Peer-Reviewing and Submission Dynamics Around Top Software-Engineering Venues: A Juniors' Perspective

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ABSTRACT

Academic research, by its nature, is notorious for being a challenging and demanding field. However, these challenges may become more complicated for certain groups of researchers rather than others. For instance, junior researchers who make up a large group of the current scientific community, particularly in the computer science domain, may face various types of impediments. A notable hindrance to realizing the impediments is the difficulty of precisely delineating them. In this paper, we report an empirical investigation to measure the level of awareness of any kind of obstacles that might hinder junior researchers' publishing ability and disturb their involvement. For this purpose, we conducted a survey targeting active researchers from the Software Engineering field with a total of 52 respondents. We mainly focus on two types of aspects: peer reviewing models and collaboration. Our findings indicate that junior researchers seem to be more comfortable with double-blind reviewing models with more than half (approximately 67.2%) of them voting in favor of this model. The results also show a significant agreement that a lack of experience especially in academic writing and supervision problems constitute the most influential barriers to publishing. Our findings can help understand the needs of junior researchers and provide insights into our research community and its specific groups.

CCS CONCEPTS

• **General and reference**; • **Software and its engineering**;

KEYWORDS

juniors, peer review, bias, challenges, collaboration

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1 INTRODUCTION

Academic research is an intrinsically hard career path with many challenges. However, these challenges may increase and become more complicated for certain groups of researchers rather than others, and it is the responsibility of the community to pay closer attention to those groups and provide the needed support. In our research, we study junior researchers, who are of particular importance to the scientific community. Junior (or early career) researchers are defined as those young researchers who have only recently started to work in research; typically, they have up to three years of research experience [13]. Those early career researchers play a vital role in shaping the future of academic research; they have the potential to enhance the working atmosphere of their research teams by broadening their knowledge, perspectives, and incorporating innovative ideas. Moreover, they represent a novelty-enhancing part of their teams [11]. Despite the key role juniors play in the computer science domain generally, and in Software Engineering (SE) specifically, they face multiple impediments. For instance, joint collaborations with more established researchers might increase publication quantity, but can negatively affect the perceived impact, potentially resulting in major problems for juniors, such as doctoral students, whose output relevance may be perceived negligible [25]. Moreover, reviewing models might pose bias problems and mitigate their ability to publish papers [17].

The current understanding of the discrepancy between the general academic challenges and challenges faced by juniors is poor, as most current research ignores the obstacles they face and focuses on their achievements. In this paper, we focus on investigating some concerns within the SE field related to juniors by conducting an empirical study based on a survey resulting in 52 responses from the SE community, including juniors and seniors. The participants answered an online survey in which they, for example, approximated their own experience regarding specific issues that could be challenging to juniors. We set up our study as an exploratory investigation with the goal of discovering the most important aspects to investigate, since enhancing the community perception can bring benefits to the entire scientific community. We first surveyed related literature that led us to form the overarching research question of our study: *What impediments to publishing do junior*

researchers in software engineering face? We refined this question into sub-questions, which we answer by analyzing the survey data.

Our aim is to provide an understanding rather than a solution to the problem. Through the questionnaire, we were able to collect valuable quantitative data and analyze it statistically. Finally, we derived multiple conclusions to answer our research questions. The results show some patterns that are likely to affect the ability of juniors to publish at top SE venues, such as a lack of experience and supervision problems. Moreover, it was agreed on by the majority of our participants that double-blind reviewing is preferred by juniors. Our findings help to triangulate and investigate different aspects and hidden obstacles the group of juniors in the SE community faces, and shed a light on their problems. The results can support many advances in the community, for example, searching for possible obstacles in the development of juniors and their integration processes. In general, we believe that the results reported in this paper are useful for both junior and senior SE researchers.

2 BACKGROUND AND RELATED WORK

In this section, we present background information regarding the two aspects we considered in our survey, collaboration and peer reviewing in academic publishing. In addition, we describe the role of juniors in the scientific community.

2.1 Junior Researchers & Collaboration

Various definitions of junior researchers exist in many academic contexts. In general, a junior (or early career) researcher is defined as a young researcher who has recently started their research career; typically, they have up to three years of research experience [13]. Juniors are the future of science and represent the next generation of experienced scientists. They are the drivers of change and innovative ideas by bringing new perspectives to old problems and finding creative solutions [11]. Additionally, they usually start with high motivation and inspire their working environment.

Nonetheless, juniors may face impediments when starting their career and hardships that hinder their activities and motivation. According to Rørstad and Aksnes [22], a rise and a decline pattern in a researcher's scientific career is age-related, which is most evident in the field of engineering and technology where scientists are apparently at their maximum productivity during their thirties and early forties [1, 2]. There are numerous causes behind this pattern, and it can be analyzed from various perspectives. For instance, developing experience over time is a normal process, but unnecessary and resolvable problems are our primary interest in this paper.

Juniors, in their early stage of career, seek support from more experienced community members in the form of successful collaborative work. Scientific collaboration is indispensable for a scientist's academic life, it impacts a researcher's current and future career. Previous research by Qi et al. [21] demonstrates that collaborating with outstanding scientists can benefit the academic career of young researchers and it has the highest influence on the early stage of young scholars' academic careers. Multiple other studies emphasize the significant importance of collaborating with the supervisor and the role it plays as a driving factor in juniors' publication activity and overall career development [10, 18]. Furthermore, the relationship with academic colleagues influences the professional development of young researchers [9]. Another important study by Tamburri and Casale [25] summarizes a longitudinal study of a large active European research institution in software science research, revealing that the high collaboration is stagnant, which means that collaboration is mainly revolving around previous working relationships. Moreover, collaboration is reflecting very low cognitive distance, meaning that the doors are not always open for juniors to collaborate.

2.2 Peer Reviewing Models

As stated by Peters and Ceci [16], a peer review should be above all fair in every aspect. In the SE community, major conferences recently switched from the widely established single-blind to double-blind review. During single-blind reviewing, the reviewer identities are concealed from the authors, but not vice versa. During double-blind reviewing, neither the authors nor the reviewers are revealed to each other [23]. Research on peer reviewing has rapidly increased to highlight the biases within the process. Reviewer bias is understood as the violation of impartiality in the evaluation of a submission [12]. Multiple influencing factors might cause bias [3, 12]. Related studies indicate, for instance, that authors with higher prestige in terms of affiliation, publication record, or overall visibility have better chances of receiving less critical reviews, more grant funding, and are cited more often [12, 12, 16, 17, 24]. Investigating the Behavioral Ecology Journal, the study performed by Budden et al. [5] shows a significant increase in the acceptance rate of female first-authored publications under double-blind reviewing. Interestingly, two experiments determining the impact of double-blind reviewing on the acceptance rate of junior researchers in SIGMOD have resulted in contradicting conclusions [15, 26]. One interesting survey study by Prechelt et al. [20] indicates that younger respondents prefer to hide their name from reviewers, while older ones do not. Recently, Prechelt et al. [19] surveyed 932 ICSE authors and reviewers from 2014 to 2016 to determine the current and future status of peer reviewing in SE. Their results indicate employing double-blind reviewing as one of the most popular opinions among the respondents, while modest effects are observed in terms of aging and seniority.

Junior researchers without a high reputation may be negatively impacted by reputation biases, and thus could have even more problems of publishing and building their reputation independently. With our study, we aim to understand whether peer reviewing itself poses a hardship to juniors and investigate whether the introduction of double-blind reviewing helps to resolve such problems if they existed in the first place. So, we complement the previous studies with a focus on one important group of researchers and their specific problems.

3 METHODOLOGY

We designed and conducted an exploratory web-based survey, aiming to identify the SE community's awareness of juniors' impediments. Next, we describe the design of the survey.

3.1 Research Questions

We structured our survey around four research questions (RQ):

RQ_1 *What opinions does the community have on the fairness of the reviewing models (double-blind versus single-blind)?*
We investigate this question to understand what problems the SE community sees with respect ot peer reviewing models.

RQ_2 *Is there an impact of the reviewing model on junior researchers?*
Our results provide a first understanding of the fairness of the reviewing models (double-blind and single-blind) based on the community's perceptions.

RQ_3 *How important is collaborating with experienced researchers for juniors?*
We investigate how essential collaboration is for juniors in terms of publishing and succeeding in academia.

RQ_4 *What are the most influential barriers regarding publishing that junior researchers face?*
We list and order potential barriers impeding juniors according to the influence levels assigned by our participants.

Overall, answering these questions helps our research community to analyze, understand, and improve the inclusion and support of junior researchers.

3.2 Survey Design

We created and hosted our survey using SoSci Survey,[1] which is a professional online questionnaire building platform. As an introducing part of the survey, we provided the participants with the study's purpose followed by a consent form explaining data protection aspects that we considered, namely ensuring anonymity to all participants, consequently removing all personal information from the data set, and not linking the answers to identities. This consent ensures the participant's decision whether to get involved in the survey or not. The complete questionnaire was in English and it comprised 27 questions in four groups, mostly closed questions with multiple choice answers, grouped into six pages. Answering the survey took approximately 10 minutes.

Each of our research questions was transformed into several survey questions distributed according to the survey's homogeneous flow. We mostly depended on closed-ended questions, sometimes followed by open-ended questions to provide the opportunity for the participants to describe their opinions clearly. However, closed-ended questions are easier to analyze. Because we were interested in opinions, the majority of questions relied on a Likert scale to measure agreement (items ranged from "strongly disagree" to "strongly agree") or measure personal experience (items ranged from "Never" to "Every time"). All non-free-text questions were mandatory. However, for sensitive questions, we allowed not to answer.

Before sending invitation emails to the target population, three members of our research group reviewed the questionnaire, which resulted in several rounds of refinements, corrections, and improvements. Additionally, the first author checked the analysis process multiple times to ensure the readiness of the survey and kept observing the response rates. At the end of the survey, participants were asked to share their email addresses only in case they wanted to participate in a raffle to win gift cards and multiple book vouchers. However, emails were stored separately and were not linked to the responses. We distributed the survey on September 10th, 2021, and planned to keep it online until October 24th, 2021, with a total of 45 days of administration. However, the data collection actually ended on October 11th, 2021, after we performed several rounds of invitations and did not receive additional responses.

[1] https://www.soscisurvey.de/

Scoping. Our target group of participants were researchers from the SE community, specifically academics with different positions, academic ages, and roles, who are engaged with research activities, such as publishing at major SE venues. For distributing the survey, we used multiple channels in parallel to spread the survey and reach as many participants as possible. We relied on convenience sampling, which is a common strategy in SE [14]. We distributed the survey using the following channels:

- *Manually collected mailing list comprising SE researchers from diverse universities (306 members).* We sent an invitation email with a personalized survey link to each member of this list to prevent multiple responses from the same participant. Invitation emails were followed by two reminders at most.
- *Social network (Twitter).* We distributed a general survey link through the account of the research group at the University of Magdeburg and two authors' personal accounts.
- *Contacts in the personal network.* We personally invited possibly interested researchers we know from collaborations by sending them emails (26 contacts).
- *Forwarding.* We encouraged participants to share the general survey link with their colleagues from the same target group.

By combining these channels, we aimed to achieve a high number of responses, but participants could have answered multiple times.

Survey Questions. We divided our questions into four groups.

Group 1 (Demographics & Research Experience): At the beginning, we asked participants to answer some demographic questions related to their role, years of academic experience, and papers. At the end, we asked about their gender. They could choose their academic level (Q103: Bachelor/Master student, Ph.D. student, Postdoctoral researcher, Assistant Professor, Associate Professor, Full Professor), their years of research experience (Q201: <1 year, 1 to 3 years, >3 to 10 years, >10 years), and their publishing activity reflected by the number of published papers as first author or as co-author (Q202, Q203: 0, 1 to 10, 11 to 25, 26 to 50, 51 to 100, 100+ papers). Furthermore, all participants had to specify whether SE is their main field of research or not (Q204).

Group 2 (Peer Reviewing Models): Moving to the next group of questions, we were concerned with our first research question (RQ_1) for which we defined seven questions about peer reviewing models adopted in most SE venues. Our aim was to provide an introductory to the following questions concerning juniors. In this group, we defined the reviewing models (double-blind, single-blind) to avoid confusions about any term. We started by asking participants about their preferred reviewing model as authors (Q302) and as reviewers (Q308). Furthermore, we started gathering opinions regarding fairness aspects of the available reviewing models and most influential factors in that regard from the participants' perspectives (Q301, Q303, Q304, Q504, Q505). For Q505, we provided a ranking possibility to the participants, allowing them to freely rank fairness aspects according to the severity of their impact on papers' acceptance under single-blind reviewing. We derived the aspects they could rank form the literature: author's fame within the community, author's

Table 1: Gender, research experience, and role of our participants (Q101, Q201, Q202, Q203, Q103).

Question	Answer Options	# Responses	
Gender	Male	30	(57.6%)
Q101	Female	13	(25%)
	Not answered	9	(17.3%)
Years of Experience	<1 year	6	(11.5%)
Q201	1 to 3 years	17	(32.6%)
	>3 to 10 years	19	(36.5%)
	>10 years	10	(19.2%)
# First author	0	3	(5.7%)
Q202	1 to 10	34	(65.3%)
	11 to 25	10	(19.2%)
	26 to 50	5	(9.6%)
	51 to 100	0	(0%)
	100+	0	(0%)
# Co author	0	10	(19.2%)
Q203	1 to 10	29	(55.7%)
	11 to 25	10	(19.2%)
	26 to 50	2	(3.8%)
	51 to 100	1	(1.9%)
	100+	0	(0%)
Academia position	Bachelor/Master	2	(3.8%)
Q103	Ph.D. student	34	(65.3%)
	PostDoc	6	(11.5%)
	Assistant Professor	2	(3.8%)
	Associate Professor	4	(7.6%)
	Full Professor	2	(3.8%)
	Other	2	(3.8%)
Total		52	(100%)

academic age, author's prior publications, paper's quality, author's country and/or affiliation, and acceptance rate of the venue.

Group 3 (Junior Researchers & Reviewing Models): In the third group of questions, we were concerned with our second research question (RQ_2). For this purpose, we aimed to collect participants' opinions on juniors and their dealing with the reviewing models based on personal experiences. This group comprised six Likert scale questions (Q305, Q306, Q307, Q501, Q502, Q503) and one open-ended question (Q506).

Group 4 (Collaboration & Barriers): Finally, we asked questions to answer our third (RQ_3) and fourth (RQ_4) research questions. Our aim was to reveal collaborations' importance and potential barriers that juniors face; and the familiarity of the participants with such obstacles. With six questions, five Likert scale (Q402, Q403, Q404, Q405,Q406) and one free-text (Q408), we ended our survey before moving to the last page that asked for the participant's gender (Q101, not mandatory) and the email address for the raffle.

4 SURVEY RESULTS

In the following, we report the results of our survey structured according to our research questions. For the final results, we used descriptive statistics and Likert plots to analyze the distributions.

As previously mentioned, we used various distribution channels to accomplish this survey. For email invitations with personalized links, we sent 306 emails; however, 17 address entries resulted in an error flag. We sent general invitations to 26 people through personal contacts, and the survey reached an unknown number of people via Twitter. In the end, we received 55 responses in total; 34 via personalized links and 21 responses via all other channels. After retrieving the results, our first step was to clean the data. We removed empty responses; note again that SoSci Survey separates personal information, such as email addresses, from the main results. Out of 55 responses, 52 were not empty, meaning that the three eliminated responses had no answer to any survey question.

Table 2: Research areas of our participants (Q204).

Research Area	# Responses		Other
SE	32	(61.5%)	
SE +	4	(7.6%)	Database
			Psychology
			Security
			Variability management
Other	16	(30.7%)	SLAM CV
			Semantic web
			Semantic data integration
			Machine learning
			IT performance management
			Databases
			Data science
			Data mining
			Data management
			Analytics, SW development
Sum	52	(100%)	

4.1 Demographics & Research Experience

In Table 1, we present the responses to the first group of questions. Out of 52 participants, 43 revealed their gender identity (Q101), indicating 30 males and 13 females. Furthermore, we can see the frequency and percentage of participants according to their years of research experience, which are the results of Q201. In terms of the participants' experiences measured in years, 36.5% of them had 3 to 10 years of experience, while 32.6% had 1 to 3 years experience. Despite the fact that our survey targeted junior researchers, only ≈45% of the 52 participants had up to 3 years of experience. Most of the participants (≈55%) have more than 3 years of experience, and almost one fifth of that sample has more than 10 years of experience. This variety is important to draw an overall picture comprising the perception of the entire community. The majority of the participants has publishing experience, which is reflected by the number of papers they have published (i.e., all but 3 participants have at least one published paper as first author, all but 10 as co-author). Moving to the academic position or role (Q103), the dominant role with 34 responses out of 52 was "Ph.D student" followed by "PostDoc", accounting for 65.3% and 11.5%, respectively. In Table 2, we display the obtained results for Q204 and can clearly see that the majority of the participants are from the SE research field (69.1%). More precisely, 61.5% of our participants reported that it is their main field and 7.6% indicated an additional field together with SE. In the following subsections, we use the survey responses to answer our research questions.

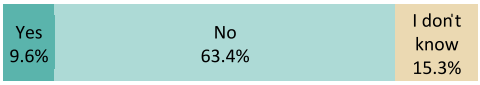

Figure 1: Responses on the reviewing model's impact on submission decision (Q301).

Figure 2: Responses on the preferred reviewing model as an author (Q302).

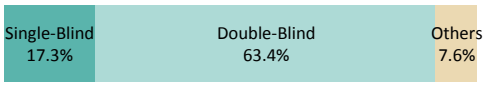

Figure 3: Responses on the preferred reviewing model as a reviewer (Q308).

4.2 Opinions on Reviewing Models (RQ_1)

Regarding our first research question (RQ_1), we aim to explore the community's preferences regarding reviewing models and their awareness level in terms of fairness and bias. We concentrate on two of the most adopted reviewing models in SE conferences and journals. These are double-blind and single-blind reviews. In Figure 1, we present the results for Q301, which was concerned with the influence level the reviewing models have on participants' decision to submit a paper. We can see that the vast majority of participants (63.4%) is not influenced by the reviewing model, meaning that reviewing models do not affect their decision to submit a paper. Only a small number of our participants (9.6%) consider the venue's type of reviewing model as an impact factor to their decision. More precisely, only 8.6% of juniors and 10.3% of seniors say that the reviewing model has an impact on their submission decision; and 39% of juniors did not know or did not provide an answer—which we argue indicates a level of uncertainty among them. No responses comprise 52% of juniors and 72% of seniors, meaning that the reviewing model does not impact the submission decision. However, we checked whether juniors' answers are substantially different from the seniors' using Fisher's exact test for contingency tables. Statistical significance means that the numbers are considerably different. In Table 3, we display the test results with a 95% confidence level ($p < 0.05$). As we can clearly see, the two groups' answers are evenly distributed. In Figure 2, we present the responses to Q302, in which we asked the participants about their preferred reviewing model as authors. This question was followed by a similar one, but this time from the perspective of a reviewer (Q308, cf. Figure 3). Interestingly, in both cases, responses were almost identical with votes for double-blind reaching 67.3% and 63.4% for the author and reviewer, respectively. This indicates a good level of awareness in the community of the benefits of double-blind reviews in general. Note that 6 participants did not answer the questions related to Figure 1, Figure 2, and Figure 3, which is why the percentages only represent 46 responses.

We used several Likert scale questions to gather more details on participants' opinions on peer reviewing models in general. First, in Q303 and Q304 (cf. Figure 4), we asked our participants about their impression of whether one or more of their papers got accepted or rejected because of the reviewing model—namely single-blind reviewing, which reveals the identities of the authors. "Never" and "Hardly ever" were the most popular votes. However, when it comes to paper acceptance, the majority (40.3%) voted "Never," indicating that the revealed identities had nothing to do with their papers getting accepted. A quite decent number of participants expressed that they "Sometimes" got the impression that revealing identities did impact their papers getting accepted or rejected (19.2% and 23%, respectively). Furthermore, we can see that for more than a quarter of our participants (26.8%), question Q303 was not relevant, since they chose "Not applicable" or decided not to answer. It is positive to see that no participant voted for the option "Every Time" for either question. To shed light into the aforementioned results, we asked our participants about their level of agreement regarding reaching highly ranked SE venues, and whether that depends on the paper's quality only (Q504, cf. Figure 5). The responses were extremely similar for both juniors and seniors—indicating that there is a division in the community. Roughly 29% agreed or strongly agreed with the notion that only a paper's quality is relevant, while almost 27% disagreed or strongly disagreed, and 40% of our participants remained neutral. To emphasize the opinions regarding bias issues related to single-blind reviewing, we considered the ranking question (Q505), which gave freedom to the participants to order influencing factors according to their severity.

Table 3: Fisher's exact test results regarding the reviewing model's impact (Q301) with a 95% confidence level. Note that six participants did not answer this question, and eight selected "I don't know."

	Junior	Senior	Total
Yes	2	3	5
No	12	21	33
	15	24	38
	p = 1	differences not significant	

In Table 4, the numbers (1 to 6) are indicators for the ranks at which the participants positioned the factors. The results indicate that more than half of the participants agree that "Paper's quality" is the most important factor that influences the reviewers when making their decision. This factor is followed by the authors' fame in the community, which was ranked as the second most influential factor at the first position with 23% of all votes—and is highly ranked among all the first three positions (i.e., 19.2% for second and third). A venue's acceptance rate received 34.6% of the votes as the second most influential factor. The third rank has been assigned primarily to the author's previous publications (34.6%), and thus experience to some extent. Furthermore, 30.7% of our participants voted directly

Table 4: Single-blind reviewers' influence factors ranked according to our participants' opinions (Q505).

Factor	1(%)	2(%)	3(%)	4(%)	5(%)	6(%)
Author's fame in community	23	19.2	19.2	13.4	5.7	**7.6**
Author's academic age	3.8	23	30.7	**30.7**	–	–
Author's prior publications	1.9	15.3	**34.6**	23	11.5	1.9
Paper's quality	**51.9**	17.3	7.6	7.6	1.9	1.9
Author's country/affiliation	1.9	5.7	7.6	**30.7**	**42.3**	–
Acceptance rate of the venue	11.5	**34.6**	17.3	13.4	7.6	3.8

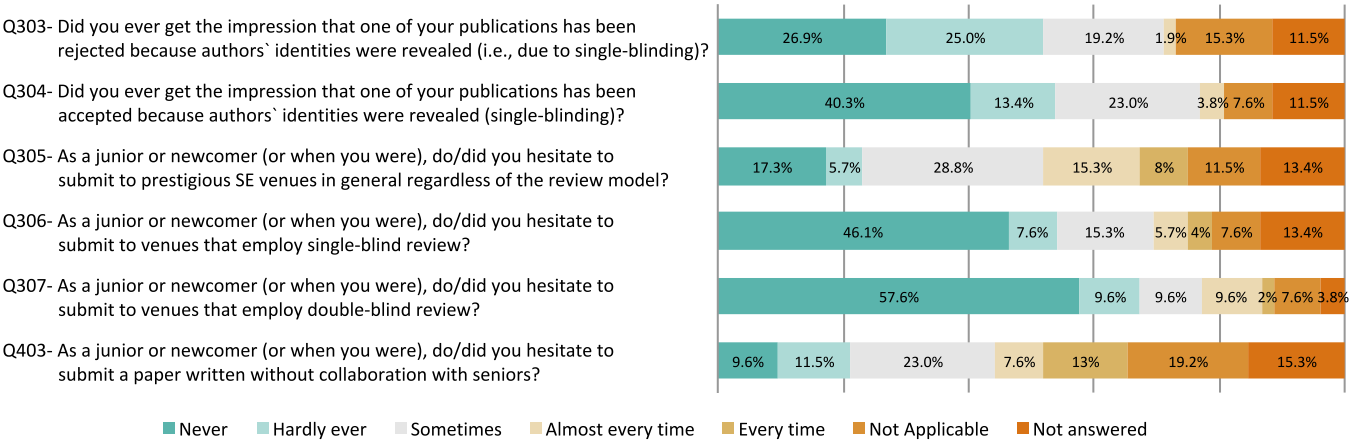

Figure 4: Likert scale questions and our participants' answers on the impact of peer reviewing models (Q303–Q307, Q403).

for the author's academic age at the fourth position, which hints in the same direction. The country and/or affiliation is ranked by 30.7% and 42.4% of the participants as the fourth and fifth primary factor, respectively. Surprisingly, although an author's fame in the community was ranked as the second most influential factor at the first position after papers quality, 7.6% of our participants stated that it has the least influence on reviewers' decisions. In addition to the previous questions, we also resolved free-text answers into consistent values. With Q506, we asked the participants to add additional concerns regarding reviewing models. We received six responses in total, the first one pointing out the hardship of using double-blind reviewing when publishing follow-up work, as it can be hard to anonymize. Therefore, it may be easier to use single-blind reviewing. Another participant mentioned an important problem reviewers may face and which could cause paper rejections, namely time limitations that may prevent the reviewer from obtaining a deep understanding of a paper, and thus cause its rejection. Interestingly, some responses defended single-blind reviewing by stating that bias is a psychological issue and it is normal to all humans, and any reviewer will be influenced by the author's past experience or affiliation. An experienced reviewer indicates that they tend to reveal their name while reviewing, because attaching a name to a review would make it more professional and it never caused any trouble. Finally, one participant commented that it is hard to say whether a paper was rejected/accepted unfairly, since only the authors themselves can judge whether a reviewer's arguments are appropriate.

Summary RQ_1: Reviewing Models

- *Reviewing models do not affect submission decisions of a majority of our participants (seniors and juniors).*
- *A majority of our participants favors double-blind reviewing from both a reviewer's and an author's perspective.*
- *Reviewing models are not perceived as being primarily accountable for papers getting accepted or rejected.*
- *There is a noticeable division regarding whether reaching prestigious SE venues depends on a paper's quality only.*
- *A paper's quality is perceived as the most influential factor for getting a paper accepted, followed by the authors' fame.*

4.3 Junior Researchers & Reviewing (RQ_2)

To answer our second research question (RQ_2), we used a list of different types of questions. Starting with three Likert scale questions (Q305, Q306, Q307) that we display in Figure 4, we asked the participants (as juniors or newcomers or when they were) whether they hesitated to submit to a prestigious SE venue regardless of the adopted reviewing model. Most of the participants (28.8%) said that they "Sometimes" did hesitate. Also, 16.1% stated they hesitated "Every time" or "Almost every time". A quite high number (23%) indicated a high level of motivation by voting "Never" or "Hardly ever." To get a closer look, we repeated the question and specified the reviewing model by distinguishing between single and double blind. Apparently, juniors are more comfortable with double-blind reviewing, with more than half (57.6% + 9.6%) voting in its favor. Moving to the next set of questions (Q501, Q502, Q503), which we show in Figure 5, we captured the level of agreement among our participants on different statements concerning juniors and reviewing models. More than half of our participants responded that single-blind reviewing favors senior researchers—indicating bias, fairness issues, and a lack of trust that should be further investigated. Just under 10% disagreed. Furthermore, for Q502 almost 70% of our participants agreed or strongly agreed that the type of review model can negatively impact the chances of juniors or newcomers of getting papers accepted, emphasizing the previous result. Particularly for Q503, more than half of our participants responded that the chances are not equal for juniors and seniors to get their papers accepted; regardless of the review model. This indicates that other aspects also play a role in juniors' papers acceptance rates, which we discuss in our next research questions.

Summary RQ_2: Review Fairness and Junior Researchers

- *Juniors sometimes hesitate to submit to prestigious venues.*
- *Juniors are more comfortable with double-blind reviewing.*
- *Single-blind reviewing favors more senior researchers in the opinion of more than half of our participants.*
- *Papers accepted chances are not equal for juniors and seniors.*

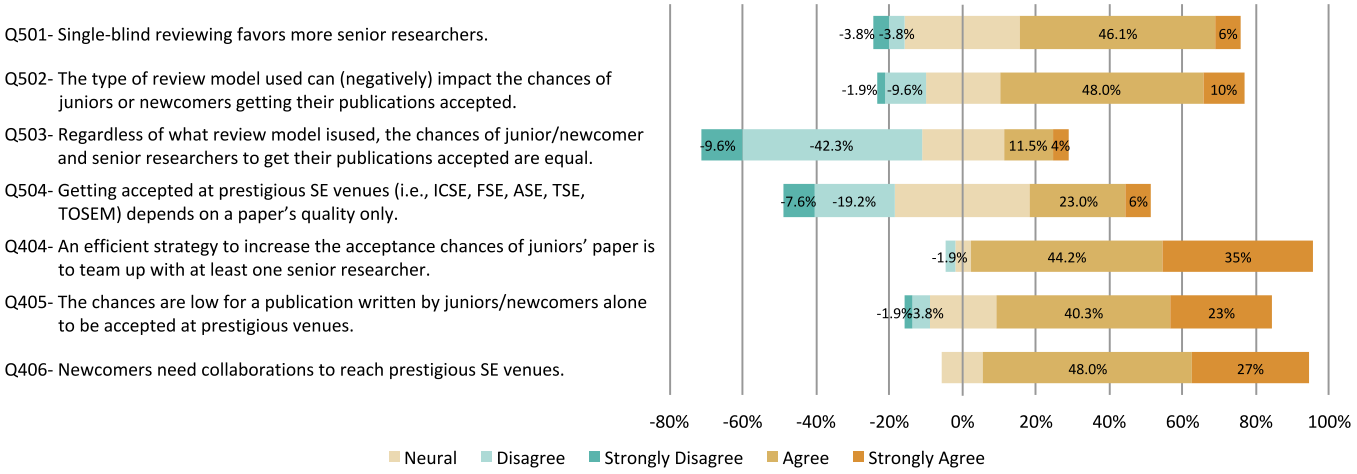

Figure 5: Likert scale questions and the answers on factors impacting junior researchers (Q501–Q504, Q404–Q406).

4.4 Junior Researchers & Collaboration (RQ_3)

To answer our third research question (RQ_3) regarding juniors and collaborations, we asked our participants how important they perceive collaborations with more senior researchers for juniors to be successful. We can see in Figure 4 (Q403) that just under 10% of our participants responded that they never hesitated to submit a paper that they wrote without collaborating with senior researchers. Moreover, just under a quarter (23%) responded that they "Sometimes" hesitated. We can see in Figure 5 that more than three quarters of our participants (79.2%) agreed or strongly agreed that an efficient strategy to increase acceptance chances for juniors' papers is to collaborate with at least one senior (Q404). The same applies for juniors to reach prestigious SE venues, with 75% of our participants (strongly) agreeing to Q406. Also, most of our participants (strongly) agree that juniors or newcomers alone have low chances of reaching prestigious venues (Q405). This reflects the strong opinion the community has with respect to the importance of collaboration for juniors.

Summary RQ_3: Juniors and Collaboration

- *There is strong agreement among our participants about the importance of collaboration and teaming up with seniors.*
- *Our participants agree that collaboration raises the chances of juniors' papers getting accepted and improving their experience.*

4.5 Junior Researchers & Barriers (RQ_4)

Next, we summarize barriers that juniors might face in publishing in the SE community based on the responses of our participants to Q402. In Figure 6, we display the results we use to answer our fourth research question (RQ_4). We asked our participants to select the choice that reflects their opinion about each possible influential barrier to juniors. The results in Figure 6 indicate that most of our participants either think that a "Lack of experience" has a strong (67.3%) or at least some (9.6%) influence. Furthermore, according to our participants academic writing problems represent the second most influential barrier (59.6% + 17.3%). More than half of the participants state that "Supervision problems" (50% + 28.8% followed by "Uncollaborative work group" (46.1% + 19.2%), "Lack of collaboration" (44.2% + 28.8%), and "Unmotivated research group" (36.5% + 26.9%) represent the strongest barriers to juniors' ability to publish their research. Considering social barriers (nationality, gender, political directions), we can see that most participants agree that these have the least influence. Regarding "Reviewing models (double/single-blind)," 17.3% of our participants think they have a strong influence and 38.4% say they have some influence. These opinions align with our other findings during the survey and the results of other studies we discussed in Section 2.

We used a final open-ended question (Q408) to gather additional opinions regarding obstacles that juniors in the SE field face. In total, we received five answers. Interestingly, the answers revolved around two factors that the participants considered of high importance: supervision and collaboration with the research group. They emphasize the role a supervisor plays in motivating juniors and pushing them towards reputable venues. One participant indicates that a supervisor can impede juniors from submitting to high ranked venues, since the supervisor might rather promote quick publishing instead of being revoked several times. On the second factor, teaming up and collaborating with seniors is essential to rely on their expertise, and not only their fame in a community. One participant stated that collaboration itself can be challenging if the junior cannot figure out their right "circle" and they might end up outside of it. A "circle," as the participant defines it, is a group of researchers who share the same opinions and views. A last answer suggests that the current reviewing models at SE conferences could leave juniors demoralized, and it would be of great benefit to juniors if the conferences would switch to journal-like reviewing with opportunities for the authors to respond to reviewers.

Summary RQ_4: Barriers Junior Researchers Face

- *Our participants agree that a lack of experience and academic writing pose the strongest barriers for junior researchers.*
- *They further agree that supervision and work group problems pose the next most strongest barriers.*

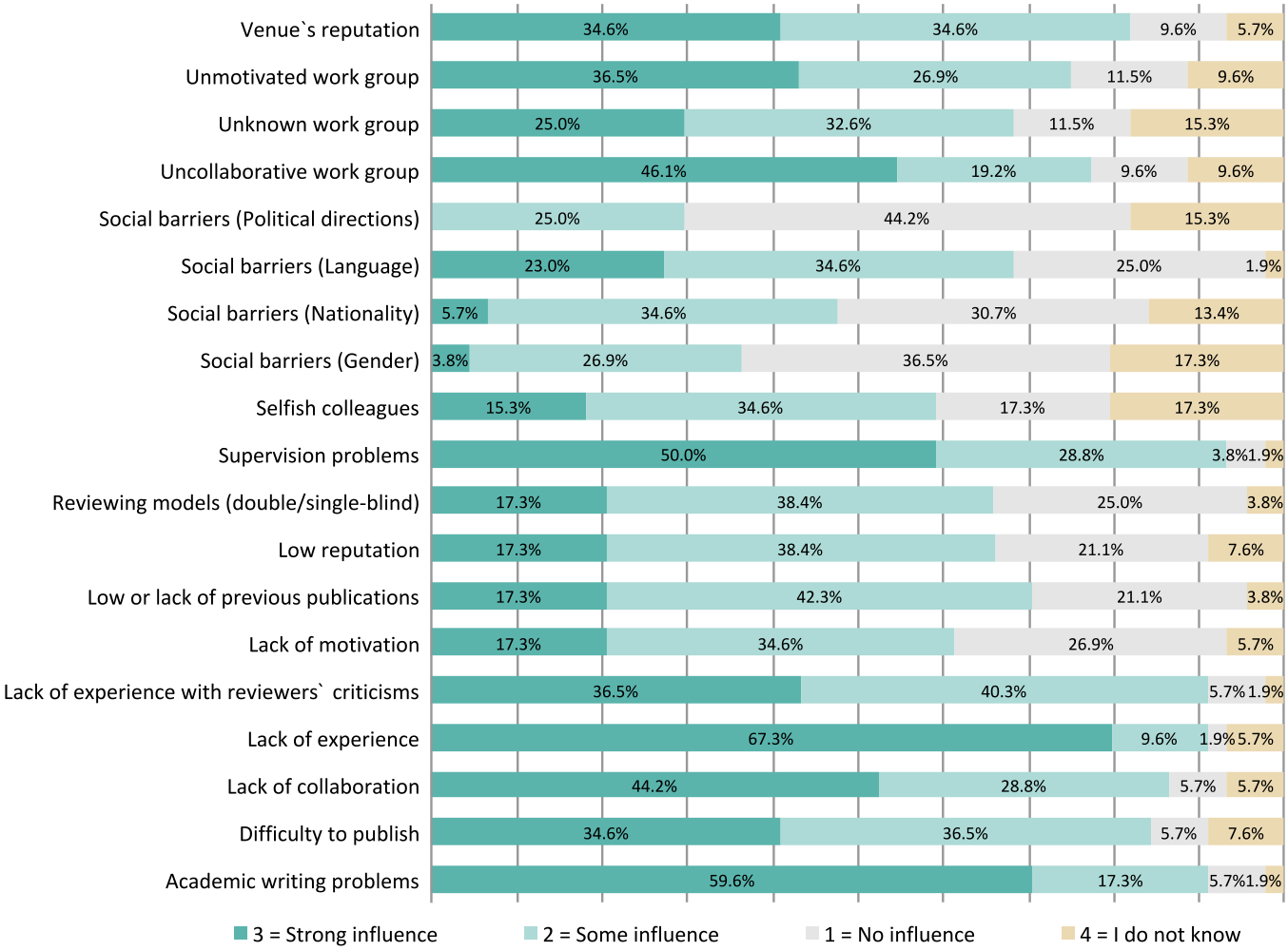

Figure 6: Our participants' answers to Q402: How influential are these barriers to the publishing ability of juniors?

5 DISCUSSION

Next, we summarize our findings and discuss their implications based on our research questions. Within our survey, we primarily aimed to shed light on publishing barriers of a certain group of researchers (juniors) in the computer science community, specifically SE. Still, we remark that we elicited opinions only, but the high level of agreement between our participants indicates awareness that such barriers actually exist. Notably, a homogeneous distribution of our participants is noticeable even though we involved seniors and juniors. Namely, "PhD Students" comprise the largest group, which might result in a more negative perspective. However, we consider this a strong point of our survey, since we are able to collect juniors' barriers from themselves (i.e., personal experiences). A next step would be to use our findings to define implications for theory, practice, and strategic guidelines to better support juniors and concretely measure the barriers identified.

5.1 RQ_1 & RQ_2: Juniors & Peer Reviewing

Despite how comprehensive reviewing usually is at computer science venues, based on the responses we collected, we believe that there are indications of biases in reviewing (e.g., authors' reputation). Moreover, we argue that imposing double-blind reviewing can help mitigate such biases. More than 60% of our participants stated that they would favor double-blind reviewing over single-blind reviewing as authors and as reviewers. Despite this indication, a similar proportion of our participants stated that a venue's reviewing model does not affect their submission decision. When we analyzed the details, we found that the percentages of seniors who confirm this perception is basically identical to juniors.

Our results also indicate a confounding division in the community around a paper's quality and whether it is the main factor to get a paper accepted at prestigious venues or not. Bacchelli and Beller [3] have listed 17 features of authors that have the potential to influence a reviewer's judgment. These include an author's fame, affiliation, and others. Unfortunately, implicit biases in evaluations result from automatic and subconscious processes that are not usually blocked by the conscious mind [4, 6]. Our results align with these studies, seeing that 26.8% of our participants believe that revealing the authors' information in single-blind might have helped in their papers getting accepted, while another 20.1% state

this might have had an influence on their papers getting rejected. To emphasize, we found that most of our participants agree that single-blind favors seniors and has a negative affect on juniors. Nevertheless, juniors show no hesitation to target any venue regardless of the reviewing model adopted—but the majority of either group prefers double-blinding.

5.2 RQ_3: Juniors & Collaboration

While collaboration is an essential requirement for juniors to improve and learn, the circumstances of the work group as well as supervision pose certain barriers that can be difficult to overcome. Supervisors play an important role in helping juniors and preparing them for their next opportunity from the moment they start their position [27]. It is more than mentoring students; a supervisor is ideally a role model and mentor for young researchers. Supervision is a necessary support activity, and should be transparent as well as realistic in providing feedback regarding all prospects. In addition to their guidance, supervisors should be able to provide social and psychological support during emotionally difficult periods [7]. Missing sufficient support from such roles can negatively impact juniors' development. Our results are consistent with such arguments. The majority of our participants stated that teaming up with seniors and receiving support through collaborating in a motivated work group raise the chances of reaching reputable venues. They also believe that the chances for juniors' papers getting accepted are mostly low without collaborations with seniors.

5.3 RQ_4: Juniors' Barriers

Although we tried to shape the list of barriers that juniors in the SE field perceive as particularly problematic, we are aware that far more factors exist. Thus, our list of barriers can only provide an impression of what juniors are confronted with in our community. Our results strongly emphasize on two groups of obstacles—the other results vary drastically. The first group represents a junior's lack of experience on different levels (academic writing, general experience, experience in dealing with reviewers). The second group represents a lack of supervision and collaboration. Arguably, both have a strong relationship, they simply depend on each other: To gain more experience, a junior should team up with more established researchers and surround themself with a collaborative work group. The ability of academic writing is an important factor that can be improved through collaboration and reading high quality papers relevant to one's chosen research area [8]. Our participants perceive an author's reputation, reviewing models, and, social barriers as less important than those two groups of barriers. While our findings are highly valuable, we are still aware of various factors that can strongly effect juniors and their productivity, and that we did not investigate in our survey, such as a lack of financial support that could potentially impact working conditions or future training opportunities, short-term or insecure contracts, and limited social security benefits.

Essentially, the findings we obtained through our survey support the following key observations:

- There is a lack of communication between researchers, specifically between juniors and seniors to communicate knowledge and opportunities for collaboration—leading to the found barriers. An actionable insight would be opening communication channels explicitly and promote collaboration.
- Our participants have unanimously agreed that double blinding should be adopted instead of single-blind reviewing.

To increase the validity of our results, we recommend further research with a broader sample and more fine-grained questions to investigate the importance of additional factors in greater detail.

6 THREATS TO VALIDITY

Our survey and conclusions face several threats to validity, which we discuss in this section.

Construct Validity. The terms we used might have caused misunderstandings. Moreover, our questions might have been ambiguous to some participants despite the steps that we took to ensure their comprehensibility. Besides multiple validations of the survey and using well-known terms, we mitigated this threat by adding the terms' definitions in our survey where needed.

External Validity. The external validity relates to the generalizability of the results of our survey [28], which is threatened primarily because of the limited number of participants. Yet, we argue that the protocol we followed to reach participants was rigorously constructed and it can be extended to a broad range of contexts. We also have to mention again that while the results are representative of junior researchers, only 45% of our participants were actual juniors. However, when comparing answers of seniors and juniors in the first group of questions, we found that the two groups' answers were distributed basically identically; and we asked most questions questions so that our participants should reflect on their experiences as juniors. Consequently, we argue that our results reflect the perceptions of our participants from the juniors' perspectives. Additionally, social, psychological, or cultural factors might have influenced the results. Since we could not control such factors, based on the answers to our questions, we assume that the academic levels, motivations, and concerns are relatively harmonious among our participants and should be representative for SE research.

Internal Validity. While we carefully built and revised our questionnaire, there is a chance that some ideas were not covered in the questions and that some questions did not reflect specifically what we wanted to assess. As a mitigation strategy to make sure that our survey is valid, we revised the questionnaire multiple times with the help of several researchers. Also, to ensure transparency and replicability of our analysis, we publish all survey questions and anonymized raw data as a spreadsheet that can be downloaded from an open access repository.[2]

Conclusion Validity. A threat to the conclusion validity are potentially different interpretations of our results. Precisely, while we derived our conclusions based on quantitative measures and descriptive statistics of the elicited data, the results could be interpreted differently by other researchers depending on their research perspectives and goals. To minimize researcher bias, we discussed the survey among several authors, who performed multiple rounds of improvements and verified the results. Moreover, we provide our data to others to investigate, check, and potentially derive additional findings or discover different results that enrich our analysis. Still, most empirical studies are subject to this threat, and finding new results from its data is not an actual threat to our survey.

Nonetheless, we believe that our surveys can be adopted and improved in future studies. For this purpose, we provide access to an anonymous version of our artifacts.[2] Yet, we argue that our results offer reliable initial insights on a significant emerging research area with high relevance.

7 CONCLUSION

In this paper, we reported an empirical analysis concerning the barriers junior researchers face when publishing in the SE community. For this purpose, we conducted a survey study with 52 researchers to gather opinions and ideas concerning juniors and their impediments. With our study, we explored the awareness in the community regarding existing barriers, and shed light on a number of factors. Primarily, such factors relate to peer reviewing models and collaboration. Our results revealed that there is an agreement among our participants that the chances of getting their papers accepted are not equal for juniors and seniors. Most importantly, our results highlight that juniors prefer double-blind reviewing and almost all participants believe that teaming up with a collaborative work group including at least one senior raises the chances of juniors' papers getting accepted. When it comes to barriers, it is apparent that juniors' lack of experience in academic writing and dealing with reviewers' critique as well as supervision and work group problems represent barriers.

Inspired by the need for studies on junior researchers' impediments in SE, our study presents a first step in accomplishing a comprehensive analysis. We hope that this paper encourages further discussions in the SE community towards additional studies and formal characterizations of challenges certain groups of researchers face. Our future work includes empirically investigating the discussed factors in more detail using semi-structured interviews, focus groups, and specific case studies to gain deeper insights into juniors' impediments in the SE community. Eventually, we aim to set up guidelines on how to improve the inclusion of juniors into the SE research community.

DATA AVAILABILITY

We share our questionnaire and anonymized raw data in a publicly available repository.[2]

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