

## The effect of key characteristics of the title and morphological features of published articles on their citation rates

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The title is one of the most important parts of the article because it is the first contact that reviewers and readers have with the paper. This study aimed to evaluate the effect of key characteristics of the title and morphological features of articles on their citation rates. One thousand two hundred and fifty one articles published in eight ISI-indexed reputable journals were analyzed. A form was designed to collect information on the number of citations in the Scopus, characteristics of the title and morphological features of each article. The results revealed that the title type, number of words and characters in the title were not correlated with the number of citations ( $P>0.05$ ). Also, the authors' country of origin and mentioning time in the title were not associated with the number of citations ( $P>0.05$ ). A significant relationship was found between types of articles and number of citations ( $P<0.001$ ); the average number of citations for review articles was higher than original articles. The average number of authors was positively and significantly correlated with the average number of citations ( $P<0.001$ ). Moreover, the average number of citations was considerably higher in the articles with no reference to the place of the study in the title ( $P<0.001$ ). The results showed that some characteristics of the articles and their titles such as types of articles, number of authors and reference to the place in the title affect the citation rates of published articles.

**Keywords:** Citation rate; Type of articles; Title characteristics; Scopus

### Introduction

The number of scientific journals and published articles is growing exponentially in the field of medical sciences<sup>1</sup>. It has been reported that in many branches of science, especially in social sciences, more than half of the published articles will never be cited. Although this figure is lower for biomedical fields, in some specialties it will even rise to 95%<sup>2</sup>. It is clear that the citation rate of an article is affected by many different factors among which are the importance of the topic, availability of the journal in which the paper is published (i.e. open access versus subscription journals), publication types and the topic of the article<sup>3-5</sup>. Apart from the scientific quality of a published article, the citation

number of the articles can be determined by the type of journal and journal's language, type of published article (review and others), publication frequency of journal and how specialized is the journal<sup>6</sup>. In some fields such as law, the chance of an article to be accepted by a journal and its citation rate are both affected by variables such as title as well as authors' gender<sup>7</sup>.

Title is the most important part of a scientific paper and, in most the cases, a lot of information can be extracted out of it<sup>3,5</sup>. To date, there have been only a limited number of studies that examined the impact of characteristics of the title and morphological features of articles on their citation rates in the medical sciences literature<sup>8</sup>.

### Objective of the Study

- To study the effect title characteristics and morphological features of published articles on their citation rates

### Methodology

One thousand two hundred and fifty one articles from eight ISI-indexed Elsevier journals (*Preventive Medicine, Nutrition, Sleep Medicine, Public Health, Pain, Midwife, Cancer Epidemiology and Adolescence Health*) published in 2009 were studied. The year 2009 was selected in order to have a follow-up period of five years for the articles. The number of citations in the last five years were considered because the 5-year impact factor is used as a reliable index. All articles published in 2009 in each of the journals were reviewed and the required information was collected using a pre-designed data collection form. The form contained the number of citations to each article in Scopus (as in February 2014), article type, title type, number of words in the title, number of characters in the title, number of keywords, the way that keywords were repeated in the title, number of authors, authors' country of origin and the way in which time and place were referenced in the title. The article types were categorized as original, review and other (short report and interpretations). The title types were classified into complex titles (those which contained dash or colon), nominal, questions and complete sentences. The number of words and characters of the title and the number of the keywords were also recorded. An article was registered as one with different words in the keywords if at least two of the keywords were not present in the title of a paper. This study also distinguished whether or not place (country, city or restrict) or time (year) were mentioned in the title. The collected data were analyzed by one-way analysis of variance, t-test, Pearson Correlation Coefficient as univariate analysis and multiple liner regression as multivariable analysis by using SPSS-22 software.

### Results

The mean citation numbers for all articles, as reported in Scopus database, was 16.28 (18.28) (percentiles: 25=6, 50=12, and 75=21). Table 1 reports the descriptive statistics and comparisons between the number of citations and the article characteristics. The results revealed that the title type, reference to time in the title and the authors' country of origin were not associated with the citation rates of articles. A significant relationship was found between

the title type and citation rate. The average citation rate for review articles was higher than other types. The average citation rate for articles without any reference to the place of study in the title was higher than those with reference to the place in their titles. Also, the results revealed that articles with different words (at least two words) in the keywords had higher number of citations.

The results revealed that number of words and characters in the title were not correlated with the number of citations ( $r=0.02$ ,  $P=0.503$  and  $r=0.04$ ,  $P=0.134$ , respectively). The number of authors was positively related to the number of citations of the article ( $r=0.11$ ,  $P<0.001$ ). This means that articles with more authors were cited more. No relationship was found between the citation number of the articles and the number of keywords ( $r=0.05$ ,  $P=0.076$ ).

Table 2 shows the results of multiple linear regression analysis of the effect of key characteristics of the title and morphological features of articles on citation rates of articles. The characteristics of the title and morphological features of articles as independent variables were included if the univariate analysis suggested the

Table 1—The descriptive statistics and comparisons between the number of citations and key characteristics of the title and morphological features of articles

Article and title characteristics	N	%	Mean (SD)	P-value
Type of article				
Original	1075	85.9	16.48 (17.64)	<0.001
Review	76	6.1	30.87 (26.85)	
Other	100	8	9.75 (9.76)	
Total	1251	100	16.82 (18.28)	
Type of title				
Nominal	631	50.4	16.17 (17.34)	0.454
Combinational	462	36.9	17.27 (20.05)	
Question	58	4.6	16.36 (14.70)	
Complete sentence	100	8	19.07 (17.37)	
Authors from different countries				
No	991	79.2	16.69 (18.80)	0.648
Yes	260	20.8	17.28 (16.20)	
Different words in the keywords				
No	477	39.2	15.53 (17.56)	0.051
Yes	740	60.8	17.60 (18.41)	
Reference to place				
No	983	78.6	18.03 (18.57)	<0.001
Yes	268	21.4	12.36 (16.49)	
Reference to time				
No	1199	95.8	16.82 (18.22)	0.967
Yes	52	4.2	16.71 (19.84)	

Table 2—Multiple linear regression analysis of the effect of key characteristics of the title and morphological features of articles on the citation rates of articles

Variable	Coefficients	95% Confidence interval	P-value
Number of authors	0.78	0.44 to 1.11	<0.001
Number of keywords	0.35	-0.27 to 0.97	0.269
Type of article			
Original (ref.)			
Review	13.78	9.28 to 18.29	<0.001
Other	-5.26	-9.16 to -1.37	0.008
Different words in the keywords			
No (ref.)			
Yes	1.49	-0.54 to 3.52	0.149
Reference to place			
No (ref.)			
Yes	-4.74	-7.16 to 2.33	<0.001

“ref.” indicates reference category in the regression analysis.

significant association (at least at the 20 percent significance level) between the numbers of citations at the covariate. As reported in Table 2, number of authors, type of article, and reference to place in the title were statistically significantly associated with the citation rates of articles.

## Discussion

To date, some studies have shown that some characteristics of the articles such as the title type, article type and differences in keywords may have an impact on the citation rates of articles<sup>4,8</sup>. Jacques and Sebire<sup>3</sup> investigated 25 articles with high citation rates and 25 articles with low citation rates and concluded that the structure of the title has a great impact on the frequency of citation to articles and articles with more words in the title were cited more than those with fewer words in the title. The authors showed no relationship between the length of the title or number of words/characters in the title and the citation rates of articles. Other studies, however, have reported that articles with longer titles were cited more frequently<sup>4,5</sup>. In contrast, a study by Rostami and colleagues<sup>8</sup> suggested that articles with shorter titles are cited more. Although having longer title and more words in the title may result in more citations for a limited number of articles, this could not be observed in the present study. In other words, even though it is possible that higher number of words in the title may increase the visibility of articles in databases, it may not increase citation rates of all

articles because other characteristics of articles also affect the citation rates. On the other hand, it can be argued that short titles can potentially attract readers due to the fact that they are brief and precise and thereby may have an impact on the number of citations.

Studies have shown that articles with combination and two-part titles are cited more<sup>3,4</sup>. The present, however, could not find an association between the types of articles and their citation rates. In other words, the structure of the title such as nominal titles, complete sentences, combined titles and question titles did not affect the citation rates of articles. It was found that the average citation of the articles with adverbs of time in their title was not statistically different from other articles. However, titles with adverbs of place were cited less than those without an adverb of place. It is interesting to note that, albeit having two parts in the title did not necessarily result in more citation, types of the sentence added to the title in two-part title articles affected the citation frequency of the article. Reference to place limits information provided in the article to a particular location and thus readers are less eager to use these papers in their work. Findings of the present study indicated that review articles were cited more than other types of articles. It seems that the comprehensive nature of this type of article as well as covering a wider range of issues persuades the authors to include these articles more in their work. Rostami and colleagues<sup>8</sup> have reported similar results.

Some studies<sup>3,8</sup> demonstrated that number of keywords and differences in the title and keywords may affect the citation rates. The present study, nevertheless, did not find any association between the number of keywords or their repetition in the title and citation rates of the articles. Furthermore, the results of present study revealed that the average number of authors was related to the number of citations of the article and articles with more authors were cited more. In contrast to this finding, Bornmann and colleagues<sup>9</sup> did not find a statistically significant correlation between citation counts and number of authors.

## Conclusion

Caveat considered, this study found that some morphological features of the article such as article types, number of authors and reference to the place in the title affect the citation frequency of the article. Therefore, these features may predict the frequency with which an article will be cited

and may help in writing an article. This study showed that the title type, number of words and characters had no impact on the citation frequency. Although this study provided an insight into the potential impacts of some factors on the citation rates of articles, more studies with larger sample sizes are required to better understand the determinants of citation rates of published articles.

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