



ORIGINAL ARTICLE

# Analysis of Six Orthodontic Journals in Science Citation Index and Science Citation Index Expanded: A Bibliometric Analysis

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## ABSTRACT

**Objective:** To analyze the article type, origin, main affiliation, number of publications, authors, and affiliations of six orthodontic journals during two intervals of 5 years each (2006-2010 and 2011-2015).

**Methods:** In total, 4879 articles examined in this study were screened online at the individual journal's website. The types of articles and their authorship characteristics in the six orthodontic journals [three journals indexed by Science Citation Index (SCI) and the others indexed by Science Citation Index Expanded (SCIE)] were recorded. Parameters were tested using the Pearson chi-square for independence at a 0.05 level of significance.

**Results:** Among all the article types, research articles were the most published in the orthodontic journals indexed by SCI and SCIE in the first (2006-2010; 88.1% and 77.6%, respectively) and second periods (2011-2015; 84.4% and 74.6%, respectively). In the first and second intervals, the European Union was the most common origin among articles accepted by the journals listed in SCI (30.1% and 29.2% respectively), whereas Asia/Oceania was the common origin among articles accepted by the journals listed in SCIE (44.1% and 43.4%, respectively).

**Conclusion:** The articles published in the orthodontics journals listed under SCI and SCIE for 2006-2010 and 2011-2015 were significantly different in terms of numbers and characteristics.

**Keywords:** Article characteristics, bibliometrics, orthodontic journals

## INTRODUCTION

In scientific fields, several statistical methods have been used to compare the effectiveness of journals and articles, including bibliometric analysis. Bibliometrics is used to assess the direction of research activities and publication trends of journals by quantitatively analyzing publication in a certain field in a certain time period regarding author, journal, subject, number of citations, and references cited; it emerges as an important tool in the orthodontics field that facilitates management, storage, and classification of information (1-3).

Advances in techniques and applications have led to a marked increase in international studies on orthodontics. It was reported that between 1981 and 2016, the total number of the published orthodontic articles continuously increased (4, 5). The features characterizing these publications, such as authorship, demographics, constituent components of affiliation, and origin, provide insight about the current trends on the acceptance of articles for

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publication (6). In a bibliometrics study, Mavropoulos and Kiliaridis (4) found that a majority of articles published in orthodontics journals focus on the diagnosis and treatment methods and that studies about novel treatment techniques have markedly decreased in the last two decades, highlighting the increased need for high-quality studies producing reliable evidence. According to the previous studies evaluating the literature of orthodontics between 1998 and 2012, a significant increase was detected in original articles compared with review articles and case reports (5, 7-9).

Features determining characteristics of a journal include the impact factor, which represents the extent of citation for an article, and the circulation rate, which indicates the measurement of recognition among others (10). Although the citation index is not a measure that demonstrates quality and significance, it is widely accepted as a measurement of recognition (11). The analysis of citation characteristics reveals useful and interesting information about the impact of an article, a researcher, a country, or the year and has been used to project the future influence of articles (12, 13).

In our study, we aimed to identify how characteristics of articles have changed during the last decade by evaluating features of articles, such as type of article, number of authors, origin of article, main affiliation of authors, and number of affiliations in three journals listed in Science Citation Index™ (SCI Ex; WoS, Thomson Reuters, New York, NY) and three journals listed in Science Citation Index Expanded™ (SCIE; WoS, Thomson Reuters, New York, NY) published in the orthodontics field during 2006-2010 and 2011-2015. We used the SCI and SCIE databases to identify a means of assessing the present status of available researches and analyzed the publication performance of these researches with respect to authors, institutions, and countries.

**METHODS**

This was a retrospective and observational study planned to disclose the types of published articles by comparing two groups (n=3 per group) of orthodontic journals over two different time periods. In the present study, all articles published in Angle Orthodontist (AO), American Journal of Orthodontics and Dentofacial Orthopedics (AJODO), European Journal of Orthodontics (EJO), Australian Orthodontic Journal (AOJ), and Orthodontics & Craniofacial Research (OCR) during two consecutive periods (2006-2011 and 2011-2015) were reviewed through an online web edition. Since Korean Journal of Orthodontics (KJO) was first introduced in 2008, the articles published in 2008-2011 and 2011-2015 were reviewed. The reviewed articles were classified according to the status of journals where they were published as follows: the journals listed in SCI (AO, AJODO, and EJO) and SCIE (AOJ, KJO, and OCR).

For each article, the following parameters were evaluated:  
 (1) Article type: Research, review, case report, and other (unclassified)  
 (2) Number of authors: ≤3 or >3  
 (3) Origin: Stratified based on the data regarding geographic origin of the first author. The categories included the United States/Canada, European Union, non-European Union, Asia, Oceania, and others (unclassified). The origins of articles are classified as shown in Table 1.

(4) Main affiliation: Stratified based on the affiliation of the first author. The categories included orthodontic (research conducted in orthodontics department), nonorthodontic (research conducted in other teaching facilities), and nonacademic (research conducted in private practice or private facilities).

(5) Number of affiliations: Stratified as ≤3 or >3 based on the number of author affiliations. Since authors may have more than one affiliation in some studies, the number of affiliations can be higher than the total number of authors in such articles.

Data analysis was performed using Statistical Package for Social Sciences (SPSS) version 19.0 (IBM Corp.; Armonk, NY, USA). The Pearson’s chi-square test was used to analyze parameters. A p-value of <0.05 was considered statistically significant.

**Table 1.** Geographic origins of articles

Code	Country	Code	Country
3	Albania	2	Malta
5	Argentina	5	Mexico
4	Australia	5	Morocco
2	Austria	4	Nepal
2	Belgium	2	Netherlands
5	Brazil	4	New Zealand
1	Canada	5	Nigeria
2	Czech Republic	3	Norway
5	Chile	4	Pakistan
4	China	5	Palestine
5	Colombia	5	Peru
5	Costa Rica	4	Philippines
2	Croatia	2	Poland
2	Denmark	2	Portugal
5	Egypt	5	Qatar
2	Finland	2	Romania
2	France	3	Russia
2	Germany	5	Saudi Arabia
2	Greece	5	Senegal
4	Hong Kong	3	Serbia
2	Hungary	5	Sicily
3	Iceland	4	Singapore
5	India	2	Slovenia
4	Indonesia	5	South Africa
5	Iran	4	South Korea
2	Ireland	2	Spain
5	Israel	5	Sudan
2	Italy	2	Sweden
4	Japan	3	Switzerland
5	Jordan	5	Syria
4	Korea	4	Taiwan
5	Kuwait	4	Thailand
2	Latvia	3	Turkey
5	Lebanon	5	United Arab Emirates
5	Libya	2	United Kingdom
2	Lithuania	1	United States
4	Malaysia	5	Venezuela
		5	West Indies

1: United States/Canada; 2: European Union countries (European Union membership according to 2015 status); 3: non-European Union; 4: Asia/Oceania; 5: other

**RESULTS**

In total, 4879 articles including 4053 from SCI and 826 from SCIE were published during 2006-2015. The productivity of SCI was higher than that of SCIE in both periods. Tables 2 and 3 show the analyses' results.

**Characteristics of Articles Published in the First Period (2006-2010)**

In the first period, research articles were the leading article type published in the journals listed in SCI and SCIE (84.4% and 74.6%, respectively). The European Union (30.1%) and Asia/Oceania (44.1%) was the most common origin among articles accepted by the journals listed in SCI and SCIE, respectively.

Articles from orthodontic departments comprised 72% of all articles published in the journals listed in both SCI and SCIE. Arti-

cles with >3 authors comprised 60% of articles published in the journals listed in SCI but comprised 55.7% of those listed in SCIE. Articles with ≤3 affiliations comprised 94% of articles listed in SCI and 83.8% of those listed in SCIE. The findings for the first period are presented in Table 2.

**Characteristics of Articles Published in Second Period (2011-2015)**

As in the first period, in the second period, research articles were the leading article type published in the journals listed in SCI and SCIE (88.1% and 77.6%, respectively). The rate of articles with >3 authors was 71.1% and 69.1% in the journals listed in SCI and SCIE, respectively. The European Union (29.2%) and Asia/Oceania (43.4%) was the most common origin among articles accepted by the journals listed in SCI and SCIE, respectively. In journals listed in both SCI and SCIE, a majority of studies were conducted

**Table 2.** Article type, origin, main affiliation, number of publications, authors, and affiliations per journal per interval

	SCI 2006-2010	SCI 2011-2015	SCIE 2006-2010	SCIE 2011-2015
<b>Number of Publications</b>	2126	1927	370	456
	Share, %	Share, %	Share, %	Share, %
<b>Article Type</b>				
Research	88.1% (1873/2126) <sup>a</sup>	84.4% (1627/1927) <sup>a</sup>	77.6% (287/370) <sup>a</sup>	74.6% (340/456) <sup>a</sup>
Review	3.1% (67/2126) <sup>c</sup>	4,6% (89/1927) <sup>c</sup>	13.8% (51/370) <sup>b</sup>	1.7% (49/456) <sup>b</sup>
Case report	8% (171/2126) <sup>b</sup>	9,3% (180/1927) <sup>b</sup>	7.8% (29/370) <sup>b</sup>	13.2% (60/456) <sup>b</sup>
Other	0.7% (15/2126) <sup>d</sup>	1,6% (31/1927) <sup>d</sup>	0.8% (3/370) <sup>c</sup>	1.5% (7/456) <sup>c</sup>
p	0.000***	0,000***	0.000***	0.000***
<b>Number of Authors</b>				
1-3	39.7% (843/2126) <sup>b</sup>	28.9% (556/1927) <sup>b</sup>	44.3 % (164/370) <sup>b</sup>	30.9% (141/456) <sup>a</sup>
4-	60.3% (1282/2126) <sup>a</sup>	71.1% (1371/1927) <sup>a</sup>	55.7% (206/370) <sup>a</sup>	69.1% (315/456) <sup>a</sup>
p	0.000***	0,000***	0.000***	0.59
<b>Origin</b>				
United States/Canada	20.3% (432/2126) <sup>b</sup>	18.6% (359/1927) <sup>c</sup>	14.9% (55/370) <sup>b,c,d</sup>	10.1% (46/456) <sup>c</sup>
European Union	30.1% (639/2126) <sup>a</sup>	29.2% (563/1927) <sup>a</sup>	16.8% (62/370) <sup>b</sup>	21.5% (98/456) <sup>b</sup>
Non-European Union	12.1% (257/2126) <sup>c</sup>	9.1% (175/1927) <sup>d</sup>	8.6% (32/370) <sup>d</sup>	14% (64/456) <sup>b,c</sup>
Asia/Oceania	23.1% (491/2126) <sup>b</sup>	23.8% (458/1927) <sup>b</sup>	44.1% (163/370) <sup>a</sup>	43.4% (198/456) <sup>a</sup>
Other	14.4% (307/2126) <sup>c</sup>	19.3% (372/1927) <sup>c</sup>	15.7% (58/370) <sup>b,c</sup>	11% (50/456) <sup>c</sup>
p	0.000***	0.000***	0.000***	0.000***
<b>Main affiliation</b>				
Orthodontic	72% (1530/2126) <sup>a</sup>	68.6% (1322/1927) <sup>a</sup>	72.2% (267/370) <sup>a</sup>	70.4% (321/456) <sup>a</sup>
Non-orthodontic	17.3% (370/2126) <sup>b</sup>	21% (404/1927) <sup>b</sup>	23.5% (87/370) <sup>b</sup>	23.5% (107/456) <sup>b</sup>
Non-academic	10.6% (226/2126) <sup>c</sup>	10.4% (201/1927) <sup>c</sup>	4.3% (16/370) <sup>c</sup>	6.1% (28/456) <sup>c</sup>
p	0.000***	0.000***	0.000***	0.000***
<b>Number of affiliations</b>				
1-3	94.1% (1999/2126) <sup>a</sup>	90% (1735/1927) <sup>a</sup>	83.8% (310/370) <sup>a</sup>	80.3% (366/456) <sup>a</sup>
4--	5.9% (127/2126) <sup>b</sup>	10% (192/1927) <sup>b</sup>	16.2% (60/370) <sup>b</sup>	19.7% (90/456) <sup>b</sup>
p	0.000***	0.000***	0.000***	0.000***

Different letters indicate statistically significant differences between periods (table columns; p<0.05)

SCI: Science Citation Index Orthodontic Journals; SCIE: Science Citation Index Expanded Journals; p: statistical significance

**Table 3.** Article type, origin, main affiliation, number of publications, authors, and affiliations per time interval

	SCI 2006-2010	SCI 2011-2015	SCIE 2006-2010	SCIE 2011-2015	p
	Share, %	Share, %	Share, %	Share, %	
<b>Article Type</b>					
Research	45.4% (1873/4127) <sup>a</sup>	39.42% (1627/4127) <sup>b</sup>	7% (287/4127) <sup>c</sup>	8.2% (340/4127) <sup>c</sup>	0.000***
Review	26.2% (67/256) <sup>a,b</sup>	34.8% (89/256) <sup>b</sup>	19.9% (51/256) <sup>a</sup>	19.1% (49/256) <sup>a</sup>	0.000***
Case report	38.9% (171/440) <sup>a</sup>	40.9% (180/440) <sup>a</sup>	6.6% (29/440) <sup>b</sup>	13.6% (60/440) <sup>c</sup>	0.000***
Other	26.8% (15/56) <sup>a</sup>	55.4% (31/56) <sup>b</sup>	5.4% (3/56) <sup>c</sup>	12.5% (7/56) <sup>a,c</sup>	0.000***
<b>Number of Authors</b>					
1-3	49.5% (843/1704) <sup>a</sup>	32.6% (556/1704) <sup>b</sup>	9.6% (164/1704) <sup>c</sup>	8.3% (141/1704) <sup>c</sup>	0.000***
4--	40.4% (1282/3174) <sup>a</sup>	43.2% (1371/3174) <sup>a</sup>	6.5% (206/3174) <sup>b</sup>	9.9% (315/3174) <sup>c</sup>	0.000***
<b>Origin</b>					
United States/Canada	48.4% (432/892) <sup>a</sup>	40.2% (359/892) <sup>b</sup>	6.2% (55/892) <sup>c</sup>	5.2% (46/892) <sup>c</sup>	0.000***
European Union	46.9% (639/1362) <sup>a</sup>	41.3% (563/1362) <sup>b</sup>	4.6% (62/1362) <sup>c</sup>	7.2% (98/1362) <sup>d</sup>	0.000***
Non-European Union	48.7% (257/528) <sup>a</sup>	33.1% (175/528) <sup>b</sup>	6.1% (32/528) <sup>d</sup>	12.1% (64/528) <sup>c</sup>	0.000***
Asia/Oceania	37.5% (491/1310) <sup>a</sup>	35% (458/1310) <sup>a</sup>	12.4% (163/1310) <sup>b</sup>	15.1% (198/1310) <sup>b</sup>	0.000***
Other	39% (307/787) <sup>b</sup>	47.3% (372/787) <sup>a</sup>	7.4% (58/787) <sup>c</sup>	6.4% (50/787) <sup>c</sup>	0.000***
<b>Main affiliation</b>					
Orthodontic	44.5% (1530/3440) <sup>a</sup>	38.4% (1322/3440) <sup>b</sup>	7.8% (267/3440) <sup>c</sup>	9.3% (321/3440) <sup>c</sup>	0.000***
Non-orthodontic	38.2% (370/967) <sup>a</sup>	41.8% (404/967) <sup>a</sup>	9% (87/967) <sup>b</sup>	11.1% (107/967) <sup>b</sup>	0.000***
Non-academic	48% (226/472) <sup>a</sup>	42.7% (201/472) <sup>a</sup>	3.4% (16/472) <sup>b</sup>	5.9% (28/472) <sup>b</sup>	0.000***
<b>Number of affiliations</b>					
1-3	45.3% (1999/4410) <sup>a</sup>	39.3% (1735/4410) <sup>b</sup>	7% (310/4410) <sup>c</sup>	8.3% (366/4410) <sup>c</sup>	0.000***
4--	26.9% (127/469) <sup>b</sup>	41% (192/469) <sup>a</sup>	12.8% (60/469) <sup>d</sup>	19.2% (90/469) <sup>c</sup>	0.000***

Different letters indicate statistically significant differences between periods (table columns; p<0.05)  
 SCI: Science Citation Index Orthodontic Journals; SCIE: Science Citation Index Expanded Journals; p: statistical significance

in orthodontics departments. Articles with  $\leq 3$  affiliations comprised 90% of articles listed in SCI and 80% of those listed in SCIE. The findings for the second period are presented in Table 2.

#### Differences between the First and Second Periods

Although the number of research articles decreased in the journals listed in SCI and showed no significant difference compared with those listed in SCIE, the highest rate of research articles was found in the journals listed in SCI in the first period (45.4%). There was no significant difference in the rate of reviews published in the journals listed in SCI or SCIE. Case reports showed a significant increase in the journals listed in SCIE. Other types of articles showed a significant increase in the journals listed in SCI in the second period.

In the second period, there was a decrease in the number of articles with  $\leq 3$  authors in the journals listed in SCI, whereas the number of articles with  $>3$  authors increased in the journals listed in SCIE.

In the journals listed in SCI, the rate of articles from the United States/Canada, European Union, and non-European Union origins decreased, whereas there was no significant difference in the rate of articles from Asia/Oceania in the second period com-

pared with the first period. However, the rate of articles from other countries significantly increased in the second period compared with the first period. In the journals listed in SCIE, there was an increase in the rate of articles from the European Union, whereas a decrease in articles from the non-European origin in the second period compared with the first period was noted. However, no significant difference was detected in the rate of articles from the United States/Canada, Asia/Oceania, and other origins.

Although there was a decrease in the articles from orthodontics department published in the journals listed in SCI during the second period, the rate of articles from orthodontics department was the highest in the journals listed in SCI and SCIE during both periods. The rate of articles with  $\leq 3$  affiliations decreased in the journals listed in SCI during the second period, whereas an increase was detected in the articles with  $>3$  affiliations in the journals listed in SCI and SCIE.

#### DISCUSSION

Bibliometric analyses can be helpful regarding access to the information and classification of studies (14). The reputation of a journal can be assessed by several methods including the cita-

tion index or impact factor (15). Although the citation index has not been accepted as a measurement of quality or importance, it is accepted as a measurement of recognition (11). In recent years, there is a considerable increase in studies about bibliometrics and citation analyses in orthodontics (4, 7, 8, 14, 16, 17). We aimed to identify how characteristics of articles published in the orthodontics journals listed in SCI and SCIE during previous 10 years (2006-2015) changed using bibliometric analysis and to guide researchers with their investigations.

In a longitudinal study comparing three major orthodontics journal (AJODO, AO, and EJO) during a 10-year period (1998-2002 and 2008-2012), it was found that the rate of articles from the non-European origin was 2-fold higher than those from other origins in all reviewed journals in during both periods (5). In our study, it was found that the rate of articles accepted from the European Union was the highest by the journals listed in SCI, whereas the rate was highest for those accepted from Asia/Oceania by the journals listed in SCIE in both the periods. It can be suggested that the origin of articles published in orthodontics journals listed in SCI shifted from non-European to European Union origin during the last decade.

In our study, it was found that the orthodontics department mainly contributed to the publications in both periods and types of journals. Baumgartner et al. (5) found that the majority of articles published in three major orthodontics journals listed in SCI were from the orthodontics department during 1998-2002 and 2008-2012.

In the journals listed in SCI and SCIE, the articles with a higher percentage in the first period and >3 authors showed a further increase in the second period. Today, multidisciplinary and interdisciplinary approaches are preferred in terms of scientific improvement and producing high-quality studies. Thus, the number of authors in an article increases (18). Coauthorship will not only provide different perspectives but also help to minimize potential errors. In particular, collaboration of inexperienced researchers with experienced ones will contribute to the quality of future studies (19). Current orthodontic literature interacts with other fields of science, such as biology, otorhinolaryngology, and engineering (20). In our study, the higher rate of articles with ≤3 affiliations in both periods and types of journals indicates that the accepted articles were conducted with the common effort of authors in the same facility. In the second period, the number of studies with >3 affiliations increased in parallel to the increase of the number of authors. The increased number of scientists with multi-country affiliations might be related to the different disciplines (sciences, biology, otorhinolaryngology, and engineering), cross-appointed faculty or researchers, with multi-country affiliations (20).

Gibson et al. found that 42.6% of all clinical studies published in Journal of Orthodontics and EJO between 1999 and 2008 were case reports or case series (17). McDermott et al. (21) reported that the rate of case reports decreased from 30% to 4% in medical journals in the last two decades, whereas Tulloch et

al. (22) stated that the most common type of clinical trials was the longitudinal or cross-sectional research. We also found that the research article was the most common type published in the orthodontic journals listed in SCI and SCIE in both periods. No significant difference was detected regarding the type of articles accepted between the first and second periods, whereas it was found that the number of case reports increased in the orthodontics journals listed in SCIE in the second period. It can be suggested that the fact that the journals that mainly accept research articles for publication have attenuated the motivation of the researchers to perform reviews or case reports. Case reports and series are studies assessing the diagnosis and treatment of diseases, defining interesting findings, and providing treatment protocols. Considering that case reports and series supported by literature data and visual materials are helpful to the researchers and clinicians at the beginning of their academic careers, it will be more beneficial to feature case reports in journals more frequently (23, 24).

## CONCLUSION

- In our study, it was found that there were significant differences in the characteristics of articles, such as type of article, number of authors, origin of article, main affiliation of authors, and number of affiliations, which were published in the orthodontics journals listed in SCI and SCIE in 2006-2010 and 2011-2015. In the journals listed in SCI, articles from the United States/Canada, European Union, and non-European Union origins significantly increased in the second interval. In the second interval, fewer articles from the non-European countries but more publications from the European Union countries were found in the journals published in SCIE. In both periods, Asia/Oceania was the most common origin among articles accepted by the journals listed in SCIE.
- Research articles were the most commonly published article type in the journals listed SCI and SCIE in both periods, and these journals mainly published studies conducted by orthodontics with academic affiliation. The highest rate of research articles were observed in the journals listed in SCI in the first period.
- In the second period, the articles with >3 affiliations were increased in the journals listed in SCI and SCIE. The percentage of articles from orthodontics department was the highest in all journals during both periods.

**Ethics Committee Approval:** N/A.

**Informed Consent:** Written informed consent was obtained from the volunteers who participated in this study.

**Peer-review:** Externally peer-reviewed.

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