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The peer review process: A survey among scientists in radiology

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ABSTRACT

Purpose: To map the experience and view of scientists in radiology on the peer review process.

Method: A survey with 12 closed-ended questions and 5 conditional sub-questions was conducted among corresponding authors who published in general radiology journals.

Results: 244 corresponding authors participated. In considering a peer review invitation, most respondents found the topic and the availability of time very important (62.1% [144/132] and 57.8% [134/232], respectively), the quality of the abstract, the prestige/impact factor of the journal, and the sense of professional duty important (43.7% [101/231], 42.2% [98/232], and 53.9% [125/232], respectively), and were indifferent about a reward (35.3% [82/232]). However, 61.1% (143/234) believed that a reviewer should be rewarded. Direct financial compensation (27.6% [42/152]), discounted fees for society memberships, conventions, and/or journal subscriptions (24.3% [37/152]), and Continuing Medical Education credits (23.0% [35/152]) were the most frequently desired rewards. 73.4% (179/244) of respondents never received formal peer review training, of whom 31.2% (54/173) would like to, particularly less experienced researchers (Chi-Square $P = 0.001$). The median reported review time per article was 2.5 h. 75.2% (176/234) of respondents found it acceptable that a manuscript is rejected by an editor without formal peer review. The double-blinded peer review model was preferred by most respondents (42.3% [99/234]). A median of 6 weeks was considered the maximum acceptable time from manuscript submission to initial decision by a journal.

Conclusion: Publishers and journal editors may use the experiences and views of authors that were provided in this survey to shape the peer review process.

1. Introduction

Peer review is the critical evaluation of scientific work by experts in the same field to safeguard the quality of published research. It is an indispensable step between manuscript submission and publication. Peer review is used by all major journals but has some limitations that occasionally occur, including poor performance in detecting gross errors and fraud, subjectiveness, susceptibility to bias, and slowness [1,2]. Despite its potential limitations, peer review is still the standard to control the quality of scientific manuscripts.

In order for journals to provide high peer review quality, it is important to find motivated and skilled reviewers [3]. However, many journals have difficulties in finding reviewers to evaluate the ever-growing number of manuscripts that are submitted [4–7]. The Global State of Peer Review report by Publons which surveyed more than 11,000 researchers globally showed that it has become harder to get each review done: the total number of review invitations between 2013

and 2017 increased by 9.8% year-on-year [7]. This puts manuscript turnaround times and peer review quality under increasing pressure. Putting aside the issue of the increasing number of manuscripts that require review, it is currently also unclear which factors motivate potential candidates from serving as peer reviewer in radiological research. It is also unknown how much time peer reviewers spend on evaluating an article.

Three other important peer review practices that vary widely among the many journals are manuscript rejection by an editor without formal peer review (editorial desk rejection) vs. formal review of all submitted manuscripts, the method of blinding (e.g. single-blinded, double-blinded, or open review), and the maximum allowable time from manuscript submission to initial decision. These policies are principally established by the journal editors.

Authors can be considered very important stakeholders in the peer review process, and it is important to understand their view on these topics. This information may be useful to publishers and journals in

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shaping the peer review process according to their experience and preferences.

Therefore, the aim of our study was to map the experience and view of scientists in radiology on the peer review process.

2. Methods

2.1. Study design and participants

This study was approved by the Medical Ethics Review Committee of (*name blinded for review*). Corresponding authors who published an original research article in one of the top 12 general radiology journals (according to impact factor by Journal Citation Reports [8]) in 2019 were invited by email to complete a survey about the peer review process of imaging journals. The journals had to be clinically oriented and accept unsolicited manuscript submissions. The 12 selected journals included *Radiology*, *Investigative Radiology*, *Diagnostic and Interventional Imaging*, *Korean Journal of Radiology*, *European Radiology*, *American Journal of Roentgenology*, *Radiologica Medica*, *Journal of the American College of Radiology*, *Academic Radiology*, *European Journal of Radiology*, *British Journal of Radiology*, and *Clinical Radiology* (Table 1). The email request to the corresponding authors was sent in the first week of January 2023. Four reminder emails were sent, each with a time interval of one week. Corresponding authors from the circle of acquaintances of the authors of this survey study were excluded. The survey could be completed through a weblink created with Qualtrics software (Qualtrics, Provo, UT, USA).

2.2. Survey

The survey was composed by two radiologists (*initials blinded for review*, both with > 6 years of clinical radiology experience and both with > 15 years of research experience). The survey (with 12 closed-ended questions and 5 conditional sub-questions) collected information on respondents' characteristics (age, gender, continent of work, academic degree and position, research experience, peer review experience, and editorial board experience), their motivations to accept a peer review invitation (respondents were asked to rate several factors on a 5-point importance scale: "very unimportant", "unimportant", "indifferent", "important", or "very important"), the time they spend on reviewing an article, their view on peer review training, their view on manuscript processing time, their view on editorial rejections without formal peer review, and their preferences with regard to type of blinding during the peer review process and the maximum allowable time between manuscript submission and initial decision (supplemental file).

2.3. Data analysis

Descriptive statistics were used to summarize the data. Median rating on a 5-point importance scale for factors in considering a review request was calculated. Extreme outliers regarding the number of hours spend on reviewing one article were detected used Tukey's method [9] and excluded from analysis. A Chi-Square test was used to determine whether research experience was associated with the wish to receive formal peer review training. *P*-values less than 0.05 were considered statistically significant. Statistical analyses were executed using IBM Statistical Package for the Social Sciences (SPSS) version 23.

3. Results

3.1. Characteristics of survey respondents

244 (7.4%) of 3293 invited corresponding authors participated in the survey (Table 2). Most respondents were aged 25–64 years (86.1% [210/244]), male (73.8% [180/244]), and came from Europe (43.4% [106/244]) or North America (42.6% [104/244]). The majority had a

Table 1

All Q1 journals in the category "RADIOLOGY, NUCLEAR MEDICINE & MEDICAL IMAGING" (2021 Journal Citation Reports [8]) with their impact factors, and top 12 general journals that were selected for this study.

Journal	Impact factor	Journal impact factor quartile	Journal selected for this study
Radiology	29.146	Q1	Yes
JACC-Cardiovascular Imaging	16.051	Q1	No
Medical Image Analysis	13.828	Q1	No
Journal of Nuclear Medicine	11.082	Q1	No
IEEE Transactions on Medical Imaging	11.037	Q1	No
Clinical nuclear Medicine	10.782	Q1	No
Investigative Radiology	10.065	Q1	Yes
European Journal of Nuclear Medicine and Molecular Imaging	10.057	Q1	No
Photoacoustics	9.656	Q1	No
European Heart Journal-Cardiovascular Imaging	9.130	Q1	No
Ultrasound in Obstetrics & Gynecology	8.678	Q1	No
Circulation-Cardiovascular Imaging	8.589	Q1	No
International Journal of Radiation Oncology Biology Physics	8.013	Q1	No
Computerized Medical Imaging and Graphics	7.422	Q1	No
Neuroimage	7.400	Q1	No
Diagnostic and Interventional Imaging	7.242	Q1	Yes
Zeitschrift fur Medizinische Physik	7.215	Q1	No
Korean Journal of Radiology	7.109	Q1	Yes
Physical and Engineering Sciences in Medicine	7.099	Q1	No
European Radiology	7.034	Q1	Yes
Journal Of Cardiovascular Magnetic Resonance	6.903	Q1	No
Radiotherapy and Oncology	6.901	Q1	No
American Journal of Roentgenology	6.582	Q1	Yes
Radiologia Medica	6.313	Q1	Yes
Radiographics	6.312	Q1	No
Journal of the American College of Radiology	6.240	Q1	Yes
Cancer Imaging	5.605	Q1	No
Journal of Thoracic Imaging	5.528	Q1	No
Academic Radiology	5.482	Q1	Yes
Ultraschall in der Medizin	5.445	Q1	No
Seminars in Radiation Oncology	5.421	Q1	No
Human Brain Mapping	5.399	Q1	No
Journal of Cardiovascular Computed Tomography	5.170	Q1	No
Journal of Magnetic Resonance Imaging	5.119	Q1	No
European Journal of Radiology	4.531	Q2	Yes
British Journal of Radiology	3.629	Q2	Yes
Clinical Radiology	3.389	Q2	Yes

medical doctor degree (73.0% [178/244]), held an academic position (94.3% [94/244]), and had more than 10 years of research experience (76.6% [187/244]). The majority had experience as a reviewer (99.2% [242/244]) and experience as journal editorial board member (59.4% [145/244]). Most respondents (56.1% [137/244]) had reviewed 1 up to 10 articles in the past 12 months prior to this survey.

3.2. Motivations

In considering a peer review invitation, most respondents found the topic and the availability of time very important (62.1% [144/132] and 57.8% [134/232], respectively), the quality of the abstract, the

Table 2
Characteristics of 244 participating corresponding authors and their responses to this survey.

	Category	Number and %
Age	25–34 years	n = 12
	35–44 years	(4.9%)
	45–54 years	n = 69
	55–64 years	(28.3%)
	>65 years	n = 67
		(27.5%)
		n = 62
		(25.4%)
		n = 34
		(13.9%)
Gender	Male	n = 180
	Female	(73.8%)
	Neutral	n = 62
		(25.4%)
		n = 2
		(0.8%)
Continent of work	Europe	n = 106
	North America	(43.4%)
	Asia	n = 104
	South America	(42.6%)
		n = 30
		(12.3%)
		n = 4
		(1.6%)
Academic degree	Medical doctor (with or without other degree)	n = 178
	Other degree	(73.0%)
		n = 66
		(27.0%)
Academic position	Full professor	n = 94
	Associate professor	(38.5%)
	Assistant professor	n = 63
	Fellow or resident	(25.8%)
	Other	n = 27
	None	(11.1%)
	Instructor/Lecturer	n = 13
		(5.3%)
	n = 19	
	(7.8%)	
	n = 14	
	(5.7%)	
	n = 14	
	(5.7%)	
Research experience	<5 years	n = 9
	5–10 years	(3.7%)
	>10 years	n = 48
		(19.7%)
		n = 187
		(76.6%)
Experience as a reviewer for a journal	Yes	n = 242
	No	(99.2%)
		n = 2
		(0.8%)
Experience as an editorial board member for a journal	Yes	n = 145
	No	(59.4%)
		n = 99
		(40.6%)
Number of articles reviewed in the past 12 months	0	n = 5
	1 to 5	(2.0%)
	6 to 10	n = 73
	11 to 15	(29.9%)
	16 to 20	n = 64
	>20	(26.2%)
		n = 34
		(13.9%)
		n = 15
		(6.1%)
		n = 41
		(16.8%)
Received formal peer review training	Ever	n = 65
	Never	(26.6%)

Table 2 (continued)

	Category	Number and %
Wish to receive formal peer review training¹	Yes	n = 179
	No	(73.4%)
	Undecided	n = 54
		(31.2%)
		n = 79
		(45.7%)
		n = 40
		(23.1%)
Should the reviewer be rewarded?²	Yes	n = 143
	No	(61.1%)
	Undecided	n = 51
		(21.8%)
		n = 40
		(17.1%)
Preferred peer review system³	Single-blinded	n = 30
	Double-blinded	(12.8%)
	Triple-blinded	n = 99
	Quadruple-blinded	(42.3%)
	Open peer review	n = 7
	Other	(3.0%)
		n = 40
		(17.1%)
		n = 18
		(7.7%)
		n = 40
		(17.1%)
Is it acceptable that an editor rejects an article without having sent it out for review by one or more reviewers?⁴	Yes	n = 176
	No	(75.2%)
	Undecided	n = 35
		(15.0%)
		n = 23
		(9.8%)

¹ 173 of 179 respondents completed this survey question.

² 234 of 244 respondents completed this survey question.

³ 234 of 244 respondents completed this survey question.

⁴ 234 of 244 respondents completed this survey question.

prestige/impact factor of the journal, and the sense of professional duty important (43.7% [101/231], 42.2% [98/232], and 53.9% [125/232], respectively), and were indifferent about a reward (35.3% [82/232]) (Fig. 1)".

3.3. Reward

The majority of respondents (61.1% [143/234]) believed a reviewer should be rewarded. The most frequently desired rewards were direct financial compensation (27.6% [42/152]), discounted fees for society memberships, conventions, and/or journal subscriptions (24.3% [37/152]), and continuing medical education (CME) credits (23.0% [35/152]) (Fig. 2).

3.4. Peer review time

The median number of reported hours spend on reviewing one article was 2.5 h (interquartile range [IQR] 2.0, range 0.5–10) (Fig. 3).

3.5. Training

Most respondents (73.4% [179/244]) never received formal peer review training, of whom 31.2% (54/173) indicated they would like to receive formal training, whereas 45.7% (79/173) would not. Less experienced researchers more frequently indicated to be willing to receive peer review training (71.4% (5/7) among those with <5 years, 52.8% (19/36) among those with 5–10 years, and 23.1% (30/130) among those with > 10 years of research experience, $P = 0.001$).

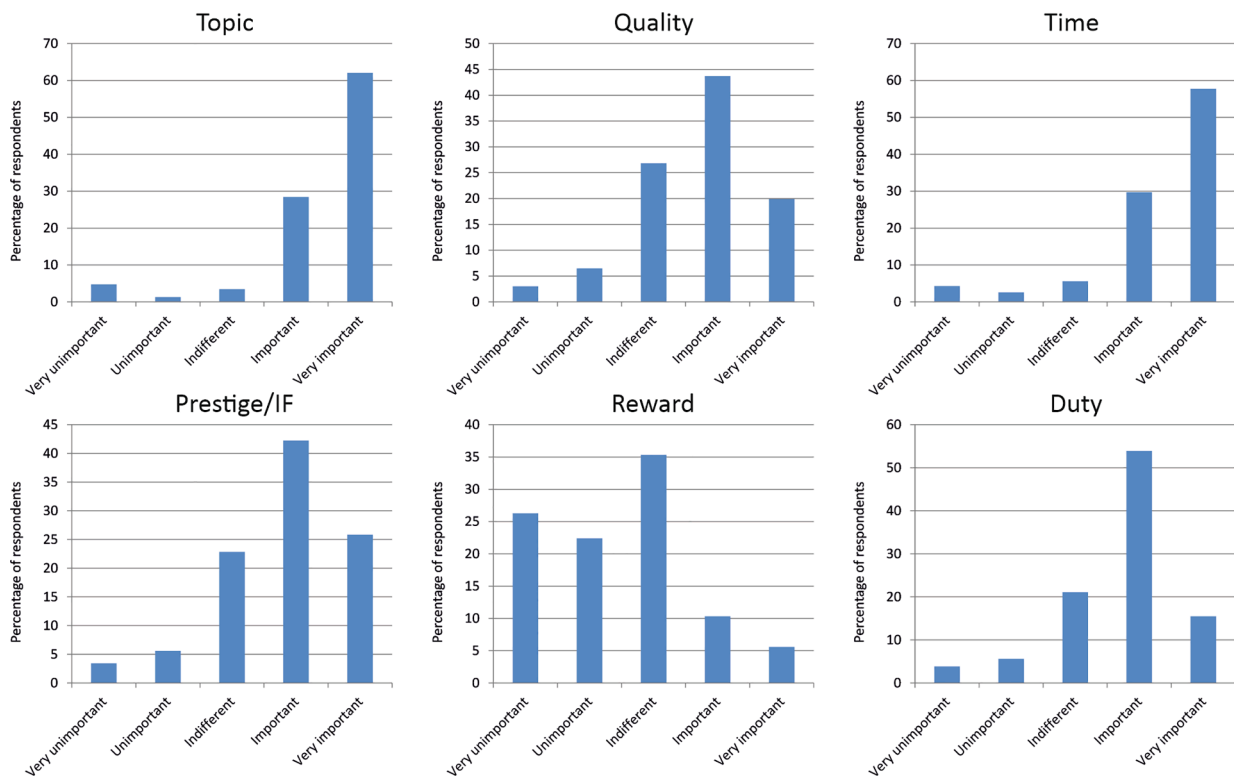


Fig. 1. Importance of several factors in considering an invitation to review an article: the topic of the manuscript, the quality of the abstract of the manuscript, availability of time to review the manuscript, the prestige/impact factor of the journal, presence or absence of a reward for reviewing the manuscript, and sense of professional duty.

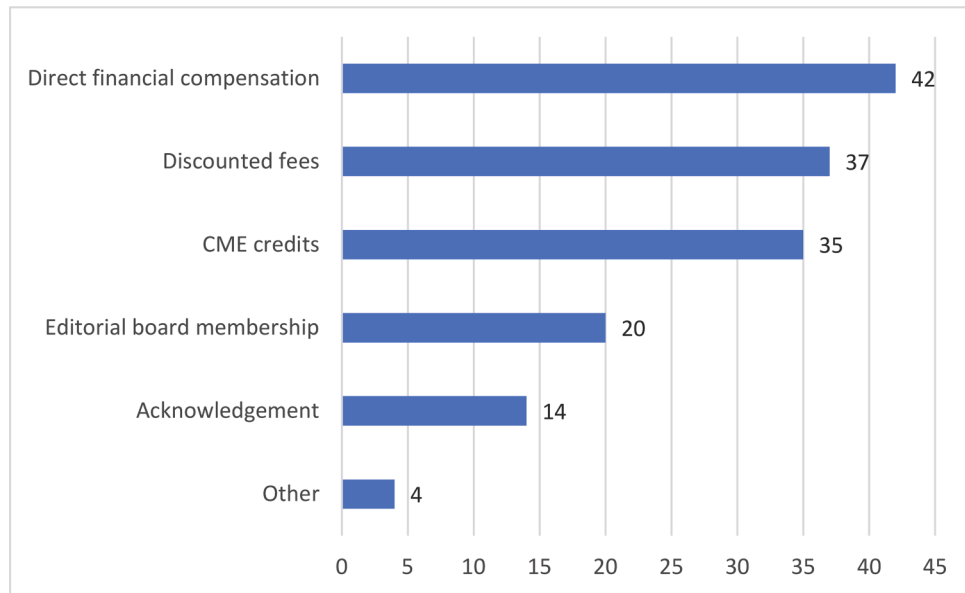


Fig. 2. Selected options regarding the best way to reward a reviewer (absolute counts).

3.6. Manuscript processing time

According to the survey respondents, the median maximum acceptable time from manuscript submission to initial decision by a journal is 6 weeks (IQR 4, range 1–26) (Fig. 4).

3.7. Editorial rejection without formal peer review

Most respondents (75.2% [176/234]) found editorial desk rejections acceptable.

3.8. Peer review model

Most respondents preferred a double-blinded peer review model (i.e.

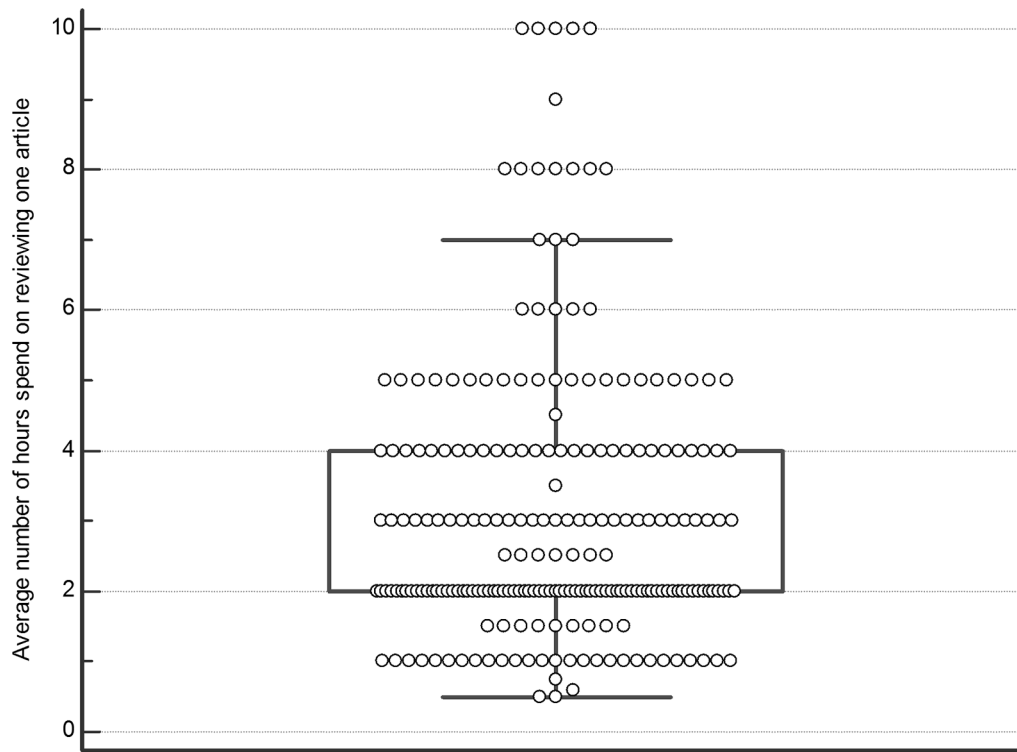


Fig. 3. Box-and-whisker plot showing the average number of reported hours spent on reviewing one article.

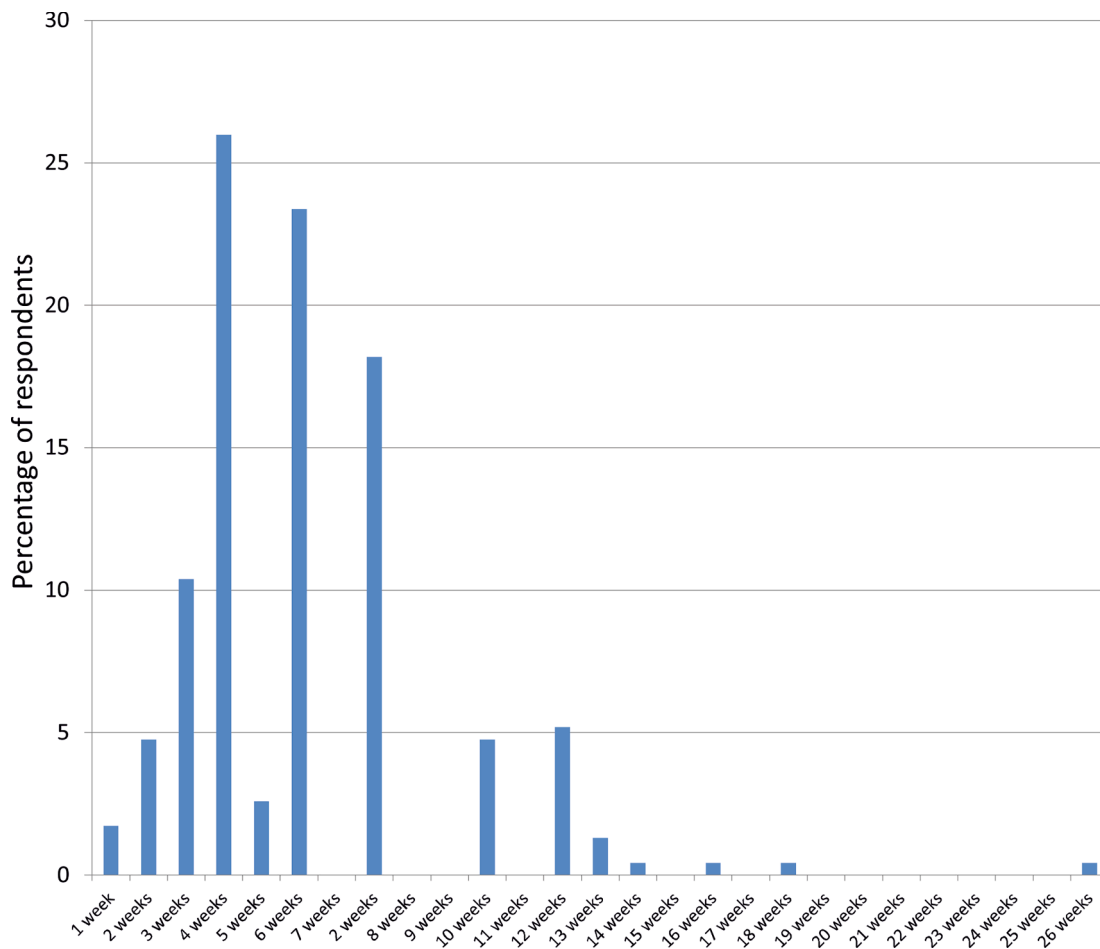


Fig. 4. Maximum acceptable time from manuscript submission to initial decision by a journal according to respondents.

authors and reviewers are blinded to each others' identities) (42.3% [99/234]), followed by the quadruple-blinded system (i.e. authors, reviewers, and handling editor are all blinded to each others' identities) (17.1% [40/234]), remotely followed by the single-blinded system (i.e. only the authors are blinded to the reviewers' identities) (12.8% [30/234]) (Table 2).

4. Discussion

In 2002, Jefferson et al. [10] published an article in the *Journal of the American Medical Association*, in which they mentioned that the main purpose of medical research is to improve health or the delivery of health care. They also mentioned that peer review is regarded as an established stage in this process, but that it is difficult to assess its effect on health outcomes [10]. The clinical value of peer review still remains unknown, let alone the effect of various variables in the peer review process on clinical outcomes (e.g. the training of reviewers and the peer review model). Given this background, it is important to emphasize that our study only captured the experiences and views of authors in the field of radiology on the peer review process, and that no evidence-based conclusions can be drawn on how to actually improve it. Nevertheless, because authors can be regarded as very important stakeholders in the peer review process, publishers and journal editors may take into account their experiences and preferences as outlined in our study in shaping the peer review process they offer. A striking finding was that most respondents (61.1%) believed that a reviewer should be rewarded for her/his services to the journal, with direct financial compensation as the preferred method, followed by discounted fees for professional memberships and activities, and CME credits. The median reported review time per article was 2.5 h, which can be used as a reference to determine the size of the reward. The sources of the budget allocated for this purpose need to be determined, but may perhaps be derived from journals' subscription and advertising revenues.

There has been previous work related to the current study's topic. The Publons' 2018 Global Reviewer Survey aimed to gauge attitudes and perceptions toward peer review of scholarly journals [7]. That survey was performed between May-July 2018, and included over 11,800 researchers globally, largely sourced from the Publons community and authors with articles indexed in Web of Science [7]. The data from that survey showed that a median of 5 h was spent on writing each review [7], which is more than the median of 2.5 h reportedly spent by the present survey's respondents. This may be due to the fact that Publons' 2018 Global Reviewer Survey included multiple scientific disciplines [7]. In another study by Huisman and Smits [11] that investigated the duration of the first review round, the total review duration, and the immediate rejection time, it was reported that the fields of medicine, public health, and natural sciences showed the shortest durations while mathematics and computer sciences, social sciences, economics and business, and humanities the longest [11]. It can be speculated that these findings can be extrapolated to the time spent by individual reviewers on evaluating a manuscript, with those in the field of medicine (including radiology) requiring less time. However, this hypothesis and the underlying reasons why reviewers in the field of medicine would be faster in reviewing articles require further investigation. Data from the Publons' 2018 Global Reviewer Survey also showed that 39% of reviewers never received any formal peer review training [7]. In our survey, the percentage of reviewers who never received formal peer review training was higher (approximately 72.4%). We speculate that there may be more "self-taught" reviewers in the field of radiology that may have adopted styles of reviews they found useful for their own previously submitted work. The Publons' 2018 Global Reviewer Survey revealed similar motivations among researchers to respond to a review request: 70.6% decline because of the topic and 42.0% decline because they have lack of time [7]. In addition, similar to our survey, it was also demonstrated that many researchers (40.8%) consider peer reviewing as professional duty [7]. Another survey among

551 reviewers for five biomedical journals owned by the BMJ Publishing Group also demonstrated that the topic and availability of time were the most important factors to decide whether or not to accept a review invitation [5]. Interestingly, according to most respondents from that survey a financial reward would not be effective when time constraints are prohibitive but non-financial incentives might encourage them to accept review requests [5]. This further strengthens the notion that journals should consider rewarding reviewers for their service.

Another recent study that investigated the peer review practices of 119 medical imaging journals listed in the 2018 Journal Citation Reports, reported that most medical imaging journals (52.1%) used the single-blinded peer review model (i.e., the reviewers know the identity of the authors but not vice versa) followed by the double-blinded peer review model (41.2%) (i.e., the identities of both authors and reviewers are kept hidden from each other) [12]. However, our survey showed that the double-blinded peer review model is preferred over the single-blinded peer review model (42.3% vs. 12.8%). Thus, journals may consider using the double-blinded peer review model instead of the single-blinded peer review model that is also supposed to be more prone to bias [12].

Our study had some limitations. First, some of the survey participants' responses should be viewed as opinions rather than "absolute proven truths". For instance, it remains to be further investigated whether a reviewer's reward, formal peer review training, or any type of peer review model over the other really improves the peer review process in terms of speed and quality. Second, survey response rate was relatively low (7.4%), which may limit the generalizability of our findings. Third, there may have been bias due to the specific selection of journals (although they all concerned general radiology journals) and due to the characteristics of the survey respondents. Fourth, the average number of reported hours spend on reviewing one article was based on a retrospective estimate by the survey respondents. Retrospective judgments may underestimate the time investment compared to prospective judgments [13].

In conclusion, publishers and journal editors may use the experiences and views of authors that were provided in this survey to shape the peer review process.

CRediT authorship contribution statement

Robert M. Kwee: Conceptualization, Formal analysis, Investigation, Methodology, Visualization, Writing – original draft, Writing – review & editing. **Maan T. Almaghrabi:** Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. **Thomas C. Kwee:** Conceptualization, Formal analysis, Investigation, Methodology, Visualization, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ejrad.2023.110940>.

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