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Publication performance of women compared to men in German cardiology ☆

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ABSTRACT

Background: Abstract presentations at scientific congresses are a preparation for publication in peer reviewed journals. The present study aimed to investigate the prediction of abstract acceptance of peer reviewed publications focusing on the difference between male and female first authors.
Methods: We evaluated 8411 abstracts submitted to the German Cardiac Society by 2090 females and 6321 male scientists. Abstract grading (3 to 9 reviewers, blinded on a 5-point scale) separated those accepted and rejected followed by a bibliometric analysis of Medline publications from 2006 to 2012.
Results: While rating of abstracts was not different between males and females ($p = 0.475$), publication rate of females was lower compared to males (17.5% vs 24.4 ≥ %, $p < 0.001$). Female authors achieved a higher impact factor in their publications (5.1 ± 0.2 vs 4.4 ± 0.1, $p = 0.0003$) and were more often listed on papers in highly ranked journals (impact factor ≥5) than males. Although, more accepted abstracts than rejected ones were published in high rank journals, a considerable number of papers were generated from rejected abstracts (22%).
Conclusions: Female cardiologists had a better publication success than males concerning high rank peer reviewed publications. Acceptance in blinded abstract evaluation often detects work published later, while rejected contributions still might represent high quality work suitable for publication in peer reviewed journals.

1. Introduction

Scientific conferences provide a forum to present and discuss scientific results, in particular of young investigators, as a preparation for publication in peer review journals [1,2]. The prediction of publication success by the abstract evaluation process is largely unknown. The role of women as scientists in academic medicine is continuously growing [3]. This investigation addressed the question of whether the abstract grading process can accurately predict the success of a work to be accepted as a peer reviewed paper. Furthermore, we explored gender differences in abstract and publication success. We studied the quality of the review process of abstract submission to the yearly conference of the German Cardiac Society to predict publications in peer reviewed journals. A bibliometric analysis of the publication data bases followed to identify resulting publications in scientific journals with high and low impact factors (IF). The success of women and men as authors of accepted and rejected abstracts as well as the related high and low IF journal publications were determined.

2. Methods

We evaluated 8411 abstract submissions to the annual meetings of the German Cardiac Society (Deutsche Gesellschaft für Kardiologie/Herz-Kreislaufforschung, DGK) between 2006 and 2010. Of the 8411 submitted abstracts, we identified 2090 female and 6321 male authors. This is a German speaking congress with participants from Germany, Switzerland, Austria and a very small portion of other nationalities. Abstracts were graded by 3–9 reviewers on a scale from 1 to 5 (best 5, worst 1). This is a nonvalidated scale such as a reverse scale of school scores used in Germany. In total, 5535 abstracts were accepted for presentation at the meetings. This analysis was followed by a bibliometric analysis of the Medline base screening publications from 2006 to 2012. Publications were evaluated according to the IF of the publishing journals in the year of publication and publications graded from data of rejected and accepted abstract were evaluated according to the gender of the first author on the abstract and publication, respectively.

2.1. Statistics

Data are presented as numbers (%) or mean ± standard deviation. Comparisons between groups were performed using the Pearson chi-square test for categorical variables and the Mann–Whitney-*U*-Test for continuous variables. Fig. 1 displays boxplot diagrams with median and 25th/75th percentile (whiskers = 5th and 95th percentile). Statistical analyses were performed with SPSS statistical software (version 21.0, SPSS Inc., Chicago, Illinois).

☆ Previous presentations: Part of the study was presented at the German Cardiac Society meeting April 2013 in Mannheim and at the Autumn Meeting of the German Cardiac Society in Dresden 2013.

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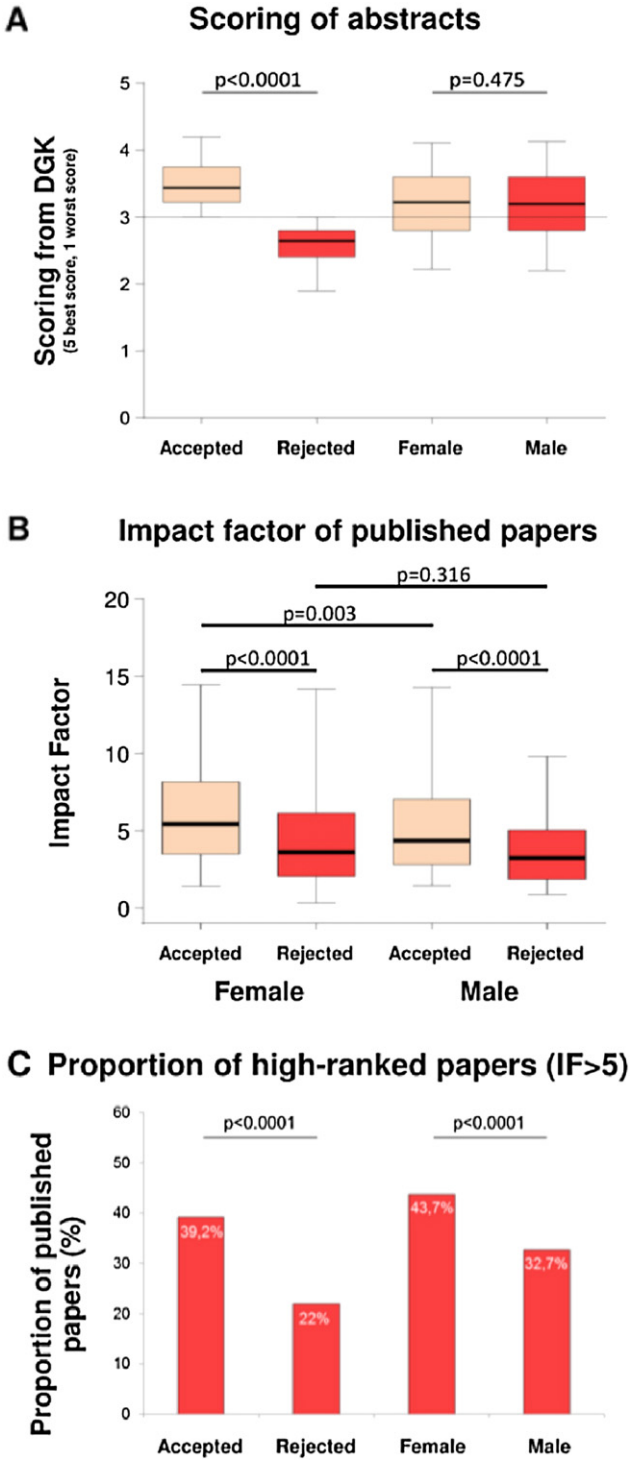

Fig. 1. Scoring of abstracts (A), journal impact factor of published papers (B), and proportion of high-ranked paper (C) according to congress acceptance and gender of first author of the abstracts. DGK: German Cardiac Society. IF: impact factor.

3. Results

Between 2006 and 2010, 8411 abstracts from 2090 female authors and 6321 male authors were published. From 2006 to 2012, 1907 (23%) publications in peer reviewed journals appeared. Gender comparison of the abstracts and the publications are depicted in Table 1. The rating of abstracts was similar between male and female authors ($p = 0.475$, Fig. 1A). Publication rate of female authors was lower compared to male authors (17.5% vs 24.4%, $p < 0.0001$). Acceptance rate of abstracts was similar between males and females (65.9% vs 65.8%, $p = 0.476$). Female authors tend to be younger concerning abstract acceptance (34.2 ± 6.7 vs 37.1 ± 7.3 years, $p < 0.0001$) and paper publication (33.5 ± 6.3 vs 36.1 ± 6.4 years, $p < 0.0001$). The average IF of 1905 abstracts rated for publication was 4.5 ± 0.1. 366 publications of females had a higher IF than 1541 publications of male authors (5.1 ± 4.3 vs 4.36 ± 4.2, $p = 0.003$, Fig. 1B). Interestingly, rejected abstracts led in 22% to impact factor publications (Fig. 1C). Female authors achieved higher IF as male authors in accepted abstracts (5.4 ± 4.2 vs 4.8 ± 4.4, $p = 0.03$). A similar trend was observed in rejected abstracts (3.9 ± 4.5 vs 3.1 ± 3.1, $p = 0.316$). High graded publications were defined as publications in journals with an IF ≥ 5. More accepted than rejected abstracts are published in a highly ranked journal (39.2% vs 22%, $p < 0.0001$). In these higher impact journals, females were more often listed as first authors (43.7% vs 32.7%, $p < 0.0001$, Fig. 1C).

Table 1
Gender comparison of abstracts and published papers.

	Female	Male	p-value
Abstract			
All	2090 (24.8%)	6321 (75.2%)	
Age	34.2 ± 6.7	37.1 ± 7.3	<0.0001
Score	3.19 ± 0.58	3.18 ± 0.6	0.475
Accepted for congress	1377 (24.9%)	4158 (75.1%)	
Age	33.9 ± 6.6	36.8 ± 7.2	<0.0001
Score	3.51 ± 0.38	3.51 ± 0.38	0.683
Rejected from congress	713 (24.8%)	2163 (75.2%)	
Age	34.6 ± 7	37.8 ± 7.5	<0.0001
Score	2.58 ± 0.36	2.54 ± 0.39	0.031
Publications			
All	366 (19.2%)	1541 (80.7%)	
Age	33.5 ± 6.3	36.2 ± 6.4	<0.0001
Score	3.37 ± 0.58	3.28 ± 0.59	0.009
Accepted for congress	285 (20%)	1140 (80%)	
Age	33.4 ± 6.2	35.9 ± 6.2	<0.0001
Score	3.59 ± 0.41	3.54 ± 0.38	0.033
Rejected from congress	81 (21.3%)	401 (78.7%)	
Age	34.3 ± 6.8	36.9 ± 7	<0.0001
Score	2.59 ± 0.43	2.54 ± 0.46	0.455

Values are numbers (%) or mean ± standard deviation.

Interestingly, 78.71% (N = 6935) members of the German Cardiac Society (number of members at that time 8811) were male and 21.29% (N = 1876) were female. Therefore, female individuals are overrepresented as abstract submitters. Furthermore, females as members of the German Cardiac Society tend to be younger (30–35 years, 48.4% females vs 30.1% males). Therefore, as abstract submitters in total females were underrepresented according to the whole group of German cardiologists.

4. Discussion

Our results show that as judged from abstract submission, the success of abstract acceptance was similar between men and women. The resulting publications had a higher quality according to IF of the journals, when the first author was female compared to males. However, the number of female authors on IF rated papers was lower than male authors. Women had been underrepresented as authors of peer review publication in major journals, although this gap is declining over time [3,4]. The role of the higher quality of publications of female vs male is an interesting observation. In clinical medicine, female physicians are more likely to conduct more detailed analysis of patient conditions [5,6] and are more likely to adhere to guideline recommendations of drug treatment in heart failure [7]. Whether these findings of a more thorough elaboration of clinical and scientific tasks in females is a general phenomenon has to remain open. In addition, gender bias with a greater selection of highly motivated individuals going into academic medicine might contribute to these findings. In general, taking into consideration the value of scientific contribution of females, a specific

program to facilitate the goal to improve gender diversity and to improve team building [8] are needed.

Although, abstract readers and reviewers of manuscripts might strive to be objective in their decisions, the knowledge of authors' gender might introduce bias in decision making. In female students judging manuscripts by "John or Joan", manuscripts were given a higher rating when the manuscript was named to be written by "John" compared to "Joan" [9] suggesting that females are biased against female authors. However, the abstract rating was done blinded without giving the name of authors. In the evaluation of scientific publications this might not have been the case, but we did not investigate how many of the journals provided a blinded review process. Previous investigated authors suggested that the number of publications might be lower for female scientific authors, but have overall a higher quality after peer reviewing [10] supporting the observations of this investigation.

5. Limitations

In the present analysis, we could not judge "overlapping" publications and could not distinguish between double publications and slice by slice publications. Furthermore, publications with a long lag time after the presentation at the meeting might not have been captured. We cannot exclude that females submit their work less to low impact journals or do not resubmit papers rejected by high impact journals to low impact journals. These confounders could have contributed to the finding that females had a higher representation in high impact journals.

6. Conclusions

Despite a lower number of publications and a similar acceptance rate at the scientific meeting of the German Cardiac Society, younger female cardiologists have a better success in publications judged by the IF they achieve with their publications. Blinded abstract evaluation often underscores high quality work, which is, despite abstract rejection, published in highly ranked journals. To achieve the goal of scientific high quality presentations at meetings [11,12], training of reviewers [13] or unblinding of reviewers could improve the process [14].

Conflicts of interest

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