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Medical and health sciences' community attitudes towards hybrid journals, academic networks, social media and research evaluation metrics: a perspective from Greece

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Abstract:

Purpose *– The present paper attempts to identify medical and health scientists' attitude towards the use of hybrid journals, social media and academic networks and the selection factors of publication medium, including alternative metrics.*

Design/methodology/approach *- A quantitative survey was conducted, based on a structured questionnaire. It focused on Health Sciences and Medicine, with a population sample mainly consisting of hospital healthcare professionals. Likert scale, simple multiple-choice and ranking type questions were used.*

Analysis: 215 completed questionnaires were gathered and various statistics parameters were correlated with the demographic data (profession, experience, gender).

Findings *- Most participants agreed that publishing in hybrid journals results in a significantly high cost for the authors which cannot be paid without funding support and probably affects the validity of the evaluation procedures. They also agreed that an open article published in a hybrid journal needs a shorter time for the peer review process, receives more citations and contributes essentially to the research process. Most of the participants use or would like to use ResearchGate and Google Scholar services. Social media involvement was considerably low in participants' responses. The number of publications and the prestige / credibility of the publishing media are considered to be the most important factors in research evaluation and in publishing media selection respectively.*

Originality/value *- No survey has been reported recently that focuses on health professionals' attitude towards Open Access movement in Greece. It is valuable to explore this community's attitude because of their extremely active publishing profile, which decisively affects their career and largely contributes to research progress and national innovation.*

Index Terms **—** hybrid journals, academic networks, social media, research evaluation metrics, medical and health sciences, Open Access.

I. Introduction

The massive progress in digital technology**,** along with the explosive pace of the production of scientific papers**,** has changed the scientific communication and publishing landscape radically. In an entirely digitised environment, scientists from different research fields and social backgrounds can collaborate without limitations (e.g., geographical, cultural, etc.) by using revolutionary technological tools. There is a great need for scientists to communicate without obstacles**,** to improve their ideas, invent new methods, avoid mistakes or repetitions and contribute to research progress in terms of scientific validity and accuracy.

Since scientific knowledge is considered a democratic value, *Openness* appears inevitable for the dissemination of science. Therefore, the Open Access (OA) movement which started to form at the end of 20th century and was officially established with the *3B* (Budapest[1], Berlin[2], Bethesda[3]) **[1]** declarations, initiated the process of the scientific publishing radical transformation. **Suber's [2]** definition of OA reveals the revolutionary essence of this movement: "*Open access literature is digital, online, free of charge, and free of most copyright and licensing restrictions*."

There are two dominant models of Open Access publishing: the Gold Open Access model which refers to publications that are freely available to the public at the time of their publication and the Green Open Access model**,** according to which an accepted manuscript can be submitted by the author to a digital repository before, after, or along with its publication.

Reference the Gold model, *big publishers* came up with new pathways, in an attempt to align with the advancements that the OA movement has brought to the scholarly journals and achieve a transition in a cost-neutral way. The pure or full Gold Open Access journals refer to publications whose content is freely accessible, without any type of subscription fees, and authors usually need to pay the Article Publication or Processing Charges (APCs). There

[1] http://www.budapestopenaccessinitiative.org/read

[2] http://legacy.earlham.edu/~peters/fos/bethesda.htm

[3] https://openaccess.mpg.de/Berlin-Declaration

are also many journals that do not charge APCs at all (see in Directory of Open Access Journals web site for journals without APCs[4]), as they rely on external funding. Another form of OA publishing is the hybrid journals introduced in 1998 by Thomas Walker **[3].** He suggested that authors could pay for free access visibility of their articles in *closed* (subscription) journals. This idea was later refined by David Prosser **[4]**. According to the hybrid OA model, subscription journals give the alternative to authors to pay APCs, if they wish their work to be immediately available to the public. As most of the publishers' income comes from subscriptions and APCs, they promote hybrid journal model as the best and more viable solution for the transition to pure Gold OA journals. Nevertheless, hybrid OA is considered by many to be the worst of both worlds **[1]**, **[5]**, creating an expensive model **[6]**, that results in the *double-dipping phenomenon*, thus making this model unacceptable to many APC budget holders, over half of whom limit spending to fully OA journals **[6]**, **[7]**. On the other hand, APCs proponents consider hybrid journals an intermediate step towards to pure Gold OA journals where all contents are openly accessible to people, with APCs paid by authors and no subscription fees paid by libraries **[8]**.

From the above discussion, it becomes evident that the landscape of scientific publishing and the perspectives of a broader access to researcher's work are in a transition phase. The transition is expected to last years, without any clear indication of the resultant new publishing model. Additionally, an essential prerequisite for a successful transition is the cultural change of the involved research community. Authors need a strong motive to fully embrace the principles of the Open Access movement and to subsequently contribute to the development of a new publishing model. Many factors, including research output evaluation metrics, social media and academic networks, seem to affect scientists' attitudes and need to be investigated and given serious consideration before planning a strategy for the smooth change to the new era of scientific publishing.

In this context, the present research attempts to identify the attitudes and perspectives of academics and professionals within medical and health sciences**,** towards the new landscape that is being formed for publishing and how they are evaluating and disseminating their research. More specifically, the objectives of this survey are to profile medical and healthcare researchers' attitudes towards hybrid journals, in terms of potential citations, research progress, publication time, evaluation objectivity, APCs and funding. Additionally, the medical and healthcare researcher's behaviour is being investigated towards social media and academic networks' use in research dissemination and certain criteria (including alternative metrics) for the research evaluation.

Comparing the results of the presented survey with the results of similar studies, show that the Greek medical community shares the same attitude characteristics as their colleagues at international level.

II. Related work

According to **Pool's research (2016) [9],** 64% of 6.679 academics would be satisfied with the replacement of the existing subscription model with an OA, where the research results would be accessible to the public, increasing the impact and readability levels of the research in question. However, scientists appear to be confused and skeptical towards the option to publish in Open Access journals. Although they recognise the advantages of the OA, at the same time they do not seem to have an indepth understanding of its fundamental principles **[10], [11], [12]**. They are cautious about the impact of open access publication on their scientific community and whether this will affect their future intentions to publish in freely accessible media **[13], [14]**.

Moreover, the authors' charges for being included in hybrid journals are quite high, and therefore libraries often complain to the publishers**,** asking for lower prices, including the cost of their subscriptions. In comparison, organisations make deals known as *offset deals* to ensure lower prices **[9]**. In developing countries, scientists disagree with the APCs, because they believe that research has a significant social value. Therefore, research output should be considered common property and for the good of the public **[15]**. In recent studies, high cost is highlighted as a potential obstacle to OA publishing for authors and institutions that cannot afford to pay the imposed fees **[16], [15], [17]**. OA was initially adopted in developing countries because scholars in these countries had the opportunity through OA to get their work seen by scholars from around the world, something that would otherwise not have been available **[18]**.

In Health Sciences and Medicine (HSM)**,** compared with Social Sciences and Humanities (SSH), scientists think that APCs are reasonable because the publication of their articles is more likely to be funded by the organisation for which they work**,** or by other institutions **[19], [14], [15]**. A recent study shows that the scientists who manage to get published in the top medical journals are mostly older, work as academics, have the time and financial support. Also, English is their native language **[20]**. Consequently, older scientists trust their professional experience acquired over years and the traditional peer-review system of subscription-based journals **[13]**. To some extent, this can be justified by the fact that senior health scientists managed to gain recognition long before the emergence of the OA movement **[15]**. Unlike older scientists, younger ones are more positive towards technological developments and more open to collaborative networks to increase the number of their citations **[10]**. The main reason for this is that in an extremely competitive environment, where the paper production is intensive, professional recognition depends on scholarly publishing **[21], [13].** Moreover, health scientists seem to connect Open Access only with APCs, and they

[4] https://doaj.org/faq#fees

hesitate to publish their work in pre-prints repositories **[19], [22]**. Nevertheless, COVID-19 pandemic has profoundly affected health researchers' publication behavior as they use more pre-prints option to communicate their work early and broadly (Preprints and Rapid Communication of COVID-19 research[5]).

Despite the ever-growing number of social networks and their high usage rates, scientists use social media mostly to maintain an online profile, make themselves and their research outcomes more discoverable and find posted work, rather than strengthen collaborations and social interaction **[23], [24]**. They believe that social networks can harm their career and do not consider them to be trustworthy media. Therefore, they keep a conscious distance **[25]**. Notably, younger scientists are more cautious about participating in social media because of their continuous professional anxiety due to tenure-track positions searching. Senior scientists, on the contrary, feel more confident using social networks **[25], [26], [27]. Procter et al. [28]** also mentions that it is mostly male senior scientists who use social media for dissemination purposes. Moreover, significant heterogeneity and inconsistencies of altmetrics measurements and values along with the gaming and commercial characteristics which give to research activities **[29]**, question the reliability of the results **[30], [31]**, and can be misleading in the world of science. It is worth mentioning that journals widely utilise social media for dissemination. It is reported that top medical journals have Facebook and Twitter presence **[32]**. A large number of journals ask for authors to provide abstracts suitable for the social media (e.g., Twitter), to promote their work **[33]** or encourage them to participate actively in Wikipedia **[34], [35]**. Additionally, clinical surveys, systematic reviews and meta-analysis receive a large number of tweets, because their context is attractive to the public **[36]**.

To conclude, openness emphasises the social and political aspect of science and manages to transform scientific knowledge for the good of the public, so that is transparent and creatively usable by everyone. In the field of Health Sciences and Medicine, in particular, there is an urgent need for the benefits of OA principles to be highlighted because of the intense pace of research publications, the continuous discovery of drugs and therapeutic methods, especially during emergency periods (e.g. pandemic events such as COVID-19). The progress in medical research and the new scholarly communication and publishing models have a direct impact on public health services improvement and society in general. Therefore, it is crucial for scientists to understand the principles of the OA movement indepth and to implement them beneficially for their research**,** taking advantage of the technological developments.

III. METHODOLOGY

For investigating the effect of the new publishing, dissemination and evaluation research models on the health sciences and medicine researchers' attitude, a quantitative survey was conducted based on a structured questionnaire, which is divided into the four sections accompanied by the corresponding questions (See Appendix A).

The questions were inspired by similar surveys such as Taylor & Francis 2014 **[37]** and Vlachaki **[38]**. The main difference with this survey compared to similar ones is that it focuses on a particular scientific field, health sciences and medicine and the community of Greek health professionals and researchers. No such survey has been reported in recent years in Greece reference health professionals' attitude towards Open Access movement. There is value in assessing health professionals' attitudes towards the new models of scientific publishing, dissemination and evaluation because of this community's extremely active publishing profile. The population sample to which the survey was addressed consisted of academic doctors, doctors in the National Health System (NHS doctors), medical residents, nursing and paramedical staff, postgraduate medical students and health sciences and medical researchers. The survey participants were or continue to be related to the General Hospital of Athens "Hippocration". The population sample is considered quite representative because of its high diversity since it includes a variety of personnel categories and its high mobility since quite of the participants move to other public or private hospitals around the country. The results of the present survey can be a starting point for research in all hospitals in national level or in other scientific fields and will allow useful conclusions and considerations about OA potentials in international level.

Concerning the types of questions and the calculation of the results, the answers for the first part (Part A - Hybrid Journals) were based on the psychometric Likert scale, which is often used in structured protocols such as questionnaires**,** for the evaluation of population attitude or opinion. There was a restriction to 4 instead of 5 answer selections which are commonly used, to achieve more concrete results by minimising the *fence-sitter phenomenon*, meaning to prevent respondents to take the easy way out rather than really express their real opinion. For Part B a simple multiple-choice question was used, allowing participants to select the social media and academic networks in which they did or did not participate, or those that they would like to use in the future. For Part C and D (Decisive factors for the evaluation of research - Publishing outlet selection factors), ranking type questions were used. For each factor included in the questions, the following statistics were calculated per professional category, years of professional experience and gender.

- ***Ranking Score*** (RS - low ranking score = high importance): is calculated by the following equation: $x_1 * w_1 + x_2 * w_2 + \cdots + x_n * w_n$, where x is the number of answer choice and w the weight of the ranked position (in our case, for the Part C with 6 factors the #1 choice has a weight equal to 1, #2 choice has a weight equal to 2, etc.).
- ***Mean Ranking Score*** (MRS): is calculated by the following equation:

[5] https://asapbio.org/preprints-and-covid-19

$$\frac{RS}{total\ count\ of\ responses}$$

- ***Ordinal Ranking Score*** (ORS): is the order values (1st, 2nd, 3rd, etc.) of a factor based on the Ranking Score in ascending sorting (from lower to higher).
- **Min-Max Normalised Ordinal Ranking Score** (MMN-ORS): is a rescaling method and is used for a more accurate results representation as far as concerns the Ordinal Ranking Score values and its calculation is based on Ranking Scores. The following formula provides the needed values.

$$MMN - RS = a + (RS_i - \min(RS))(b - a)/ (\max(RS) - \min(RS))$$

where a and b are an arbitrary set of values for the rescaling (e.g. for the Part C list with 6 items $a = 1$ and $b = 6$), RS_i is the ranking score for an item and $\min(RS)$ and $\max(RS)$ are the minimum and maximum ranking scores for all items.

It was regarded as necessary to implement a pilot of the questionnaire aiming to collect useful observations and comments. Next, the questionnaire was sent electronically through the Lime Survey platform, except for a few cases where it was completed manually by the participants. It is worth mentioning that the questionnaire was accompanied by the appropriate text, which ensures the confidentiality of participants' data.

As soon as 215 completed questionnaires were gathered in January 2020, data processing began. Table 1 depicts the demographic characteristics of the population sample (professional category, years of professional experience and gender). The completed questionnaires represent 51% of the 425 people in total, which ensures the validity of the survey.

Table 1. Population sample - demographic characteristics

Professional category	#	%	Years of prof. experience	#	%
Academic doctors	42	19,5%	1 to 10	50	23,3%
NHS doctors	107	49,8%	10 to 20	88	40,9%
Nursing	24	11,2%	20+	77	35,8%
Paramedical staff	10	4,7%	**Male**	105	48,8%
Other	32	14,9%	**Female**	110	51,2%
Total	215				

IV. RESULTS

In the first section of the survey (Part A) entitled as *Hybrid Journals*, participants were asked to define their position regarding hybrid journals' debate topics. In particular, they were asked to choose between agree, somewhat agree, somewhat disagree or disagree (according to the Likert scale) with statements such as (a) the positive effect on citations number for publishing OA articles in this type of journals (Q1 & Q2), (b) the time needed for an article following the APC model to be evaluated (peer review process) and published (Q3), (c) the impact of hybrid-journals' publishing model on the research process and scientific advancement in general (Q4), (d) the economic burden that APCs place on authors or research institutions and the funding options (Q5 & Q6) plus (e) the impact on the quality of the peer review process (Q7).

Based on the results depicted in Figure 1, most participants expressed their agreement (Q5 - 88% agree and somewhat agree) with the opinion that publishing in hybrid journals has a high cost for the authors (APCs). It is essential to point out that participants agree that an open article published in a hybrid journal will probably receive more citations compared to a Toll-Accessed (TA) article or an article deposited in a repository of pre-prints (Q2 - 84% agree and somewhat agree). Moreover, the participants align with the idea that hybrid journals substantially contribute to the research process and scientific advancement (Q4 – 77% agree and somewhat agree). Most participants also agree that articles published in hybrid journals would receive more citations, as they combine advantages of the subscription journals and the OA benefits (Q1 - 77% agree and somewhat agree). With a lower score but still above 70% of participants approve the statement that in hybrid journals time for the peer review process and publishing is shorter for articles that follow the APC model (Q3 - 75% agree and somewhat agree). They also recognise that the APCs are too high for authors to pay without support from funders (Q6 – 71% agree and somewhat agree), and because of the financial incentive, there is a significant chance that objective and valid evaluation procedures might not be followed (Q7– 71% agree and somewhat agree). Finally, no differences were observed compared to the overall results based on demographic characteristics of the population sample such as professional category, years of professional experience and gender.

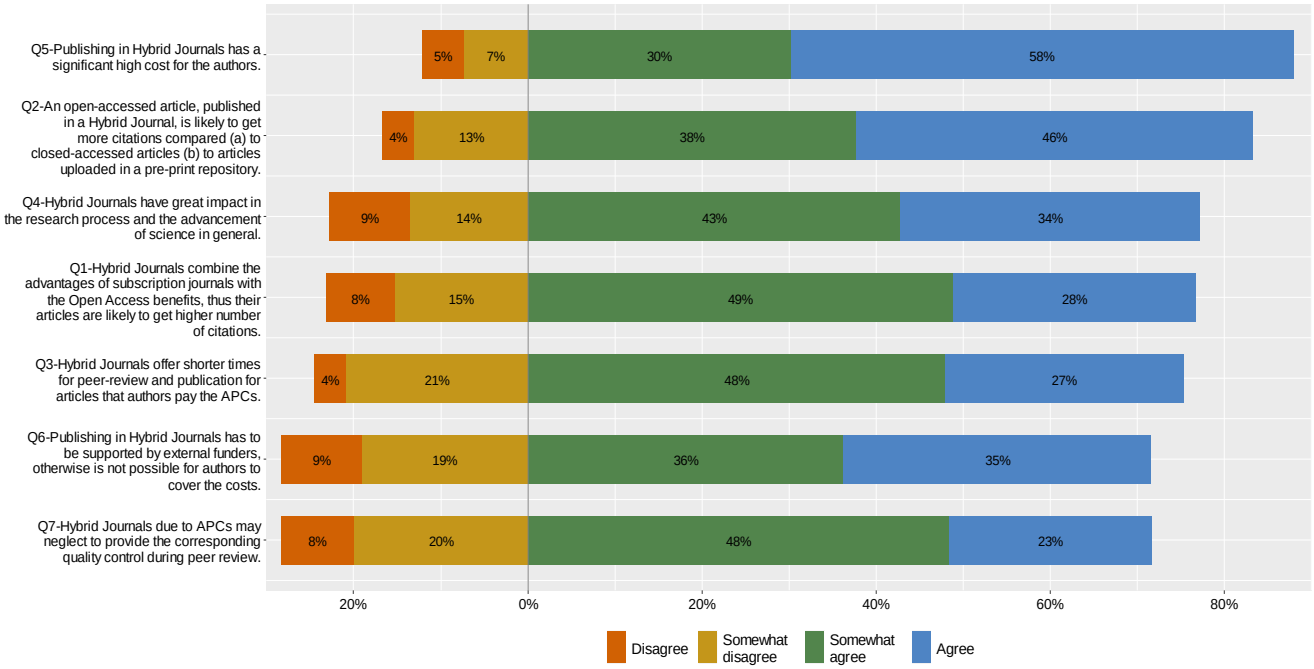

Figure 1. Hybrid Journals

The next question aims to determine the level of participants' engagement in social media and academic networks websites as new trends for the dissemination of their research activities. Figure 2 clearly illustrates that most of the participants use or would like to use ResearchGate (53% use - 17% would like to use) and Google Scholar (48% use - 17% would like to use) services. It is worth mentioning that 73% of Academic doctors already use ResearchGate compared to only 48% of the NHS doctors. Social media such as Facebook (16% use - 7% would like to use), Youtube (11% use - 13% would like to use) and Twitter (7% use - 10% would like to use), were considerably low in participants' responses both in terms of current participation, or the possibility of its use in the future.

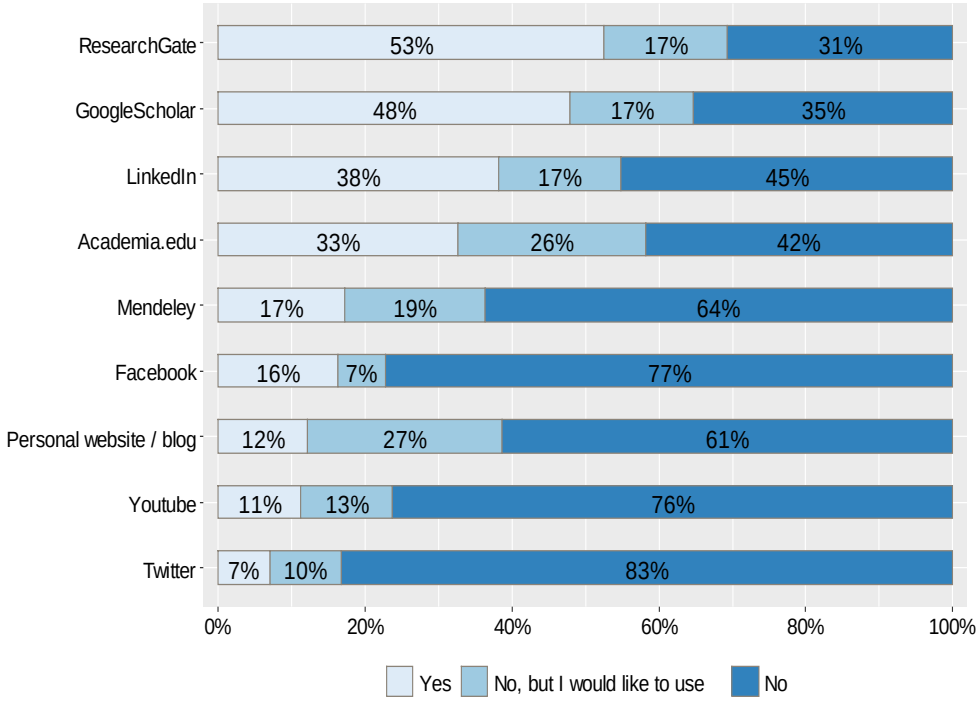

Figure 2. Social media and Academic Networks participation

In the third section (Part C), participants were also asked to rank in order of importance, decisive factors for the evaluation of their or other colleagues' research. Traditional (the number of publications, citations, the impact factor of the journals that a researcher publishes, the author's h-index) as much as social media factors (e.g., views, downloads) were included in order to trace the acceptance level of social media and academic networks by the participants.

In Figure 3, the stacked chart depicts the percentage of ranking choices per factor (e.g. 1st, 2nd, 3rd etc.). Also, in Table 2 the RS, the MRS and the ORS values for all participants are presented. Also, the Min-Max normalised Ordinal Ranking Score (MMN-ORS) has been calculated for all participants and per professional category, years of professional experience and gender. The colour index in column ORS is applied to the rest of the table's columns. As it can be seen by the results, the most important factor for the research evaluation is the number of publications (MMN-ORS value 1). The total number of citations and the researcher's h-index follow in second and third place, with MMN-ORS values 1.1 (very close to the number of publications) and 1.7, respectively. The impact factors of the journals is ranked as 4th with the normalised ranking value equal to 2.2. Last in the ranking list appeared the two factors related to altmetrics such as views/downloads and mentions or citations in social media with scores 3.9 and 6, respectively. It is apparent that traditional factors got remarkably similar ranking values (as the min-max normalisation method helped to prove), and as expected they dominate over altmetrics.

Participants' responses combined with the demographic characteristics, revealed a few differences that are worth mentioning and are illustrated in Table 2 by the colour index that is being used. In particular, the paramedical staff ranked first in order the number of citations and the h-index. The impact factors of the journals came third and the number of publications followed in the fourth place. Moreover, academic doctors considered the impact factors of the journals to be as important as the number of publications and the doctors of the National Health System gave priority to citations, instead of the number of publications. Moreover, nursing staff ranked impact factors of the journals higher than the h-index. Regarding gender, women appear to think that the number of citations is equally important along with the number of publications. As far as professional experience is concerned, participants with 10-20 years of experience consider the number of citations as the most important factor for research evaluation, whilst those participants with more than 20 years of experience rank as the third most important the impact factors of the journals they publish their work.

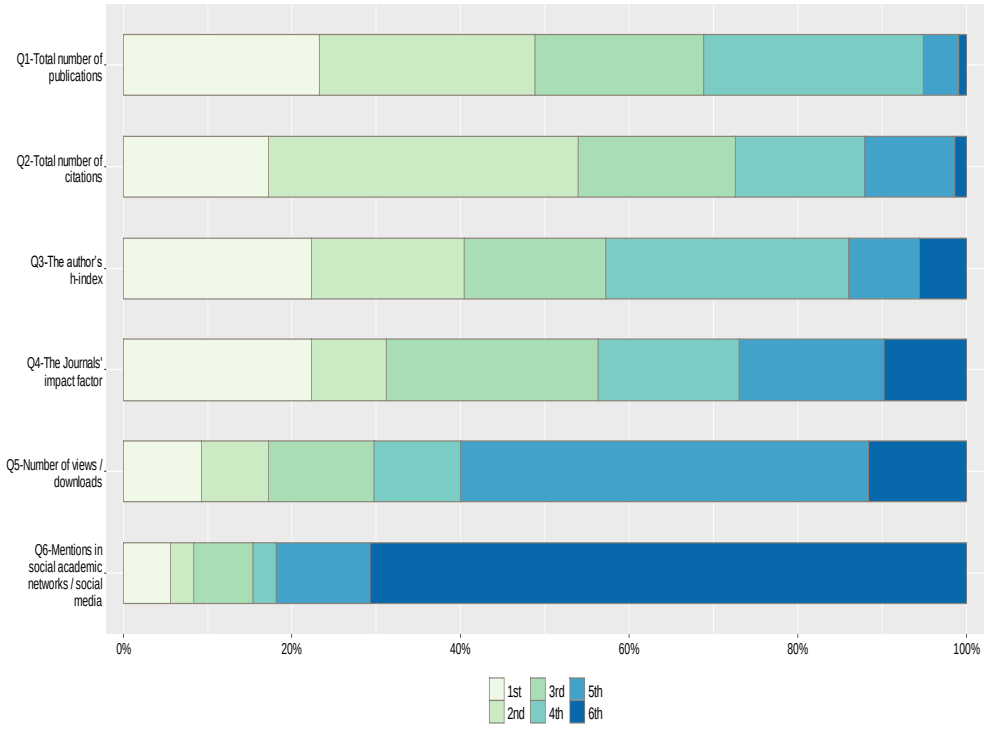

Figure 3. Decisive factors for the evaluation of research

Table 2. Part C Statistics (RS, MRS, ARS for all responders and MMN-ARC values per category, years of professional experience and gender)

	All participants			Min-Max normalised Absolute Ranking Score									
	RS	MRS	ORS	All	Acad. Doc.	NHS Doc.	Nurs. Staff	Par. Staff	1-10y	10-20y	>20y	Male	Female
Q1. Total number of publications	570	2,7	1st	1,0	1,0	1,1	1,0	1,6	1,0	1,2	1,0	1,0	1,0
Q2. Total number of citations	580	2,7	2nd	1,1	1,3	1,0	1,5	1,0	1,3	1,0	1,4	1,2	1,0
Q3. The author's h-index	644	3,0	3rd	1,7	1,4	1,6	3,5	1,0	1,3	1,7	2,2	1,4	1,9
Q4. The Journals' impact factor	703	3,3	4th	2,2	1,0	2,7	3,2	1,3	2,6	2,4	2,0	2,0	2,4
Q5. Number of views / downloads	893	4,2	5th	3,9	4,0	3,8	4,0	4,7	3,8	3,5	4,7	3,8	4,0
Q6. Mentions in social academic networks / social media	1125	5,2	6th	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0

In the last section (Part D), participants were asked to rank the most important criteria for publishing outlet selection. As derived from Figure 4 and Table 3, the prestige and credibility of the publishing media seem to play a crucial role. In other words, the journal reputation dominates researchers' viewpoints when it comes to publishing their work (MMN-ORS value 1). The short peer review and publication time and a trustworthy evaluation system are also essential criteria for the researchers and this element therefore took the second (MMN-ORS value 2.8) and third position (MMN-ORS value 3.6) in their final ranking. Furthermore, researchers evaluate higher the importance of including the scientific journals, they publish their work, in major citation indexes (MMN-ORS value 4.1) compared to supporting open access (MMN-ORS value 4.8) or open peer review processes (MMN-ORS value 5.5). These results somehow contradict their views that open access offers lots of benefits, as was illustrated from the results of Part A.

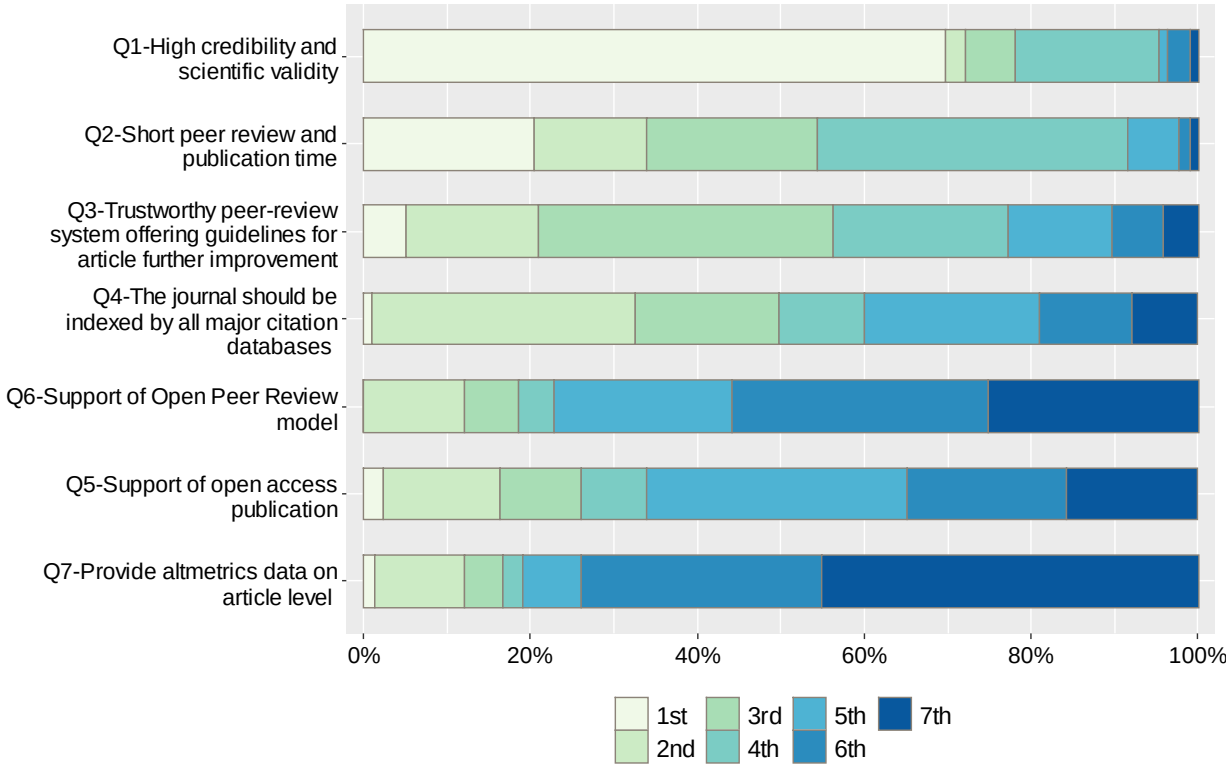

Figure 4. Publishing outlet selection factors

Table 3. Part D normalised final ranking values per category, years of professional experience and gender

	All participants			Min-Max normalised Absolute Ranking Score									
	RS	MRS	ORS	All	Acad. Doc.	NHS Doc.	Nurs. Staff	Par. Staff	1-10y	10-20y	>20y	Male	Female
Q1. High credibility and scientific validity	407	1,9	1st	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0
Q2. Short peer review and publication time.	651	3,0	2nd	2,8	2,4	2,8	3,2	3,8	1,7	2,9	3,1	2,6	3,0
Q3. Trustworthy peer-review system offering guidelines for article further improvement.	763	3,5	3rd	3,6	2,8	3,7	3,9	4,5	3,0	3,6	3,89	3,4	3,7
Q4. The journal should be indexed by all major citation databases	825	3,8	4th	4,1	2,6	4,5	5,0	3,6	3,6	4,4	3,9	3,9	4,2
Q5. Support of open access publication	1015	4,7	5th	5,5	5,2	5,6	5,5	5,2	5,7	5,2	5,7	5,3	5,6
Q6. Support of Open Peer Review model	1134	5,3	6th	6,3	6,5	6,3	5,3	5,6	6,3	5,9	6,9	6,5	6,2
Q7. Provide altmetrics data on article level	1225	5,7	7th	7,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0

In common with Part C, this part of the survey (Part D) shows that altmetrics is considered to be the least important factor when selecting publishing media. Finally, the responses combined with the demographic data did not conclude to any noteworthy differences compared with the total results.

V. Discussion

Most of the findings in the present survey are aligned with the outcomes of similar research efforts, as discussed in the introduction section. Going deeper into the analysis of the results, it became evident that participants generally did not have any negative attitude towards hybrid-journals**,** except for the APC issue (Part A – Q5 and Q6). They seem to believe that OA articles in hybrid journals may get higher number of citations (Part A - Q1 and Q4) as a result of the already established reputation of the publication outlet. Also, they positively respond to the statement that the peer-review process is of shorter duration when APC model is followed (Part A – Q3). Further, they agree that authors, through hybrid journals, contribute constructively to the science and knowledge progress (Part A – Q3) and at the same time, they accomplish higher levels of credibility and reputation for themselves **[39]**. The OA papers**'** citation advantage (OACA) **[40], [41], [42]** is being supported by a large number of studies that prove their higher visibility **[43], [44]**, **[45]**, [**46]**. Nevertheless, the majority of high impact journals follow the subscription model, indicating authors' preferences for them. In the minds of authors, hybrid journals combine the already established reputation and high-quality characteristics of the prominent, traditional publications with the option that articles can be accessed through APCs [**47]**.

The rooted selectivity of healthcare professionals (maybe stronger than in other disciplines) to publish in prestigious subscription journals with high credibility and scientific validity (Part D – Q1) combined with their views that the total number of publications/citations and the researcher's h-index (Part C – Q1, Q2 and Q3) are the most decisive factors for the evaluation of their work [**48], [49],** [**50]** partially justifies their positive attitude towards hybrid journals. As Sotubdeh et al. **[43],** indicates**,** the selectivity of the authors in choosing the author-pays outlet to publish their high-quality papers, signifies the overall prestige of the OA papers published in the model. However, the present survey revealed that 71% of them agree with the opinion that due to the financial incentive, there is a high probability that the evaluation process is less strict when the APC model is followed (Part A - Q7). Besides, Zhang and Watson **[51]** reinforce the above conclusions by reporting clearly in their survey the low average impact factor of free open access journals and the much lower citation rates compared with open access journals, APC or subscription journals and confirm once again the dominance of journal prestige and quality factors when researchers select a publication outlet.

Regarding academic, social networks and social media usage, the same motivation is cited as for the aforementioned OA scientific publishing. In particular, scientists create accounts mainly for increasing profile visibility, posting and accessing papers and information consumption instead for active online discussion, collaboration, or a more convenient form of reference management **[23], [52].**

Nevertheless, there is a high level of awareness of academic networks such as ResearchGate, LinkedIn, Academia.edu, Mendeley etc, mainly due to the substantial number of documents uploaded by users, especially for ResearchGate **[24], [23]**. The response results in Part B of the questionnaire are reinforcing all the above factors by reporting that most of the participants use or would like to use ResearchGate (70%) while the Academia.edu, LinkedIn, and Mendeley received substantially lower usage percentages (e.g., Mendeley with 36% had the lowest usage). This could be interpreted partly by participants' ignorance of the new academic networks and the researchers' cautiousness towards them. It is reported that researchers from the hard sciences – engineering and technology, medical and health sciences and natural science – experience it as *spamming* and a *waste of time* or as a considerable barrier under the tenure gun **[25], [27].** It is

worth mentioning that the Google Scholar high usage percentage (65%) in this survey could be justified by the fact that scientists in Health Sciences and Medicine are using Google Scholar for biomedical papers retrieval on a regular basis and for the variety of scientific literature types offered **[53]**.

In the US there is clearly a growing use of social media (YouTube, FB, Twitter) among healthcare professionals. Unlike in Western Europe, social media usage remains quite small except for in the Netherlands and the United Kingdom. It specifically grew from 2009 to 2011 via networks such as FB (from 10% to 67%) and YouTube (from 2% to 19%) **[54].** Additionally, over 2000 healthcare providers have active Twitter accounts **[55].** However, Joung et al. **[56]** also discovered very low levels of social media and social scientific networks usage by healthcare professionals**,** which is in alignment with the very low rate responses for Twitter (17%) and YouTube (24%) and the moderate usage of the other academic networks reported in the present survey.

VI. Conclusions

The traditional factors (citations, authors' h-index, journals' impact factors) along with the publication time and the trustworthy peer review process appear to be the most important criteria in scientists' minds when it comes to publishing, disseminating and evaluating their work. Regardless of demographic characteristics (professional category, years of professional experience, gender), last in the ranking for evaluation and publishing outlet selection are the usage of metrics (downloads, views) and the altmetrics (mentions in academic networks / social media).

It is rather apparent that the beneficial use of the OA concept from publication models to social and academic networks remains *foggy* and still has not reached the desirable levels of trust. Although scientists seem to recognise the benefits deriving from OA, as revealed in the first section of the survey, they mainly focus on how to increase the number of citations, their profile recognition or to publish more, obviously because of the tenure**,** or career promotion pressure. It is also necessary to outline that scientists (including health professionals) seem to ignore or to avoid using the Green OA model since they hesitate to publish their work in pre-prints repositories **[19], [22]**. Therefore, more informative guidance has to be provided on research into the distinctive differences among OA models **[57].**

For the establishment of a new framework of scientific dissemination and evaluation, the career development process should be radically reformed to *unchain* scientists from publishing overload anxiety. Specialised OA training courses, webinars, educational seminars and workshops organised and offered by libraries could be a valuable solution for scientists to adopt a more holistic perspective about the beneficial use of OA models**,** thus boosting the research advancements and scientific progress. Moreover, the large number of users registered in social media and academic networks could affect the way that research outcomes are communicated to society and give a more interdisciplinary, revolutionary and inclusive character of science.

Conclusively, a high priority issue is the establishment of an interactive collaboration among policymakers, researchers, publishers, and funders**,** through the OA communication channels**,** thus contributing positively to the Open Science goals which appear to form the new framework for scientific communication and publishing at an international level.

VII. References

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