Do reviewers get their deserved acknowledgments from the authors of manuscripts?

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Abstract

As the gatekeeper of science, reviewers play an essential role in academic publishing by improving the quality of papers and maintaining research integrity. In this research, we examined whether reviewers receive gratitude from authors for their reviewed manuscript. We analyzed over 46 million papers from 2001 to 2020 and found that although the proportion of acknowledges to reviewers in different subject areas has increased in recent years, the overall proportion of acknowledges to reviewers is low, with the lowest proportion being the field of Health Sciences and the highest in the field of Social Sciences. We also discovered that the proportion of acknowledged reviewers from different regions varied, with America, Europe and Oceania having a generally higher proportion than Asia. Our results indicate that the scientific community is generally unaware of the contributions made by reviewers, and reviewers have not received the acknowledgments they deserve. Additionally, we found that a small number of journals had more papers acknowledging reviewers. Through regression analysis, we found that although authors acknowledged the reviewer's contribution, their decision to write down acknowledgements were influenced by their language proficiency.

Keywords Reviewer · Acknowledgement · Reviewer contribution · Peer review

Introduction

Peer review is the main mechanism for quality control in most scientific disciplines, plays a very essential role in scholarly communication (Mulligan et al., 2013). As the gatekeeper of science (McClellan, 2003), reviewers not only check the quality of academic papers, but also assist editors in making decisions on whether to accept manuscripts (Bornmann, 2011). There is also evidence that reviewers' reviews are effective in helping authors improve the quality of research results reports (Goodman et al., 1994; Matsui et al., 2021; Pierie et al., 1996). However, although peer review has been widely accepted, little is known of its effects (Jefferson et al., 2002),the contributions by reviewers to the quality of

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manuscripts are even less mentioned. (Bornmann et al., 2008) quantitatively analyzed the reviewer's criteria and reasons for accepting or rejecting the manuscript. They found that there were at least nine main areas for assessing and judging the manuscript from 572 different criteria. With the rapid development of science and peer review, the standards and content that reviewers need to measure are more complex. It can be seen that reviewers have made great contributions to academic manuscripts and authors (Costas et al., 2013; Paul-Hus et al., 2017a, 2017b).

Acknowledgement is an important part of the structure of academic literature. It is an expression of public acknowledges by organizations, institutions or individuals that have contributed to the research work, research results, the writing and revision of papers. Although there are no strict academic requirements for the text of acknowledgments in a paper and it is not a fully personal behavior (Hyland, 2003), the function of the acknowledgments makes it essential to give acknowledgments to individuals, institutions, and funds, etc., who have previously contributed, indicating that the authors are sufficiently affirming and publicly identified for their work and contributions.

Acknowledgments have been seen as an important factor when measuring contributions from scientific publications (Song et al., 2020). Therefore, based on contributions of reviewers to authors, using the acknowledgment text of million papers, this study examined whether reviewers get the deserved acknowledgments from the authors of manuscripts.

The necessity and importance of this study mainly focus on two aspects. In practice, reviewing is an activity with academic contributions, and in the face of the current crisis facing peer review (Balietti et al., 2016; Stephan et al., 2017), recognizing the academic contributions of reviewers is a possible way to solve this crisis. It is beneficial for arousing the enthusiasm of the reviewers, strengthening the sense of involvement and honor, and improving the quality of the manuscript (Matsui et al., 2021). Our research makes efforts to promote responsible peer review by reviewers. In terms of theory, not all scientific innovation activities are done by authors, and the review process of journal papers is an important channel for reviewers to communicate with authors, it is also an excellent opportunity for direct communication with peers (Rose & Georg, 2021). Acknowledgments to reviewers are an effective means of promoting scientific communication. Therefore, this study is also of great significance for improving scientific communication.

Related research

On the one hand, research on reviewers in peer review has focused on evaluating reviewers' reviewer quality and reviewer discrepancies. Scholars mostly studied the length and the speed of reviewing opinions as entry points, and take the length (Bianchi et al., 2019; Casnici et al., 2017; Laband, 1990) and the speed (Bianchi et al., 2019; Casnici et al., 2017) of reviewing opinions as indexes to evaluate reviewers. The studies found that women (Schmaling & Blume, 2017; Wing et al., 2010) and young (Bravo et al., 2019) reviewers had longer and more constructive opinions (Garcia-Costa et al., 2022). Reviewers of different disciplines also have different characteristics. Reviewers of natural sciences are quicker (Garcia-Costa et al., 2022; Huisman & Smits, 2017) and have longer opinions than those of social sciences (Buljan et al., 2020; Xu et al., 2019), possibly because reviewers of social sciences have relatively higher standards (Garcia-Costa et al., 2022). On the other hand, researchers also focused on discussing the fairness and reliability of reviewers in the peer review process. In the perspective of fairness, scholars have examined what factors influence reviewer preferences during the peer

review process. It is found that gender differences (Demarest et al., 2014; Fox & Paine, 2019; Murray et al., 2018), author's geographic location (Burns & Fox, 2017; Murray et al., 2018), the reputation of the author's organization (Tomkins et al., 2017; Wei & Lei, 2018), and inter-personal relationships (Fox et al., 2017; Seeber & Bacchelli, 2017; Shopovski et al., 2020) may influence peer review preferences. In terms of reviewer reliability, researchers measure reviewer reliability by experimenting with the consistency of different reviews for the same paper (Cicchetti, 1991). Most of the experimental results show that the results of the reviews are not reliable (Bornmann et al., 2010; Peters & Ceci, 1982), and changing the reviewers will have a great impact on the results of the reviews (Brezis & Birukou, 2020).

Acknowledgments are important data widely used to analyze scientific support, collaboration, and research practices (Paul-Hus et al., 2017a, 2017b). In 1970, Crawford and Biderman first used acknowledgments to analyze the source of funding for papers (Crawford & Biderman, 1970).Wang, Paul-Hus, and Mejia subsequently analyzed the funding of the paper through acknowledgment text (Mejia & Kajikawa, 2018; Paul-Hus et al., 2016; Rattan, 2014; Wang et al., 2012). Acknowledgments in papers provide more than funding information, with acknowledges to the institutions and individuals who provided help, and as such, acknowledgments are also seen as expressions of scientific debt, even conceptualized as 'superactions' (Edge, 1979). The number and roles of people in the acknowledgments provide a new perspective for the research of scientific collaboration (Adele Paul-Hus et al., 2017a, 2017b). Research on author collaboration through the acknowledgment text also combines it with citation indicators to provide a more comprehensive assessment of authors (An et al., 2017; Paul-Hus et al., 2017a, 2017b). The functional division of acknowledgment text is also an important aspect that scholars have focused on. With regard to the functional category of acknowledgments, some studies put forward various classification perspectives from different data sets or technical perspectives, and the main categories include support in acquiring data and materials, peer interaction communication, technical support, fund support, statements, etc. (Song et al., 2020; Tiew & Sen, 2002). Cronin classified it into six major categories (Cronin, 1991), whereas Tiew and Sen defined the acknowledgments text function into seven categories (Tiew & Sen, 2002). Rattan classified them into eight categories based on an analysis of acknowledgments in the *DESIDOC Journal of Library & Information Technology* (Rattan, 2014). However, regardless of the research methods and datasets used, financial support for the acknowledgment text and peer interactive communication are enclosed within the foundational functionality of the acknowledgments.

With the development of open peer review, reviewers are no longer hidden behind the scenes, and their academic contributions are beginning to be gradually valued by the scientific community (Matsui et al., 2021). Although the research on reviewers and acknowledgment texts has increased in recent years. However, few studies extracted the gratitude to reviewers from the acknowledgement text, outline the true situation of the author's gratitude to reviewers in the acknowledgement and measures whether the reviewers have got the deserved acknowledgments from the authors of manuscripts.

Data and strategy

Data source

41,640,566 journal papers published from 2001 to 2020 in Scopus from October 18 to 23, 2022 were analyzed. According to the classification of subject areas by Scopus, there are

11,586,732 papers in the field of Health Sciences; 9,146,627 papers in the field of Life Sciences; 15,567,994 papers in the field of Physical Sciences; 5,339,213 papers in the field of Social Sciences.

Research strategy

In this study, to avoid the influence of multiple languages on the findings, we first screened the papers only in English language, and 37,229,870 papers remained. We next extracted the paper including acknowledgments accurately and completely from all data. Drawing on the approach of Smirnova & Mayr, (2023), similarly, we gathered the acknowledgement texts from the Scopus database containing the collection of funding acknowledgments (Smirnova & Mayr, 2023). Then, we continued to use the strategy proposed in Wang et al., (2012) to extract the papers including acknowledgements (Wang et al., 2012). Assume that the acknowledgments text for all papers begins with the 26 alphabets of a-z or the 10 Arab numbers of 0–9. Combining the wildcard of "*". So, in this study, we designed the following strategy to retrieve all the target data: FUND-ALL(a* or b* or c* or d* or e* or f* or g* or h*or i* or j* or k* or l* or m* or n* or o* or p* or q* or r* or s* or t* or u* or v* or w* or x*or y*or z* or 0* or 1* or 2* or 3*or 4* or 5* or 6* or 7* or 8* or 9*). Next step we also need to extract the acknowledgments of the papers that acknowledged the reviewers. Assuming that the authors have given acknowledgments to the reviewers, a "reviewer" or "reviewers" character is bound to appear in the acknowledgments text. Therefore, combining the wildcard of "?", we designed a strategy retrieval as follows: FUND-ALL (reviewer?).

Result

We first studied all the papers and papers acknowledged reviewer in all subject areas. Through the analysis of the number and ranking changes of all papers, number of papers acknowledged reviewers, proportion of papers acknowledged reviewers in all papers (PP), and the trend of PP, we analyzed the situation of authors acknowledged reviewers in different subject areas. Next, we explored papers including acknowledgments, papers acknowledged reviewer, proportion of papers acknowledged reviewers in those papers with acknowledgments (PA) from the perspective of different countries and regions, and conducted a trend analysis of PA in five main countries. Similarly, we also conducted a study on the distribution of papers acknowledged reviewers in different journals. Finally, we tried to explore the reasons for the different proportion of papers acknowledged reviewers in different countries.

Papers and papers acknowledged reviewers in all subject areas

Overall analysis

Since the data comes from the Scopus database and draw on the experience of (Squazzoni et al., 2021), the subject areas in this paper are divided into four categories, and the sub-areas of subject areas are shown in Table 1.

Table 1 Subject areas and subject sub-areas

Subject areas	Subject sub-areas
Physical Sciences	Chemical Engineering, Chemistry, Computer Science, Earth and Planetary Sciences, Energy, Engineering, Environmental Science, Materials Science, Mathematics, Physics and Astronomy
Social Sciences	Arts and Humanities, Business, Management and Accounting, Decision Sciences, Economics, Econometrics and Finance, Psychology, Social Sciences
Life Sciences	Agricultural and Biological Sciences, Biochemistry, Genetics and Molecular Biology, Immunology and Microbiology, Neuroscience, Pharmacology, Toxicology and Pharmaceutics
Health Sciences	Medicine, Nursing, Veterinary, Dentistry, Health Professions

Table 2 The number of papers and papers acknowledged reviewers in 4 subject areas

Subject areas	No. of all papers	Rank	No. of papers acknowledged reviewers	Rank	Proportion of papers acknowledged reviewers in all papers (PP) %	Rank
Physical Sciences	13,918,625	1	263,041	1	1.89	2
Health Sciences	9,983,473	2	28,601	4	0.29	4
Life Sciences	8,644,373	3	133,278	2	1.54	3
Social Sciences	4,683,399	4	93,338	3	1.99	1

Table 2 shows the number of papers in the four subject areas, the number of papers acknowledged reviewers, and proportion of papers acknowledged reviewers in all papers (PP). Among the four subject areas, the number in Physical Sciences is the greatest, which is 13,918,625, followed by Health Sciences and Life Sciences, and the number in Social Sciences papers is the minimum, accounting for 4,683,399. The number of papers acknowledged reviewers in Physical Sciences was also the largest, with 263,041 papers, followed by Life Sciences and Social Sciences, and only 28,601 papers acknowledged reviewers in Health Sciences. Correspondingly, the PP in Social Sciences is the highest (1.99%), followed by Physical Sciences and Life Sciences, and the PP in Health Sciences is extremely low (only 0.29%).

It is worth noting that the rank of Social Sciences and Health Sciences are relatively special. The ranking change of Social Sciences is the strongest. The number of papers ranks the last. Although the ranking of papers acknowledged reviewers has increased to the third place, the ranking of PP has risen directly to the first place. It can be concluded that authors in Social Sciences agree more with reviewers' help and contribution than other subject areas. On the contrary, Health Sciences show a cliff-like decline in the rank, ranking second for the number of papers, ranking last for the papers acknowledged reviewers and PP. Few authors in Health Sciences give acknowledgments to reviewers. To a certain extent, the authors in Health Sciences have insufficient recognition of contributions from reviewers. Reviewers in Health Sciences rarely got the deserved acknowledgments from the authors of manuscripts. The performance of Physical and Life Sciences is relatively stable. Both the number of Physical Sciences papers and the number of papers acknowledged reviewers ranked highest, PP ranked second. Life Sciences papers and PP ranked third, and the number of papers acknowledged reviewers ranked second.

However, we can see from Table 2 that the indicators of PP in all four subjects are rather low. The overall PP is 1.99% in Social Sciences, greater than 1.89% in Physical Sciences and 1.54% in Life Sciences. Health Sciences has the lowest PP of only 0.29%. Overall, there are few authors who acknowledged the reviewers, scientific community has not paid enough attention to the contribution of reviewers. Reviewers have not got the recognition and acknowledgments they deserve.

Trend analysis of PP

Overall, the indicators of PP are low in all subject areas. In order to explore the changing trend of PPs in all subject areas, PP trend analysis was conducted in four subject areas. As shown in Fig. 1, as a whole, the PPs in all subject areas have increased. Especially in the last six years (2015–2020), the PP has increased rapidly. Four subject areas were divided into two groups, with the first group consisting of Physical Sciences, Life Sciences, and Social Sciences, which have intersection and similar PP from 2001 to 2020; when the second group, Health Sciences, which has the lowest PP even though the proportion was gradually improving in recent years and has much gap compared with other areas.

The first group of three subject areas, PPs in 2000–2010 are roughly similar, after 2010, PPs in different subject areas gradually widen the gap. The PPs of Social Sciences and Physical Sciences are similar from 2010 to 2015. From 2015 to 2018, the PP value of Physical Sciences was the highest, and the growth of Social Sciences was slower than that of Life Sciences. After 2018, Social Sciences have the highest proportion, followed by Physical Sciences, and Life Sciences is close to the average.

Most notably, the PP curve of Social Sciences is quite special—it has a strong jump, and the curves of the other three subject areas have not crossed since 2010. The PP of Social Sciences is close to Physical Sciences from 2010 to 2015, overlaps the curve of Life Sciences from 2015 to 2017, overlaps Physical Sciences in 2018, and surpass three other subject areas in terms of rapid growth after 2018. Therefore, the PP of Social Sciences is more susceptible to various factors. In recent years, the academic community has gradually realized the contribution of reviewers, although the overall proportion is very low.
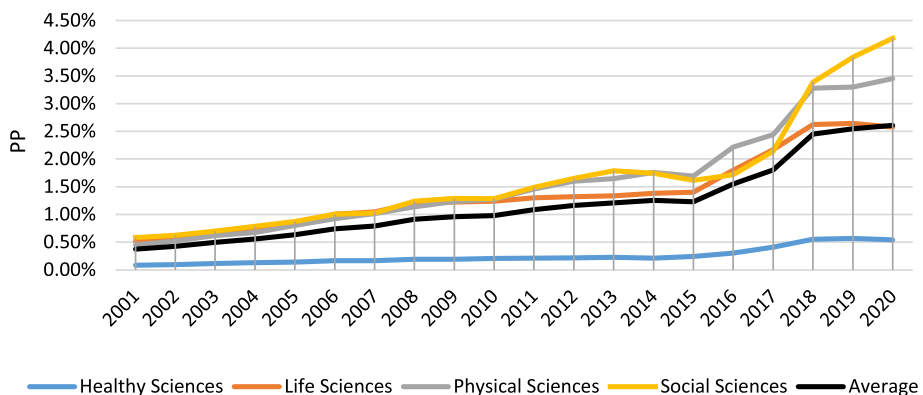

Fig. 1 PP in 4 subject areas from 2001 to 2020

Region analysis

In some situation, scientific papers in some publishers don't have the acknowledgment section. Therefore, to eliminate this kind of bias, we extracted all the papers containing acknowledgments, including 2,972,884 papers in Health Sciences, 5,983,313 papers in Physical Sciences, 4,025,291 papers in Life Sciences, and 989,300 papers in Social Sciences. A total of 13,970,788 papers accounted for 37.53% of the original initial data sample. The proportion of papers including acknowledgments was not high. Next, in the regional analysis, to avoid the impact of small-value countries, we set a threshold of 100,000 papers. For 25 countries with more than 100,000 papers, the remaining sample size was 13,654,734, accounting for 97.74% of the English papers including acknowledgments, which had little effect on the original sample size.

As Table 3 shows, in the current sample, papers come from 25 countries, the largest of which is the United States, with 3,496,780, followed by China, with 2,542,251. USA and China are the only two countries have more than one million papers. There are six countries with more than 500,000 papers, including the United States, China, the United Kingdom, Germany, Japan, and Canada. The highest proportion of papers acknowledged reviewers in papers including acknowledgments (PA) was Canada (5.48%) and Australia (5.35%) ranked next, and they are the only two countries that have PA values greater than 5%.

Distribution of PA across continents

We find that there are two countries with PA values of more than 5%, Australia and Canada, respectively, from America and Oceania. All countries with PA values of less than 5% and more than 4% come from Europe, while Asia occupies three positions among the five countries with PA values of less than 3%.

Therefore, as shown in Fig. 2, we have visualized the distribution according to the continent to which each country belongs. The distribution of Oceania and America is generally higher than that of Europe, while the PA of Oceania, America and Europe is significantly higher than that of Asia. The PA in Asia is the lowest, indicating that the acknowledgement of Asian authors to reviewers is more ignored. There are obvious regional differences in the degree of acknowledged and recognition of reviewers. To a certain extent, it can also be supposed that the regional cultural differences, or education training in school in different regions have affected researchers' recognition of the contributions of reviewers.

Trend analysis of PA

In order to study the trend characteristics of PA in different countries, among the countries with acknowledgement texts in the paper, the top 5 countries with most papers were selected as representatives to conduct trend analysis from 2001 to 2020, namely, the United States, China, the United Kingdom, Germany and Japan. Among the five countries, the United States comes from the Americas, China and Japan from Asia, the United Kingdom and Germany from Europe.

Table 3 The number of papers including acknowledgments and papers acknowledged reviewers in different regions

Continent	Country	No. of papers including acknowledgments	Rank	No. of papers acknowledged reviewers	Rank	PA (%)	Rank
America	USA	3,496,780	1	122,295	1	3.50	19
Asia	China	2,542,251	2	97,763	2	3.85	14
Europe	UK	937,641	3	38,964	3	4.16	10
Europe	Germany	735,146	4	31,195	4	4.24	7
Asia	Japan	690,823	5	14,994	9	2.17	23
America	Canada	518,421	6	28,422	5	5.48	1
Europe	France	452,105	7	19,877	7	4.40	6
Europe	Spain	437,751	8	16,647	8	3.80	15
Asia	South Korea	425,120	9	6307	16	1.48	25
Oceania	Australia	410,791	10	21,989	6	5.35	2
Europe	Italy	358,234	11	10,911	13	3.05	20
Asia	India	340,690	12	12,129	10	3.56	17
Europe	Russian	317,115	13	5619	18	1.77	24
America	Brazil	315,030	14	11,098	12	3.52	18
Europe	Netherlands	260,159	15	11,478	11	4.41	5
Europe	Switzerland	222,340	16	9387	14	4.22	9
Europe	Sweden	216,077	17	9145	15	4.23	8
Europe	Poland	151,589	18	4207	23	2.78	21
Europe	Belgium	150,423	19	5814	17	3.87	13
Europe	Denmark	128,193	20	5262	19	4.10	11
Asia	Iran	120,320	21	2847	25	2.37	22
Europe	Portugal	113,153	22	4603	22	4.07	12
Europe	Austria	107,744	23	4933	20	4.58	3
Europe	Finland	104,507	24	4626	21	4.43	4
Europe	Czech Republic	102,331	25	3847	24	3.76	16

As shown in Fig. 3, most countries show an overall upward trend. The five countries are also divided into two groups, the first group includes the United States, China, the United Kingdom and Germany, and the second group includes Japan.

In the first group, the change trend of the PA curve of the United States, Germany and the United Kingdom is roughly the same. Before 2007, the PA values of the four countries were roughly the same. Between 2007 and 2017, the PA values of Germany were higher than those of the United Kingdom and the United States in most years. After 2017, the United Kingdom began to surpass Germany and have the highest PA. And China presented a rising profile before 2012, and although the ratio was highest in the period 2009–2013, it was in a downtrend most years after 2012. In particular, it decreased rapidly after 2016, and by 2020 the ratio is already close to that of Japan. In the second group, Japan had consistently the lowest PA values compared to the other four countries. Distant from that of the United States, United Kingdom, Germany in the first group.

After 2015, the PA of the five countries in our study, except China, the remaining four countries, the United States in America, the United Kingdom, Germany in Europe
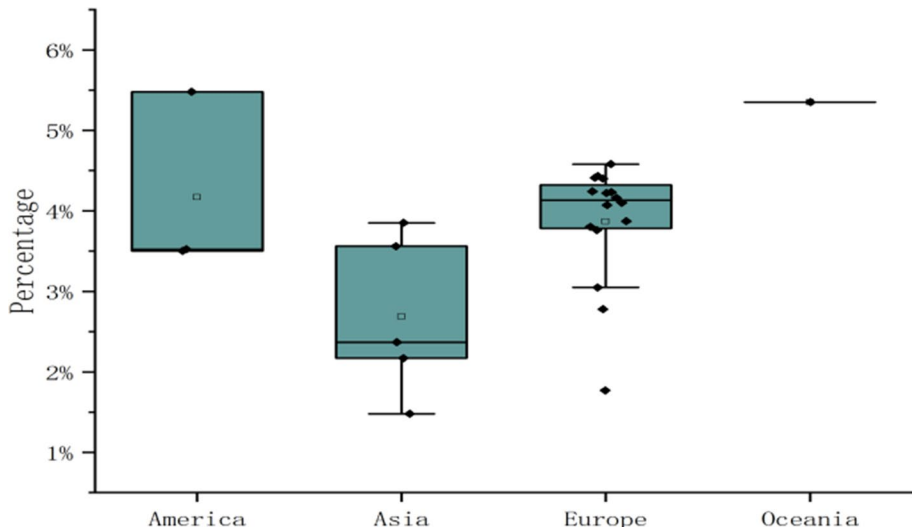
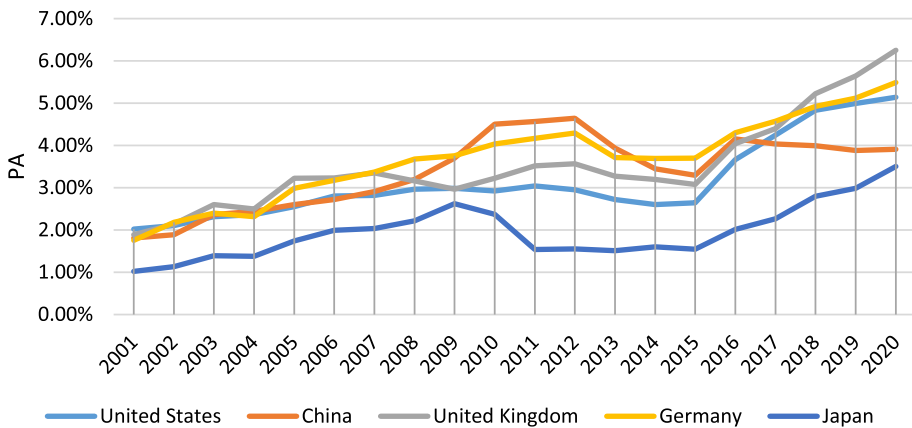**Fig. 2** Distribution of PA in countries across continents

Fig. 3 PA in 5 main countries from 2001 to 2020

and Japan in Asia are increasing year by year. Although Japan, which is located in Asia, is also gradually rising, it has been in the lowest PA position. China in Asia is in a downward trend.

Currently, Germany and the United Kingdom in Europe are slightly higher than the United States in America. China is lower than the European and American countries and tends to Japan, while Japan has improved but is not grouped with the countries in Europe and America. Therefore, the trend analysis further confirms the recognition of contributors in Europe is slightly higher than in America and America than in Asia. Whereas Asia has lower levels of acknowledgments to reviewers relative to European

and American countries. Across continents and countries, there are more marked regional variations in the degree to which reviewer contributions are recognized.

Journal analysis

In the process of writing a journal paper, it will be written according to the requirements of the journal. Meanwhile, the authors will learn from the published papers in the target journal as templates. So, we examined the papers acknowledged reviewers in different journals. It was shocking that we found that a large number of papers acknowledged reviewers was clustered in a few journals. As of 2020, there were 23,452 peer-reviewed journals in the Scopus database. Due to the interdisciplinary nature of scientific papers, after deduplicating, a total of 400,650 papers from 2001 to 2020 were collected. We used 500 as a threshold for the number of papers acknowledged reviewers, and selected 129 journals with papers published in the 20-year period that the number of papers acknowledged reviewers was exceeded the threshold. After measurement, these journals published a total of 120,661 papers containing acknowledgements to reviewers.

These 129 journals account for 30.12% of the total number of papers acknowledged reviewers, while these 129 journals only account for 0.0055% of the total number of journals in the Scopus database. It can be seen that more papers acknowledged reviewers are gathered in a few journals. This is bound that the scientific community has developed a positive atmosphere under a journal atmosphere that acknowledges the contributions made by reviewers of in the scientific community with the journal atmosphere. Table 4 lists the top 20 journals that publish the largest number of papers acknowledged reviewers. These 20 journals have two characteristics, one is that most of them are journals in the Q1 region of the JCI QUARTILE in JCR, and the other is that except for a few journals that are multidisciplinary journals, almost all of these are classified as earth sciences and environmental sciences under the physical sciences.

Factors influencing the authors acknowledged reviewers

In this section, we examined the factors that affect the PPs in different countries. Our study above found that the PPs vary in different regions, and to explore the reasons behind this, we conducted the following studies on the country level.

Proposal of the hypothesis

Whether authors will acknowledge reviewers in their papers stems primarily from two premises, first, that the authors are aware of the reviewers' contribution, and second, the authors' decision-making process when writing acknowledgments. Existing studies suggest that people's decisions and judgments vary considerably when the same event is presented in different language proficiency, such as native language or foreign languages (Keysar et al., 2012). This is because with high language proficiency, the processing of language texts is smoother, which promotes emotional processing in the decision-making process (Chen, 2013; Shin & Kim, 2017).

Therefore, based on the first premise that the authors are aware of the reviewer's contribution, English language proficiency is more likely to affect authors' decision-making when acknowledging reviewers in their papers. During data cleaning, we filtered all papers into English papers. Based on the above research, the following hypotheses are proposed:

Table 4 The number of papers acknowledged reviewers in different journals

Rank	Journal	No. of papers acknowledged reviewers	Rank	Journal Name	No. of papers acknowledged reviewers
1	Science of The Total Environment	3363	11	Geophysical Research Letters	1630
2	Geochimica Et Cosmochimica Acta	3014	12	Oecologia	1614
3	Earth and Planetary Science Letters	2640	13	Journal of Cleaner Production	1562
4	Journal of Hydrology	2634	14	Quaternary International	1525
5	Forest Ecology and Management	2132	15	Chemical Geology	1498
6	Plos One	1981	16	Remote Sensing	1447
7	Remote Sensing of Environment	1938	17	Geomorphology	1397
8	Climate Dynamics	1880	18	Journal of Asian Earth Sciences	1360
9	Scientific Reports	1805	19	Biological Conservation	1327
10	Palaeogeography Palaeoclimatology Palaeoecology	1726	20	Quaternary Science Reviews	1309

Null hypothesis, H0: English proficiency has a positively influence on national authors acknowledging reviewers in their English papers. Alternative hypothesis, H1: English proficiency does not have a statistically significant effect on national authors acknowledging reviewers in their English papers.

The regression model is $Y_i = x_i\beta + \varepsilon_i (i = 1, ..., n)$.

In Eq., Y_i represents PPs in different countries, x_i represents independent and control variables, ε_i represents error terms.

Samples and data

Due to the low overall PP, we selected countries with a total number of papers greater than 10,000 as study samples. The data mainly includes two parts: (1) PPs in each country derived from the calculations in this study. (2) English proficiency using the English Proficiency Index (EPI), which is calculated based on more than 2.1 million test-takers worldwide taking the standardized English test (EF SET).

Variable measurement

The dependent variable is the proportion of papers that acknowledge reviewers in all papers (PP), the independent variable is EF-English Proficiency Index (epi), the control variable is Real GDP per capita (gdp_pc) and the dummy variables are regions (rg), subject areas(sj_a) and time periods(tm_p, from 2001 to 2010 and from 2011 to 2020).

As shown in Table 5, the descriptive and correlation statistics indicate a low correlation between variables. After adding variables to the regression, the maximum value of VIF of 2.28, which is much less than 10, indicating that there is no severe collinearity.

In this paper, the OLS regression model is used for one-dimensional parameter estimation, the Multidimensional fixed-effects model is used for multidimensional parameter estimation (countries-subject areas-time periods). Due to the small PP value, the independent variables are normalized to eliminate the dimension, and then regression analysis is performed. Table 6 reports the regression analysis results after including the independent and control variables. In model 1, only independent variable EPI is considered. Model 2 adds the control variable Real GDP per capita (gdp_pc) of each country. Since the control variable GDP_PC is not significant, a dummy variable for the continent to which each country belongs is added to model 3. Model 4 and 5 gradually add dummy variables subject areas (*sj_a*) and time periods(*tm_p*). Overall, there is a positive correlation between EPI and PPs in various countries, and after adding other control variables, it is still significant at the

Table 5 Descriptive statistics and correlation analysis of variables

	pp	epi	gdp_pc
pp	1		
epi	0.3716	1	
gdp_pc	0.1664	0.5527	1
num	61	61	61
Mean	4.160851	5.617377	2.535103
Std	1.416802	0.7668548	2.279811
VIF		2.28	1.61

0.05 level. Therefore, the null hypothesis that English proficiency positively influences national authors to acknowledge reviewers in their papers was validated. At the same time, the conclusion of the previous study was verified again, PPs in different countries showing significant differences in different subject areas, regions and time periods.

Conclusion

As gatekeepers of science, reviewers of scientific papers play an essential role in academic communication and have contributed in improving the quality of articles. It is natural that the authors thank reviewers for their contributions in the acknowledgments. However, this study found a low number and proportion of papers that acknowledged reviewers from all subject areas, even with just one or two lines of text in the acknowledgments.

From a subject area perspective, the study found that the PP across all subject areas was low. The lowest PP was in Health Sciences, with only 0.29% overall, indicating that the contribution of reviewers are hardly acknowledged. The highest PP was in Social Sciences, but it is still only 1.99%. Analyzing the trend of PP in various subject areas over time, the study found that although the PP has increased in recent years, it remains low overall. In conclusion, the scientific community's recognition and acknowledgement of reviewers' contributions is severely inadequate.

From the perspective of countries and regions, we used PA as an indicator for analysis and found that PA was still relatively low across countries. The highest PA was observed in Canada, with 5.48% of papers containing acknowledgment text to reviewers, while the two countries with the greatest number of published papers, the USA and China, have PA rates of 3.5% and 3.85%, respectively.

We found regional difference in the provision of acknowledgments to reviewers, with European countries having higher PA than American countries, and Asian countries having the lowest.

We also conducted a comparative study of PPs in different journals that papers acknowledged reviewers were clustered in a small number of journals. These journals develop an atmosphere and habit that prompt the scientific community to acknowledge reviewers in their papers. At the same time, we also found that the journals with a large number of

Table 6 Regression analysis results of variables ($N=61$)

variable	Univariate	Add control variable	Add dummy variables		
	m1	m2	m3	m4	m5
epi	0.687*** (0.204)	0.744*** (0.243)	0.577** (0.287)	0.338*** (0.11)	0.219** (0.091)
gdp_pc		-0.035 (0.095)			
rg	NO	NO	YES	YES	YES
sj_a				YES	YES
tm_p					YES
Constant	0.304 (1.157)	0.071 (1.245)	0.481 (1.386)	−0.256 (0.599)	0.407 (0.505)
R-squared	0.1381	0.1403	0.3617	0.389	0.54

**Significance level, $p<0.05$, ***Significance level, $p<0.01$

papers that acknowledged reviewers are mostly in the field of earth sciences and environmental sciences in physical sciences, and their JCI divisions were high.

We also examined factors that affected the PPs in different countries and found that a country's English fluency positively influenced the country's authors to acknowledge reviewers when writing an English paper.

Discussion

The time and expertise that reviewers contribute to peer review is vital to the advancement of science. While some studies have recognized and proven the contributions of reviewers through empirical research, our research found that reviewer's effort and contribution are not fully recognized by the academic community. Authors should acknowledge reviewers in acknowledgments section, as it is one of the essential functions of acknowledgments. However, overall, few researchers express gratitude to reviewers in the acknowledgements, and authors' language fluency may be one important factor.

Authors in different disciplines vary in the degree of acknowledgments given to reviewers, with the Social Sciences currently showing the highest proportion of acknowledgments to reviewers, but the ratio is still small, and Health Sciences barely acknowledge reviewers. The proportion of reviewers acknowledged by authors from different regions also varies, with the proportion in America, Europe and Oceania generally higher than in Asia. To a certain extent, it can also be supposed that the regional cultural differences or education training in different regions have affected researchers' recognition of the contributions of reviewers.

Fortunately, in recent years, researchers have become increasingly aware of reviewers' contributions from both the disciplinary and regional perspectives (most countries). Through this study, we hope to raise the level of acknowledgments to reviewers by making the academic community aware of the lack of recognition for the contribution made by the reviewers. We urge authors to give reviewers the acknowledgment they deserve, and we also suggest that journals play a role in promoting a culture of recognition through appeals to their authors.

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