

# ResearchGate Metrics' Behavior and Its Correlation with RG Score and Scopus Indicators

A Combination of Bibliometric and Altmetric Analysis of Scholars in Medical Sciences

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## ABSTRACT

**Objective:** Social networking sites are appropriate tools for sharing and exposing scientific works to increase citations. The objectives of the present study are to investigate the activity of Iranian scholars in the medical sciences in ResearchGate and to explore the effect of each of the four ResearchGate metrics on the RG score. Moreover, the citation metrics of the faculty members in Scopus and the relationship between these metrics and the RG score were explored.

**Methods:** The study population included all SBMU faculty members who have profiles in ResearchGate (N=950). The data were collected through ResearchGate and Scopus in January 2021. The Spearman correlation coefficient was applied to examine the relationship between ResearchGate metrics and Scopus indicators as well as to determine the effect of each ResearchGate metric on the RG score.

**Results:** The findings revealed that the publication sharing metric had the highest correlation (0.918) with the RG score and had the greatest impact on it ( $p$ -value  $<0.001$ ), while the question asking metric showed the lowest correlation (0.11). Moreover, there was a significant relationship between the RG score and Scopus citation metrics ( $p$ -value  $<0.05$ ). Furthermore, all four RG metrics had a positive and significant relationship with Scopus indicators ( $p$ -value  $<0.05$ ), in which the number of shared publications had the highest correlation compared to other RG metrics.

**Conclusion:** Researchers' participation in the ResearchGate social network is effective in increasing citation indicators. Therefore, more activity in the ResearchGate social network may have favorable results in improving universities' ranking.

## INTRODUCTION

Conducting any scientific activity first requires gaining knowledge of previous relevant research and citing those sources. There is often a content link between these activities and the sources cited.<sup>1</sup> Typically, receiving citations is essential and valuable for researchers because, on the one hand, this issue is effective in the career advancement and promotion of researchers and, on the

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other hand, researchers intend to have a greater impact on science by receiving more citations. These works should be shared with other researchers and exposed to their observation to increase scholars' research activities' citation rate using appropriate tools.<sup>2</sup>

In this respect, academic social network sites are appropriate tools for sharing and exposing scientific works to increase citation rates.<sup>3</sup> Academic social network sites have brought researchers together regardless of time and space constraints and have facilitated scientific communication and information exchange.<sup>4</sup> In addition, researchers can use these networks to pursue their common interests with other users.<sup>5</sup> Various studies indicate that sharing publications and subsequently publications' visibility through social networks increases the citation rate of these works by more than 50%. It has also been observed that journal articles which are shared through these networks have received more citations than other articles in the same journals.<sup>6</sup>

One academic social network site for the exchange of scientific information is ResearchGate, which authors can use to cooperate with researchers in all scientific disciplines.<sup>7</sup> Through this network, researchers' scientific works will have better visibility by other people.<sup>8</sup> To use this network, users must initially create their profile and then perform scientific activities.<sup>9</sup> The researchers' activity level in this network is indicated by the RG score, which is determined based on four individual metrics, including the number of shared publications, the researcher's activity in asking questions, the researcher's activity in answering other people's questions, and the number of followers. The individual RG metrics affect researchers' RG score, but the extent of individual metrics impact on this score is not clear.<sup>10</sup>

Shahid Beheshti University of Medical Sciences (SBMU) is one of the top universities in Iran. According to the evaluation of medical universities' research activities in the Webometrics Ranking of World Universities, SBMU has achieved the fourth rank among Iran's medical universities.<sup>11</sup> In the Centre for Science and Technology Studies (CWTS) Leiden Ranking, this university is ranked 11th among Iranian universities and 646th among world universities.<sup>12</sup>

Faculty members are one of the main components in universities' educational structure and play a crucial role in generating, conducting, and disseminating knowledge. Due to the importance of citations of faculty members' scientific works in ranking systems and the situation of SBMU in world rankings, it seems that measures should be taken to improve the citations of faculty members of this university as one of the ways to improve the ranking of the university. Considering that more than half of the published articles never receive citations, as well as the positive role of research sharing on social networks in increasing the number of citations, it seems that the activities of SBMU faculty members in the ResearchGate network may increase the citations count to their research and, consequently, improve the university's ranking.<sup>13</sup> However, to date, no research has been carried out on the activity of the faculty members of SBMU in ResearchGate.

## LITERATURE REVIEW

Various studies have addressed researchers' activity in the ResearchGate academic network. The level of researchers' activities in ResearchGate and the relationship between citation metrics and RG score are among the topics that have been investigated.

Regarding researchers' activity in ResearchGate, numerous studies have been carried out. Among these, the research of Nikkar, Rahmani, Lui, Sheeja, Muhammad Yousuf Ali, Mahajan, and Joshi can be mentioned.<sup>14</sup>

Nikkar et al. conducted a study to investigate surgical researchers' activities in ResearchGate, which revealed that the majority of these researchers (86.24%) are active members in ResearchGate.<sup>15</sup>

Rahmani et al. identified the activity of faculty members of technical colleges in ResearchGate, which showed that most of these researchers (64.16%) were active members of this network.<sup>16</sup>

The study by Sheeja et al. of Naval Architecture Engineering researchers at ResearchGate revealed that most of them (65%) have a ResearchGate profile.<sup>17</sup> The study by Muhammad Yousuf Ali, titled "Altmetrics of Pakistani Library and Information Science Researchers at ResearchGate," indicated that 75.73% of researchers have a ResearchGate profile.<sup>18</sup>

In contrast, in studies conducted by Mahajan et al., Joshi et al., and Lui et al., findings showed that less than half of the surveyed researchers are active users of this network.<sup>19</sup>

In addition to measuring activity in ResearchGate, some other studies also examined the relationship between the RG score and citation indicators. In this regard, in a study by Joshi et al., it was revealed that there is a significant relationship between the RG score and citation metrics.<sup>20</sup> Shrivastava et al. also conducted an analysis of ResearchGate profiles of Panjab University lecturers.<sup>21</sup> The results demonstrated that there is a significant relationship between RG and citation metrics. A study conducted by Naderbeigi et al. showed that there is a significant relationship between activity on the ResearchGate network, RG score, and Scopus metrics of the faculty members of Sharif University of Technology.<sup>22</sup>

The allied medical science scientists' activity in ResearchGate was examined by Valizadeh-Haghi et al.<sup>23</sup> The study revealed that there is a significant relationship between RG scores and Scopus indicators. Correspondingly, the findings showed that there is a significant relationship between lecturers' academic ranking and their RG scores as well as Scopus indicators.

According to the literature, it seems that the effect of each of the individual metrics of ResearchGate on the RG score has not so far been studied. ResearchGate also has not officially specified the impact of any of its individual metrics on the RG score, while researchers' awareness of this impact may affect their activity behavior in any of the individual metrics to increase their RG score. Previous studies also show that limited research has been conducted in Iran regarding faculty members' activity in ResearchGate. Accordingly, none of these studies has investigated the activity of all faculties of a university. Therefore, the objectives of the present study include (1) investigating the activity of SBMU faculty members in ResearchGate, (2) investigating the effect of each of the four individual ResearchGate metrics on the RG score of the faculty members, (3) determining the citation metrics of the faculty members in Scopus, and (4) the relationship between individual RG metrics and the faculty members' Scopus citation metrics.

## **MATERIAL AND METHODS**

The present altmetrics study population included all SBMU faculty members who have profiles in ResearchGate (N=950).

To extract the number as well as the name of the faculty members, we used the Iranian Scientometrics Information Database, which is developed by the Deputy of Research and Technology of Ministry of Health and Medical Education of Iran.<sup>24</sup> The number of faculty members in this system was 1,430, of which 950 had profiles in ResearchGate and were examined. The data regarding RG score were collected through direct observation of their profiles in ResearchGate.

The RG score includes four metrics: number of shared publications, researcher's activity in asking questions, researcher's activity in answering other people's questions, and followers. Data related to the number of citations and the h-index of each of the lecturers were collected by viewing their profiles in the Scopus database in January 2021.

In this study, it was assumed that there is a significant relationship between ResearchGate individual metrics and Scopus citation metrics. Given that the data were not normally distributed, to examine this relationship, the Spearman correlation coefficient was used. Moreover, regarding that the impact of each of the ResearchGate metrics on the RG score has not been officially determined, the Spearman correlation coefficient was applied to determine the effect of the individual metrics of ResearchGate on the RG score of the participants.

The collected data were analyzed using Excel and SPSS version 18 software.

## RESULTS

The RG score of the faculty members is shown in table 1. All faculty members had an RG score, and most of the faculty members (79.5%) had an RG score of less than one. The average RG score of participants was 15.88.

**Table 1.** RG score of the SBMU faculty members

RG score	Frequency		Mean	Min	Max	SD	Median
	Members	%					
<1	55	5.79	0.01	0	0.59	0.08	0
1-11	300	31.58	6.18	1.13	10.98	2.89	6.56
11-21	297	31.26	16.09	11	20.98	2.83	15.92
21-31	209	22	25.24	21.06	30.97	2.79	25.25
31-41	82	8.63	34.9	31.02	40.32	2.56	34.5
41-51	6	0.63	42.88	41.46	45.84	1.57	42.34
41-61	1	0.11	56.49	56.49	56.49	-	56.49
Total	950	100	15.88	0	56.49	10.42	15.05

The findings show that most of the faculty members have shared their publications in ResearchGate, but only 4.11% of them are not active in sharing their publications (see table 2).

**Table 2.** Number of shared publications of the SBMU faculty members

Publication	Frequency		Mean	Min	Max	SD	Median
	Members	%					
0	39	4.11	0	0	0	0	0
1-50	689	72.53	19.70	1	50	13.12	17
51-100	145	15.26	69.83	51	100	13.24	68
101-150	36	3.79	121.28	101	147	13.50	118
151-200	23	2.42	174.04	153	199	14.66	172
201-250	10	1.05	222.80	203	243	14.29	226
251-300	5	0.53	262.40	251	275	11.13	264
401-450	1	0.11	402	402	402	-	402
501-550	1	0.11	522	522	522	-	522
801-850	1	0.11	824	824	824	-	824
Total	950	100	39.32	0	824	54.73	23

The findings indicate that most faculty members (94.42%) did not have any activity in asking questions. The highest level of activity in this metric was performed by 0.11% of faculty members (see table 3).

**Table 3.** The faculty members’ activity in asking questions

Question	Frequency		Mean	Min	Max	SD	Median
	Members	%					
0	897	94.42	0	0	0	0	0
1-10	51	5.37	1.73	1	9	1.58	1
20-30	1	0.11	28	28	28	-	28
41-50	1	0.11	46	46	46	-	46
Total	950	100	0.17	0	46	1.82	0

**Table 4.** Faculty members’ activity in answering questions

Answers	Frequency		Mean	Min	Max	SD	Median
	Members	%					
0	840	88.42	0	0	0	0	0
1-5	91	9.58	2.08	1	5	1.34	2
6-10	10	1.05	7	6	9	1.15	7
11-15	3	0.32	13.33	12	15	1.53	13
16-20	2	0.21	16	16	16	0	16
21-25	1	0.11	25	25	25	-	25
31-35	1	0.11	31	31	31	-	31
41-45	1	0.11	41	41	41	-	41
216-220	1	0.11	218	218	218	-	218
Total	950	100	0.68	0	218	7.43	0

Additionally, in answer to other researchers’ questions, most faculty members (88.42%) did not have any activity. The highest level of activity in this metric was done by 0.11% of them (see table 4).

The findings demonstrated that most faculty members had followers, and only 0.74% had no followers (see table 5).

**Table 5.** The number of followers of SBMU faculty members

Followers	Frequency		Mean	Min	Max	SD	Median
	Members	%					
0	7	0.74	0	0	0	0	0
1-50	654	68.84	21.51	1	50	13.58	20
51-100	146	15.37	69.36	51	99	13.76	65.5
101-150	66	6.95	121	102	150	14.53	119
151-200	39	4.11	171.92	151	198	14.38	169
201-250	20	2.11	223.60	202	246	13.29	223.5
>250	18	1.89	391.44	253	891	181.72	338
Total	950	100	53.05	0	891	72.17	31

The correlation between RG metrics and RG score was examined using the Spearman correlation test. The findings showed that the publication sharing metrics had the highest correlation (0.918) with the RG score; therefore, it had the greatest impact on the RG score (p-value <0.001). The question asking metric had the lowest correlation (0.11) with the RG score (see table 6).

**Table 6.** The correlation between ResearchGate metrics and RG score of faculty members

		Publication	Followers	Question	Answers
RG score	Correlation coefficient	0.918	0.774	0.11	0.185
	P-value	< .001	< .001	.001	< .001

The number of citations of the faculty members in the Scopus database is presented in table 7. The findings showed that most faculty members had citations, and only 5.16% of them had not received any citations.

**Table 7.** Number of citations of SBMU faculty members in Scopus

Citation	Frequency		Mean	Min	Max	SD	Median
	Members	%					
0	49	5.16	0	0	0	0	0
1-500	771	81-16	108.91	1	495	114.80	67
501-1000	68	7.16	694.06	503	997	148.87	690
1001-1500	29	3.05	1213.66	1016	1481	131.55	1180
1501-2000	14	1.47	1771.14	1594	1995	131.41	1741
2001-2500	9	0.95	2175.56	2029	2446	137.10	2192
2501-3000	2	0.21	2747	2686	2808	86.27	2747
3001-3500	2	0.21	3207.5	3007	3408	283.55	3207.5
3501-4000	2	0.21	3767	3582	3952	261.63	3767
4001-4500	1	0.11	4459	4459	4459	-	4459
4501-5000	1	0.11	4581	4581	4581	-	4581
6501-7000	1	0.11	6907	6907	6907	-	6907
19001-19500	1	0.11	19272	19272	19272	-	19272
Total	950	100	279.37	0	19272	817.14	83

The findings indicated that most faculty members had an h-index in Scopus, and the mean of their h-index was 6.46 (see table 8).

**Table 8.** H-index of SBMU faculty members

H-index	Frequency		Mean	Min	Max	SD	Median
	Members	%					
0	49	5.16	0	0	0	0	0
1-10	732	77.05	4.54	1	10	2.57	4
11-20	137	14.42	14.38	11	20	2.81	14
21-30	29	3.05	24.41	21	30	2.71	24
31-40	2	0.21	35.50	31	40	6.36	35.5
61-70	1	0.11	63	63	63	-	63
Total	950	100	6.46	0	63	5.96	5

The correlation between ResearchGate indicators and Scopus citation metrics is presented in table 9.

**Table 9.** Correlation between ResearchGate indicators and Scopus citation metrics

	<b>H-index</b>		<b>Citation</b>	
	<b>P-value</b>	<b>Correlation coefficient</b>	<b>P-value</b>	<b>Correlation coefficient</b>
<b>RG score</b>	< .001	0.803	< .001	0.791
<b>Publication</b>	< .001	0.735	< .001	0.715
<b>Question</b>	.006	0.09	.019	0.076
<b>Answers</b>	< .001	0.147	< .001	0.119
<b>Followers</b>	< .001	0.694	< .001	0.676

The findings showed a positive and significant relationship between the RG score and Scopus citation metrics ( $p$ -value  $< 0.05$ ). Additionally, all four RG metrics had a positive and significant relationship with Scopus citation metrics, including citations and the h-index ( $p$ -value  $< 0.05$ ). The findings showed that the number of shared publications had the highest correlation with citations (0.715) and h-index (0.735) compared to other RG metrics.

## DISCUSSION

ResearchGate's mission is to link the academic world and make research accessible to all scholars. This study has compared the RG metrics of SBMU faculty members. The major findings are highlighted and discussed around the four research questions of this study.

The findings of the present study revealed that even though more than half of the faculty members have profiles in ResearchGate and are active in this network, compared to the findings of other studies, such as those of Yousuf Ali, Janmohammadi, Rahmani and Nikkar, this rate is low.<sup>25</sup> This issue may be due to the lack of knowledge and familiarity of faculty members with the ResearchGate social network or the lack of the need to publish outputs on the ResearchGate social network, which needs further investigation. The present study results also showed that the mean RG score of SBMU faculty members is similar to the results of other studies conducted in Iran and other international studies.<sup>26</sup>

The current study results indicated that the subjects' activity in the four RG metrics was slight in some indicators, and the highest activity was related to publications metric. The lowest level of members' activity was related to the asking-questions metric. Considering that the RG score results from the scores obtained by the researcher in the four RG metrics, this study's research results confirm that the faculty members did not pay enough attention to the activity in all the RG metrics.

The present findings showed that faculty members have limited activities in sharing publications, which is aligned with the results from other studies.<sup>27</sup> This could be due to several reasons. Firstly, young faculty members who have recently joined the university as faculty members may have fewer publications in comparison with older members. Another reason may be that faculty members who have recently joined the ResearchGate social network have not had enough time to share all of their publications. It should be noted that sharing publications on ResearchGate has massive ramifications for the open access movement. It might be that one of the reasons authors do not publish on RG is because they do not have the rights to do so. In this regard, it is worthy to mention that the publication-sharing metric includes both full-text sharing and/or abstract



sharing in which sharing the abstract is legal. So, researchers were free to share their abstracts but they have not done it.

The findings also show that most of the SBMU faculty members have no activity in two metrics: asking questions and answering questions. Compared to other studies, the activity of SBMU faculty members in these metrics is at a lower level.<sup>28</sup> Possible reasons for this could be a lack of awareness of the importance of these metrics to increase the RG score, a lack of English language proficiency to participate in asking and answering questions, and a lack of time. However, more research is needed in this area. The results showed that most of the SBMU faculty members have followers. The mean number of followers of the faculty members is similar to what was found in other studies.<sup>29</sup> As the number of followers increases, a person's popularity in their subject area increases. They may even be influenced by the researcher's studies in other areas and follow the researcher's activities in ResearchGate and, with the increase of followers, there is a possibility of increasing the citation rate.<sup>30</sup> Therefore, it is recommended to elaborate on the importance and role of each of the RG metrics in raising the RG score through posters, workshops, and educational brochures for faculty members.

In this study, the correlation between each of the RG metrics and RG score was examined using the Spearman correlation test. The present study results revealed that the shared publication and number of followers metrics have a stronger correlation with the RG score compared to the metrics of questions and answers. The results also showed a significant correlation between all RG metrics and the RG score of SBMU faculty members.

The study results indicated that most of the SBMU faculty members have citations in the Scopus database and have an h-index, but most of them received the least number of citations. According to the present study findings, the subjects have little activity in the ResearchGate social network. As one of the possible reasons for the low number of citations, we can mention the low activity in the ResearchGate social network. Research on surgeons' publications has also confirmed this.<sup>31</sup> Nevertheless, there is a need for further research on the low number of citations of faculty members of SBMU.

The present study's findings demonstrated a significant relationship between the RG score and Scopus citation metrics (h-index and number of citations). In this regard, the highest correlation was observed between the h-index and RG score (p-value = 0.803). This finding is consistent with other studies' findings.<sup>32</sup> There is also a significant relationship between each of the RG score metrics and Scopus citation metrics. In this regard, the highest and lowest correlations with Scopus citation metrics were observed between publication, questions, and answers metrics, respectively (p-value = 0.001). Considering the positive relationship between each of the RG metrics and Scopus citation metrics, it is suggested that faculty members pay enough attention to all of these metrics to help increase their citation indicators.

Due to the ResearchGate social network's role in increasing the visibility of researchers' scientific outputs, faculty members can consider the use of this network as one of the tools to increase the number of citations and the h-index.

## CONCLUSION

Easy access to research outputs and increasing visibility is one of the most important features of ResearchGate, which, according to the results of this study, has a significant impact on increasing

the use and thus increasing citations. As the results revealed, researchers' participation in the ResearchGate social network is effective in increasing citation indicators, including the number of citations and h-index. Therefore, more activity in the ResearchGate social network, followed by receiving citations, can have favorable results in improving rankings for both research institutes and universities. Universities can encourage faculty members to join and work in ResearchGate and other academic-social networks by considering privileges to improve their academic rank. Libraries and research centers can explain the importance of faculty members' activities in these networks by holding workshops on altmetric indicators and academic social network sites, especially ResearchGate. They can also justify to researchers the benefits of using this network and sharing more scientific outputs.

**Declaration of Interest:** None

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