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The Relationship between Number of Keywords Used in Titles of Articles and Number of Citations to These Articles in Selected Journals Published by Tehran University of Medical Sciences

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Abstract

Purpose: This study aimed at investigating the relationship between number of citations and keywords used in title of articles, and was conducted in a cross-sectional design on eleven English-language journals published by Tehran University of Medical Sciences.

Methodology: A total of 495 articles from these journals were searched in Google Scholar. The correlation between citations and keywords used in titles was found through Spearman correlation coefficient using SPSS.

Findings: Study results confirmed existence of a significant correlation between keywords used in titles of articles and the number of citations ($P=0.009$, $r=0.117$). There was also a significant correlation between the number of keywords specified to the article and the number of citations.

Conclusion: According to the results, providing titles with appropriate structure and with main keywords of articles by authors can be effective in easy selection and examination of subject association of articles by researchers, and in increasing citations of articles.

Keywords: article title, keywords, citation

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Introduction

One of the most important parts of an article is its title, which with a proper informative structure, can convey the content of the article (McGowan & Tugwell 2005). The structure of title depends on subject areas, journals, nationality and the number of authors (Lewison & Hartley 2006). Since emergence of new technologies of storage and retrieving information has led to an unprecedented increase in information sources and scientific products of researchers globally, finding articles relevant to people's information needs such as researchers in various scientific and specialized fields, out of masses of articles, journals, and existing databases can be extremely difficult. Consequently, people will still be faced with shortage of time and strength required to investigate every single article from masses of retrieved results from various search engines and databases, or even with implementing necessary customizations/constraints in search strategies.

Therefore, in such conditions, people often decide about the relevance of the retrieved information merely by reading through titles of the retrieved articles. Since title is one of the most important parts of an article, its selection and investigation by researchers has an important impact on increased likelihood of citation of the article (Wang & Bai 2007). Thus, when main keywords are recognized in the title of the article, it is indicative of the content of that article and can help easier access to relevant articles by different people including researchers. Hence, authors will take more care in writing titles of their articles. Not only will this help exposure and faster retrieval of researchers' and authors' articles, but it also increases citations to these articles.

This is also important to researchers within the country, as increased search and use of internally produced articles by different researchers around the world leads to increased number of citations of

Iranian researchers and emergence of internal scientific products in international sources.

Literature Review

Many different studies have been conducted on the importance of title of an article and also connection of its structure (including length of the title, use of colon, question mark, its satire and pleasance and having main keywords in the title) with the chance for retrieval of the paper and citation to it. Jamali (2011) evaluated that Articles with longer titles were downloaded slightly less than the articles with shorter titles. Ball (2009) found a significant increase from 50% to more than 200% in the number of articles with question-mark titles and Sagi (2008) showed that the pleasantness rating was weakly associated with the number of citations.

Therefore, in this study, by investigating the level of use of keywords in articles from selected medical sciences journals and the number of citations created, we attempted to further clarify the relationship between the use of keywords in titles and the level of citations.

Methodology

This is a cross-sectional, applied study with statistical population of English-language journals published by Tehran University of Medical Sciences on the university site from 2007 onwards, with at least four issues in 2007 (not including supplements) that included eleven publications as follows. Articles of selected journals were searched in Google Scholar, which is a suitable database for retrieving articles and access to their citations. Except for four articles, the rest had been fully indexed. Then, the number of keywords, level of their use in titles of articles, and the number of citations for each, in terms of journal subjects were entered in Microsoft Excel and analyzed in terms of relationship. To determine the correlation between the

number of keywords used in titles and the number of citations to those articles, Spearman correlation coefficient was used.

Data were collected according to a sheet designed in Microsoft Excel to enter the following data: title of articles, number of keywords in articles, number of keywords in title of articles, level of citation of article in Google Scholar, and general subject of the journal. Finally, the data were analyzed in Microsoft Excel and SPSS, and the results were presented in tables.

The journals studied included the following:

- 1- ActaMedicaIranica[AMI]
- 2- DARU Journal of Pharmaceutical Sciences [DARU]
- 3- Iranian Journal of Allergy, Asthma and Immunology[IJAAI]
- 4- Iranian Journal of Environmental Health Science & Engineering [IJEHSE]
- 5- Iranian Journal of Parasitology [IJPA]
- 6- Iranian Journal of Pediatrics [IJPE]
- 7- Iranian Journal of Psychiatry [IJPS]
- 8- Iranian Journal of Public Health [IJPU]
- 9- Journal of Dentistry of Tehran University of Medical Sciences [JDTUMS]
- 10- Medical Journal of the Islamic Republic of Iran [MJIRI]
- 11- The Journal of Tehran University Heart Center [JTUHC]

Research Questions

1. How many keywords are used for the selected articles of medical journals?
2. What is the frequency of the keywords used in the title of the selected articles of medical journals?
3. What is the frequency of the citation of the selected articles of medical journals in Google Scholar data base?

Findings

A: The number of keywords assigned to articles in selected medical science journals

Table 1: The number of keywords assigned to articles in selected medical science journals

The number of keywords/ journals	1	2	3	4	5	6	7	8	9	Total
[AMI]	1	2	34	34	18	5	3	0	0	97
[DARU]	1	3	4	20	5	6	1	0	0	40
[IJAAI]	0	2	9	15	11	3	2	0	2	44
[IJEHSE]	0	9	4	17	10	6	2	0	0	39
[IJPA]	0	0	8	16	9	0	0	0	0	33
[IJPE]	0	0	2	17	27	5	1	0	0	52
[IJPS]	0	0	5	13	4	3	0	0	0	25
[IJPU]	0	0	18	24	14	6	0	0	0	62
[JDTUMS]	0	0	12	9	6	4	0	0	0	31
[MJIRI]	0	2	15	15	6	2	1	0	0	41
[JTUHC]	0	0	20	8	3	0	0	0	0	31
Total	2	9	131	188	113	40	10	0	2	495

It can be seen from the data in Table 1 that articles in medical science publications have used at least one and at most nine keywords, with most articles using four keywords that included 188 articles from selected journals, followed by 131 articles with three keywords.

Meanwhile, no article contained eight keywords, the least numbers were one and nine keywords, and only two articles contained this number of keywords. In this respect, one keyword related to the publication “ActaMedicaIranica” and “DARU Journal of Pharmaceutical Sciences” and nine keywords related to the “Iranian Journal of Allergy, Asthma, and Immunology”.

B: The number of keywords in title of articles in selected medical science journals

Table 2: The number of keywords in title of articles in selected medical science journals

The number of keywords/ journals	1	2	3	4	5	6	7	total
[AMI]	1	20	35	25	15	1	0	97
[DARU]	0	8	13	7	10	2	0	40
[JAAAI]	0	5	14	18	4	3	0	44
[JEHSE]	0	6	9	16	6	0	2	39
[JPA]	0	4	13	13	3	0	0	33
[JPE]	0	10	26	11	4	1	0	52
[JPS]	1	6	8	4	5	1	0	25
[JPU]	0	5	21	28	6	2	0	62
[JDTUMS]	0	7	15	6	1	2	0	31
[MJIRI]	0	8	12	16	5	0	0	41
[JTUHC]	0	2	15	9	5	0	0	31
Total	2	81	181	153	64	12	2	495

It can be seen from table 2 that the number of keywords used in titles of articles in selected medical science journals was between 0 and 6 out of the total number of keywords in articles (between 1 and 9).

Among these, most articles (181 articles) had two keywords in their titles. Next, 153 articles contained three keywords and 81 contained one. The lowest number of articles (two articles) had zero keywords, and two articles had six keywords in their titles.

C: The number of citations to articles in selected medical science journals in Google Scholar

Table 3 presents the number of citations received by selected journals' articles that shows citations between 0 and 34. Most articles (168) did not have any citations. Next, most number of articles in these journals (69 articles) had two citations and 68 articles received one citation each. The highest number of citations (40) related to the [DARU].

Table 3: The number of citations to articles in selected medical science journals in Google Scholar

Journals/The number of citations	[AMI]	[DARU]	[JAAAI]	[JEHSE]	[LPA]	[LPE]	[LPS]	[LPU]	[JDTUMS]	[MJIR]	[JTUHC]	Total
0	43	7	2	5	8	18	8	9	13	35	20	168
1-4	44	17	21	17	12	23	13	32	17	6	11	213
5-9	8	11	10	10	6	10	3	10	1	0	0	69
10-14	1	2	9	4	4	1	1	8	0	0	0	30
15-19	1	1	1	2	2	0	0	0	0	0	0	7
20-24	0	1	0	1	1	0	0	2	0	0	0	5
25-29	0	0	1	0	0	0	0	1	0	0	0	2
30-34	0	1	0	0	0	0	0	0	0	0	0	1
Total	97	40	44	39	33	52	25	62	31	41	31	495

D: The relationship between use of keywords in titles of articles in selected medical science journals and the number of citations to these articles

In Table 4, total number of citations and mean citation of selected medical science journals that had been retrieved from Google Scholar was 495 articles. This has been identified according to title and subject of each journal and most citations related to Iranian Journal of Public Health with the subject of public health.

Table 4: Total number of citations and mean citation of selected medical science journals

Journal	Subject	Total citations	Mean citations
[AMI]	Medicine	143	1.47
[DARU]	Pharmaceutics	203	5.07
[IJAAI]	Allergy and immunology	271	6.15
[IJEHSE]	Environmental health and engineering	212	5.43
[IJPA]	Parasitology	173	5.24
[IJPE]	Pediatrics	141	2.71
[IJPS]	Psychology	54	2.16
[IJPU]	Public health	303	4.88
[JDTUMS]	Dentistry	39	1.25
[MJIRI]	Medical sciences	12	0.29
[JTUHC]	Cardiology	22	0.70
Total	-	1573	35.35

The highest mean citation (total number of citations divided by number of journal articles in Google Scholar) related to Iranian Journal of Allergy, Asthma, and Immunology, with subject of allergy and immunology, was 6.15 citations. In this respect, the lowest sum and mean citations related to the medical journal of the Islamic republic of Iran .

Table 5 presents the total value of Spearman correlation coefficient between the number of citations to articles, keywords used in titles and keywords assigned to articles. It can be seen from table 5 that there is weak correlation between the number of citations and the number of keywords used in titles of articles ($P=0.009$, $r=0.117$). Correlation is significant at 0.01, which means with confidence level of 99%, there is a weak correlation between the number of citations to articles and the number of keywords used in articles. Also, there is a weak correlation between the number of citations and the number of keywords assigned to articles ($P<0.001$, $r=0.19$). Additionally, a weak correlation also exists between the number of keywords used in titles and keywords in articles ($P<0.001$, $r=0.229$).

Table 5: Correlation coefficient and probability between number of citations and keywords in titles and in articles

	Citations		Keywords in title		Keywords in article	
	Correlation coefficient	Probability	Correlation coefficient	Probability	Correlation coefficient	Probability
Citation	1.000	-	0.117**	0.009	0.190**	0.000
Keywords in title	0.117**	0.009	1.000	-	0.229**	0.000
Keyword in article	0.190**	0.000	0.229**	0.000	1.000	-

** Correlation was significant at 0.01

Given that in Kolmogrov-Smirnov test, probability is less than 0.001 ($P < 0.001$), which shows lack of normal distribution of variables, Spearman correlation coefficient was used for assessing the correlation between the number of citations and the number of keywords used in titles. This confirmed the assumption of existence of a mildly significant correlation between these variables with a probability of $P = 0.009$ at 0.01 level, and with confidence of 99%. It can therefore be concluded that there is a weak correlation between the number of citations to articles and the number of keywords used in their titles.

In Table 6, correlation coefficients and values of probability between the number of citations to articles and the number of keywords used in titles and also in articles for each journal have been presented.

Table 6: Spearman correlation coefficient between the number of citations, the number of keywords in titles, and keywords in articles

Journal	Keywords in title		Keywords in article	
	Correlation coefficient	Probability	Correlation coefficient	Probability
[AMI]	-0.064	0.532	0.111	0.281
[DARU]	0.153	0.347	0.068	0.676
[IJAAI]	0.170	0.270	0.333*	0.027
[IJEHSE]	0.093	0.572	0.217	0.184
[IJPA]	-0.093	0.608	-0.289	0.103
[IJPE]	0.200	0.154	0.208	0.138
[IJPS]	0.312	0.129	0.641**	0.001
[IJPU]	0.151	0.240	-0.060	0.646
[JDTUMS]	-0.114	0.542	0.227	0.219
[MJIRI]	-0.261	0.100	-0.100	0.533
[JTUHC]	0.024	0.898	-0.074	0.691
Total	0.571	4.392	1.282	3.499

It can be seen from this table that there is a weak correlation between the number of citations and the number of keywords assigned to articles in the Iranian Journal of Psychiatry at the 0.01 level, and with confidence of 99%, it can be stated that there is a weak correlation between the number of citations and the number of keywords assigned to them. For the Iranian Journal of Allergy, Asthma, and Immunology, the correlation is significant at the 0.05 level. . This means there is a weak correlation between the number of citations and the number of keywords assigned to articles in this journal, although it is smaller than that for the previous journal.

Conclusion

The results of the present study indicate that the number of keywords assigned to articles in selected English-language journals published by Tehran University of Medical Sciences was between one and nine, with the highest number of articles using four keywords, followed by articles using three and five keywords. The smallest number of articles contained one or nine keywords.

Therefore, majority of these articles contained 3 to 5 keywords, with correct selection of keywords, this number could appropriately indicate content of these articles. The results of a study by (Davarpanah and Iranshahi2005) reveal higher retrieval of results from search through thesis descriptors than search through titles. Given the above, using more keywords and matching descriptors with titles as much as possible could be indicative of content of articles and higher retrieval of documents.

In connection with the number of keywords in titles of articles, it was found that between zero and six keywords were used in titles of the articles. Most articles contained only two keywords in their titles, which cannot truly be indicative of the content of articles. Authors should therefore use more keywords in the titles of their articles. Similar studies including (Tugwell& McGowan 2005), and Yitzhaki(1977) have expressed the same, so with appropriately informative structure, title of an article can be indicative of its content. Furthermore, by seeing the title, readers of an article decide about reading the article, which increases the likelihood of use and subsequent increased citation of the article (Wang & Bai 2007).

Therefore, increased use of keywords in titles of articles will be appropriate, and more keywords make the title longer. According to studies by (Habibzadeh and Yadolahi2010), and Jacques and Sebire(2010), the number of citations for articles with longer titles was higher, so this also causes increased citations.

With regard to citations to articles, our study showed that the maximum number of citations to an article from 495 articles in selected journals published in 2007 as searched and retrieved via Google Scholar was 40. The majority of articles were never cited, followed by papers with two and one citations, respectively. The only article receiving 34 citations was published in DARU Journal of Pharmaceutical Sciences.

With regard to total number of citations and mean number of citations of articles in selected medical science journals, for each journal and its subject, most citations were to papers in the Iranian Journal of Public Health with subject of public health, and highest number of mean citations (6.15) was for Iranian Journal of Allergy, Asthma, and Immunology, with subject of allergy and immunology.

Given that most articles in these journals did not receive any citations due to various factors, one way to make them more visible and cited is through enhancing the quality of titles. To this end, choosing an informative title for the article can be an effective strategy for increasing citations to it, as arguably the most common retrieval method for articles is by scanning through their titles among the often huge number of articles retrieved in a primary search. Generally, having an informative title with appropriate structure that contain main keywords and descriptors of an article will be effective in retrieving the paper and increasing citations. Ghosh(1977), Hodges (1983), Lewison(2011), and Yitzhaki(1977) have shown the importance of title in retrieving relevant papers.

Retrieval of these articles in the study by Hodges (1983) had the most effect in retrieval of documents in social sciences followed by science fields. In our study, psychology journals showed the highest correlation between number of citations and use of keywords in titles and also, sum of keywords in their articles.

Regarding the last question concerning the relationship between the number of citations and the number of keywords used in titles, our results showed that there is a positive correlation between these variables, though not a strong one. Additionally, the results also indicated a positive correlation between the number of keywords used in titles of articles and total number of keywords in articles in selected journals.

This study also investigated the relationship between the number of keywords of articles used in titles and the number of citations to these articles and showed a mildly positive relationship. Investigation of other journals with other subjects could make this relationship more clear.

It has become clear that title of an article is effective in the article's retrieval and citation and a characteristic of title of an article is having informative content including keywords, which affects its retrieval and citation.

As such, authors should take more care with structure and content of titles of their articles and try to use main keywords of the article that show the article content, thereby, increasing the chance their papers being cited both nationally and internationally.

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