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Publication lag in biomedical journals varies due to the periodical's publishing model

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Research manuscripts face various time lags from initial submission to final publication in a scientific periodical. Three publishing models compete for the market. Professional publishing houses publish in print and/or online in a "reader-pays" model, or follow the open access model of "author-pays", while a number of periodicals are bound to learned societies. The present study aims to compare the three business models of publishing, with regards to publication speed. 28 topically similar biomedical journals were compared. Open access journals have a publication lag comparable to journals published by traditional publishers. Manuscript submitted to and accepted in either of these two types of periodicals are available to the reader much faster than manuscripts published in journals with strong ties to specialized learned societies.

Introduction

Translating information from research findings into public knowledge takes time as the publication process faces numerous delays.[1-3] In the production of a scientific article, time lags occur at various stages from obtaining raw results, completion of manuscript, work received by editors, acceptance by journal, to the final publication.

Authors may have to address multiple competing tasks at a given time, and thus may delay drafting of manuscripts although necessary data is compiled for a long while.

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Effort needs to be spent on translating non-English manuscripts for the publication in English journals. The manuscript can reach editors with delays depending on the format of submission. Electronic submission certainly shortens this time lag compared to traditional submission by post. It is hard to quantitatively evaluate the time lapse during these first stages before a manuscript reaches the editorial office.

By contrast, once editors receive the manuscript, most periodicals track the publication speed for each individual article, i.e. provide information on the dates when the manuscript was received, revised, accepted and published online or in print. This information helps to numerically analyze journal publication speed.

A research article should describe a novel discovery, or propose a new research methodology. Rapid publication of such articles enhances the translation of the research to application, and also promotes further research in the particular discipline. On the other hand, a long publication lag may affect visibility and thus citation rate. For example, an author may be keen to cite a relevant article which is still in its preprint version but not officially published in a scientific journal yet. This, as a result, may even decrease the journal's "impact factor" – the most widely accepted bibliometric tool for journal quality measurement. The impact of a given work cannot be quantified without leaving room for dispute. The journal impact factor, annually compiled for some 4000 scientific periodicals by the Institute for Scientific Information, is currently the most commonly used quantitative assessment tool for the impact a periodical has on the scientific dispute in a given field of research. It is open to bias, and may be used only as a very indirect hint to indicate the potential quality of a given article.[4] As journal quality and publication speed are two important factors influencing authors' decision when choosing journals to publish[5] a slow publication speed may stop authors from submitting their work to the respective journal.

A decade ago, the traditional paper-based journals were still the dominant medium of scholarly communication. Few researchers perceived electronic journals to be legitimate means of scientific commnunication.[6] With the increasing penetrance of the Internet, electronic serials of articles were circulated by mailing lists in the early 1990s, and were posted on websites since the mid 1990s. In the late 1990s, several publishers began hosting electronic versions of their paper-based journals. By 1998, these combined print and electronic journals constituted the most common form of scientific publishing.[7] While the Institute for Scientific Information (ISI), the company that calculates the journal impact, states on its website (http://www.isinet.com/oaj) that there is no difference in citation behavior between open access and traditional journals, the comparison on which this statement is based actually undervalues the impact of open access. Harnad and Brody were able to show that if one compares the citation of articles with open access to those without open access published in the same journal, there is a dramatic increase of citations for open access articles.[8]

In addition to having access to periodicals the respective readers and their institutional libraries are subscribed to, scientists share information through personal copies of the manuscript. Alternatively, single articles can be obtained through library exchange services. In the biomedical disciplines, "BRS Colleague" and its successors, for example, have offered document retrieval from full-text journals in electronic format since 1984, but for a price. Similar "document-services" have been offered by various other companies including ISI.

As an initiative to bridge the information gap between developed and developing countries, the Health InterNetwork Access to Research Initiative (HINARI) was launched in January 2002 as a collaboration between the World Health Organisation (WHO) and some of the world's largest publishers.[9] HINARI provides online access to major biomedical and related social sciences to local and not-for-profit institutions in developing countries free of charge or at very low cost. PubMed Central (PMC) offers free access to selected biomedical literature to everyone who can access the Internet. This digital archive was set up by the U.S. governments' National Institutes of Health (NIH) in 2000 and hosts full-text articles from nearly 200 biomedical journals. Harnad has recently pointed out that unbarred access to research articles is of great interest to scientific authors as it increases the impact of their work, which may even translate into material rewards such as salary increases, promotions, etc.[10]

A logical hypothesis is that electronic technologies can speed up journal publication as they can reduce the communication time between all participators including authors, editors, reviewer, publishers and readers. However, this belief has recently been challenged.[11] Kling suggested that many other factors may significantly affect publication speed, such as publication volume, disciplinary differences in demand for rapid publication, speed of the peer-review process, submission rates, and dominate over physical speed limitations.

In recent years, especially since "serial crisis"[12] has become a serious problem faced by readers and librarians because of the increasing journal subscription charge, Open Access Publishing (OAP) has attracted the researchers' attention in almost every discipline. It advocates free access to the scientific literature in the belief that research will be promoted through wider readership. As a true child of the Internet age, OAP is less than ten years old. BioMed Central, the largest OAP publishing house, was launched only in 2000.

Some commercial publishers started to adapt this new publishing model of "author-pays"[13] that is opposed to the traditional "reader-pays"[11] model. It can achieve a wider readership by offering free access to readers but has the disadvantage of charging authors for publication.

At present, three main types of publishing business models exist, i.e. the traditional publishing house, the open access publishing house, and the association related publisher. A traditional publisher is defined here as a publishing house that

professionally manages a scientific publication, has a professional editorial team and a scientifically qualified editorial board, publishes in regular intervals, and is paid for by the readership, charging no or only partial fees to authors of published articles. An "open access publishing" house, by contrast, has the same organizational set-up, but charges the author, rather than the reader, for the publication of articles. Association journals are defined as journals targeting specialized interest groups, started through the initiative of a learned society, and are either linked to a professional publishing company for the technical editing process, or entirely self-managed by the association to which they are bound. As there is no systematic analysis on how the new OAP model impacts publication speed, it seems worthwhile to gain an insight on how publication speed differs in different publishing models.

The present study was designed to compare the publication speeds of biomedical articles published by traditional publishers, open access publishers, and professional associations. Publication information was collected from websites of representative journals published by the three business models respectively.

Methods

Journal selection for publication speed analysis

Using Nature Publishing Group (NPG)[14] and BioMed Central (BMC)[15] as representatives of the traditional and open access publishing models respectively, the title lists of published journals was retrieved from the two publishing groups and those with identical research focus were used for comparison in the present study (see Table 1). A maximum of 100 original articles, including short communications, research articles, letters, technical reports, were picked from the latest 2004 volumes/issues of each journal for the present study. The total number of annually published articles with BMC is relatively small compared to that of NPG. As the BMC journals analyzed here do not have sub categories such as "correspondence" and "opinion", all publications except correction articles could be counted as valid BMC articles in the present study.

Association related journals focus on more specialized topics. Five specialized categories, Neurology, Nephrology, Surgery, Gastroenterology & Hepatology, and Endocrinology & Metabolism, were identified as a test bed for the comparison of publication speed between OAP journals and association journals. A list of journals for each subject category was obtained from the Science Citation Index (SCI) database and sorted by order of impact factor. In the next step, the top two or three association journals that provide publication time information were picked from this pool. Again, the 100 latest publications in 2004 were selected from each association journal. The corresponding BMC journal for each category was chosen for comparison (see Table 2).

Table 1. BMC and NPG journals chosen for the study

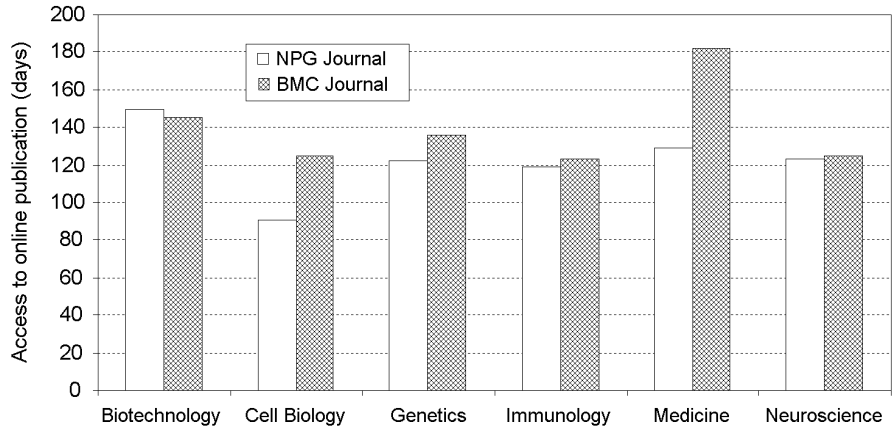
BMC journal		NPG journal	
Journal name	Year launched	Journal name	Year launched
BMC Biotechnology	2001	*Nature Biotechnology*	1983
BMC Cell Biology	2000	*Nature Cell Biology*	1999
BMC Genetics	2000	*Nature Genetics*	1992
BMC Immunology	2000	*Nature Immunology*	2000
BMC Medicine	2003	*Nature Medicine*	1995
BMC Neuroscience	2000	*Nature Neuroscience*	1998

Table 2. BMC and association journals chosen for the study

BMC journal		Association journal	
Journal name	Year launched	Journal name	Year launched
BMC Neurology	2001	*Annals of Neurology*	1977
		Neurology	1951
BMC Nephrology	2000	*Journal of the American Society of Nephrology (JASN)*	1990
		American Journal of Kidney Disease (AJKD)	1981
		Nephrology, Dialysis, Transplantation (NDT)	1986
BMC Surgery	2001	*Journal of Vascular Surgery (JVS)*	1984
		Journal of Thoracic and Cardiovascular Surgery (JTCS)	1931
BMC Gastroenterology	2001	*Gastroenterology*	1943
		Journal of Hepatology	1985
BMC Endocrine Disorder	2001	*Diabetologia*	1965
		Osteoporosis International	1990

Collection of information on publication dates

Both NPG and BMC journals state clearly the dates of receipt, acceptance and online publication of a manuscript. NPG journals publish articles first online, and only later in print. The in print date of NPG journals was taken as the first day of the month in which an article appears in the printed edition of the journal. BMC articles are published online immediately after their acceptance.



t-test on publication lag from receipt to online publication & statistical power

	NPG mean	NPG Std	Sample size	BMC mean	BMC std	Sample size	p-value	Statistical power (%)
Biotechnology	149.58	50.42	93	144.58	80.72	33	0.740	6.30
Cell Biology	90.46	44.09	100	124.20	68.68	50	0.002	88.60
Genetics	121.35	48.04	100	135.50	66.73	34	0.260	20.70
Immunology	118.25	43.82	100	122.13	45.27	23	0.712	6.60
Medicine	128.33	58.86	100	181.77	59.72	39	0.000	99.70
Neuroscience	112.69	38.13	100	124.78	48.58	58	0.107	36.90

Figure 1. Receipt-to-online-publication comparison between NPG and BMC journals

PERL scripts were written to parse necessary information from the BMC website, whereas, information had to be collected manually from the NPG website due to access restriction.

The time lag from receipt to acceptance, to online publication, and to print publication were averaged over all articles selected from a particular journal.

All association journals chosen for analysis have date information of receipt and acceptance. The in print date was taken as the first day of the respective month in which an article appears unless the journal states a clear publishing date. Similarly, PERL scripts helped to automatically collect data from those journal websites that allow public access to their abstracts which contain date information, else the task was accomplished manually.

As not all association journals provide their online publication dates, the calculation of publication speed was divided into two parts. In the first part, all selected association journals were considered as a whole, the dates of receipt, acceptance and in print date were consolidated for calculation of publication speed and the print publication was considered to be the only text source available to readers. In the second part, the subset

of association journals which do provide an online publication date was further analyzed. The online publication was considered as the first-hand information resource for readers, and the time lag was calculated following the same procedures as described for NPG journals.

The publication speed for the BMC journals corresponding to the selected association journals was calculated following the aforementioned procedures. Their publication date is always exactly the same as the acceptance date.

Results

The present study analyzes publication lag from receipt (R) to acceptance (A), to online publication (O) or/and to print publication (P).

Comparison between NPG and BMC journals

Table 3 lists the number of articles chosen from each individual journal. NPG journals have been, in general, longer in circulation than BMC journals by six years on average.

Table 3. Total number of publications chosen from NPG and BMC

Specialty	NPG journal	BMC journal
Biotechnology	93	33
Cell Biology	100	50
Genetics	100	34
Immunology	100	23
Medicine	100	39
Neuroscience	100	58

In all six topical categories, NGP journals have a much shorter delay to acceptance compared to BMC journals (80 days versus 139 days) (see Table 4).

Electronic publications are considered as the first-hand available resources to readers with valid subscription. On average, it takes NPG over one month to publish an article online after its acceptance. Accordingly, the average time lapse from receipt to online publication differs much less between the two publishing models (120 days for NPG and 139 days for BMC) as BMC articles are published on acceptance. With regards to the individual category, statistical significant difference is found for “Cell Biology” and “Medicine” ($p = 0.002$ and $p = 0.00001$). For the other categories, large standard deviations and unbalanced sample size numbers reduce the p-value to non-significance.

NPG journals, contrary to BMC journals, are also published in print, which incurs a further average time delay of 17 days. Despite this additional delay, manuscripts submitted to NPG journals are accepted and published faster than those submitted to BMC journals even when the print edition is considered the final publication date (on average 137 days' delay to print publication for NPG journals).

Table 4. NPG and BMC journal publication lag (in days). R = Receipt, A = Acceptance, O = Online publication, P = Print publication

Specialty	NPG journal					BMC journal
	R to A	A to O	O to P	R to O	R to P	R to A/O
Biotechnology	90	59	19	150	168	145
Cell Biology	59	31	12	91	102	124
Genetics	87	35	17	121	139	136
Immunology	78	40	22	118	140	122
Medicine	97	31	17	128	145	182
Neuroscience	70	42	16	113	128	125
Average	80 (±14)	40 (±11)	17 (±3)	120 (±19)	137 (±22)	139 (±23)

Comparison between association and BMC journals

For each association journal, only the latest 100 articles in 2004 were included in the study. By contrast, the entire 2004 volumes of BMC journals were covered (see Table 5). The association journals have, on average, been in publication for 30 years longer than the BMC journals, with a minimum of ten years and a maximum of 70 years.

For the entire selected association journal set, the dates of receipt, acceptance and in print were included in the calculation. The time lag from receipt to acceptance, and to print publication were averaged over journals analyzed for each topical category (Table 6).

Manuscripts submitted to association journals are usually accepted 146 days after their submission, which is faster than what is seen for BMC journals (average 156 days after submission). The acceptance speed for the five categories does not show a unitary change but varies across categories when comparing the two groups. Compared to BMC journals, association journals accept submitted manuscripts faster in four categories, whereas, the situation is reversed for "Gastroenterology & Hepatology". Among the five BMC journals, *BMC Gastroenterology* is the only BMC journal yet whose citation record is tracked by the ISI.

Table 5. Total number of publications of BMC journal in 2004

BMC journal	Publications in 2004
BMC Neurology	23
BMC Nephrology	18
BMC Surgery	15
BMC Gastroenterology	32
BMC Endocrine Disorder	4

Table 6. Association and BMC journal publication lag (in days). Abbreviation of journal names as in Table 2. N/A = Not available, R = Receipt, A = Acceptance, O = Online publication, P = Print publication

BMC journal		Association journal					
Journal name	R to A/O	Journal name	R to A	A to O	O to P	R to O	R to P
BMC Neurology	140	*Ann. of Neurology*	110	83	17	192	210
		Neurology	163	N/A	N/A	N/A	299
BMC Nephrology	161	*JASN*	173	N/A	N/A	N/A	261
		AJKD	103	N/A	N/A	N/A	212
		NDT	185	N/A	N/A	N/A	315
BMC Surgery	163	*JVS*	96	90	-11	186	176
		JTCS	142	N/A	N/A	N/A	336
BMC Gastroenterology	148	*Gastroenterology*	194	N/A	N/A	N/A	290
		J. of Hepatology	173	33	80	206	286
BMC Endocrine Disorder	167	*Diabetologia*	99	118	-11	217	206
		Ost. Inter.	167	84	130	251	380
Average	156 (±11)		146 (±37)	81 (±31)	41 (±62)	210 (±26)	270 (±63)

While BMC journals always publish on the day of acceptance, association journals on average take an additional 124 days to print publication, resulting in receipt to publication delays of 176-380 days (Table 6).

Table 6 also shows online publication lags for those association journals that provide full publication information. "N/A" is indicated if the particular journal does not provide online publication information. On average, electronic articles are available online 81 days after their acceptance, and it takes an additional 41 days for articles to appear in the printed format. The *Journal of Vascular Surgery* and *Diabetologia* are, however, about 11 days faster to publish in print compared to online.

Discussion

Scientists hope to communicate the results of their research to their peers and further their career prospects by publishing work in "prestigious" and widely-read journals. In a

recent study, Mabe found that authors look for journal "quality" and publication speed when choosing journals to publish in.[5] Over four decades, the "impact factor", as defined by ISI, has been the dominant parameter that authors use to judge the reputation of a journal, despite the various flaws that such inappropriate use of the impact factor has.[4] Articles with short publication lag tend to cite more recent publications even from the same journal. This, as a result, biases the impact factor, and this indirectly affects the potential authors' choice of where to submit their works.

Swan and Brown surveyed more than a thousand authors world-wide asking how they selected journals in which to publish. Contrary to Mabe, their survey showed a first priority for the continuing availability of back volumes, followed by the cost of electronic publishing. Nevertheless, high publication speed is still one major factor influencing the decision making.[16]

At this time, the majority of scientific periodicals are produced by traditional publishing groups that have a long-standing history of print-based publication. A subset of these journals has strong ties to professional associations that have contracts with commercial publishing house for the technical side of journal publication. Many journals from these two groups developed electronic versions of their articles during the last decade. Both follow the traditional reader-subscription-based business model, i.e. readers pay for access to full-text articles.

More recently, the traditional publishing model is being challenged by "open access publishing". This new model works opposite to the traditional model by providing readers free access to articles published online while charging authors for publication. The viability of this model has been cause for much discussion involving publishers, scientific societies, and government agencies.[17,18] Proponents argue that the OAP model is a benefit to science and society as it allows a broader readership through free access.[19] Opponents doubt the economical sustainability of the OAP model because some pioneers of open access such as BMC and PLoS (Public Library of Science) are charging substantially below the actual cost of publication.[20] While debates and arguments continue, the number of OAP journals is rising steadily.[21]

Readers gain access to articles through either one of two ways. Journals fully dedicated to "open access publishing" host articles on their websites, similar to the electronic journal sites of traditional journals. Here, readers can access the articles, but as opposed to traditional publishers, access is free. Alternatively, journals with a "mixed" copyright and access policy may host free articles at PubMed Central, a US government funded digital repository which was created following massive lobbyism from the scientific community.[22] The different publishing models factually impose different hurdles to the publication process, and it may be assumed (and indeed, is claimed by some[23]) that online journals bring the knowledge to the reader faster than more traditional publishing model.

Given the expectations and hopes for speed that the target audience of scientific journals has, it is necessary to analyze the factors that influence the speed of the publication process. The present study analyzed the publication speed of journals published by three different business models. Representative journals were chosen for analysis.

NPG was officially formed in 1991 to incorporate multiple scientific journal publications including *Nature*, *Nature* research journals, NPG academic journals, and other scientific, medical and technical journals. *Nature*, the flagship journal of the group, has been communicating innovative and original scientific discoveries across all disciplines of science since 1869. NPG's historical mark, prestigious scientific role, and broad coverage of various biomedical fields make it a good representative for the traditional publishing model.

The number of OAP journals increases rapidly. The ISI at present covers nearly 200 OAP journals in its SCI database.[21] BMC is the largest commercial open access publisher. It was founded in May 2000 and publishes articles on biomedical research ranging from general interest to specialized topics. To date, the BMC home page hosts links to more than 150 biomedical journals. Of these, about 60 are directly edited by BMC while the rest are independent journals under their own editorial control. [24] All original research articles are made freely and permanently available online upon publication to achieve a rapid and efficient scientific communication. Just as NPG is a typical traditional publishing model, BMC ideally represents the Open Access.

Both NPG and BMC cover general biomedical topics. While NPG has more than one hundred thirty years' history and publishes thousands of articles in numerous categories, BMC is a young publisher with much less publications per year. In order to avoid too much numerical imbalance in the comparison, only the latest 100 articles for each topic rather than the entire NPG's 2004 publications were included in the study.

Compared to BMC journals, NPG journals have a faster acceptance speed in all six topical categories (Table 4). The availability, however, of articles from Nature/BMC Biotechnology, Genetics, Immunology and Neuroscience published online is very similar. Significant differences are found for only two specialties, "Cell Biology" and "Medicine" ($p = 0.002$ and $p = 0.00001$ respectively). The applicability of statistical measures of significance in this comparison is somewhat doubtful. The large standard deviations not only distort the analysis (and cannot be counterbalanced due to the limited number of articles published in the BMC journals), but also remind that each research effort faces its own challenges. In particular, the review process of experimental work may be prolonged due to the need to repeat and readjust experimental procedures or provide additional data.

Association journals focus on the publication of specialized research topics. Five categories in medicine were selected for analysis. Similar to NPG journals, association journals are faster to accept articles compared to BMC journals. The advantage,

however, is lost by an enormous time lag to publication (Table 6). Further study on the subset of association journals that published online publication data showed a general speedup of availability to readers through electronic publication for all selected journals except the *Journal of Vascular Surgery* and the *Diabetologia* (Table 6). Online publication is logically expected to appear before print publication, but a negative 11 days' lag from online to print publication is observed for these two journals. This may be due to the assumption of the in print date as the first day of the month, while in fact the journals may appear later in the month, closer to the date of online publication.

Dióspatonyi et al.[3] divided the entire publication lag into two phases. The first phase is the time lapse from the receipt to acceptance. This time is mainly spent on the "human steered" peer-review process. It may be shorter or longer depending on the discussion between reviewers and authors, the author's speed in returning a revised manuscript, and the number of revisions needed upon acceptance. The second phase is the time lag from acceptance to publishing. This "technical" phase mainly focuses on the final formatting of the manuscript, and the printing and binding for the print publication. Dióspatonyi's study of publication speed in analytical chemistry journals suggested publication lags might be improved best in the "technical" phase but not during the "human steered" peer-review process.

BMC journals combine the two phases into one. First of all, they provide a set of electronic formatting templates for BMC manuscripts, so that all articles are ensured to have the correct format before their official acceptance. Furthermore, BMC publishes all articles online immediately as a preliminary PDF file. While the scientific information is already available to everyone, BMC continues the copy-editing process towards a professional formatting for a HTML and the final PDF versions of the article. The "advanced online publication" (AOP) of articles published with NPG journals, by contrast, includes a second time lag. These AOP articles are copy-edited in a form that is very similar to the final print articles. This time lag somewhat reduces the speed advantage of NPG over BMC journals, resulting in overall quite comparable time lags from submission to publication. BMC journals do not disclose the actual time lag between online publication of the "provisional PDF" and the copyedited version, but advise authors of a usual delay of four weeks. This is faster than the average 40 days lost between acceptance and online publication in NPG journals. NPG might consider publishing provisional manuscripts on acceptance as an option to further speed up the publication process.

However, the great disparity in the time span of receipt to acceptance raises questions. Dióspatonyi's hypothesis that the technical phase is the better target for speed improvement is not supported by our findings. NPG has to deal with a far larger number of manuscripts, yet manages to publish even the print version faster than BMC. From own publishing experience with both BMC and association journals which allow online tracking of the assessment process, and from working as a reviewer for several

association journals, it seems that BMC editors follow up less urgently on the reviewers' input than do the editors of other journals. While this is purely observational evidence, observational evidence is a good predictor if analyzed more stringently. Observational studies can serve to generate a useful hypothesis, and often give similar results to more formal trials.[25-28]

As most learned societies have contracts with commercial publishing houses which take care of the business and technical matters of their periodicals' publication process including procedures involved in the processing of manuscripts to published articles, many factors can possibly affect the publication speed. The slow publication may be due to the time spent on administrative procedures between the association and the publisher. "Backlog effect" is another possible reason for print-based publication lag.[7] Journals are usually budgeted to publish a certain number of pages for every volume or for every year. A manuscript accepted in a particular month may only be published in a later issue due to page limitation. NPG journals seem to suffer from this phenomenon less than association journals. In particular, the weekly publication interval of *Nature* gives the editors more potential to evenly spread the backlog. NPG differs from association journals mainly in the editorial responsibility. While NPG journals have full-time professional editors, who are supported by an editorial board with specific domain knowledge, the editors of association journals are active researchers who devote only part time to their editorial activities. The relative lack of economic pressure on association journals may in part explain why these journals take a much longer time than NPG journals to publish an accepted manuscript despite a competitive speed for the review process.

Much time is devoted to final formatting and proofreading before accepted manuscripts are published in association journals. Societies and associations have found ways to shorten this publication lag in the "technical" phase, and made the "near" final articles available to readers much earlier than the final version. For example, "Online First" of the *Circulation Research* and "Articles in Press" of the *American Journal of Respiratory and Critical Care Medicine* post manuscripts online within a few days after acceptance.[29,30] These manuscripts provide readers rapid access to the latest research. The format of the final print publication may be slightly different from the online manuscript because of copyediting but the content is the same. This online publishing policy of certain journals, similar to BMC journals, shortens the time lag considerably.

Some editors tend to wait for enough accepted manuscripts, bundle them together as one issue, and publish them online at one time. Alternatively, if online publication is hosted by a scientific database portal, such as "Science Direct", the database may post the entire issue online on the same date. Publication data from the *Journal of Vascular Surgery* (JVS), for example, shows that all articles for the 2004 December issue were published online on December 23, 2004. This kind of publishing does not fully utilize the advantage of electronic publishing and thus loses some potential publication speed.

Compared to NPG and association journals, BMC journals selected in the present study still publish much less articles per year. It should be born in mind that the difference in sample size may bias final results.

The *Journal of the American Society of Nephrology* (JASN), edited by the American Society of Nephrology (ASN), is the most highly cited journal in the field of Nephrology/Urology. The society had a 15-years partnership with the publishing house Lippincott Williams and Wilkins (LWW) since JASN was launched in 1990. The average lag from receipt to acceptance is 165 days, which is very close to the data obtained from *BMC Nephrology*, i.e. 161 days. By contrast, the accepted articles will appear in the print copy of the journal only three months later. This is a very noticeable time delay compared to OAP articles that appear online immediately after their acceptance. Since January 2005, JASN is self-published.[31] Monitoring the publication speed of JASN for 2005 may allow to infer on the publication lag induced by communication between editors and publishing house.

On request, JASN indicated 90 days' publication lag from receipt to acceptance, 104 days' lag to online publication, and 180 days' lag to print publication. These differ substantially from the 165 days to accepted and 252 days to print publication found in the analysis presented here. One explanation for this discrepancy may be that JASN includes all types of articles when calculating the publication lags. Editorials and commentaries are usually accepted and published faster than original research articles.[29] Prospective authors may wish to take this into consideration when choosing a journal to publish in. At scientific conferences, it is common to see publishing houses advertising with short publication lags. Authors should find out how these are calculated.

From the reader's perspective, timely access to the article of interest is paramount. Online accessibility provides a clear advantage over print journals as various additional time delays occur by mailing the print copy to scientists or librarians, and while sorting the journals in the library. Similar to those "pre" receiving delays after authors send out manuscripts, these "post" publishing delays cannot be quantified directly either.

Undoubtedly, open access can broaden the readership of scientific articles by allowing free access. As of now, however, it remains uncertain whether this has really increased the impact of OAP journals. In 2004, the ISI released a citation study report on the performance of OAP journals.[21] Only 6% of the OAP journals are in or above the 91st percentile, while two thirds fall below the 50th percentile of their respective subject category's citation ranking list. ISI's study suggested that no clear effect of open access has been observed to date.

Rather than analyzing the impact of OAP *journals*, it has been suggested to measure the impact of open access by analyzing the impact of open access *articles* because the evolution of OAP journals is still at the early stage. Lawrence's study of 119,924 conference articles in computer science demonstrated high citation rates to articles freely available online.[23] Antelman[32] extended the study to more disciplines including

mathematics, electrical and electronic engineering, political science, and philosophy. His study came to the same conclusion that open access articles have a greater impact than articles that are not accessible freely online.

Conclusion

The present study shows that "OAP" journals and "traditional" journals have a competitive publication speed, while it takes much longer for manuscripts submitted to association journals to be published. Traditional publishers tend to co-publish electronic versions of the print publication, but restrict the access to subscribed users only. In contrast, the open access publishing model has the potential to reach a broader readership by offering free accessibility to readers. Due to the relative novelty of open access publishing, the scientific impact of OAP has not yet been established. Authors should consider a compromise between fast publication speed, efficient spread to the appropriate target audience, and availability of article when choosing which journal to submit to.

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