arch	Book		Paper		Rese	earch	Bo	ok
	submi	ssions	present	ations	public	ations	submissions		presentations		publications		submissions		presentations		publications		submissions		presentations		publications	
Answer	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Less than 1	98	19.1	36	7.0	258	50.4	74	29.7	27	10.8	109	44.3	67	26.4	40	15.7	114	44.7	75	18.9	81	20.5	100	25.3
1	121	23.6	83	16.2	75	14.6	63	25.3	64	25.7	25	10.2	73	28.7	53	20.8	32	12.5	153	38.6	129	32.6	51	12.9
2	128	25.0	151	29.5	46	9.0	42	16.9	66	26.5	29	11.8	60	23.6	86	33.7	29	11.4	113	<u>28.5</u>	106	26.8	31	7.8
3	58	11.3	69	13.5	41	8.0	25	10.0	31	12.4	18	7.3	26	<u>10.2</u>	40	<u>15.7</u>	21	8.2	32	<u>8.1</u>	43	<u>10.9</u>	41	10.4
4	24	<u>4.7</u>	56	10.9	28	<u>5.5</u>	12	4.8	15	6.0	11	4.5	8	<u>3.1</u>	15	<u>5.9</u>	13	<u>5.1</u>	11	<u>2.8</u>	21	<u>5.3</u>	35	8.8
5	43	<u>8.4</u>	37	7.2	23	<u>4.5</u>	15	6.0	24	9.6	17	6.9	9	<u>3.5</u>	9	<u>3.5</u>	17	6.7	10	<u>2.5</u>	10	<u>2.5</u>	29	7.3
6	11	<u>2.1</u>	24	4.7	11	2.1	3	1.2	4	1.6	5	2.0	3	<u>1.2</u>	2	0.8	3	1.2			4	<u>1.0</u>	21	5.3
7	3	<u>0.6</u>	3	0.6	1	0.2	1	0.4	2	0.8	3	1.2	1	<u>0.4</u>			2	0.8	1	<u>0.3</u>	2	<u>0.5</u>	14	<u>3.5</u>
8	3	<u>0.6</u>	13	2.5	2	0.4	1	0.4	1	0.4	3	1.2	1	<u>0.4</u>			3	1.2					11	2.8
9			2	0.4	1	0.2	1	0.4			1	0.4											4	<u>1.0</u>
10 or more	23	<u>4.5</u>	38	<u>7.4</u>	26	<u>5.1</u>	12	4.8	15	6.0	25	10.2	6	<u>2.4</u>	10	3.9	21	8.2	1	<u>0.3</u>			59	<u>14.9</u>
Total	512	100.0	512	100.0	512	100.0	249	100.0	249	100.0	246	100.0	254	100.0	255	100.0	255	100.0	396	100.0	396	100.0	396	100.0

 $<sup>*\</sup> No.\ of\ "Paper\ submissions"\ and\ "Research\ presentations"\ are\ indicate\ the\ number\ of\ submissions\ and\ presents\ per\ year.$ 

<sup>\*</sup> No. of "Book publications" is indicate the total number of books published to date.

We used IBM SPSS v.29 for the analysis, and applied T-tests and Chi-square tests across three indicators—paper submissions, research presentations, and book publications—for each of the academic fields. Among these three indicators, paper submissions and research presentations were based on the average annual count, whereas book publications refer to the total number of publications over a researcher's lifetime. It is important to note that indicators based on the total number of book publications may favor older researchers.

## 3 Results

In this chapter, the results are presented in chronological order based on the questionnaires. First, from the perspective of information acquisition: "objects of information search, methods of information collection, and methods of information acquisition." Then, from the perspective of information dissemination: "open access and methods of information dissemination."

#### 3.1 Information acquisition

Table 3 shows the results of comparing the objects of information search. The questions were asked using a 4-point scale, and an asterisk (\*) indicates items where the T-test showed a significant difference in mean values. Items with higher values are underlined. Those with positive implications (frequently selected by high performers) are highlighted in green, and those with negative implications (frequently selected by low performers) are highlighted in orange. Overall, "(1) Search for research" and "(2) Search for researchers" were commonly positive, however there are no significant differences common to all fields, indicating that the trends vary widely by field.

Table 4 shows the results of comparing the methods of information collection. The respondents were allowed to select multiple methods they use, and the results were cross-tabulated. An asterisk (\*) indicates items where the Chi-square test showed a significant difference. Items with positive implications (frequently selected by high performers) are highlighted in green, while those with negative implications (frequently selected by low performers) are highlighted in orange. There were no items that showed significant differences across all academic fields, indicating that trends vary greatly by field. Focusing only on items with significant differences, in Physical Sciences, only negative items are present, while in Social Sciences & Humanities, only positive items existed. In Life Sciences, few items are significantly different, and the few are negative. In Health Sciences, there are negative items related to book publications, but otherwise, many items are positive. Since the book publication index asks about the number of publications over a lifetime, it favors older researchers and may have a different trend than the article submission and research publication index, which asks about the number of publications per year.

Table 5 shows the results of comparing methods of information acquisition in financial terms. The approach to interpreting these results mirrors that of Table 4. There are significant differences in the Health Sciences and Social Sciences & Humanities fields, with two specific aspects showing marked disparities, particularly in the research presentations within Social Sciences & Humanities. However, the overall number of items with significant differences remains small.

Table 3: Objects of information search (T-tests)

Academic field			Phy	sical Scien	ces	Н	ealth Scienc	ces	]	Life Science	S	Social Sciences & Humanities			
		Paper		Research	Book	Paper	Research	Book	Paper	Research	Book	Paper	Research	Book	
Question		submissions		presentations	publications	submissions	presentations	publications	submissions	presentations	publications	submissions	presentations	publications	
	Group	Mean	p	Mean p	Mean p	Mean p	Mean p	Mean p	Mean p	Mean p	Mean p	Mean p	Mean p	Mean p	
(1) Search for research (look up the article	High	3.77 *		3.76 **	3.56 *	3.87 *	3.78	3.78	3.78	3.89 **	3.75	3.82	3.85 **	3.83	
itself)	Low	3.66		3.63	<u>3.71</u>	3.72	3.73	3.74	3.71	3.66	3.72	3.79	3.74	3.78	
(2) Search for researchers (find out what	High	2.75		2.77	2.71	2.82 *	2.58	2.68	2.68	2.73	2.71	2.96	3.03	3.05	
people are doing)	Low	2.71		2.70	2.72	2.56	2.62	2.59	2.67	2.65	2.66	2.98	2.94	2.96	
(3) Search for research institutions (find out	High	1.71 *	k ak	1.87	1.85	2.23	2.08	2.30 *	2.06	2.08	2.24 *	2.35 *	2.16	2.29	
about universities and other institutions)	Low	1.95		1.93	1.93	2.09	2.13	2.06	2.08	2.08	2.03	2.15	2.19	2.14	
(4) Search for societies and organizations (find	High	2.12		2.18	2.19	2.30	2.32 *	2.47	1.98	2.12	2.19	2.78	2.69	2.61	
out about related societies and organizations)	Low	2.15		2.13	2.13	2.49	<u>2.54</u>	2.45	2.18	2.15	2.12	2.61	2.58	2.64	

<sup>\*</sup> p < 0.05, \*\* p < 0.01

Options: 1.Never, 2.Rarely, 3.Sometimes, 4.Always

Table 4: Methods of information collection (Chi-square tests)

Academic field		Physical Sciences						Health Sciences								Life Sci	ences			Sc	cial S	manities	—		
		Pape	er l	Resea	ırch	Boo	k	Pap	er	Rese	arch	Boo	k	Pap	er	Resea	rch	Boo	k	Pap	er	Rese	arch	Boo	k
Ouestion		submiss		presenta	ations	publica	tions	submis		present	ations	publica	tions	submis		presenta	tions	publica	tions	submiss	sions	present	ations	publicat	tions
		High	Low	High	Low	High	Low	High	Low	High	Low		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
(1) Use general-purpose Internet	Yes	80	414	166	328	128	366	37	167	77	127	44	160	50	188	69	169	56	182	50	308	171	187	80	278
search (Google, Yahoo, etc.)	No	3	15	7	11	5	13	8	38	15	31	10	36	4	15	7	12	3	16	5	34	15	24	8	31
(2) Use ChatAI (ChatGPT, Bing AI	Yes	7	62	16	53*	120	323	8	19	13	14	8	19	7	21	9	19	5	23	8	27	17	18	10	25
Chat and other interactive AI)	No	76	367	157*	286	13	56	37	186	79	144	46	177	47	182	67	162	54	175	47	315	169	193	78	284
(3) Use SNS for general	Yes	15	90	30	75	113	294	11	30	19	22	7	34	10	46	16	40	9	47	17	86	61**	42	22	81
(X, Facebook, etc.)	No	68	339	143	264	20	85	34	175	73	136	47	162	44	157	60	141	50	151	38	256	125	169**	66	228
(4) Use SNS for researchers	Yes	37	210	73	174	59	188	21*	61	30	52	21	61	29	107	45	91	31	105	22	148	90*	80	35	135
(ResearchGate, Academia, etc.)	No	46	219	100	165	74	191	24	144*	62	106	33	135	25	96	31	90	28	93	33	194	96	131*	53	174
(5) Use commercial article DB (Scopus,	Yes	53	247	110	190	81	219	17	66	30	53	16	67	28	116	40	104	32	112	28*	123	79	72	36	115
Web of Science, etc.)	No	30	182	63	149	52	160	28	139	62	105	38	129	26	87	36	77	27	86	27	219*	107	139	52	194
(6) Use government article DB (CiNii,	Yes	49	271	100	220	75	245	41	178	86*	133	50	169	44	176	68	152	51	169	44	291	163	172	80	255
PubMed, etc.)	No	34	158	73	119	58	134	4	27	6	25*	4	27	10	27	8	29	8	29	11	51	23	39	8	54
(7) Use researchers' achievement DB (Kake	Yes	54	326*	118	262*	92	288	34	130	59	105	29	135*	43	155	57	141	46	152	46	285	155	176	74	257
n, researchmap, Orcid, GoogleScholar, etc.)	No	29*	103	55*	77	41	91	11	75	33	53	25*	61	11	48	19	40	13	46	9	57	31	35	14	52
(8) Use institutional repositories	Yes	18	137	43	112	28	127**	9	60	19	50	14	55	10	61	17	54	18	53	40	229	129	140	66	203
published by each research institution	No	65	292	130	227	105**	252	36	145	73	108	40	141	44	142	59	127	41	145	15	113	57	71	22	106
(9) Read abstract or full text on the journa	Yes	60	354*	135	279	103	311	33	142	62	113	40	135	41	158	61	138	46	153	48	294	165	177	78	264
I's publication page or download the file	No	23*	75	38	60	30	68	12	63	30	45	14	61	13	45	15	43	13	45	7	48	21	34	10	45
(10) Use commercial research analysis	Yes	1	12	5	8	3	10	1	2	2	1	1	2	1	11	2	10	1	11	1	1	2	0	1	1
tools (SciVal, InCites, Dimensions, etc.)	No	82	417	168	331	130	369	44	203	90	157	53	194	53	192	74	171	58	187	54	341	184	211	87	308
(11) Use literature management	Yes	35	146	66	115	40	141	23	74	39	58	13	84*	25	76	32	69	20	81	16	73	46	43	16	73
software (Mendeley, EndNote, etc.)	No	48	283	107	224	93	238	22	131	53	100	41*	112	29	127	44	112	39	117	39	269	140	168	72	236
(12) Read the research institute's	Yes	16	94	30	80	22	88	11*	25	19*	17	8	28	9	51	15	45	7	53*	17	70	45	42	18	69
public relations articles	No	67	335	143	259	111	291	34	180*	73	141*	46	168	45	152	61	136	52*	145	38	272	141	169	70	240
(13) View articles reported in	Yes	34	167	70	131	60	141	21*	64	38	47	21	64	23	82	30	75	26	79	34*	154	103**	85	50*	138
professional journals	No	49	262	103	208	73	238	24	141*	54	111	33	132	31	121	46	106	33	119	21	188*	83	126**	38	171*
(14) View articles reported in general	Yes	15	80	32	63	30	65	13**	23	17	19	11	25	16	53	20	49	17	52	19	95	58	56	26	88
magazines	No	68	349	141	276	103	314	32	182**	75	139	43	171	38	150	56	132	42	146	36	247	128	155	62	221
(15) View articles broadcast on TV	Yes	7	41	14	34	14	34	8**	12	10	10	6	14	6	26	5	27	8	24	9	39	21	27	14	34
and other media	No	76	388	159	305	119	345	37	193**	82	148	48	182	48	177	71	154	51	174	46	303	165	184	74	275
(16) Find in libraries, archives,	Yes	20	112	40	92	35	97	9	46	18	37	13	42	14	40	15	39	14	40	37	196	107	126	54	179
bookstores, and other physical stores	No	63	317	133	247	98	282	36	159	74	121	41	154	40	163	61	142	45	158	18	146	79	85	34	130
(17) Search in the reference section of	Yes	60	322	125	257	92	290	24	120	53	91	27	117	34	132	43	123	36	130	47	277	155	169	75	249
known articles and books	No	23	107	48	82	41	89	21	85	39	67	27	79	20	71	33	58	23	68	8	65	31	42	13	60
(18) Introduction from research	Yes	13	127*	42	98	20	120**	15	54	20	49	11	58	11	69	13	67**	14	66	13	100	63*	50	24	89
supervisor	No	70*	302	131	241	113**	259	30	151	72	109	43	138	43	134	63**	114	45	132	42	242	123	161*	64	220
(19) Referrals from colleagues and	Yes	45	241	104	182	68	218	24*	76	36	64	19	81	29	120	37	112	37	112	32	184	120**	96	52	164
collaborators	No	38	188	69	157	65	161	21	129*	56	94	35	115	25	83	39	69	22	86	23	158	66	115**	36	145
(20) Participate in conferences and	Yes	67	355	148	274	107	315	33	141	65	109	38	136	44	163	58	149	47	160	45	272	161**	156	72	245
symposiums	No	16	74	25	65	26	64	12	64	27	49	16	60	10	40	18	32	12	38	10	70	25	55**	16	64
* n < 0.05 ** n < 0.01																									

<sup>\*</sup> p < 0.05, \*\* p < 0.01

Table 5: Methods of information acquisition (Chi-square tests)

												1		. ( -		1									
Academic field		Physical Sciences							Н	lealth S	cience	s				Life Sci	iences			Social Sciences & Humanities					s
		Pap	er	Rese	arch	Boo	ok	Pap	er	Resea	arch	Boo	ok	Pap	er	Rese	arch	Boo	ok	Pap	oer	Rese	arch	Boo	эk
Question		submis	sions	present	ations	publica	ations	submis	sions	present	ations	publica	ations	submis	sions	present	ations	publica	ations	submis	sions	present	tations	publica	itions
		High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
(1) Papers available free of charge via web	Yes	83	423	170	336	131	375	43	201	90	154	53	191	53	203	75	181	59	197	55	336	182	209	87	304
download, etc. (free of charge)	No	0	6	3	3	2	4	2	4	2	4	1	5	1	0	1	0	0	1	0	6	4	2	1	5
(2) Obtain articles directly from the authors	Yes	28	104	53	79	39	93	11	35	17	29	10	36	19	60	23	56	18	61	18	98	67**	49	29	87
(e.g., Ask them to send. Almost free of charge)	No	55	325	120	260	94	286	34	170	75	129	44	160	35	143	53	125	41	137	37	244	119	162**	59	222
(3) Articles for which your organization has subsc-	Yes	71	383	153	301	108	346	42	168	84*	126	47	163	50	184	67	167	49	185	43	247	138	152	65	225
ription contract (Paid for but not directly paid for)	No	12	46	20	38	25	33	3	37	8	32*	7	33	4	19	9	14	10	13	12	95	48	59	23	84
(4) Borrow articles from libraries, etc. (Including	Yes	52	250	99	203	82	220	24	132	55	101	35	121	29	130	46	113	41	118	48	292	157	183	78	262
outside oforganization. Pay for photocopying)	No	31	179	74	136	51	159	21	73	37	57	19	75	25	73	30	68	18	80	7	50	29	28	10	47
(5) Pay as you go and get your papers (Pay	Yes	28	120	54	94	40	108	15	56	30	41	11	60	10	40	19	31	17	33	18	154	91*	81	41	131
only when you need them)	No	55	309	119	245	93	271	30	149	62	117	43	136	44	163	57	150	42	165	37	188	95	130*	47	178
(6) Journals to which you subscribe or for which	Yes	41	228	89	180	67	202	22	89	48	63	26	85	26	96	39	83	28	94	33	262**	143	152	70	225
you are a member (With annual/monthly payments)	No	42	201	84	159	66	177	23	116	44	95	28	111	28	107	37	98	31	104	22**	80	43	59	18	84

\* p < 0.05, \*\* p < 0.01

#### 3.2 Information dissemination

Table 6 shows the results of responses to Open Access publishing. The approach to interpreting these results mirrors that of Table 4 or 5. While the item "(1) Open Access (no subscription or publication fees)" was received a negative response in Physical Sciences, all other items in all fields were answered positively. Notably, "(2) Gold OA (author pays publication fee)" emerged as the most prevalent practice. Furthermore, the fields of Health Sciences, and Social Sciences & Humanities were more likely to engage in "(7) Closed Access (readers pay a subscription fee)". There are no notable differences in the use of preprint servers, whose use has been increasing rapidly in recent years "(8) Pre-reviewed papers are published to a preprint server".

Table 7 shows the results related to the frequency of disseminating research information. The approach to interpreting these results mirrors that of Table 3. Significant differences are observed across numerous aspects of research dissemination, with nearly all outcomes being positive, except for one. Notably, practices such as "(1) Posting an introduction of your research on your own laboratory website, etc." and "(4) Your organization publishes a press release introducing your research" are prevalent across various fields.

Academic field Physical Science Book Paper presentation oublications resentation Question ubmission: ubmission resentation ublication ubmission ublications bmission resentation oublications High Low (1) Open Access (no subscription Yes or publication fees are charged) (2) Gold OA (author pays publication fee) 24 233\*\* 183\* 18 119\* 140 183\*\* 95\* (3) Green OA (author's own Yes 56 348\*\* 122 282\*\* publication in repository) No (4) Hybrid OA (author Yes 60 354\* 46 321\*\* chooses to pay, reader is free) No (5) Bronze OA (free of charge Yes at publisher's discretion) (6) Delayed OA (automatically Yes released after a reserved 42\* (7) Closed Access (readers 135\* pay a subscription fee) 108\* 205\*

Table 6: Use of open access (Chi-square tests)

No

(8) Pre-reviewed papers are

97 37

332 136 262 109

24 90

Table 7: Methods of information dissemination (T-tests)

10 23 12 21 10

20 14

10 4 20

Academic field		Ph	ysical Scien	ces	Н	ealth Scienc	es	]	Life Sciences	S	Social Sciences & Humanities				
		Paper	Research	Book	Paper	Research	Book	Paper	Research	Book	Paper	Research	Book		
Question		submissions	presentations	publications	submissions	presentations	publications	submissions	presentations	publications	submissions	presentations	publications		
	Group	Mean p	Mean p	Mean p	Mean p	Mean p	Mean p	Mean p	Mean p	Mean p	Mean p	Mean p	Mean p		
(1) Posting an introduction of your research	High	2.95 **	2.87 **	2.76 **	2.72 **	<u>2.36</u> *	2.26	3.02 **	2.84 **	2.60	2.11 *	1.91 **	1.87		
on own laboratory website, etc.	Low	2.47	2.39	2.48	2.04	2.05	2.13	2.24	2.22	2.35	1.72	1.66	1.75		
(2) Posting an introduction of your research	High	1.65 *	<u>1.57</u> *	1.48	1.50	1.49	1.35	1.72 **	1.53	1.49	1.76	<u>1.68</u> *	1.64		
on X, Facebook, and other SNS yourself	Low	1.42	1.41	1.45	1.37	1.34	1.41	1.34	1.38	1.40	1.55	1.50	1.57		
(3) Your organization posts your research	High	1.68 *	1.57	1.59	1.84 **	<u>1.60</u> **	1.62 *	1.65	1.66	1.68	1.46	<u>1.47</u> *	1.54 *		
introduction on X, Facebook, and other SNS	Low	1.50	1.51	1.51	1.35	1.34	1.39	1.61	1.60	1.60	1.38	1.33	1.35		
(4) Your organization publishes a press	High	2.01 **	1.85	1.93 *	2.24 **	<u>1.92</u> *	2.12 **	2.27 *	2.17 *	2.21 *	1.74	1.62	1.76 **		
release introducing your research	Low	1.75	1.77	1.75	1.64	1.65	1.66	1.95	1.95	1.96	1.55	1.54	1.52		
(5) Sending papers to your own colleagues	High	1.44 *	1.57	1.54	1.47	1.43	1.50	1.62	1.67	1.73	2.22	2.07	2.38 **		
	Low	1.60	1.58	1.59	1.53	1.56	1.52	1.66	1.65	1.63	2.03	2.05	1.97		
(6) Sending papers to the people involved in	High	2.13	2.32	2.21	2.45	2.50	2.75	2.24	2.44	2.59	2.72	2.68	2.88 **		
your research	Low	2.23	2.16	2.21	2.53	2.53	2.45	2.42	2.37	2.33	2.58	2.54	2.52		
(7) Sending papers to your sponsors of your	High	1.58	1.77 **	<u>1.73</u> **	1.42	1.42	<u>1.66</u> *	1.52	1.70	1.54	1.44	1.47	1.52		
research	Low	1.53	1.42	1.48	1.39	1.38	1.33	1.57	1.51	1.57	1.41	1.37	1.39		
(8) Sending papers to researchers that you	High	1.37	1.37	1.34	1.26	1.23	1.24	1.41	1.44	1.46	1.85	1.87	2.26 **		
think might be relevant to your research	Low	1.38	1.39	1.39	1.18	1.17	1.19	1.35	1.33	1.33	1.87	1.87	1.76		

<sup>\*</sup> p < 0.05, \*\* p < 0.01

Options: 1. Never, 2. Rarely, 3. Sometimes, 4. Always

published to a preprint server p < 0.05, \*\* p < 0.01

## 4 Conclusion

This study presents a comparative analysis of high and low performers in terms of collecting research-related information to publishing papers. In the dissemination of research findings, most of the significant differences identified were positive. Regarding Open Access, the significant differences are also positive, especially in the Physical Sciences, Health Sciences, and Social Sciences & Humanities, where Gold OA has been favorably adopted. Conversely, the method of information acquisition showed almost no significant differences. Both positive and negative significant differences were observed in the methods of information collection, suggesting notable disciplinary variances. The findings indicate that high performing researchers place a high priority on research outreach. They preferentially select Gold OA for its paid Open Access options and show a keen interest in sharing their research online, leveraging both personal and organizational websites. However, significant disciplinary differences in information search strategies are observed. Physical Sciences displayed a negative trend in preferred search methods, whereas Social Sciences & Humanities exhibited a positive trend. This distinction may echo previous studies indicating that Social Sciences & Humanities employ diverse information collecting techniques [5].

It is important to note that while some correlations are suggested, these analysis results do not imply causality, so caution must be exercised in interpreting the findings. To enhance the validity of these results, future analyses should combine these indicators with other relevant metrics such as altmetrics and will be conducted using the latest data from [3].

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