

SPANISH RESEARCHERS' OPINIONS, ATTITUDES, AND PRACTICES TOWARDS OPEN ACCESS PUBLISHING

Opiniones, actitudes y prácticas de los investigadores españoles hacia la publicación en acceso abierto

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Abstract

The open access (OA) movement has exploded in the last few years. In 2016 we invited 1,896 researchers based in Spanish institutions to fill in a survey on their opinion, attitudes and practices towards OA. We analysed the 554 responses received from researchers in all fields of knowledge (29% response ratio). Most researchers are aware of OA outlets in their fields (86%) and believe OA is beneficial (76%). There isn't a clear position on the quality of OA journals among Spain-based researchers and there are differences between disciplines. Almost 70% of researchers have published at least one OA article in the last 5 years. Half of them had to pay article processing charges (APCs) that were covered with research funds.

Keywords

Open access; Publishing practices; Researchers; Authors; Scholarly publishing; Journals; Survey; Spain.

Resumen

El movimiento de acceso abierto (*open access* en inglés, OA) ha explotado en los últimos años. En 2016 invitamos a 1.896 investigadores de instituciones españolas a rellenar una encuesta sobre su opinión, actitudes y prácticas con respecto al OA. Analizamos las 554 respuestas recibidas de investigadores en todas las áreas del conocimiento (ratio de respuesta del 29%). La mayoría de los investigadores (86%) conocen revistas en OA en su campo y creen que el OA es beneficioso para su disciplina (76%). Sin embargo no se posicionan claramente con respecto a la calidad de dichas revistas, aunque se observan diferencias entre disciplinas. Casi el 70% de los investigadores han publicado al menos un artículo en OA en los últimos 5 años. La mitad de ellos tuvo que pagar tasas para publicar que fueron cubiertas con fondos de investigación.

Palabras clave

Acceso abierto; Prácticas de publicación; Investigadores; Autores; Revistas; Encuesta; Publicación científica; España.

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1. Introduction

The Open Access (OA) movement aims to make scientific outcomes freely accessible without restrictions. Such philanthropic aspiration is certainly inspired by the French Encyclopaedists in the 18th century. However, it is only in the late 20th century, with the birth of electronic networks and the popularization of the World Wide Web (WWW), that these new ways to circulate new scientific knowledge has become a reality. This medium was defined by some authors as scholarly skywriting (Harnad, 1990). It was from the *Budapest Open Access Initiative (BOAI)* in 2002 that most authors agree the Open Access movement was "born" (Xia, 2010; Laakso *et al.*, 2011; Suber, 2012; Laakso; Björk, 2016).

Authors are among the main players in the OA movement. Without their willingness to circulate their knowledge, OA would just be an illusion. This is the main reason it is absolutely essential to learn, not only about their attitudes and opinions on OA, but also about their real practice.

Previous to the present study, only three surveys have focused specifically on OA and Spain-based researchers

The first survey that tried to find out about researcher's views on OA was carried out between 2001 and 2002 (Swan; Brown, 2003). The OA movement has been running parallel to globalization and most probably this is the reason that has triggered many researchers to issue surveys with an international and interdisciplinary orientation since the early days of OA. Examples of this are Cozzarelli; Fulton; Sullenberger, 2004; Rowlands; Nicholas; Huntington, 2004; Swan; Brown, 2004b; Nicholas; Huntington; Rowlands, 2005; Swan; Brown, 2005; Hess *et al.*, 2007; Coonin; Younce, 2009; Solomon; Björk, 2012; Frass; Cross; Gardner, 2013; Eger; Scheufen; Meierrieks, 2014; *Nature*, 2015a; 2015b; 2016; Rowley *et al.*, 2017. Among them we also find the *Study of open access publishing (SOAP)*, a *European Commission FP7* funded project that issued a survey that was answered by more than 38,000 researchers (Dallmeier-Tiessen *et al.*, 2011a).

Most surveys have focused on finding out about researchers' opinions, attitudes, and practices at the national level. For example, we found surveys focusing on countries such as South Africa (De-Beer, 2005), Germany (Over; Maiworm; Schelewsky, 2005; Eger; Scheufen; Meierrieks, 2013), USA (King *et al.*, 2006; *University of California*, 2007; Odell; Dill; Palmer, 2014; Teplitzky; Phillips, 2016), India (Deoghuria; Roy, 2007; Singson *et al.*, 2015), Australia (Kennan, 2007; Austin; Heffernan; David, 2008), United Kingdom (Brown;

Swan, 2007; Creaser, 2010; Stone, 2010; Budden, 2011; Nariani; Fernández, 2012; Zhu, 2017), Norway (Alemayehu, 2010), Argentina (Bongiovani; Gómez; Miguel, 2012), Finland (Harjuniemi; Lehto, 2012), France, (Schöpfel *et al.*, 2016), and New Zealand (White; Remy, 2016).

In the case of Spain, there have only been three surveys that have focused specifically on researchers based in Spain. The first one was carried out in 2004. It focused on Spanish medical authors specifically and obtained 100 survey responses (Hernández-Borges *et al.*, 2006). The other two surveys were issued by the *Spanish National Research Council (CSIC)*. They were carried out in 2007 and 2010 and were aimed at researchers and librarians (Bernal, 2010). The survey carried out in 2007 helped to provide an overview of the publishing habits of CSIC researchers and included information about their OA knowledge and acceptance. It also investigated their general opinions on repositories (Bernal, 2010). In 2010 the survey expanded its content and objectives, in respect to the previous one. It focused on identifying potential publication and behavior changes towards OA publishing in comparison with the previous study.

This study will explore the opinions of a representative sample of researchers in Spain. Few studies have focused on the country; in addition a study that includes a large representative sample of researchers, not limited to any particular discipline or institution, has not been conducted. Finally, it's been a long time since the results from the most recent study were published.

The main aim of this study is to find out the current views, attitudes, and practices of Spain-based researchers towards OA publishing. We administered a survey in July 2016, based on the SOAP project questionnaire, in which we asked researchers about:

- their opinion on OA;
- number of publications (non-OA and OA);
- experience with Article Processing Charges (APC); and
- factors used to select journals for submitting papers.

2. Methodology

The population for this study was Spain-based researchers that have published in journals indexed by the *Web of Science*. Researchers from all areas of knowledge were targeted. To do so we replicated the largest study of this type to date: the *Study of open access publishing (SOAP)* (Dallmeier-Tiessen *et al.*, 2011b).

We contacted 80,969 authors listed in 63,890 bibliographic records (only journal articles and conference proceedings were included) added to the *Web of Science (WoS)* between July 1st and 15th, 2016. From this sample we identified 1,896 researchers working in Spanish institutions and we invited

them to participate in the survey.

The original file was exported from *WoS* into an *MS Excel* file and we only kept the following fields: author; email; document type; postal address; subject. We assigned each author to one or more disciplines. The country was extracted from their email address, or from their correspondence address when the country of origin was not identifiable from the email domain.

We used the online survey creation tool *SurveyMonkey* (Liu et al., 2016). We fully replicated most questions in the original *SOAP* survey, but omitted some of them. The survey was divided into three main sections:

- demographics;
- opinions (what researchers think); and
- practices (what researchers do).

We ran the survey for a period of four months (July – October, 2016). We followed up our initial invitation with one reminder to those that hadn't replied after a few weeks. We received 554 responses from Spain-based *WoS* authors, a 29% response rate. We applied descriptive statistics using cross tabulations to measure the association between researchers' beliefs and practice and their discipline. We applied inferential statistics to test the significance level of these associations using chi-square tests.

Although the original questionnaire was longer, in the following table we list those questions that were analyzed in detail for this paper:

3. Results

3.1. Demographics

It is important to note that all disciplines were represented in the study, although not at the same proportion. The highest response rates were concentrated in disciplines linked to experimental sciences. The lowest response rates were found in the humanities; therefore, the results in this area might not be representative. Also note that the responses distribution follows a fairly similar pattern to that of the original sample of 80,969 authors from *WoS*.

One of the questions asked in the survey was how many years respondents had been working in research. In the following chart we present the distribution of the answers.

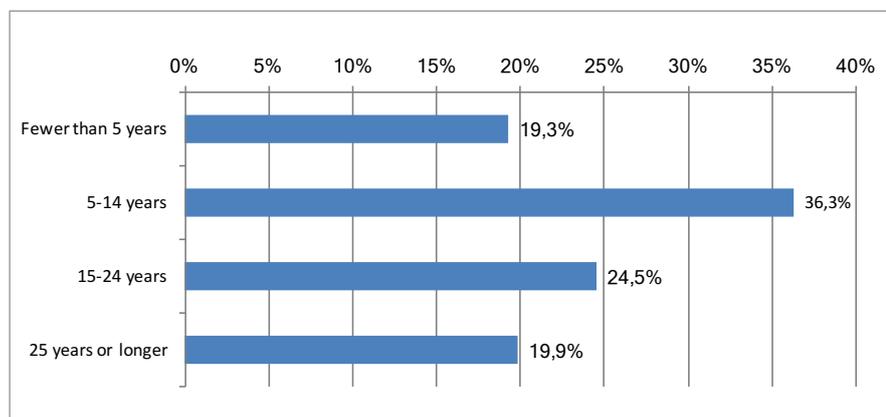


Figure 1. Responses from Spain-based researchers to the survey. Distribution by seniority (n=554)

Table 1. Partial questionnaire including only questions analyzed in this paper

Question	Possible answers
How many years have you been employed in research?	Fewer than 5 years 5-14 years 15-24 years 25 years or longer
NOTE: Many of the questions that follow concern Open Access publishing. For the purposes of this survey, an article is Open Access if its final, peer-reviewed, version is published online by a journal and is free of charge to all users without restrictions on access or use.	
Do any journals in your research field publish Open Access articles?	Yes No I do not know
Do you think your research field benefits, or would benefit from journals that publish Open Access articles?	Yes No I have no opinion I do not care
Listed below are a series of statements, both positive and negative, concerning Open Access publishing. Please indicate how strongly you agree/disagree with each statement. [The statements were presented in random order. In this case we will only present one statement, the one analyzed in detail.]	
Open Access publishing leads to an increase in the publication of poor quality research	Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree
Approximately how many Open Access articles have you published in the last five years?	0 1-5 6-10 More than 10 I do not know
What publication fee was charged for the last Open Access article you published?	No charge Up to €250 (\$275) €251-€500 (\$275-\$550) €501-€1000 (\$551-\$1100) €1001-€3000 (\$1101-\$3300) More than €3000 (\$3300) I do not know
How was this publication fee covered? (Choose more than one answer if applicable)	My research funding includes money for paying such fees I used part of my research funding not specifically intended for paying such fees My institution paid the fees I paid the costs myself

The majority of respondents had been working in research for 14 years or less (55.6%). The highest rate of responses came from researchers with 5 to 14 years of experience (36.3%). Young researchers were represented by almost 20% and so were most senior researchers.

3.2. Beliefs

In this section we will focus on researchers' views or opinions on different aspects of OA publishing. That is, what researchers think.

3.2.1. OA awareness

The majority of respondents were aware of OA journals in their field (86.1%).

A chi-square test of independence was performed to examine the relationship between awareness of OA journals and field of work. A certain degree of association between awareness and discipline was observed: $\chi^2(40) = 63.806, p = 0.010$ ($p > 0.05$).

The highest percentage of answers was 'yes' for both studies and in all disciplines, although there were differences between disciplines. Awareness of the existence of OA journals varied between 100% in Education to less than 80% of respondents in other disciplines. These are: Arts and Humanities (76%); Computer Science (79%); Chemistry (78%); Mathematics (77%).

Respondents declared they were not aware of OA journals in their fields in excess of 10% in the following disciplines: Social Sciences (11%) and Chemistry (22%). There were three disciplines in which more than 10% of respondents declared they did not know whether or not there were OA journals in their field: Arts & Humanities (14%), Business and Administration (13%), Mathematics (13%).

In terms of the experience of the researchers, we didn't observe major differences between age groups for this particular question.

3.2.2. Is OA beneficial?

The majority of respondents (75.8%) answered that they believed OA was beneficial for their research field. Around 15% of the respondents said that they didn't have an opinion or didn't really care, while 9% thought it was not actually beneficial.

We didn't observe statistically significant differences between disciplines ($\chi^2(60) = 10.452, p = 0.168$ ($p > 0.05$)). The majority of respondents declared that they believed OA was beneficial in all disciplines. This was the case for all respondents (100%) in Education. However, this percentage as just slightly higher than 50% in one case: Astronomy (57.1%).

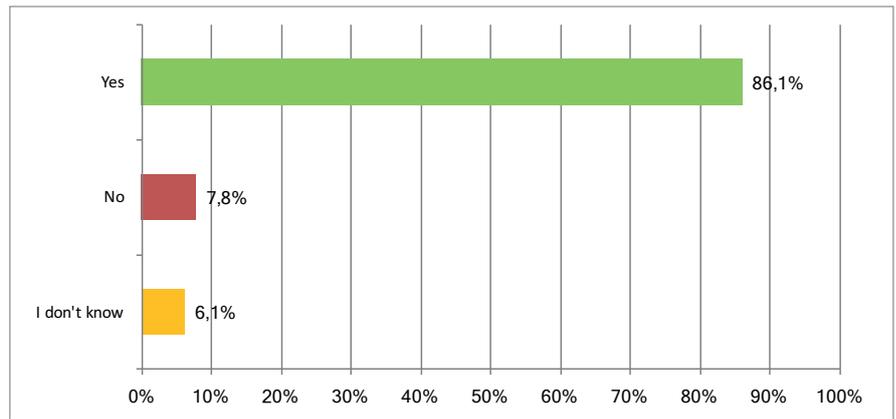


Figure 2. Spain-based researchers' answers to "Do any journals in your research field publish OA articles?" (n=554)

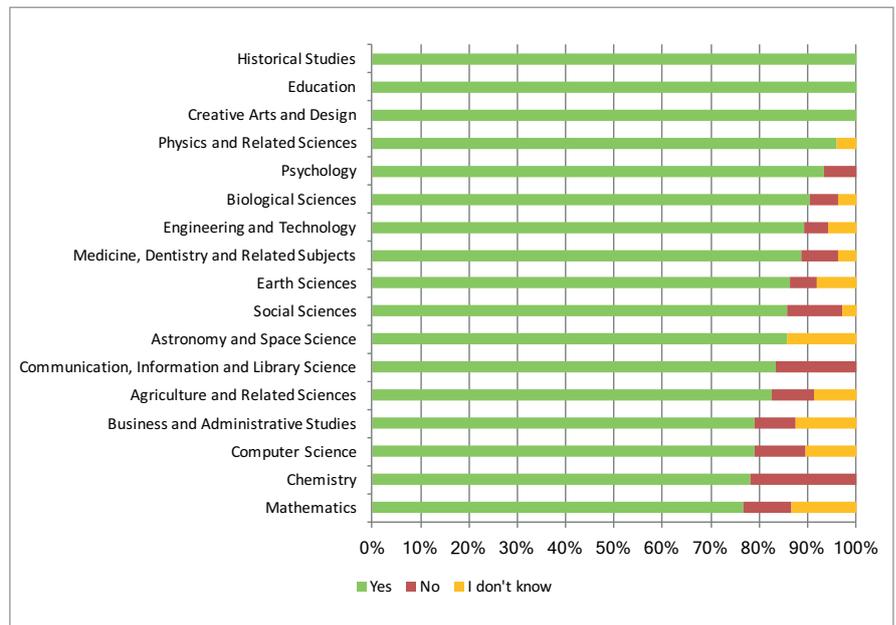


Figure 3. Spain-based researchers' answers to "Do any journals in your research field publish OA articles?". Distribution by discipline (n=601)

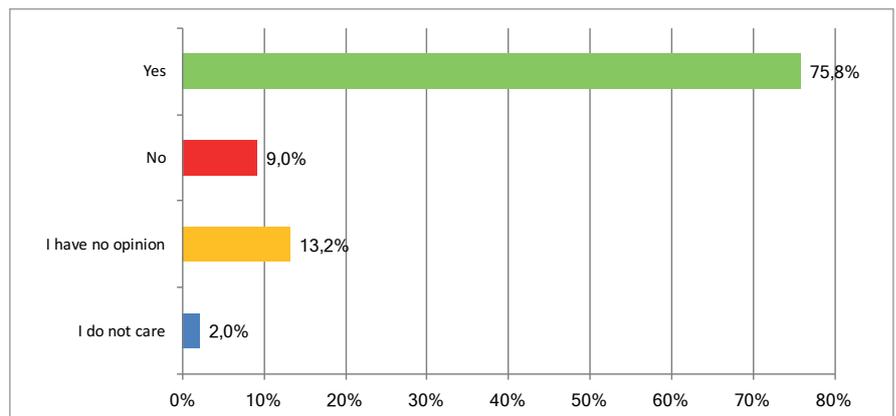


Figure 4. Spain-based researchers' answers to "Do you think your research field benefits, or would benefit from journals that publish Open Access articles?" (n=554)

More than 20% of respondents said that OA was not beneficial in Physics and Astronomy (24.2%). It also happened, in two disciplines, that more than 20% of respondents declared not to have an opinion or not to care in excess of

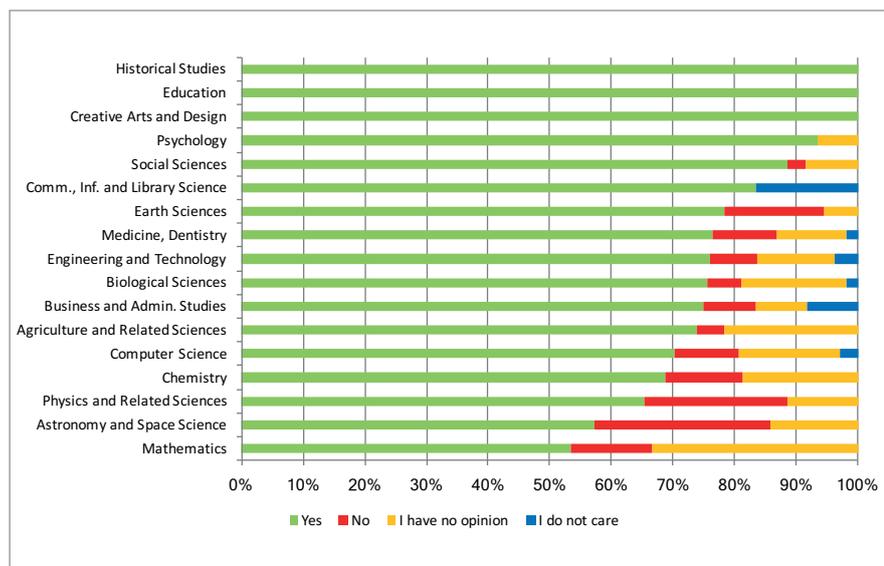


Figure 5. Spain-based researchers' answers to "Do you think your research field benefits, or would benefit from journals that publish Open Access articles". Distribution by discipline (n=601)

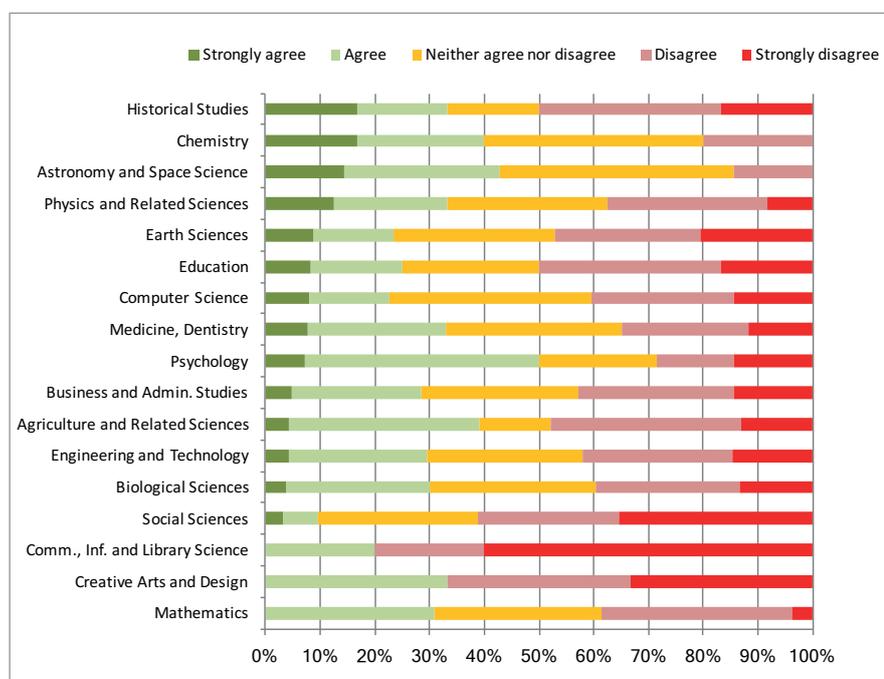


Figure 6. Spain-based researchers' agreement level with the statement "OA publishing leads to an increase in the publication of poor quality research". Distribution by discipline (n=563)

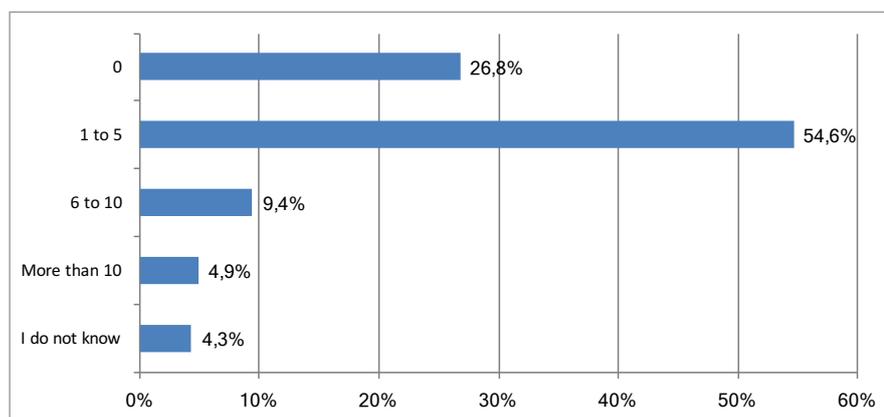


Figure 7. Number of OA articles published by Spain-based researchers in the last 5 years (n=553)

20% of the cases. These were Agriculture (21.7%) and Mathematics (33.3%).

In terms of seniority differences that were statistically significant (chi-square test: $\chi^2(9) = 23.420, p = 0.005$). All age groups responded that they believed OA was beneficial for their discipline. However, while this percentage was 90.7% for the youngest researchers it dropped to 83.7% for the most senior ones. It was also with those researchers who had 25 or more years of experience where we saw that more than 10% of respondents did not know or did not care (10.4%).

3.2.3. Quality of OA publications

Here we present the answers that Spain-based researchers gave about whether OA publishing leads to an increase in the publication of poor quality research.

From the 554 responses provided we found that 38.2% of Spain-based researchers fully disagreed or disagreed with this statement. On the other side we found 31.2% of researchers agreed or fully agreed. In total 30.6% of researchers answered "neither agree nor disagree" to this question.

We didn't observe statistically significant differences between disciplines ($\chi^2(100) = 103.205, p = 0.393$). There were two disciplines in which half or more of the respondents strongly disagreed or disagreed with the assertion that OA publishing leads to an increase in the publication of poor quality research: Social Sciences (65.8%) and Education (50.0%).

On the other side of the spectrum only researchers in Psychology reached the 50% mark in full agreement or agreement with this declaration (50%). But we also found high levels of agreement or full agreement in Chemistry (40%) and Agriculture (39.1%). The highest levels of "neither agree nor disagree" ratios were found in Chemistry (40%) and Arts and Humanities (40%).

3.3. Practice

In the following section we focus our analysis on researchers practice

in OA publishing. That is, what researchers do.

3.3.1 OA articles published in the last 5 years

We asked researchers how many OA articles they had published in the last 5 years. Almost 70% of the 553 respondents had published at least one OA article (68.9%). Close to 30% hadn't published any (26.8%) and 4.3% did not know.

Once more, when looking at the number of OA articles by discipline we obtained a low degree of association between variables [$\chi^2(100) = 126.706, p = 0.37 (p > 0.05)$].

The most common option in all disciplines was between 1 and 5 OA articles published. The only exception was the Mathematics discipline in which the most common option was zero OA articles in the last 5 years (46.7%).

In terms of seniority we didn't find statistically significant differences [$\chi^2(15) = 18.793, p = 0.215 (p > 0.05)$].

3.3.2. Publication fee paid to publish OA

In our survey we asked those authors that had published at least one OA article in the last 5 years to indicate the article publication cost (APC), if any. Most researchers didn't have to pay anything (38.9%) or did not know the cost (9.1%). The second most common option was €1,001-€3,000 (\$1,350-\$4,100), with 24.3%.

The chi-square test for the OA fee and discipline variables shows a statistically significant relationship between both variables [$\chi^2(140) = 185.495, p = 0.006 (p < 0.05)$]. Absence of publication fees was the most common option for at least half of the Spain-based researchers in several disciplines: Astronomy, Mathematics, Library science, Education, Social sciences, and History.

The €501-€1000 (\$700-\$1350) cost range was chosen by more than 20% of researchers in Chemistry (22.2%), and Computer Science (28.9%). The €1001-€3000 (\$1350-\$4100) option was chosen by more than 30% of researchers in several disciplines: Medicine (30.9%), Engineering (34.3%), Biology (35.9%), and Agriculture (50%). Most researchers in several disciplines did not pay to publish OA:

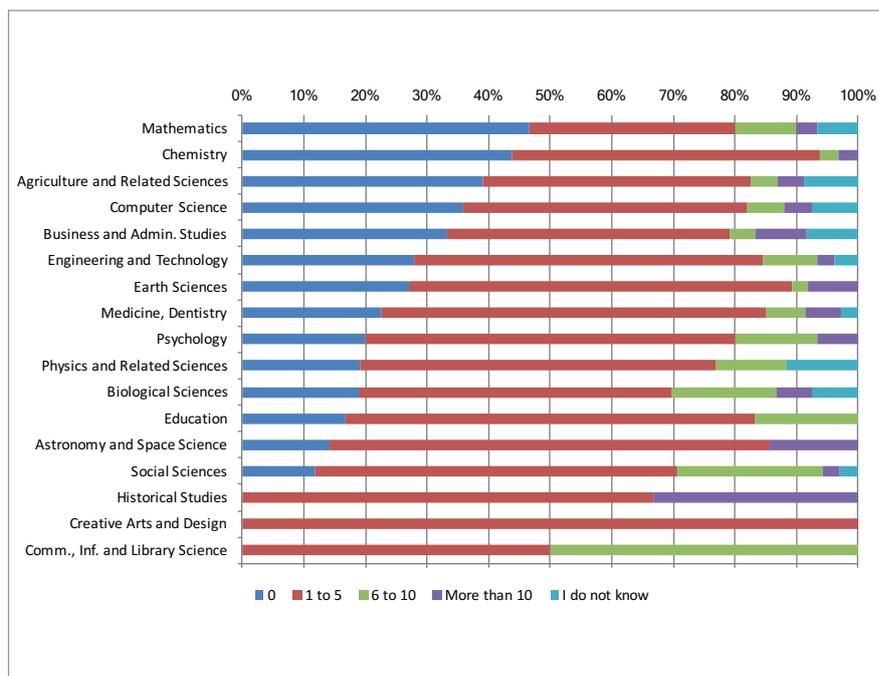


Figure 8. Number of OA articles published by Spain-based researchers in the last 5 years. By discipline (n=600)

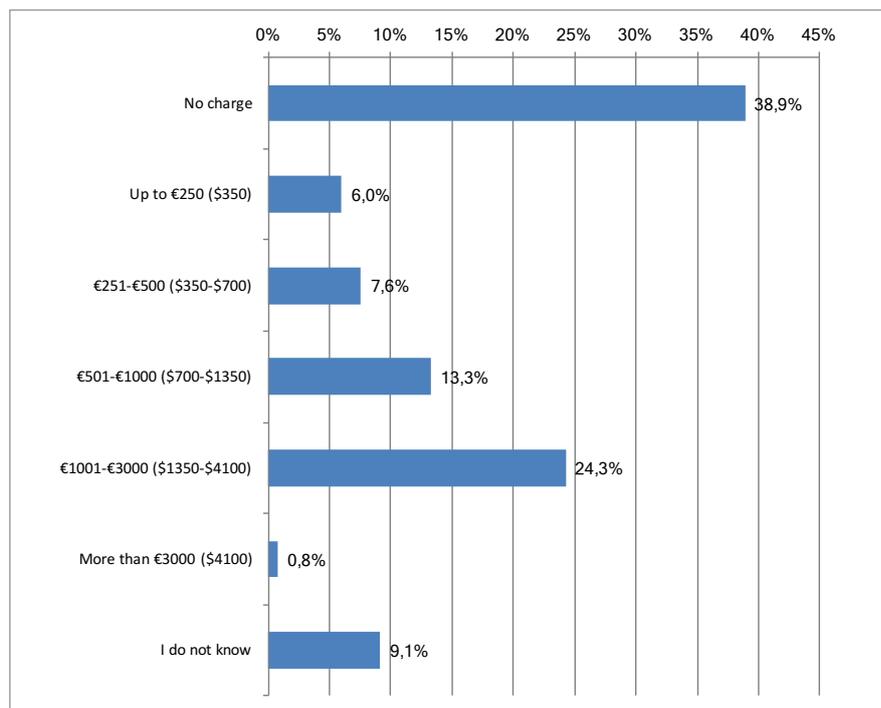


Figure 9. Publication fee paid by Spain-based researchers to publish latest OA article (n=553)

Arts and Humanities (68.8%), Social Sciences (73.7%), Education (80.0%), and Mathematics (85.7%).

In terms of seniority differences between age groups that were statistically significant [$\chi^2(21) = 39.312, p = 0.009 (p < 0.05)$]. More than half of the younger groups of researchers (fewer than 5 years in research) declared that they had not paid any fee to publish their latest OA articles (53.7%). This was also the most chosen option for the majority of researchers with 5 to 14 years of experience (35.9%), although the second most chosen option for this group was

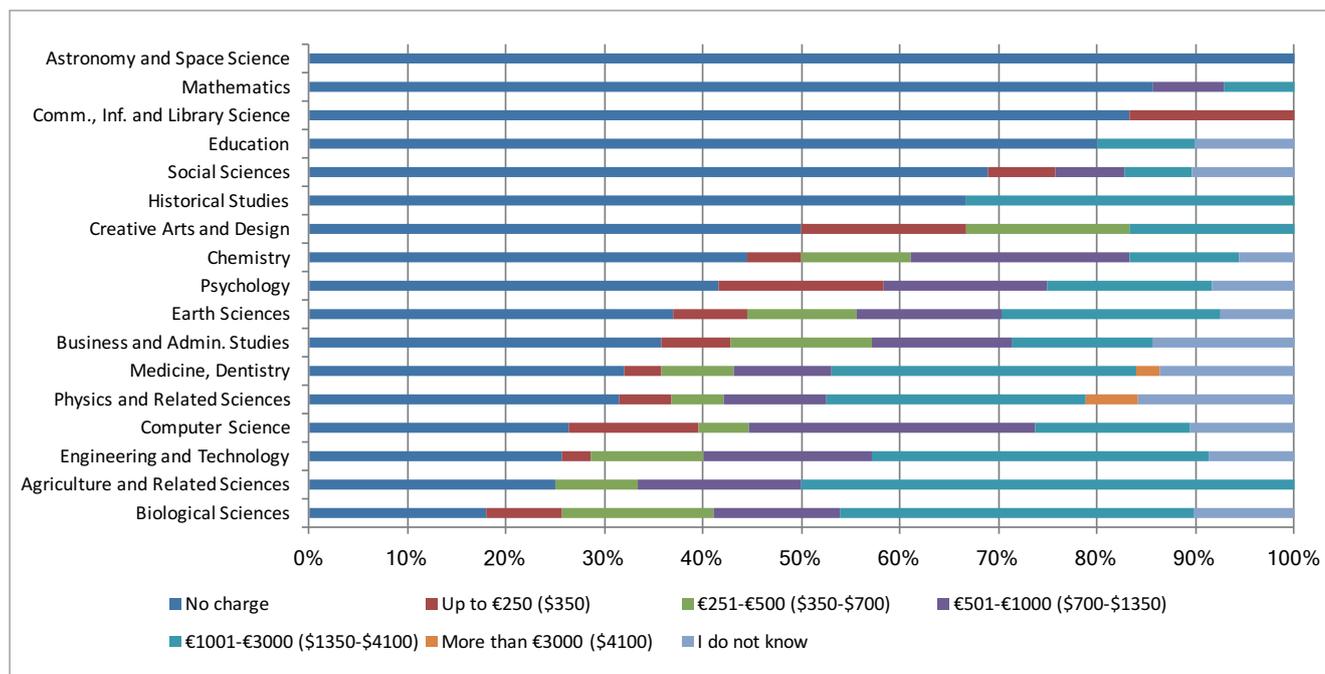


Figure 10. Publication fee paid by Spain-based researchers to publish latest OA article. By discipline (n=414)

€1001-€3000 (\$1350-\$4100) with 23.2% of researchers. No charge was also the most common option for the third age group (15 to 24 years) with 38% of researchers, although again the €1001-€3000 (\$1350-\$4100) follows with 29% of the responses. In the most senior group (+25 year of experience) once again the absence of fees was the most chosen option with 32.4% of the responses, followed once more by €1001-€3000 (\$1350-\$4100) with 28.4% of the answers.

3.3.3. Funding OA publications

In total 300 Spain-based researchers provided information on how they had covered publication fees for their latest OA article. The majority of respondents used funds spe-

cifically aimed at paying such fees (43.7%). Almost a third of Spain-based researchers used part of general research funds (32.7%). In a number of cases researchers covered those costs themselves (12.3%). Finally, 11.3% of researchers asked their institution to cover the costs.

When looking at the distribution of funding sources by discipline we find statistically significant differences [$\chi^2(76) = 795.524, p = 0.000 (p < 0.05)$]. In a number of disciplines at least half of the researchers used budgets aimed at paying OA: Chemistry (50.0%), Earth Sciences (52.6%), Physics and Astronomy (57.9%), Mathematics (60.0%), and Business and Administration Studies (62.5%).

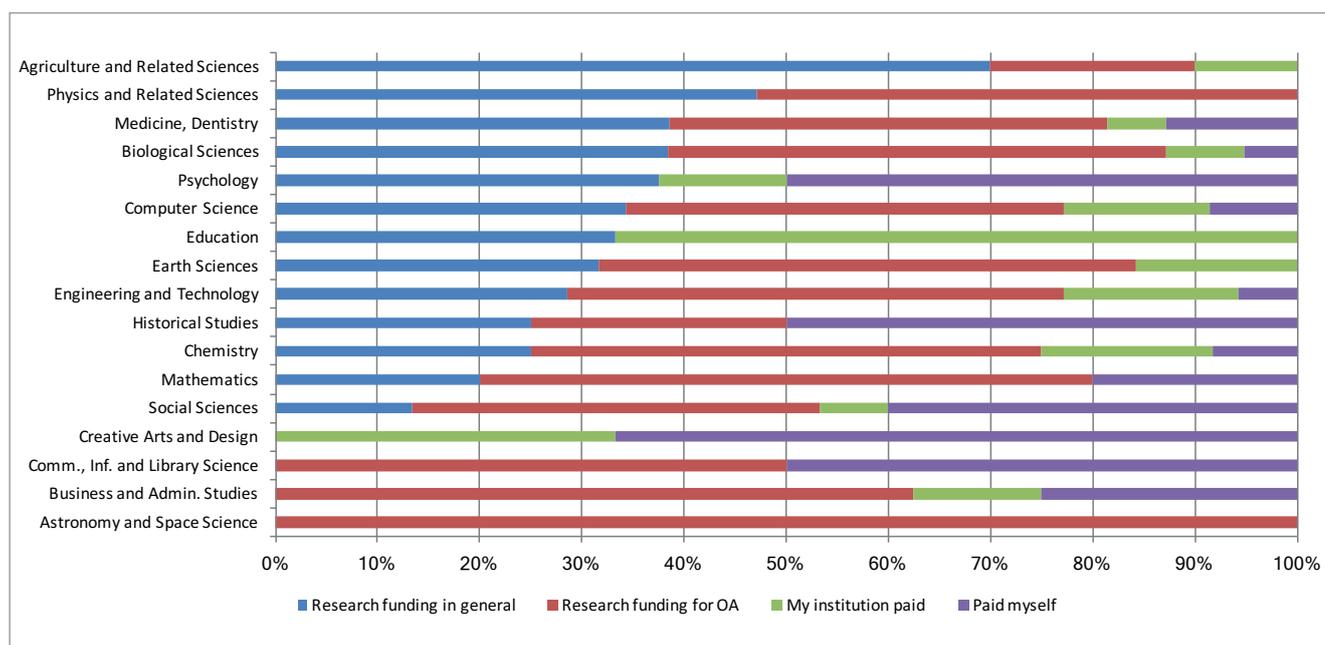


Figure 11. Who covered OA publication fee? Spain-based researchers. By discipline (n=324)

In Agriculture the most chosen option was research funding in general (70%) while in Education the majority of researchers declared that their institution paid their fees to publish OA (66.7%). We can also highlight that in some disciplines researchers had to cover OA fees from their own pockets. It was the case in: Social Sciences (44.4%), Psychology (50%), and Arts and Humanities (62.5%).

In terms of seniority we found statistically significant differences [$\chi^2(16) = 645.681, p = 0.000 (p > 0.05)$]. In the youngest researchers group (fewer than 5 years in research) the most common option to cover OA fees was to use funds aimed at this purpose (44.4%). This was also the case for the 5-14 (47.4%) and the 25+ years of experience (46.2%) groups. In the 15-24 years of experience group the most common option was research funding in general.

4. Discussion

In these type of studies, it is quite difficult to obtain a good response. In similar surveys, issued in 2015, the return rates were 9% (Frass; Cross; Gardner, 2014), 4% (Nature, 2015b), and 16% (White; Remy, 2016).

Although we reached a 29% response rate in our study we were conscious of the difficulty in obtaining representative samples in all fields of knowledge. In this particular case we believe that our results were representative of the situation in experimental sciences, but not so much in the humanities.

The vast majority of Spain-based researchers were knowledgeable of OA venues in their field. There were differences between disciplines, but in all cases at least 75% of researchers declared they were aware of OA journals in their respective fields. Surveys in the early days of OA found lower rates of awareness. In one carried out in 2004, only 62% of respondents were aware of the existence of OA journals in their fields (Swan; Brown, 2004b). A survey in 2006 found that at least 62% of researchers from different disciplines and countries were familiar with OA literature (Hess et al., 2007). In 2008 Coonin et al. reported 88.8% of the 918 respondents to a survey were familiar with OA publishing venues. In the 2015 Nature survey only 5-10% of respondents mentioned they were not aware of OA journals in their field (Nature, 2015b). A longitudinal study analyzing surveys up to 2010 reported that by 2007 at least 85% of researchers were aware of OA journals in their field (Xia, 2010), which is compatible with our findings. In general terms awareness of OA publishing venues have grown in the last few years and most researchers don't have problems finding OA options to submit their papers to.

In our survey this was the case for at least 89% of researchers in Medicine. This contrasts with a previous study in which only 22% of Spanish medical authors were aware of this possibility, although we need to note that this survey was issued in 2004 (Hernández-Borges et al., 2006). Another survey carried out in 2004 among medical researchers reported levels of 84% awareness (Schroter; Tite; Smith, 2005). Another survey aimed at Medical researchers in Cuba in 2007 reported familiarity with OA initiatives in general by 80%. However, these same respondents declared

to be aware specifically of OA journals in only 44.8% of the cases (Sánchez-Tarragó; Fernández-Molina, 2008).

Although in terms of opinion about OA we find a general positive attitude in Spain-based researchers (75.8% answered that is beneficial) this figure is several points lower than the one found in the SOAP study in 2010, 89% (Dallmeier-Tiessen et al., 2011b). The first international and multidisciplinary survey in which researchers were asked their general opinion about OA did not include this question in exactly the same way. However, 71% of respondents declared that the main reason to publish in OA was "the principle of free access for all readers" (Swan; Brown, 2004a). Another survey in 2004 reported that the prime reason for publishing in an OA journal was free access to information (Rowlands; Nicholas; Huntington, 2004). In a survey launched in 2006 with 688 respondents more than 90% of respondents stated a positive or very positive attitude towards OA (Hess et al., 2007). More than 70% of researchers in a large survey with almost 15K respondents declared in 2014 that OA is beneficial. Actually this result sees an increase of 10% in respect to the same survey in 2013 (Frass et al., 2014). Nature Publishing Group surveys reported that the most common reason to publish OA was "that research should be OA, so freely available immediately to all" by 45% of researchers in 2014 (Nature, 2015a).

“We cannot ignore the fact that 31.2% of researchers think that OA articles are synonymous with low quality research”

Although the majority of researchers in our study did not agree with the affirmation that OA articles are synonymous with low quality research (38.2%), we cannot ignore the fact that 31.2% did actually agree. It is also interesting to mention that almost one third of the respondents did not provide an answer one way or the other. These results contrast with other studies with Spain-based researchers samples, in which authors declared that the quality of journals was a determining factor to publish OA (Bernal, 2010). However, these findings are compatible with the trends found by Xia in the longitudinal study up to 2010, in which concerns about low prestige of OA journals have been present since the first studies took place. Trends have not varied significantly and are not expected to do so (Xia, 2010). In the case of the SOAP study there were also a large number of researchers not positioning themselves in one sense or the other. However, a certain level of disagreement with this statement of +50% was observed (Dallmeier-Tiessen et al., 2011c).

When we look at other authors that have queried researchers about this, we find that already in 2004 Swan & Brown mention the perception of quality of OA journals in their interviews with authors for the JISC/OSI survey. Their conclusion basically was that OA-published authors perceived OA journals to have high levels of quality because some authors refused to publish in these journals due to their concerns about their quality (Swan; Brown, 2004a). Also in 2004 another survey with 3,787 respondents reported around 55% of

researchers associating OA with high quality and a very large majority declared to believe that OA publications would improve with time (**Rowlands; Nicholas; Huntington**, 2004). In a follow up survey with 5,513 respondents in 2005 the same authors reported a bit more than half of respondents agreeing that OA would improve in the future (**Rowlands; Nicholas**, 2005). In a survey carried out in 2008 Coonin found that 46.5% would agree with the statement that OA journals are less prestigious than subscription based journals, while 22.9% of researchers did not have an opinion (**Coonin; Younce**, 2009). In 2012 a survey with 14,769 respondents reported 34% of researchers not positioning themselves in one sense or the other on a statement declaring that “OA journals are lower quality than subscription journals”, while 35% agreed and 32% disagreed (**Frass; Cross; Gardner**, 2013). In the 2014 *Nature* survey with more than 30,466 respondents we find that 40% of researchers from the hard sciences had not published in OA journals because of concerns about their quality. This figure rises to 54% in the Humanities and Social Sciences (HSS) (*Nature*, 2015a). In the follow-up survey in 2015 we find that this figure reaches 31% and it's the main reason because 7,955 did not publish in OA (*Nature*, 2015b). Another very recent longitudinal study, focused on early career researchers (ECR) at international level, also reported a clear perception of lower quality in OA journals than in subscription-based ones (**Nicholas et al.**, 2017a).

Almost 70% of respondents had published at least one OA article in the last 5 years

Publishing in OA journals seem to be fairly common within our respondents' base as almost 70% had published at least one OA article in the last 5 years. Five years ago Bernal found that the majority of Spain-based researchers had not published in OA journals (**Bernal**, 2010). On the other hand, the longitudinal study on ECRs reported that

“in Spain, publishing in OA journals is not common, and most ECRs do not publish in them. This is because they do not have enough funds to do so and because they do not trust OA completely” (**Nicholas et al.**, 2017a).

The findings of *SOAP* in 2010 also indicated around half of respondents having published at least one OA article in the last few years. In 2004 we find the first survey in which authors were asked if they had published in OA. In a 311 sample size 50% of researchers contacted declared to have published at least one article in OA (**Swan; Brown**, 2004a). In a follow-up survey, this time with a larger sample (1,296 respondents) the same authors reported 24% they had published in OA and 9% don't know (**Swan; Brown**, 2005). In 2005 a large survey with 5,513 respondents reported that a very small proportion (11%) had published in OA. We need to mention that only those respondents that declared to be familiar with OA (66%) were actually asked this question. Many authors issuing surveys around this time mention confusion around what could be considered OA and what not (**Nicholas; Huntington; Rowlands**, 2005). Another inter-

national and multidisciplinary survey in 2006 reported 33% of researchers with experience publishing OA (**Hess et al.**, 2007). A large survey issued by *Taylor & Francis* in 2012 with 14,769 respondents found that 21% had published in OA venues (**Frass; Cross; Gardner**, 2013). On the other hand the *Nature Publishing Group* 2014 survey reported that 62% of Science authors had published OA in the previous 3 years while 38% of the HSS had done so (*Nature*, 2015a). In the 2015 edition of this survey 60% declared to have done so (*Nature*, 2015b).

The longitudinal study from Xia compiled data up to 2008 and already reported a raising trend in OA publication with certain level of hesitance:

“although the rate started very low in the mid-1990s, it still did not reach a high level by the end of the sequence of observations, even with a detectable, continual rise. This may indicate a relative hesitation among scholars for making contributions to OA journal publishing” (**Xia**, 2010).

When looking at publication fees paid our results suggest two main categories. On one hand we find those authors that did not pay any fees and on the other those that paid between €501 and €3,000. In the case of Medicine our results also indicate two main categories: those who did not pay and those who paid between €1001 and €3000. **Hernández-Borges et al.** results suggested that in 2003 medical researchers would not be publishing in OA outlets charging APCs (**Hernández-Borges et al.**, 2006). *SOAP* results in 2010 indicated that half the respondents did not pay at all, with an even spread between the other cost categories and more than 10% of researchers not knowing whether they had to pay or not (**Dallmeier-Tiessen et al.**, 2011c). A recent study of Spanish researchers found that most of those who had to cover APCs paid between ~€900 and ~€2,300 (**Borrego**, 2016). The longitudinal study focused on ERCs reported certain concerns about publications fees, although direct experience with the model was not investigated. This is particularly the case for Spanish ERCs (**Nicholas et al.**, 2017b).

When looking at how APC costs are covered we found that Spain-based researchers mainly use research funds (aimed specifically at covering OA APC or not) for this purpose. This is the case in at least half of the respondents in most disciplines. We also observe a relatively high incidence of self-covering costs, especially in HSS fields. In *SOAP* in 2010 there was a lower incidence of researchers using funds intended to pay OA fees. This indicates an evolution in funders regulations aimed specifically at paying these costs. The proportion of self-funding researchers in *SOAP* is similar though (**Dallmeier-Tiessen et al.**, 2011c).

In the *JISC/OSI* survey in 2004 with 311 respondents around 45% of respondents declared to have paid OA fees. Authors reported that 25% of the respondents paid the fee from their research grant. In 17% of the cases it was their institution which paid and 4% paid the fee themselves. Researchers in this survey were not asked how much they actually paid, however, they were asked how much they would be willing to pay. While 15% of OA authors said nothing, 26% of those that had not published in OA responded in this sen-

se. In total 70% of OA authors declared to be willing to pay between \$500 and \$1,500. Non-OA authors provided this opinion in 51% of the cases (Swan; Brown, 2004a). Another survey in 2004 with 3,787 respondents reported that only 38% of authors surveyed had had any prior experience of paying OA fees. When asked how much they would be willing to pay 48% responded nothing. Authors of the survey made an estimation of \$400 as a global amount researchers would be willing to pay (Rowlands; Nicholas; Huntington, 2004). Another survey in 2008 reported 26.9% of respondents that said they had published in journals that had author fees, although it didn't indicate how much they had paid (Coonin; Younce, 2009). In a survey in 2011 Solomon & Björk asked authors published in OA journals with APCs about their experience. The authors calculated that researchers would be willing to pay an average amount of \$649 and a standard deviation of \$749 (Solomon; Björk, 2012). In the *Taylor & Francis* survey in 2012 with 14,769 respondents 8% declared to have paid APCs (either directly or through their institution) (Frass; Cross; Gardner, 2013). The next international and multidisciplinary survey in which we find details about APCs is the *Nature* survey in 2014 with 30,466 respondents. In this survey we find that 74% of science authors and 71% of HSS authors who published OA in the past 3 years did pay an APC fee they paid for their most recent OA publication. The most frequent response from HSS authors was "less than \$800" (37%), whereas for science authors the most frequent response was "between \$800 and \$1,600" (45%). However, we need to point out that the base for these responses was formed by 6,394 science researchers and 1,667 HSS. From these, 63% of science authors had funding available for publication costs, being "as part of an existing grant" the most common source of such funding. In the case of HSS 53% of authors asked their institution to pay (*Nature*, 2015a). Other studies based in various countries or at a global level have found average APC costs of ~€2,000 (Shamash, 2016) or ~€1,300 - ~€1900 (Björk; Solomon, 2014). In the 2015 version of the *Nature* survey it was reported that 68% of researchers had access to cover publication costs for OA articles. From those 21% declared to have more than \$1,000 available, while 32% responded that "reasonable costs could be covered" although did not indicate any specific amount (*Nature*, 2015b).

“ We did not find significant differences between disciplines or age groups ”

5. Conclusion

In this research we offer a picture of attitudes and practices of Spain-based researchers towards gold Open Access publishing. There are enough options to publish OA in all fields of knowledge and we did not find significant differences between disciplines or age groups. This same tendency is observed in international surveys. In the early days of OA there were fewer options available. As OA became more common, researchers' awareness started to increase progressively. Nowadays most surveys find a small proportion of researchers declaring not to be aware of OA options in their field. This is probably due to the combination of a lack

of interest and/or a general negative attitude towards OA. There are options to publish in OA in all fields of knowledge and most researchers are aware of them.

Most researchers, both in our survey and in previous ones, consider OA to be beneficial although there seems to be a tendency to agree less with this assertion. One possible explanation could be the fact that many researchers still believe that articles in OA journals are not as good as those in subscription-based journals. This perception seems to be inherited from the early days of OA. The first OA journals were conversions from traditionally paper-based journals, and most times did not have large publishers behind them. Many others were newly created journals and therefore were not indexed and obviously didn't have an impact factor associated. In our analysis we have observed a certain balance between those that agree that OA publications lack the same quality as their subscription-based counterparts, those that disagree and those that do not have an opinion. A fairly similar distribution has been reported by other authors at international level.

“ Most surveys find a small proportion of researchers declaring not to be aware of OA options in their field ”

As it happens at international level, most Spain-based researchers have had direct recent experiences publishing in OA journals. A quite similar tendency observed in other surveys was found in our study. There seems to be two groups when it comes to publish in OA, those that don't have to pay and those who pay amounts between €1001 and €3000. Authors need to find the funds to cover OA publishing costs and in many cases these funds come out directly from their own pockets. We need to link this to the fact that in many cases researchers believe that the quality of the research published in those outlets is not as good as it should be. It does not come as a surprise that there is a tendency to believe that OA is not always beneficial for their disciplines.

This analysis sheds light to the current situation of OA by WoS-published authors in Spain. Probably the main limitation found is the low number of responses in certain disciplines. This makes difficult to extract definitive conclusions for those fields, although it certainly provides an idea of tendencies. It would be helpful to have more authors from certain disciplines in the future. This would mean having a larger sample to maintain representativeness of disciplines in the global picture.

From our point of view these results could inform several stakeholders involved in OA publishing. Publishers need to understand that quality perception of OA outlets is still an issue for many researchers. Funders and policy makers will find interesting that researchers have an active interest in publishing OA. However, there is often a cost involved that needs to be met.

This is the first comprehensive study based on a large sample of Spain-based authors and not focusing in a particular institution or discipline. We believe it would be interesting

to see how things evolve in the next few years, ideally using a similar survey to find out. It would be ideal to link tendencies in opinions and practices to mandates and OA policies of funders to get a more complete picture.

Most Spain-based researchers have had direct recent experiences publishing in OA journals

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