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Original Article

Science communication in regenerative medicine: Implications for the role of academic society and science policy

Ryuma Shineha [a,*], Yusuke Inoue [b], Tsunakuni Ikka [c,1], Atsuo Kishimoto [d], Yoshimi Yashiro [e,**]

[a] Seijo University, Seijo 6-1-20, Setagaya-ku, Tokyo 157-8511, Japan
[b] University of Tokyo, 4-6-1, Shirokanedai, Minato-ku, Tokyo 108-0071, Japan
[c] National Center of Neurology and Psychiatry, 4-2-2, Ogawa-Higashi, Kodaira, Tokyo 187-8551, Japan
[d] Osaka University, Yamadaoka 1-1, Suita, Osaka 565-0871, Japan
[e] Kyoto University, Shogoin Kawaharacho 53, Sakyo-ku, Kyoto 606-8507, Japan

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ABSTRACT

It is essential to understand the hurdles, motivation, and other issues affecting scientists' active participation in science communication to bridge the gap between science and society. This study analyzed 1115 responses of Japanese scientists regarding their attitudes toward science communication through a questionnaire focusing on the field of stem cell and regenerative medicine. As a result, we found that scientists face systemic issues such as lack of funding, time, opportunities, and evaluation systems for science communication. At the same time, there is a disparity of attitudes toward media discourse between scientists and the public.
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1. Introduction

The active participation of scientists in science communication with the public has become increasingly important. Various efforts to facilitate this communication have been attempted [1,2]. In Japanese scientific policy, *The Second Science and Technology Basic Plan* pointed out the importance of scientists' outreach activities to society [3]. In addition, *The Third Science and Technology Basic Plan* emphasized the need for mutual communication between scientists and the public [4]. According to this trend, activities concerning science communication such as science café, open laboratories, and variety of information disclosure through SNS has been increased after the 2000 [5,6]. This trend has been continued. Particularly in *The Fourth Science and Technology Basic Plan* emphasized the importance of risk communication, considering the various effect of The 2011 off the Pacific coast of Tohoku Earthquake (3.11) [7]. *The Fifth Science and Technology Basic Plan* emphasized mutual communication between scientists and the public with the key word of "communication for co-creation" [8].

In a more current context, discussion regarding communication between scientists and society has progressed with the concept of "Responsible Research and Innovation (RRI)," particularly in the EU community, since 2011 [9,10]. Now, RRI has become the central concept of the "science with/for society" program of Horizon 2020 [11], which comprises the basic framework of EU scientific policy [12], and "Anticipation," "Reflexivity," "Inclusion," and "Responsiveness" have been regarded as basic ideas thereof [13,14]. Thus, RRI was expressed as a "responsible innovation means taking care of the future through collective stewardship of science and innovation in the present" [14]. With this idea, Horizon 2020 claimed that the RRI policy will [11]:

- engage society more broadly in its research and innovation activities,

Abbreviations: iPS, induced pluripotent stem; RM, regenerative medicine; RRI, Responsible Research and Innovation; SCR, stem cell science.

* Corresponding author. Fax: +81 3 3482 7740.
** Corresponding author. Fax: +81 75 366 7195.
E-mail addresses: r_shineha@seijo.ac.jp (R. Shineha), yinoue-kyt@umin.ac.jp (Y. Inoue), ikka@ncnp.go.jp (T. Ikka), kishimoto@ids.osaka-u.ac.jp (A. Kishimoto), yashiro.yoshimi@cira.kyoto-u.ac.jp (Y. Yashiro).

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[1] Present address: National Cancer Center Japan, 5-1-1, Tsukiji, Chuo-ku, Tokyo, 104-0045, Japan

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- increase access to scientific results,
- ensure gender equality in both the research process and research content,
- consider the ethical dimension, and
- promote formal and informal science education.

To achieve RRI and effective communication between scientists and the society, the opinions and attitudes among scientists toward science communication are a key factor. Although the questionnaire survey of the Wellcome Trust [15] and the Royal Society [16] found that over 80% of respondents have positive attitudes toward science communication, they also pointed out that scientists have issues such as lack of time and reputation of peers that hinder this communication. And then, such kind of trials to understand scientists' attitudes toward science communication has been conducted continuously [17]. In addition, Poliakoff and Webb [18] discussed that factors such as past experiences, motivation, understanding and support from colleagues, and necessary communication skills affect scientists' active participation in science communication.

In Japan, there have been several large-scale investigations of scientists' attitudes toward science communication. Shineha et al. [19] and Japan Science and Technology Agency [20] reported the following hurdles to scientists' participation: lack of time, opportunities, and appropriate setting for communication, understanding and support from colleagues, and an evaluation system for communication. In addition, Shineha et al. [19] found three types of attitudes by a multiple correspondence analysis: “active participants,” “communication as a business operation,” and “avoidance of communication.”

More recently, *The Fourth and Fifth Science and Technology Basic Plan* emphasized the importance of communication and discussion of ethical, legal, and social issues (ELSIs) for emerging science and technology, such as stem cell researches (SCR), regenerative medicine (RM), artificial intelligence (AI), and so on [7,8]. In brief, current Japanese science policy shows interest in promoting communication concerning emerging and advanced science and technology with rapid progress. However, emerging science and technology are a difficult theme for scientists because the range of ELSIs changes rapidly because of the rapid and continuous progress in those fields. Thus, to achieve effective communication of emerging science and technology between scientists and society, understanding the hurdles and motivation that affect the communication of scientists is essential.

In consideration of future science communication involving emerging science and technology, we focused on SCR and RM in this research. After the development of human embryo stem cells (hES cells) in 1998 [21], various ELSIs related to SCR and RM have been discussed: the ethical issues of embryo destruction, informed consent regarding the privacy and intellectual property rights of donors, power and nationalism, and so on [22–29]. Because of the growing concerns of the standardization of safety evaluation and stem cell tourism, the International Society for Stem Cell Research has actively published guidelines and statements regarding these issues [30–33].

In the Japanese context, the establishment of human induced pluripotent stem cells (iPS cells) by the research group at Kyoto University [34] triggered new discussion and social interest in SCR and RM [35]. Considering this situation, science communication and discussions on ELSIs concerning SCR and RM were needed in Japan. Thus, the Japanese Society for Regenerative Medicine (JSRM) began communication efforts with funding from the “risk communication model project” by the Ministry of Education, Culture, Sports, Science and Technology (MEXT). However, the thoughts of scientists as a concerned party regarding science communication of SCR and RM have not been examined.

The establishment of human iPS cells and the awarding of the Nobel Prize to Prof. Shinya Yamanaka for his research group's work on iPS cells resulted in the circulation of a huge amount of news articles on iPS cells and RM [36]. Although the public use media news as a major and credible information source [37], previous studies indicate a gap of opinion regarding the media's effect and discourses on emergent technology between scientists and the public [38]. When we look at previous studies in international context, Kamenova and Caulfield pointed out the optimistic tone of media discourses concerning SCR and RM [39]. Considering this situation, Caulfield et al. alerted to risk of “stem cell hype.” [40] Thus, when we consider science communication between scientists and the public, scientists' thoughts about the relationship between scientists, media, and the public should be examined.

Therefore, we conducted a questionnaire survey to fill the lack of basic information of attitudes of scientific community toward science communication to promote communication in the field of SCR and RM. We set two key aims of this research:

1. To identify the challenges faced by scientific community regarding participation in communication
2. To examine the differences in attitudes between scientific community and the public toward media discourse concerning SCR and RM

2. Materials and methods

From October 2015 to March 2016, we circulated a survey questionnaire among a sample of members of the public and scientists at the Japanese Society of Regenerative Medicine (JSRM). JSRM members are composed of stem cell and biomaterial scientists, medical doctors, journalists, and others interested in SCR and RM. We collected 1115 valid responses (the total membership of JSRM was 5047 in 2015), representing a valid response rate of 22.1%. In this study, we analyzed JSRM members' responses as example of scientific community to science communication. In addition, for the comparison of ideas related to the media effect on the public, we also collected public responses through a research and monitoring company (The Japan Research Center). The survey population (5500 people) was selected from respondent candidates in home-visit surveys at 200 locations throughout Japan, of which 2160 (39.3%) responded.

During design of the questionnaire, we set three main themes: attitude toward communication (hurdles, motivation, and measures to encourage communication), opinions about counterparts of communication, and opinions about the influence of the media on the public regarding discussion of SCR and RM (see Table 1). While developing the list of questions, we also referred to questions from previous studies [16,19,20,38].

3. Results

3.1. Status of JSRM members and their attitudes toward science communication in the SCR and RM field

Here, we show the breakdown of respondent demography. Of all respondents, 77.0% were male and 23.0% were female. Concerning age, 30s were 26.4%, 40s were 26.5%, 50s were 25.7%, over 60s were 8.9% (see Table 2). As the supplemental information, age composition of all JSRM members in 2017 (latest data) was that 30s were 30.4%, 40s were 28.57%, 50s were 21.3%, over 60s were 11.0%. On the other hand, the number of respondents from the general public was 2160. Among them, 44.8% were male, and 55.2% were female; their

Table 1
Questions asked in this survey.

Themes	Basic questions	Type of answer	Referenced studies
Attitude toward communication	Hurdles of communication	Yes/No	Shineha et al. (2009)
	Motivation for communication	Yes/No	Japan Science and Technology
	Measures for encouraging communication	Yes/No	Agency (2013)
Opinions about counterparts of communication	Which actor would be an important counterpart for communication?	Five-part scale	The Royal Society (2006)
Opinions about the influence of media on the public	What do you think about the relationship between the public and media discourses?	Five-part scale	Tsuchiya and Kosugi (2011)
	What do you think about media discourses?	Five-part scale	
Demography	Age, Gender, Education, Income, Expertise, Position, etc		

Table 2
Demography of scientist respondents.

Age	Male		Female		Total	
	n	Ratio	n	Ratio	n	Ratio
Under 20–29	58	5.2%	34	3.0%	92	8.3%
30–39	214	19.2%	80	7.2%	294	26.4%
40–49	238	21.3%	58	5.2%	296	26.5%
50–59	258	23.1%	29	2.6%	287	25.7%
60–69	66	5.9%	8	0.7%	74	6.6%
70–79	23	2.1%	0	0.0%	23	2.1%
Over 80	2	0.2%	0	0.0%	2	0.2%
No Answer					47	4.2%
	859	77.0%	209	18.7%	1115	100%

average age was 57.4. Fig. 1 shows the breakdown of respondents' positions.

We asked two questions to further categorize the JSRM members according to their attitudes toward science communication. When asked the question "What do you think about science communication with the public?", 70.8% of respondents answered "Important," and 25.0% answered "Relatively important." When asked the question "How you feel about participating in science communication?", 27.3% answered "Positive" and 50.0% answered "Relatively positive."

According to the result of Fig. 2(b), we categorized scientists into three categories: "Positive" (n = 304), "Relatively Positive" (n = 558), and "Negative" (combined with "Relatively negative," n = 242). In the following section, we compared responses of these three groups.

3.2. *Attitudes of researchers toward science communication: motivations, hurdles, and systemic issues*

We categorized JSRM members into three groups based on their responses: "Positive," "Relatively Positive," and "Negative." We compared these three groups and examined hurdles and motivations of communication for scientists to gain further insight.

Fig. 3 shows the motivation to participate in science communication. "Accountability," "to encourage public interest in science," and "educational effect to ourselves" were regarded as major motivations of communication. In addition, we compared three groups: "Positive," "Relatively Positive," and "Negative." There are significant differences in the answers of the three groups: "accountability," "to encourage public interest in science," "educational effect to ourselves," and "to enjoy conversing with the public." Concerning "accountability," 94.0% of "Positive" respondents, 91.1% of "Relatively Positive" respondents, and 84.6% of "Negative" respondents indicated it as an important motivation.

In addition, approximately 90% of "Positive" and "Relatively Positive" respondents recognized the value of "to encourage public interest in science." Particularly, we found that there was a disparity in the number of "to enjoy conversing with the public" responses between "Positive" and other groups. At the same time, approximately 60% of all three groups answered that "responsibility of funding or job" is a motivation.

Fig. 4 shows hurdles that researchers face regarding their participation in science communication. The primary hurdles for communication were "apathy of audience" and "lack of time"; 70.2% of "Positive," 71.9% of "Relatively Positive," and 75.8% of

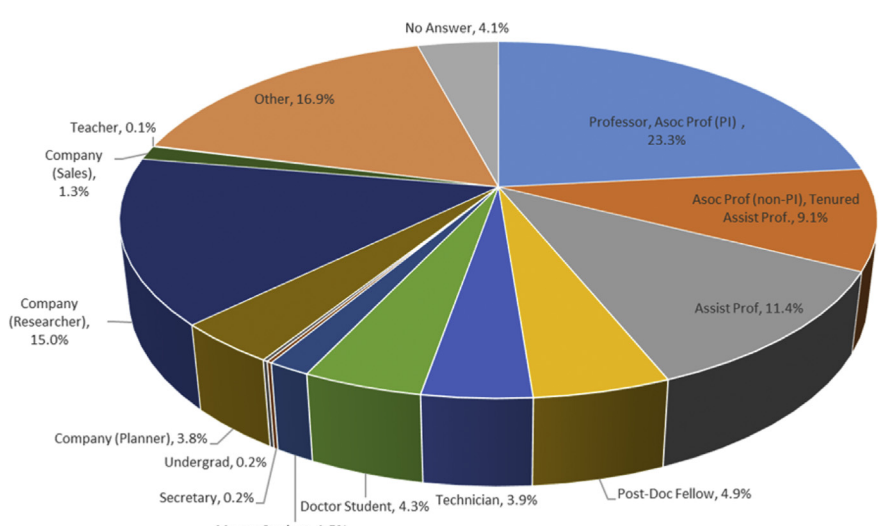

Fig. 1. Demography of JSRM members' positions.

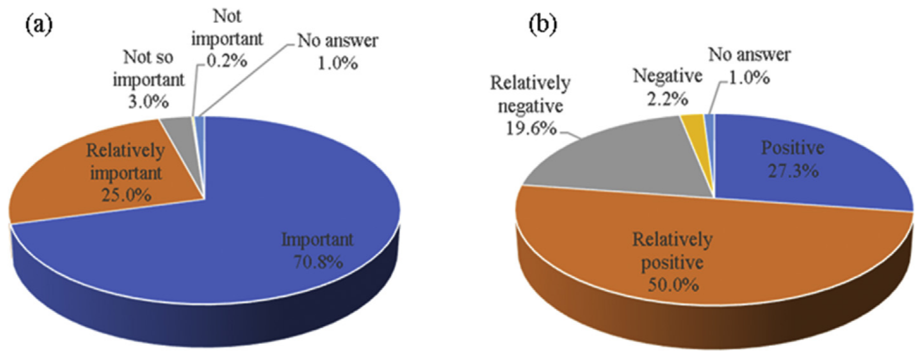

Fig. 2. (a) Opinions toward science communication. (b) Willingness to participate in science communication.

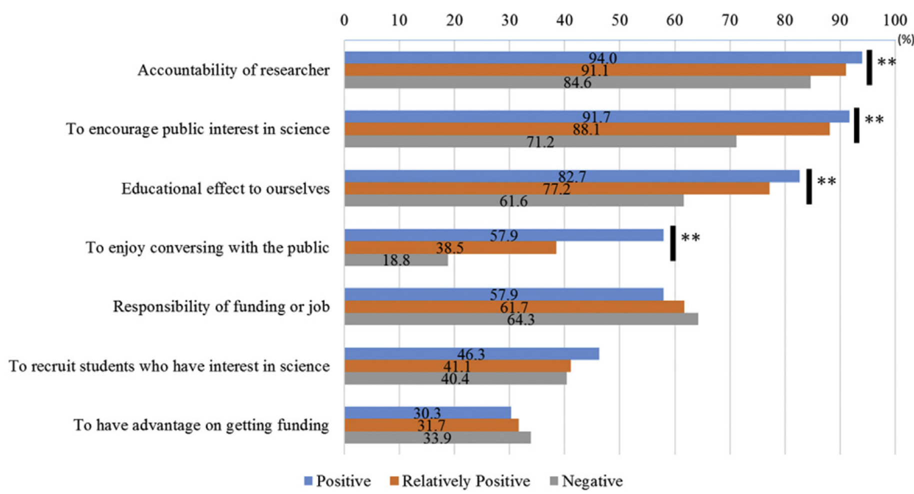

Fig. 3. Differences in responses to "Why do you participate in communication with the public?". Percentage indicates the ratio of "yes" responses. χ^2 test was conducted; $^{**}p < 0.01$, $^{*}p < 0.05$.

"Negative" respondents answered "apathy of audience," and 62.0% of "Positive," 71.9% of "Relatively Positive," and 81.4% of "Negative" respondents answered "lack of time." There were significant differences in response between the three groups: "lack of time," "lack of opportunities and setting for communication," "lack of audiences' knowledge," "difficult to explain research in simple terms," and "there are less meaningful insights from public opinions." In addition, approximately 50% of each group cited "lack of evaluation system of communication" as a hurdle.

Fig. 5 presents answers to the question "what will encourage researchers' communication activities with the public?" There were significant differences in responses between the three groups: "offer opportunities and setting for communication," "support from colleagues and laboratories," "rewards and awards from institutions and academic societies," "training course on science communication," and "monetary reward for communication." Generally speaking, "Positive" and "Relatively Positive" respondents cited opportunities, setting, support from colleagues, and evaluation as important factors to encourage communication. Furthermore, 80.6% of "Positive" respondents and 71.0% of "Relatively Positive" respondents chose "offer opportunities and setting for communication" as the most important way to encourage scientists' communication. At the same time, slightly more than 60% of those respondents regarded "support from colleagues and labs" and "funding support for communication" as effective factors. In addition, 40–50% of respondents of each group regarded an evaluation system as a measure for encouraging communication.

In summary, the findings indicate that scientists face systemic issues regarding participation in communication, including sufficient funding, time, collaboration with colleagues, and evaluation systems. This relates to discussion points within Japanese scientific policy. Although Japan has progressed to involve scientists in science communication over the last fifteen years, the infrastructure and evaluation system is not yet sufficiently organized. In addition, providing an atmosphere to encourage colleagues' support is also important to improve the environment for effective communication for scientists who view it with a positive attitude.

3.3. Opinions about targets and counterparts of communication

In the previous section, we noted the hurdles, motivation, and measures involved in encouraging scientists' participation in communication (see Figs. 3–5). We also asked JSRM members the following: "If hurdles were solved, how many communication activities would you participate in annually?" As a result, 18.4% of valid responses was "over three times annually." The majority (59.5%) answered "once or twice annually." Answers of "once in several years" comprised 19.5% of responses. Moreover, responses of "there is no necessity of communication" comprised only 2.5%.

In this context, those who will be targeted or envisioned as a counterpart of communication for scientists should be examined. Table 3 shows the ranking of importance of counterparts of communication for SCR and RM scientists. Actors listed in Table 3 were selected based on previous studies of the Royal Society [16],

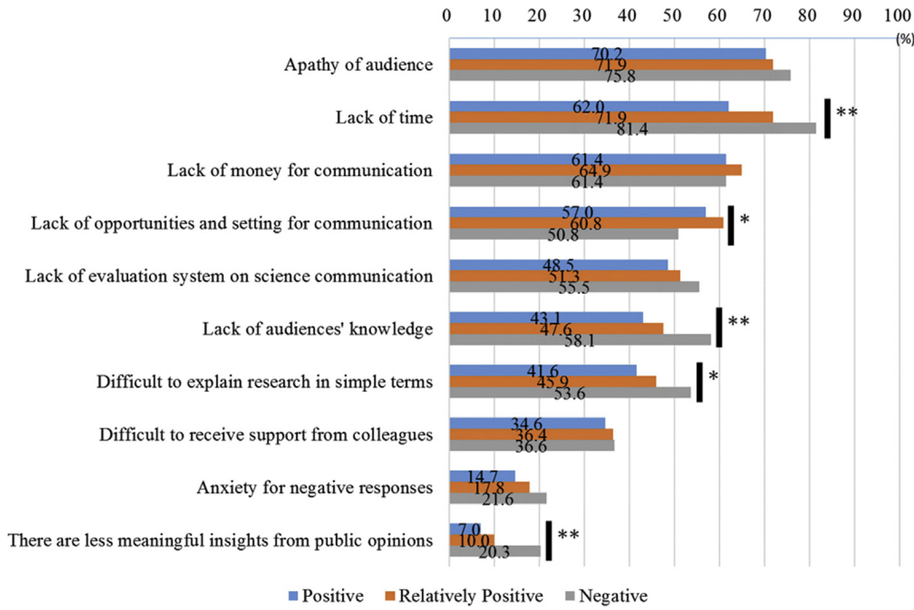

Fig. 4. Differences in response to "What do you think are reasons for difficulty in communication?". Percentage indicates the ratio of "yes" responses. χ^2 test was conducted; $^{**}p < 0.01$, $^{*}p < 0.05$.

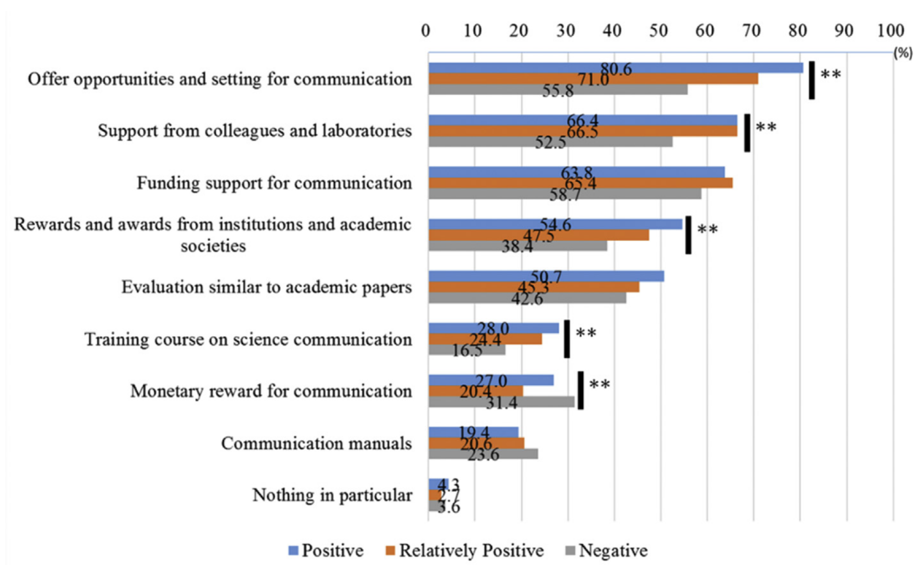

Fig. 5. Differences in responses to "What will encourage researchers' communication with the public?". Percentage indicates the ratio of "yes" responses. χ^2 test was conducted; $^{**}p < 0.01$, $^{*}p < 0.05$.

and we added "patient and patient group," considering this research focuses on SCR and RM.

As a result, the primary expected counterpart of communication was "policymaker" (bureaucrat). The second most important counterpart was "patient or patient group." Slightly more than 40% of valid responses indicated that the "priority is very high" for these two actors. Although their priorities were relatively lower than those of the two primary actors, "science journalist," "company person," "mass media," and "researcher in other fields" comprised over 20% of valid "priority is very high" responses (see Table 3).

In previous studies by the Royal Society, "policymakers", "industry/business community," and "school teachers" were a priority target of communication among UK scientists [16]. Although our current data were influenced by individuals involved in SCR and RM that have deep relationships with medical personnel and research, it was interesting that there were varying priorities for "school teachers" between our results and those of the previous UK case.

3.4. Attitudes toward media discourses and the public response to them

Although Table 3 indicates that "science journalist" and "mass media" were recognized as a relatively low priority compared to "policymaker (bureaucrat)" and "patient or patient group," we should pay attention to the role of mass media in communication and discussion on ELSIs of SCR and RM. The public response indicated that legacy media is the major news source for regenerative medicine: television comprised 87.2% of responses, while

Table 3
JSRM members' opinions about important counterparts of communication.

	Priority				
	Very high	Relatively high	No opinion	Relatively low	Very low
Policymaker (Bureaucrat)	49.9%	36.2%	11.3%	1.5%	1.1%
Patient or patient group	46.3%	37.3%	13.7%	1.6%	1.0%
Politician	34.7%	37.6%	20.1%	3.9%	3.6%
Science Journalist	28.6%	42.6%	22.4%	4.7%	1.7%
Industry/Business Community	28.3%	46.0%	20.2%	4.2%	1.3%
Mass media	24.9%	37.9%	29.2%	5.6%	2.5%
Researcher in other field	20.0%	40.5%	29.4%	7.5%	2.5%
High school student	14.4%	36.0%	33.1%	12.4%	4.1%
General public	10.5%	37.8%	40.9%	8.3%	2.5%
School teacher	10.4%	32.6%	38.9%	13.7%	4.5%
NPO, NGO	8.3%	28.3%	48.9%	10.4%	4.1%

newspapers comprised 78.0% (Fig. 6). Although the younger generation tends to use the internet as a primary news source, the television and newspapers have been regarded as the major and most credible news sources until now [37].

We compared opinions about the influence of the media on SCR and RM. The questions were developed by referring to previous studies by Tsuchiya and Kosugi [38]. The finding pertains to the difference between the public and scientists in terms of recognition of media discourse and the effects of this on society. In general, JSRM members evaluated the accuracy, objectivity, balance, and credibility of mass media as harmful and less credible than the public did (see Table 4). In addition, JSRM members tended to think that the public was influenced by media discourses and sensationalism, and there was also a difference in responses between the public and scientists related to this (see Table 4).

In summary, we found that there is a gap of opinion between the public and JSRM members concerning the effects of mass media discourses on SCR and RM.

4. Discussion

4.1. Implications of science communication and scientists

One of the feature of communication regarding SCR and RM is that JSRM members focus on communication with patients or patient group (Table 3). The most important counterpart of benefit of RM is patients, thus scientists also anticipated support from and strong relationship with patient. At the same time, scientists need to care about conflicts of interests between patients and research activities.

In addition, our result showed that the general public and school teacher were regarded as weaker counterpart of communication than policy-maker or patient. Considering that achievement of RM require to take a long time, it is essential to develop individual success of communication with care step by step. It will not only cultivate more appropriate understanding about SCR and RM and trust between these fields and society but also offer opportunities of mutual learning of each thoughts, backgrounds, and needs between scientists, patient, and the public.

In addition, our results indicate that there was a difference in JSRM members' and public responses to media discourses. In general, JSRM members have more negative attitudes toward media discourses and their effect on public responses than that of the public. This result was also seen in previous studies for nuclear scientists and engineers, biologists of genetically modified organisms, and nanotechnology [38].

Although the relationship between scientists and the media has improved [41], the media has still provided sensational coverage, and the gap of recognition about this theme between researchers and the public introduces a new discrepancy. In addition, Sumner

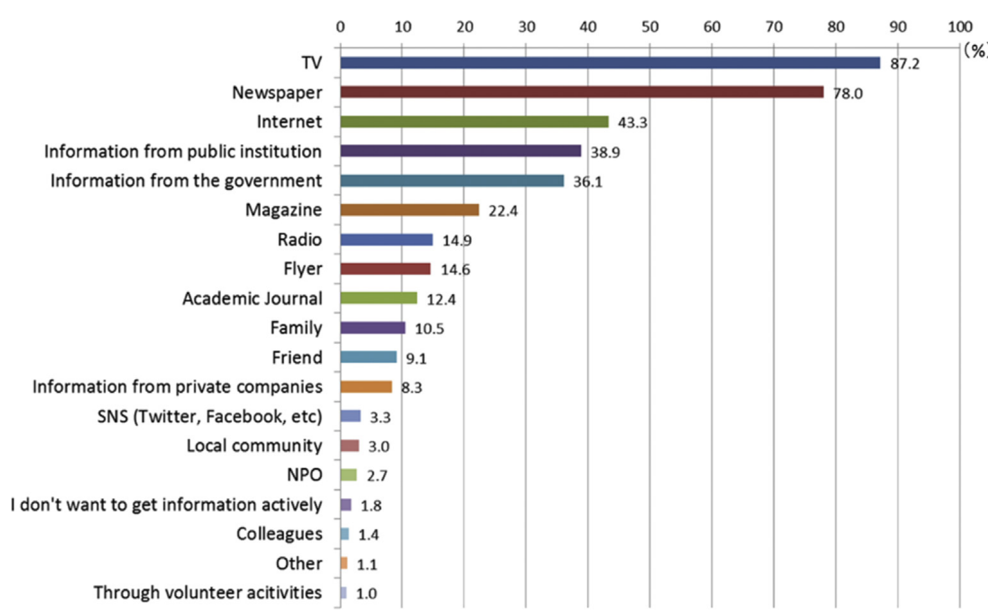

Fig. 6. Main information resources for the public concerning RM (n = 2152, five multiple responses available).

Table 4
Comparison of opinions between JSRM members and the public about the influence of the media on the public. In the table, answers "Yes" and "Relatively yes" was shown as "Yes", and answers of "No" and "Relatively no" was shown as "No".

	JSRM member			General public		
	Yes	Yes and No	No	Yes	Yes and No	No
Media coverage is accurate	21.8%	38.8%	39.6%	40.8%	49.5%	9.7%
Media coverage is objective	20.8%	32.4%	46.7%	36.4%	50.3%	13.2%
Media coverage is well balanced	8.3%	35.1%	56.6%	16.2%	63.0%	20.8%
Media coverage is biased	55.7%	28.4%	15.9%	18.9%	58.8%	22.3%
Media coverage is creditable	13.7%	43.8%	42.5%	32.4%	50.0%	17.6%
Media coverage provides sufficient information	7.5%	23.2%	69.4%	14.5%	44.1%	41.3%
Public opinion is greatly influenced by media coverage	92.9%	5.2%	2.0%	75.8%	18.7%	5.5%
Anxieties of the public toward RM are fueled by sensational media coverage	37.7%	26.7%	35.5%	35.0%	44.8%	20.3%
People can make an informed decision on RM	3.8%	17.0%	79.1%	20.4%	46.8%	32.9%
The public usually does not tolerate sensational media coverage	10.1%	26.4%	63.5%	35.2%	42.2%	22.6%

et al. [42] discussed that scientists also are responsible for the exaggeration of mass media discourses concerning biomedical subjects. The study analyzed 462 press releases published by universities and research institutes and 668 news articles that referred to those press releases. As a result, there were many institutional press releases that contained exaggerations: 40% contained exaggerated advice, 33% contained exaggerated causal claims, and 36% contained exaggerated application of animal research to humans. Surprisingly, they found that news articles contained exaggerations when the referenced press releases contained exaggerations (58% contained exaggerated advice, 81% contained exaggerated causal claims, 86% contained exaggerated application of animal research to humans). However, if press releases did not contain exaggeration, the exaggeration rate of news articles was reduced to 17%, 18%, and 10%, respectively. Their results indicated that scientists themselves are often involved in exaggeration of claims, although they tend to have negative attitudes toward media discourses because of exaggeration. At least, what scientific community on SCR and RM control their own exaggeration and media training for that will be important. At the same time, the current situation that number of media reporting has been emphasized in evaluation reinforce this exaggeration. Therefore, discussion about research evaluation system with policy-makers and the society will also useful way to solve this issue.

Particularly, in the context of SCR and RM, media discourses have a unique situation. Kamenova and Caufield [39] analyzed news articles about clinical trials involving transplantation of neural precursor cells derived from embryonic stem cells for treatment of spinal damage. As a result, they observed that an optimistic tone appeared much more in articles than a pessimistic tone. Moreover, in Japan, Shineha [36] reported that a huge amount of news on SCR and RM was broadcasted in the Japanese mass media, following the initial implementation of human iPSCs. However, Japanese mass media tended to broadcast a national promotion of SCR and RM, rather than exploring ELSIs. Considering this situation, although Table 3 shows that the priorities of journalists, including science journalists, are held in lower regard than those of policymakers as a counterpart of communication, discussions on ELSIs of SCR and RM between scientists and the media are necessary. In other words, we need to think about scientists' communication and their responsibility to encourage balanced discussion of the future of SCR and RM and the associated ELSIs.

Our data indicate that support from colleagues is crucial to encourage scientists' positive participation in communication. This has been discussed repeatedly in previous literature [11–15]. This issue encompasses sharing the importance of science communication about not only scientific knowledge but also ELSIs of emergent science. It also requires understanding of the role of scientists in society. This point can be rephrased to "which kind of education of ELSI and meta perspectives is necessary for scientists."

Our study period was 2015–2016, which was a difficult time for stem cell research in Japan, in the immediate aftermath of the STAP cell research misconduct scandal. However, expectations from society concerning regenerative medicine research did not decrease, and attitudes about sample provision was similar [43]. As for the STAP scandal, because the research community was exposed to interviewing offenses such as a wide show, we were asked to explain repeated situations, and as a result there was a possibility that the information sharing between community and society increased. It is shown that other research is justified unintentionally, and it is considered that the STAP scandal is a special case and probably did not have a big influence on reliability. Perhaps this may be one event that tells the significance of communication.

4.2. Implications of scientific policy on science communication

Our study found that JSRM members face systemic issues such as lack of funding, time, opportunities, and evaluation systems that affect their participation in communication activities (see Figs. 3–5). These themes should be further considered to promote effective communication between scientists and society. Interestingly, the current results coincide with those of previous studies [19,20]. Thus, this problem has been pointed out repeatedly as an issue that Japanese scientific policy should tackle.

Although Japanese science policy has encouraged communication by scientists over the last fifteen years [3,4,7,8], infrastructure and evaluation systems for communication have not been sufficiently organized. For example, we focused on discussions concerning the evaluation of science communication. Chapter 5 of the 4th Science and Technology Basic Plan [7] emphasized the importance of science communication as a measure to deepen the relationship between science and technology innovation and society. There are discourses concerning the evaluation of communication as follows:

> *The government anticipates accumulation and integration of know-how generated through activities, and cultivation of experts for science communication, to spread and become thoroughly entrenched in universities and public research institutes. The government also anticipates promoting scientists' participation in science communication activities and reflect their activities to evaluation. (p. 43)*

> *…The government and funding agency also progress setting education and science communication activities as evaluation criteria and standards in revaluation scheme of research and development. (p. 47)*

In the same section of the basic plan, the importance of research administrators and technicians is emphasized. However, discussion and implementation of an evaluation system for science communication and people of other expertise, such as research administrators, have not progressed. As a symbolic example of this stagnation, we must point out that the exact same phrase has been repeatedly cut-and-pasted in the governmental general guideline of research evaluation systems: "Kinds of research supporters and officers are essential for progress and research and development. There is a necessity of appropriate evaluation of expertise of supporters and officers and their contribution to progress of research and development" [44–48]. Considering these issues of evaluation, scientists also are anticipated to accumulate discussions and deliver effective evaluation system to promote and help their communication activities.

5. Conclusions

Our study, which focused on SCR and RM, shows that JSRM members face issues such as lack of funding, time, opportunities, support from colleagues, and evaluation systems that impede or prevent participation in science communication. Although Japanese science policy has emphasized the importance of science communication for over 15 years, our results indicate that scientists have continued to face infrastructural issues that hinder effective communication with society. The lack of an evaluation system is one of the more significant examples of this stagnation.

In addition, our data indicate that there is some discrepancy of opinion between scientific community and the public regarding the media's influence on the society regarding SCR and RM. However, scientific community also have been partially responsible for the exaggerated reports by the media, considering the results of previous studies. Thus, we must think about scientists' communication to encourage a balanced discussion of SCR and RM and the associated ELSIs, which includes collaborating with the media appropriately.

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