

Awareness and Perceptions of Korean Researchers on Open Access

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ABSTRACT

This study aims to determine the awareness and perceptions of Korean researchers regarding mandatory open access (OA) and OA publishing of publicly-funded research papers. In July 2019, Korean researchers who had published in Science Citation Index Expanded journals as first authors and corresponding authors participated in an online survey distributed via e-mail. A total of 1,172 valid responses were collected and analyzed using SPSS 18. The results indicated that the level of awareness of OA differed significantly based on occupation and research experience ($p < 0.001$). Although 52.56% of the respondents had experienced OA publishing, only 22.35% had self-archiving experience. Regardless of the amount of publishing cost support, researchers showed a high level of willingness to publish OA articles. Yet, since the importance of impact factor was evaluated to be very high, at present OA publication might have a limited role as a publication platform.

Keywords: open access, publishing, perceptions, Korean researchers, OA policy

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1. INTRODUCTION

The national-level management of public research outcomes provides various benefits, including the reinforcement of national knowledge competitiveness, enhancement of public interest, protection of research copyright, and increased use of research. The Korean government established “regulations on the management of national R&D [research and development] projects” to ensure the systematic management of national R&D outcomes. Additionally, the Korea Institute of Science and Technology Information (KISTI) was designated as the dedicated organization for the management of papers and reports related to national R&D, their distribution for public usage, and the building of a public utilization system. However, owing to various operational issues, such as copyrights and licenses, the management system has not yet developed into a one-stop system wherein the original full texts of research conducted under public funds can be utilized. Additionally, problems related to the repurchasing of papers funded by the government has led to increased expenditure.

Internationally, more specifically in Europe, legislative systems and policies have been developed and implemented for mandatory open access (OA) of publicly-funded research papers. A representative example is “cOAlition S,” which was launched in September 2018 by eleven European research fund organizations. It aims to realize full and immediate OA to academic research. “cOAlition S” is responsible for implementing the ten principles of OA, termed “Plan S,” and the European Commission and the European Research Council have joined these attempts. Universities that lead academic research and global publishers that dominate academic research publications have also made efforts to prepare for the rapidly changing academic information market. Such efforts were based on in-depth research about the attitude and perception of OA among targeted researchers as well as on prospects in the usage and preferences of academic information (Saenen & Borrell-Damián, 2019; Taylor & Francis, 2014).

Despite domestic and international movements toward OA in academic research, few studies have been conducted on OA and related activities. Moreover, OA can lead to successful changes only when researchers recognize the need for it and actively participate in OA publishing. Authors’ perceptions about OA for academic research remain limited, and they deem it useful only for investigative reporting. Further studies on OA are warranted to promote the development of policies regarding OA for

investigations funded by taxpayers’ money and to establish a systematic foundation for this type of access to research. Hence, this survey-based study aimed to identify the awareness and perceptions of Korean researchers regarding the obligation of OA and OA publishing in public research. We intended to provide stakeholders with feasible policy implications and methods to support OA publications for publicly-funded research. The OA publications targeted in this study refer to publicly-funded research papers.

2. PREVIOUS STUDIES

Surveys on researchers’ perceptions of OA are mainly focused on large overseas publishers and European research organizations. Particularly, Taylor & Francis (2014) conducted a perception survey with all authors who published papers in their journals from 2013 to 2014. According to the survey, the distribution of authors by continent was 33% in the Americas, 30% in Europe, 11% in Asia, and 7% in Australia. This study reflects on the need of the publishing industry to respond to the changing academic publishing environment by extensively examining the perceptions of authors—the primary agents of OA publishing—including their prospects for future publishing environments and various types of OA.

Empirical studies on researchers’ perceptions of OA have been published in the United States of America (USA) and the United Arab Emirates (UAE). Rodriguez (2014) analyzed the results of a survey conducted with 224 professors and researchers at mid-sized public universities in Michigan. The survey queried participants’ awareness of OA publishing, experience, and related issues by age, rank, experience, and specialty. The findings indicated that while researchers were aware of OA, they had limited awareness of OA publishing. Furthermore, their perceptions of issues related to OA were little affected by their age, seniority, or experience of OA. Kaba and Said (2015) surveyed professors of Al Ain University, UAE, regarding their awareness, state of use, and perception of OA. Although it was difficult to generalize the results because there were only 34 respondents, the study offered brief information about how OA is perceived among researchers in the Middle East. Shuva and Taisir (2016) conducted online surveys to understand Bangladeshi faculty members’ awareness, perceptions, use of OA journals, and motivational factors that influence faculty members to choose OA journals for publication, and suggested the importance of the qualities of prestige and editorial practices

associated with traditional international journals.

Since 2014, the European University Association (EUA) has collected data and reported on the attitudes, perceptions, and opinions of institutional managers, librarians, up-and-coming researchers, and researchers from European universities regarding whether or not they support OA and OA operating systems. The fourth survey, conducted in 2017/2018, revealed that the incentives which researchers receive for publishing in OA journals were related to administrative and monetary support for the publication of their achievements. Further, the biggest obstacle for OA publishing was related to concerns about copyright violations with publishers. Thus, to expand OA publishing, various types of support from different institutions are warranted.

Aiming to identify the exact level of awareness of OA among researchers in the humanities and social sciences and provide policy-based information, Narayan et al. (2018) investigated the perceptions and attitudes of 121 humanities and social science professors included in the Australian Listserv toward OA. They analyzed 49 responses collected using questionnaires regarding the selection of journals that respondents contribute to and their recognition of OA; they also conducted a research performance evaluation. Australian researchers chose the journals and publishers to which they contribute based on their reputation and the journal's impact factor (IF); whether or not the journal was OA was considered one of the least important factors. The level of researchers' awareness of OA was the highest for repositories in universities and the lowest for hybrid OA. Narayan et al. (2018) surveyed various types of OA, such as Green OA (a paid-for service that allows self-archiving), Gold OA requiring Article Processing Charges (APC), Green OA with an embargo, and Gold OA without APC, among others.

Majhi et al. (2018) asked 116 researchers from India's Odisha regarding their awareness of OA, preference for OA for academic literature, APC support, use of OA, and inhibiting factors of OA use. Their results showed that younger researchers had a higher level of awareness of OA. Additionally, more than 85% of the respondents said they needed to recognize the value of OA as academic literature and encourage publishers to expand the use of OA. The reasons for low OA publication rate were high cost, poor screening processes, and lack of institutional support. To improve the quality of OA, they stated that OA publishers should strengthen the screening system, include OA publications in reputable index databases, and be exempt from APC, among other factors.

Wakeling et al. (2019) conducted a large survey on the motivations, understanding, and experiences of authors of OA mega-journals; 11,883 authors registered on Scopus (including 128 Korean researchers) were surveyed and 15 mega-journals were included. More than two-thirds of the authors who published their papers in OA mega-journals did not understand that the journals operated a soundness-only peer review, which means that only the validity of the study is evaluated.

Lee (2019) independently analyzed data on the perception of Korean researchers regarding OA and compared it with similar data from the USA and South American countries. Regarding the screening criteria of the OA mega-journals, authors from Korea, Taiwan, India, China, and Brazil were misinformed about the topic. The proportion of respondents who submitted to OA mega-journals because of OA was the lowest among the comparison countries. Furthermore, it seemed necessary to formulate measures to increase researchers' understanding of OA to promote various OA policies in the future.

Seo et al. (2016) conducted a perception survey related to OA on 396 professors, students, and researchers from colleges related to science and technology. The survey revealed that 45% of undergraduate and graduate students had heard of OA for the first time. Of the 31 professors who responded, 14 did not consider OA when submitting a thesis.

Kim (2018) conducted a survey to explore awareness and publication status for OA research with 1,257 Korean researchers who published papers in Science Citation Index Expanded (SCIE)-listed journals as corresponding authors between 2016 and 2017. Among these researchers, the most important criteria for selecting journals to contribute to were whether the journal was registered with a reputable index database, IF, reputation, and influence. Although it varied by field, they preferred the big-three publishers. More than 50% of respondents said that OA was important and that they were interested in it because it made their research more accessible. Moreover, 58% of the authors had overseas OA publishing experience, with 10% having reported being willing to publish 40% of their papers in OA journals. Researchers in their 20s said they did not know much about OA because they lacked such publishing experience, while researchers in their 40s thought that the quality of OA was poor. Of the respondents, 56% were supported by APCs.

In summary, studies on researchers' perceptions of OA had the following characteristics. First, most surveys were aimed at a small number of researchers in a particular

academic field and focused on fragmentary aspects, such as their awareness of and publishing experience in OA journals. Second, surveys by institutions such as commercial publishers and the EUA focused on researchers' perceptions of the future publishing market. Third, most questionnaires corresponding to the current status of OA were insufficient in yielding direct and practical results that could be translated to policy implications for obligating public research to be published in OA journals.

3. SURVEY DESIGN

We conducted an online survey to examine Korean researchers' awareness, perceptions, attitudes, and prospects on the OA publication of publicly-funded research papers based on their journal publishing behavior. A questionnaire was filled out on Google Forms, and a link to the questionnaire was sent via e-mail to a total of 116,423 authors registered in KIST's NDSL who published papers in SCIE journals as first author or corresponding author. The survey went on for four days, from July 14, 2019. In total, 1,172 valid responses were analyzed (response rate: 1.01%). The findings were analyzed using SPSS 18 through descriptive statistics and a comparison of means between

groups (t-test, ANOVA verification).

The questionnaire was designed as shown in Table 1. Survey questions were constructed based on items found in the research conducted by Taylor & Francis (2014) on the perception of researchers about OA and Kim's (2018) questionnaire on the perception of Korean researchers about the topic.

4. RESULTS

4.1. Respondents' Characteristics

Of the respondents, 38.8% were in their 40s, 37.2% were in their 30s, and 3.4% were in their 60s and older; 35.1% were engineers, 23.7% were either medics or pharmacologists, and 23.6% were natural scientists. Researchers from all four subjects showed great interest in OA-related issues. Regarding affiliations, 69.3% of the respondents were affiliated to universities, 16.8% to government-funded research organizations, 7.2% to private companies, and 6.7% to hospitals. Regarding publishing experience, 33.4% of the respondents had experience in publishing and academic activities, allowing us to expect more reliable responses about their OA perceptions (see Table 2).

Table 1. Survey questions by category and contents

Category	Item contents
Publishing an academic paper	• The importance given to the journal being registered with major index databases for researchers' intentions to publish in that journal • Criteria for selecting journals for researchers' intentions to publish in that journal
OA publishing	• Level of awareness of OA concepts (OA, Green, Gold) • OA information sources • Publishing experience with Green OA • Publishing experience with Gold OA • Gold OA publication type • Reasons for publishing with Gold OA • Sources of funding for Gold OA publication • Reasons for not publishing with Gold OA • Likelihood of publishing in OA journals in the future
APC	• APC fee value • Scope of amount willing to pay for APC
Awareness of mandatory OA for publicly-funded papers	• Awareness of mandatory OA • [Free comments] Regarding mandatory OA • Recognizing the benefits of OA for authors • [Free comments] Regarding the benefits of OA for authors
Providing information on OA	• OA-related information desired by the researcher • OA-related information sources
Policy recommendation	• [Free comments] Policy needed to secure mandatory OA for publicly-funded research
Respondents' characteristics	• Age, field of study, occupation, research experience, type of affiliated institution, participation in academic activities, area of research activities

OA, open access; APC, article processing charges.

Table 2. Respondents' characteristics

Category	Classification	Percentage (%)	Number of respondents
Age	20s	8.1	95
	30s	37.2	436
	40s	38.8	455
	50s	12.5	146
	60s and older	3.4	40
	Total	100	1,172
Field of study	Humanities	1.1	13
	Social sciences	9.2	108
	Natural sciences	23.6	277
	Engineering	35.1	411
	Medicine and pharmacology	23.7	278
	Agricultural and marine sciences	4.4	51
	Art and physical education	1.0	12
	Interdisciplinary studies	1.9	22
	Total	100	1,172
Occupation	Graduate student	13.4	157
	Researcher	33.7	395
	Professor	48.5	569
	Others	4.4	51
	Total	100	1,172
Affiliation	University	69.3	812
	Government-funded research organization	16.8	197
	Company	7.2	84
	Hospital	6.7	79
	Total	100	1,172

We intended to examine researchers' intentions to publish in a specific journal and use this data as basic information for promoting future OA publishing. Of the respondents, 81.1% (950) said that it was important for them in order to publish in a specific journal to know whether it was registered in SCIE, Social Science Citation Index (SSCI), Arts and Humanities Citation Index (A&HCI), Scopus, or the Korean Citation Index (KCI) (see Table 3).

After conducting stratified analysis by occupation, we observed a significant difference ($p=.000<.001$). We then

conducted Scheffé's test, showing that journal indexing in various academic databases was more important for professors ($M=4.83$) than for researchers ($M=4.67$) regarding their intentions to publish in a specific journal.

After conducting a stratified analysis by research experience, we observed a significant difference ($p=.006<.01$). We then conducted Scheffé's test, showing that journal indexing in various academic databases was more important for researchers with 10-15 years of experience ($M=4.82$) than for those with less than five years of experience ($M=4.62$) regarding their intention to publish in a specific

Table 3. Stratified analysis of the importance of the journal being indexed in various academic databases for researchers' intentions to publish by occupation

Occupation	M	SD	Scheffe	F	p
Graduate student	4.73	0.616	Professor > Researcher	6.993	0.000
Researcher	4.67	0.643			
Professor	4.83	0.483			
Others	4.69	0.510			

M, mean; SD, standard deviation.

Table 4. Stratified analysis of the importance of the journal being indexed in various academic databases for researchers' intentions to publish by research experience

Research experience	M	SD	Scheffe	F	p
Less than 5 years	4.62	0.749	Less than 5 years to 10 years or more to less than 15 years	3.630	0.006
5 years or more to less than 10 years	4.76	0.564			
10 years or more to less than 15 years	4.82	0.469			
15 years or more to less than 20 years	4.78	0.482			
More than 20 years	4.79	0.542			

M, mean; SD, standard deviation.

journal (see Table 4).

We also conducted stratified analyses for differences in the importance given to journal indexing in various academic databases for researchers' intention to publish by field of study and an affiliated organization. However, these two analyses did not show significant differences.

When choosing a journal for publishing their research, 32% of the participants considered "reputation and influence" as an important criterion (e.g., IF), 28.4% considered "topic consistency," and 17.8% considered "likelihood to pass peer review" (see Table 5).

4.2. Awareness of OA and OA Publishing

4.2.1. Awareness of OA

We observed that the level of awareness of OA was at 3.16, denoting a medium level; however, when divided by type, the level of awareness of Green OA and Gold OA was 2.38 and 2.49, respectively. Hence, it was at a low level. Awareness of OA among humanities sociologists at the University of Technology Sydney (UTS) in Australia was 3.35, which is the highest level of awareness of Green OA through the UTS repository (Narayan et al., 2018) (see Table 6).

Stratified analysis by occupation showed that the level of awareness of OA differed significantly for all concepts. Specifically, for the concept of OA, the level of awareness was higher among professors (M=3.38) than among graduate students (M=2.66) and others (M=2.84;

Table 5. Criteria for selecting the journal for publishing researchers' studies

Selection criteria	N	Percentage (%)
Reputation and influence (IF)	1,040	32.0
Topic consistency	922	28.4
Likelihood to pass peer review	577	17.8
Duration for publication	391	12.0

IF, impact factor.

$p=.000<.001$). For Green OA, it was higher among professors (M=2.51) than among graduate students (M=2.09; $p=.001<.01$). For Gold OA, it was also higher among professors (M=2.66) than among graduate students (M=2.15; $p=.000<.001$).

Stratified analysis by research experience showed that the level of awareness differed significantly regarding all concepts of OA. For the concept of OA, awareness was higher in researchers with five years or more to less than 10 years of experience (M=3.08), 10 years or more to less than 15 years (M=3.36), 15 years or more to less than 20 years (M=3.25), and more than 20 years (M=3.41) than in those with less than five years of experience (M=2.67; $p=.000<.001$) (see Table 7).

Regarding the level of awareness of Green OA, it was higher for researchers with 10 years or more to less than 15 years of experience (M=2.52), 15 years or more to less

Table 6. Level of awareness of OA by occupation

Category	Occupation	M	SD	Scheffe	F	p
OA concept	Graduate student	2.66	1.361	Professor > Graduate student, Others	14.4741	0.000
	Researcher	3.08	1.331			
	Professor	3.38	1.256			
	Others	2.84	1.347			
Green OA	Graduate student	2.09	1.162	Professor > Graduate student	5.389	0.001
	Researcher	2.32	1.184			
	Professor	2.51	1.242			
	Others	2.35	1.146			
Gold OA	Graduate student	2.15	1.208	Professor > Graduate student	8.695	0.000
	Researcher	2.38	1.233			
	Professor	2.66	1.293			
	Others	2.37	1.246			

OA, open access; M, mean; SD, standard deviation.

Table 7. Level of awareness of OA by research experience

Category	Occupation	M	SD	Scheffe	F	p
OA concept	Less than 5 years (a)	2.67	1.350	(b, c, d, e) > a	10.331	0.000
	5 years or more to less than 10 years (b)	3.08	1.367			
	10 years or more to less than 15 years (c)	3.36	1.256			
	15 years or more to less than 20 years (d)	3.25	1.222			
	More than 20 years (e)	3.41	1.260			
Green OA	Less than 5 years (a)	2.08	1.108	(c, d, e) > a	5.671	0.000
	5 years or more to less than 10 years (b)	2.29	1.383			
	10 years or more to less than 15 years (c)	2.52	1.215			
	15 years or more to less than 20 years (d)	2.51	1.200			
	More than 20 years (e)	2.54	1.334			
Gold OA	Less than 5 years (a)	2.06	1.128	(b, c, d, e) > a	7.863	0.000
	5 years or more to less than 10 years (b)	2.44	1.257			
	10 years or more to less than 15 years (c)	2.66	1.273			
	15 years or more to less than 20 years (d)	2.56	1.237			
	More than 20 years (e)	2.68	1.369			

OA, open access; M, mean; SD, standard deviation.

than 20 years (M=2.51), and more than 20 years (M=2.54) than for those with less than five years of experience (M=2.08; $p=.000<.001$).

Regarding the level of awareness of Gold OA, levels were higher for researchers with five years or more to less than 10 years of experience (M=2.44), 10 years or more to less than 15 years (M=2.66), 15 years or more to less than 20 years (M=2.56), and more than 20 years (M=2.68) than for those with less than five years of experience (M=2.06; $p=.000<.001$).

4.2.2. OA Publishing

Regarding OA publishing experience, 262 researchers (22.35% of all respondents) had the experience of self-

archiving over the past three years (using Green OA), and 616 researchers (52.56%) had the experience of OA publishing (Gold OA).

Among the 616 researchers with OA publishing experience, 32.8% (n=202) were researchers in engineering, 29.1% (n=179) were in medicine and pharmacology, and 24% (n=148) were in natural sciences (see Table 8, Fig. 1).

Among the 616 respondents with OA publishing experience, 31% (n=191) had five or more years to less than 10 years of experience, 27% (n=164) had 10 or more, but less than 15 years of experience, and 15% (n=91) had 15 or more to less than 20 years of experience.

OA publications were most frequently performed by university researchers (70%); namely, the group of re-

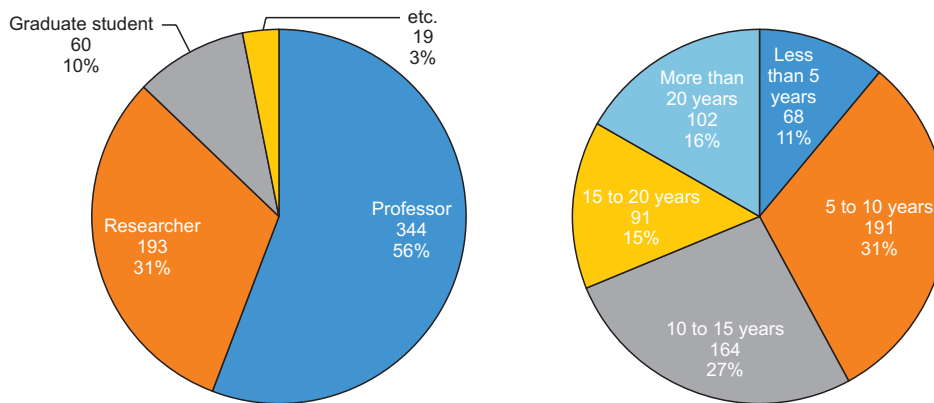


Fig. 1. OA publishing experience by occupation and research experience. OA, open access.

Table 8. OA publishing experience by field of study

Category	N	Percentage (%)
Humanities	3	0.5
Social sciences	37	6.0
Natural sciences	148	24.0
Engineering	202	32.8
Medicine and pharmacology	179	29.1
Agricultural and marine sciences	29	4.7
Art and physical education	6	1.0
Interdisciplinary studies	12	1.9
Total	616	100

OA, open access.

searchers in our sample with extensive experience in OA publishing appeared to be university faculty researchers with 5 years or more to less than 10 years of research experience (see Table 9).

Regarding the type of OA publication, 52.9% of the respondents published in an APC-based Gold OA journal, and 23.5% did not know the type of OA that the journal they contributed to used (see Table 10).

For stratified analysis of the type of OA publication by research experience, each group by experience was set to 100%. The results showed that the longer the research experience, the more researchers had experience in publishing in free Gold OA journals and APC-based Gold OA journals. The number of respondents who did not know the type of OA that the journal they contributed to used decreased with an increase in research experience. However, publishing experience in hybrid OA journals accounted for a certain percentage regardless of research

Table 9. OA publishing experience by affiliation

Affiliation	N	Percentage (%)
University	431	70.0
Government-funded research organization	91	14.8
Company ^{a)}	37	6.0
Hospital	45	7.3
Others	12	1.9
Total	616	100

OA, open access.

^{a)}Includes affiliated research organizations.

Table 10. Type of OA publication

Type of OA publication	N	Percentage (%)
APC-based Gold OA journal	326	52.9
Free Gold OA journal	102	16.6
Hybrid OA journal	43	7.0
Not sure	145	23.5
Total	616	100

OA, open access.

experience or occupation (see Fig. 2).

Regarding the reasons for publishing OA articles, “I think it will be used a lot” accounted for 21.75% of the responses, “I think it will be published fast” accounted for 21.59%, and economic reasons (e.g., only APC cost support) accounted for 11.36% (see Table 11).

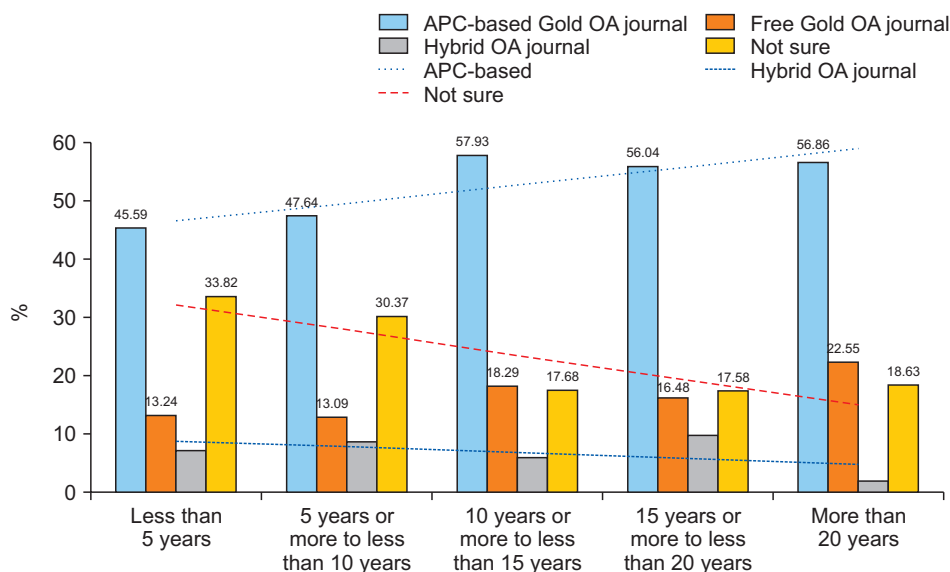


Fig. 2. Trends in types of OA publication by research experience. OA, open access; APC, article processing charges.

Table 11. Reasons for publishing the research in OA journals

Reasons	N	Percentage (%)
Easy to use	89	14.5
Will be used often	134	21.8
Fast publication	133	21.6
APC support	70	11.4
Good recognition	101	16.4
Recommended contribution	58	9.4
Others	31	5.0
Total	616	100

OA, open access; APC, article processing charges.

4.2.3. OA Publishing Costs

Approximately half of the respondents with OA publishing experience paid their OA publication costs in full using research funds. Regarding funding for OA publication cost, 14.9% of the researchers had the costs paid in full by their affiliated organization, followed by partial support from the affiliated organization (10.4%; see Table 12).

OA publishing occurs more commonly in the fields of study of natural sciences, engineering, and medicine. Stratified analysis for funding for OA publication cost by field of the study showed that cases of publication cost being paid in full by research funds occurred most commonly in engineering, followed by natural sciences and medicine. Moreover, cases of publication costs being paid

Table 12. Funding for OA publication cost

Ways to procure OA publication cost	N	Percentage (%)
Paid in full by the affiliated organization	92	14.9
Paid partially by the affiliated organization	64	10.4
Paid in full by research funds	311	50.5
Paid partially by research funds	55	8.9
Personally paid	52	8.4
Not paid	35	5.7
Others	7	1.1
Total	616	100

OA, open access.

in full by the affiliated organization occurred most commonly in engineering. Regarding cases of publication costs being paid partially by the affiliated organization and personal funds, these occurred most commonly in medicine (Fig. 3).

According to researchers who reported having OA publishing experience, most of them paid \$1,500-2,000 to cover the costs of OA publication (26%), with the average cost being \$1,334.18.

Among the fields of natural sciences, engineering, and medicine and pharmacology, which had the largest number of OA publications, and regarding the APC range of \$1,500-2,000, 9.5% of the engineering researchers and

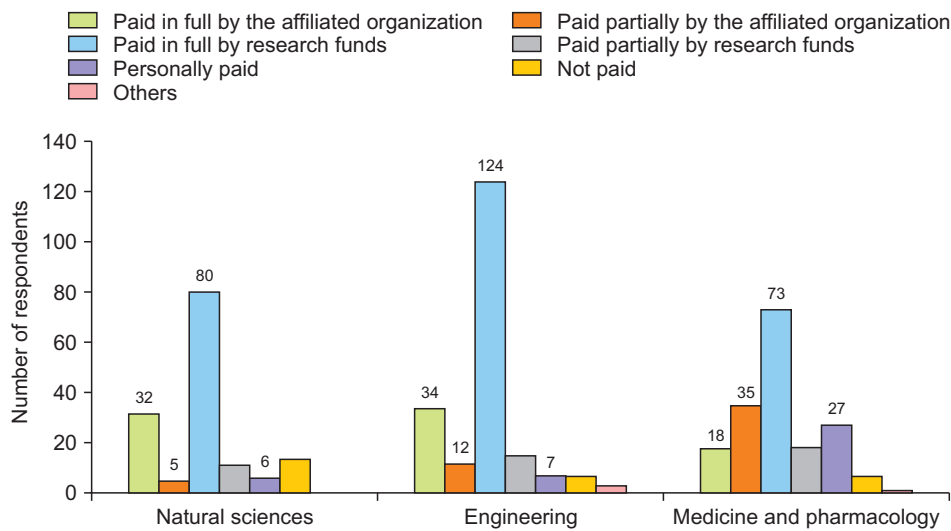


Fig. 3. Funding of OA publication cost by fields of study (natural sciences, engineering, medicine). OA, open access.

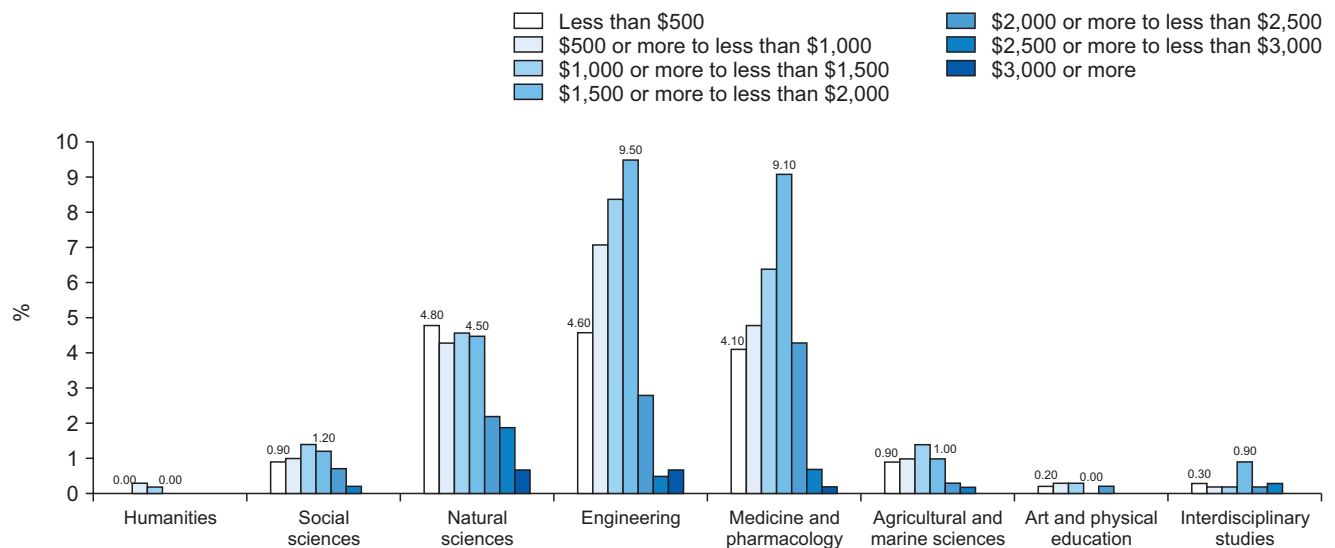


Fig. 4. Money spent on OA publication by field of study. OA, open access.

9.1% of the medicine and pharmacology researchers reportedly incurred such costs. Meanwhile, the APC range of less than \$500 appeared the most in the natural sciences field, with 4.8% of researchers reportedly incurring such costs. Particularly, in the field of natural sciences, publishing costs tended to be within the range of less than \$500, \$1,500, and \$2,000, and the difference was non-significant (i.e., less than 5% between these ranges). Hence, it appears that natural science researchers incurred relatively lower publishing costs compared with researchers in the fields of engineering, medicine, and pharmacology.

Although there were differences in APC costs between the three fields of study, the actual APC payments—which were revealed by researchers in each field—did not differ

significantly by field of study, as shown in Fig. 4.

4.2.4. Reasons for Not Publishing and Future Willingness to Publish OA

Around half of the respondents with OA publishing experience paid their OA publication costs in full using research funds. Regarding funding for OA publication cost, 14.9% of the researchers had the costs paid in full by their affiliated organization, followed by partial support from the affiliated organization (10.4%) (see Table 12).

We also examined researchers' willingness to publish OA articles by employing a 5-point scale. Regardless of the amount of publishing cost support, researchers showed a high level of willingness to publish OA articles, at 4.17.

Except for those in the humanities field, more than 70% of the researchers responded that they were “willing to publish” and “very willing to publish” an OA article.

4.3. Perceptions of Mandatory OA and Benefits

4.3.1. Perceptions of Mandatory OA

We examined researchers’ perceptions about mandatory OA by asking them about potential justifying factors for its use in publicly-funded research papers. Researchers reported that the major justifying factor was “the free use of papers increases their utilization, and they should be disclosed free of charge” ($M=4.28$). This was followed by “papers published with public funds should serve as public goods” ($M=4.22$), and “it should be disclosed to the people as it was funded by taxpayers’ money” ($M=4.18$), respectively.

After conducting stratified analyses for the justifying factors of mandatory OA for publicly-funded research outcomes by field of study and research experience, we found no statistically significant differences. The results of Scheffé’s test showed that there were significant differences by occupation; specifically, for respondents in the “others” category. The response “it should be disclosed to the people as it was funded by taxpayers’ money” ($M=4.51$) was higher for “others” ($M=4.51$) than for professors ($M=4.11$) ($p=.014<.05$). Moreover, more than professors ($M=4.13$) ($p=.007<.05$), respondents in the “others” category deemed

the response “papers published with public funds should serve as public goods” ($M=4.51$) as more important. There were no statistically significant differences in the other five items (see Table 13).

After conducting Scheffé’s test for researchers’ perceptions of the justifying factors regarding mandatory OA for publicly-funded research outcomes by affiliations, we observed significant differences. More participants affiliated with companies ($M=4.26$) responded that they deemed justifiable the use of mandatory OA for publicly-funded articles to allow for them to “participate in international trends” over participants affiliated with government-funded research organizations ($p=.023<.05$). The other six items showed no statistically significant differences (see Table 14).

4.3.2. Perceptions of the Benefits of Mandatory OA

For Korean researchers, the greatest benefits of mandatory OA for publicly-funded research papers were “increase in citations” ($M=3.93$), “increase in the disclosure of research” ($M=3.77$), and “increase in the reproduction of research outcomes” ($M=3.65$). Accordingly, the greater accessibility and dissemination of research that OA provides were perceived as the advantages of OA publishing for domestic researchers. To identify differences in these perceptions by field of study, research experience, and occupation, we conducted a stratified variance analysis, but

Table 13. Researchers’ perceptions of the justifying factors regarding mandatory OA for publicly-funded research outcomes by occupation

Category	Occupation	M	SD	Scheffe	F	p
Funded by taxpayers’ money	Graduate student	4.18	0.939	Others > Graduate student	3.564	0.014
	Researcher	4.25	0.910			
	Professor	4.11	1.097			
	Others	4.51	0.612			
Role of public goods	Graduate student	4.21	0.892	Others > Graduate student	4.079	0.007
	Researcher	4.30	0.848			
	Professor	4.13	1.070			
	Others	4.51	0.674			

OA, open access; M, mean; SD, standard deviation.

Table 14. Researchers’ perceptions of the justifying factors regarding mandatory OA for publicly-funded research outcomes by affiliation

Category	Affiliation	M	SD	Scheffe	F	p
Participate in international trends	University	3.96	1.017	Company > Government-funded research organization	3.176	0.023
	Government-funded research organization	3.87	1.007			
	Company	4.26	0.886			
	Hospital	4.08	1.023			

OA, open access; M, mean; SD, standard deviation.

no significant statistical differences were found.

After conducting Scheffe's test, we found that "ease of publishing" was more important for researchers affiliated with hospitals ($M=3.31$) than for those affiliated with government-funded research organizations ($M=3.19$) ($p=.028<.05$). Furthermore, "benefits in abiding by recommendations of funding agency" was more important for researchers affiliated with hospitals ($M=3.56$) than for those in government-funded research organizations ($M=3.08$) ($p=.001<.01$). There were no statistically significant differences in the other five items (see Table 15).

4.4. Role of Institutions and Information Desired by Researchers

4.4.1. Sources of OA-related Information

Regarding the sources of OA-related information, 432 respondents (36.86%) received information through media sources, such as papers, news articles, and blogs,

followed by fellow researchers (21.5%), conferences and seminars (17.5%), affiliated libraries (8.36%), and research fund organizations (7.17%). Hence, the participating researchers acquired OA-related information predominantly through personal activities and their networks.

Stratified analysis for the acquisition of knowledge through these sources of OA-related information by occupation showed that researchers, professors, and others most frequently acquired information through media sources, while graduate students did so through fellow researchers. Hence, student researchers obtained relevant OA information from their informal networks.

The sources of OA-related information by research experience are shown in Fig. 5. Considering that graduate students have the shortest research experience, our results allow us to infer that the longer the research experience, the higher the tendency to obtain OA-related information through media sources and the lower the tendency to ob-

Table 15. Perceptions of the benefits of mandatory OA for publicly-funded articles by affiliation

Category	Affiliation	M	SD	Scheffe	F	p
Ease of publication	University	3.26	1.177	Hospital > Government-affiliated research organization	0.287	0.028
	Government-affiliated research organization	3.19	1.183			
	Company	3.23	1.046			
	Hospital	3.31	1.161			
Benefits in abiding by recommendations	University	3.39	1.087	Hospital > Government-affiliated research organization	5.535	0.001
	Government-affiliated research organization	3.08	1.083			
	Company	3.27	1.019			
	Hospital	3.56	1.057			

OA, open access; M, mean; SD, standard deviation.

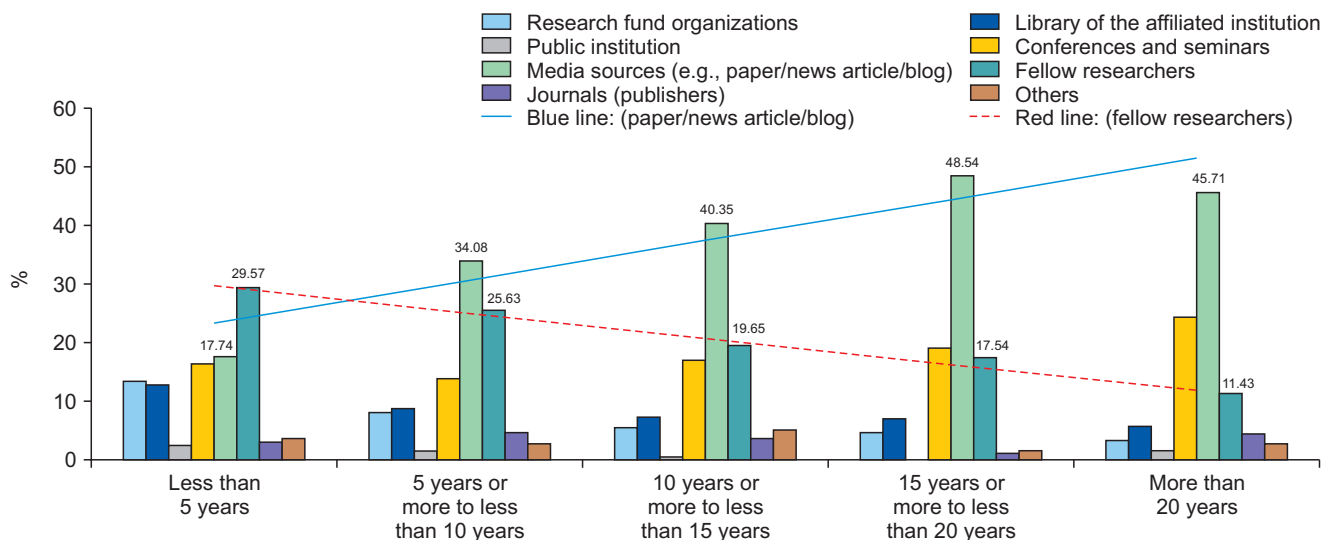


Fig. 5. Trends in sources of OA-related information by research experience. OA, open access.

tain information through fellow researchers.

This survey showed that 36.86% of the respondents obtained OA-related information through media sources, followed by personal relationships or academic activities such as academic societies, and seminars. Finally, very little information was obtained through institutions, such as research funding organizations, affiliated libraries, and government-run organizations.

The most requested OA-related information by respondents was a “list of excellent OA journals,” which was followed by information on help for publishing an OA article (e.g., how to submit a manuscript and avoid predatory journals).

Notably, researchers perceived that OA-related information should be provided by research funding agencies (30.89%) and national agencies such as government-run organizations and affiliated libraries.

Researchers reportedly wanted to receive from government-run organizations information directly related to OA trends and publication (e.g., how to look for excellent OA journals and detect predatory journals, and how to submit a manuscript from institutions that fund their research).

5. DISCUSSION

The survey results of Korean researchers’ perceptions and awareness on OA provided several implications with regard to OA policies and the legal system for mandatory OA of publicly-funded research papers. First, 81.1% of the researchers responded that two of the major criteria when choosing journals to publish their articles were whether the journal was indexed in reputable academic databases and its IF. These results might indicate the need for a way to reflect these criteria in the OA publishing environment to promote OA of a public research paper, for example, linking OA incentives to researcher and journal IF.

Second, professors and researchers with longer research experience were highly aware of OA, albeit most showed a lower level of awareness of specific OA-related information (e.g., on Green OA and Gold OA). Particularly, the level of awareness of Green OA, through repositories of universities and institutions, was lower than that of Gold OA through OA journals. This shows that Korean researchers’ level of awareness of Green OA was low, especially when compared with that of Australian researchers and their favorable attitudes toward Green OA (Taylor & Francis, 2014). Therefore, it might be necessary to raise awareness of Green OA among researchers as a starting

point to promote OA besides a re-examination of the operation and use of government- and university-run institutional repositories.

Third, the results showed that the longer the research experience, the more likely researchers were to obtain OA-related information through formal media sources. Meanwhile, the shorter the research experience, the more likely they were to obtain such information through informal networks. Thus, graduate students and upcoming researchers, who are not yet active in official academic activities, reported that it was easier to acquire OA-related information through informal and personal connections. However, such behavior could limit their ability to obtain accurate and systemic information. Therefore, OA education should be systematically provided to subsequent generations to ensure they have an accurate understanding of OA, which is the most basic prerequisite for its expansion. Moreover, strategies for the dissemination of OA-related information must differ depending on the level of research experience of the target population. Hence, we see the need to strengthen the role of affiliated libraries in the expansion of OA.

Fourth, the OA-related information most researchers reportedly wanted was a list of excellent OA journals by field. Additionally, they also wanted to obtain such information through their funding institutions or government-run organizations. Particularly, it seemed that researchers tended to recognize OA-related information as a type of information that should be managed and disseminated by the state; hence, there is space for consideration and discussion about the role of university libraries in such contexts.

Fifth, although 52.9% of OA publications were published in APC-based Gold OA journals, 23.54% of the respondents in our survey did not know in what type of OA journals their papers were published. These results are similar to those from a survey targeted at domestic researchers who contributed to OA mega-journals (Lee, 2019). A cited author found that Korean researchers had a lower level of awareness of OA mega-journals and OA journals than those in the USA, the United Kingdom, and Germany. Additionally, the response of Korean researchers regarding reasons for publishing a paper in OA mega-journals was related to the lack of frequency of such research compared with other countries. Given that this may be an obstacle to the implementation of OA-related policies in Korea, we see the need to improve the level of awareness of OA among domestic researchers.

Meanwhile, 21.75% of the respondents chose OA pub-

lishing because they thought “it would be used often,” and 21.59% chose it because they thought “it would expedite publication,” hence demonstrating that they value the efficiency of the usage and publication of OA articles. Further, cost-related reasons to choose OA publishing (e.g., APC support) accounted for only 11.36% of the total. Thus, it is necessary to expand the research achievements and the efficiency and quickness of publication (e.g., by expediting and expanding financial incentives or benefits for researchers) for OA articles.

Sixth, the most significant reason not to contribute to OA journals was the financial burden such contribution entails. This shows that cost alleviation should be considered as an important factor in the future development of OA policies. The second largest reason was related to the lack of awareness about publishing procedures and the submission process for such articles, showing the need to develop, distribute, and provide education on OA-related information and its provision systems.

Seventh, respondents’ perceptions of the justifying factors regarding the use of mandatory OA for publicly-funded research differed by occupation. For those in the “others” category, the major justifying factor included the fact that such research is publicly-funded with taxpayers’ money. Thus, these research efforts need to play their role as public goods. For professors, the major justifying factor was the possibility of free usage for research findings. We interpreted these results by considering the fact that professors, who receive more support for their academic publications than other groups, view the need to obligate OA for public research from the direct perspective of usage. However, other groups were more indirect in their expressions toward the desire to utilize research findings for free by focusing on the value of taxes and public goods. Therefore, policies for institutional researchers (e.g., professors and affiliated researchers) and independent researchers should be designed differently according to the needs of each group; this will allow for establishing relevant policies that expand OA articles and the use of OA journals in the future.

Eighth, researchers that showed the highest level of awareness of the benefits of mandatory OA for publicly-funded research were those affiliated with hospitals and companies. For those affiliated with hospitals, the focus was on the greater time efficiency and expanded reproduction (e.g., ease of publishing, reduced publishing time, and benefits in abiding by recommendations) that OA articles could provide. For researchers affiliated with companies, the emphasis was on the use of research (e.g.,

increased citations, improved collaboration, and a higher level of research disclosure).

This study demonstrates that, although Korean researchers have some awareness about OA, they have a low awareness about specific types of OA, features of publication depending on the type, publication process, publication experiences, and so on. A majority of researchers have the expectation that fast publication through OA will increase the number of references because of freedom of access. However, since the importance of IF is evaluated to be very high, at present OA publication has a limited role as a publication platform that can be used generally and practically by researchers.

6. CONCLUSION

The worldwide spread of the open science movement goes beyond OA and open data, advancing towards publicly sharing all research-related achievements, allowing research outcomes to contribute to the development of the entire human race beyond a specific group. Particularly, R&D in the science and technology sectors is changing the paradigm toward open science in an attempt to converge research and collaboration through data sharing, as this will allow for the creation of greater value. There is also a widespread perception that government-funded research achievements should contribute to the interests of the entire country, not to specific individuals or communities. Hence, laws, institutions, and policies are implemented in Europe and the USA to support OA for publicly-funded research achievements. Under these circumstances, this study sought to collect baseline data for the future establishment and implementation of OA policies by conducting surveys on researchers’ perceptions, as these are the primary agents of academic publications and OA articles.

Our results showed that researchers deemed journal indexing in reputable academic databases as the most important factor for their selection of journals in which to publish their articles. Furthermore, they also reportedly expected more usage of their studies upon publishing them through OA. Therefore, a variety of tools must be devised regarding OA-related topics, such as a method for researchers to assess the impact of a certain index database and performance evaluations to be applied to OA for publicly-funded OA articles. Moreover, practical stakeholders in OA publishing need to devise institutional tools and incentives to encourage the publication of OA articles and collect and manage related information.

The ultimate goal of mandatory OA for publicly-

funded articles is to expand the use of taxpayers' money, ensuring that there are no boundaries for access to the produced information. Hence, we suggest that stakeholders justify the benefits of mandatory OA for researchers based on the perspective of expanding citation (usage) rather than from the perspective of giving meaning to taxpayers' money or public goods. Fundamentally, the effect of increased research usage caused by the implementation of mandatory OA for publicly-funded articles should be continuously measured and presented as an outcome of the use of OA in public research.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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