

# FIFTY YEARS OF JOURNAL KINESIOLOGY: BIBLIOMETRIC CHARACTERISTICS OF CATEGORIZED PAPERS

Ivan Čolakovac and Iva Barković

*Faculty of Kinesiology, University of Zagreb, Croatia*

Original scientific paper

DOI 10.26582/k.54.1.15

## Abstract:

The aim of this paper was to present the development of the journal *Kinesiology – International Journal of Fundamental and Applied Kinesiology* over the five decades of its publication through the analysis of the articles using bibliometric indicators. The sample consisted of 1083 articles published over the period of 50 years, from the 1<sup>st</sup> volume in 1971 until the 52<sup>nd</sup> volume in 2020. The analysis of the articles revealed that the most common articles were original scientific papers, while the least represented articles were categorized as conference papers. From 1971 to 1996, most articles were written in the Croatian language, but since 1997, the articles have been written only in the English language. An analysis of the cited references in the last decade of the journal's publication was made in order to point out the patterns of scientific communication in kinesiology and to determine the recognizability of the published papers at the international level. Since 2006, greater visibility of *Kinesiology – International Journal of Fundamental and Applied Kinesiology* has been enabled by providing access to full texts of publications through the Portal of Scientific Journals of Croatia – Hrčak, whereas the articles published until the end of 2005 were retrogradely digitized.

**Key words:** *journal Kinesiology, paper analysis, bibliometric indicators, citations, Croatia*

## Introduction

The academic journal acts as a focal point of scientific activity. There are two methods of assessing the value and contribution of scientific production and its impact on development: peer review and bibliometric analysis. "Bibliometrics is a quantitative mathematical and statistical analysis of published papers at all macro and micro levels of scientific communications" (Mitrović & Romić, 2018 p. 26). Bibliometric analysis appraises the structure of scientific activity in a particular field at the national level or by country; the influence of a particular country on a field and international cooperation; use of formal communication channels in the country; scientific publication, its influence and institutional cooperation. The analysis evaluates the articles, their authors, and descriptive characteristics with citation analyses (Jokić, 2005).

Several authors in the Republic of Croatia have conducted bibliometric analyses of scientific journals. In 1990, in the field of humanities and social sciences, Dukić (1990) conducted a citation analysis of the journal *Revija za sociologiju [Journal of Sociology]*. Švenda-Radeljak (2006) also did a bibliometric analysis in the same field of science when she analyzed the journal *Ljetopis Studijskog centra socijalnog rada [The Study Center*

*for Social Work Yearbook]*, and later, in collaboration with Vejmelko, she re-analyzed the same journal on the occasion of the twentieth anniversary of its continuous publication (Vejmelka & Švenda Radeljak, 2014). Martek and Šute (2010) analyzed *Arhivski vjesnik [Archival Gazette]*. The same year, Švenda-Radeljak (2010) conducted an analysis of *Revija za socijalnu politiku [Journal of Social Policy]*, followed by research by Munjiza and Dubovicki (2012), Jokić and Zauder (2013), Romić and Mitrović (2017) and Jelaska Marijan (2019).

In the field of natural sciences, bibliometric analysis was performed on two journals: *Acta botanica Croatica* and *Kemija u industriji: časopis kemičara i tehnologa Hrvatske [Chemistry in Industry: Journal of Chemists and Technologists of Croatia]*. Authors Jokić and Borić (1992), and Jokić and Sirotić (2002) analyzed the journal *Acta botanica Croatica*. Jokić, Andreis and Klaić (2002) analyzed the journal *Kemija u industriji: časopis kemičara i tehnologa Hrvatske [Chemistry in Industry: Journal of Chemists and Technologists of Croatia]*, which was later re-analyzed by Macan (2011).

In the scientific field of engineering, Jokić (2001) conducted a bibliometric analysis of the journal *Tekstil: časopis za tekstilnu tehnologiju i*

konfekciju [*Textile: Journal of Textile Technology and Confection*], followed by Krajna and Petrak (2004) with the journal *Strojarstvo: časopis za teoriju i praksu u strojarstvu* [*Mechanical Engineering: Journal of Theory and Practice in Mechanical Engineering*], then Zabjan Bogut and Krajna (2011) with *Polimeri: časopis za plastiku i gumu* [*Polymers: Journal of Plastics and Rubber*] and Mitrović and Romić (2018) who analyzed the journal *Sigurnost: časopis za sigurnost u radnoj i životnoj okolini* [*Safety: Journal for Safety in the Work and Living Environment*].

Two bibliometric studies have been conducted in the scientific field of biomedicine, but the analysis was conducted on only one journal, *Acta stomatologica Croatica*. The first analysis of the journal was done by Borić and Strujić (2006); then Borić (2008) analyzed the indexing of the journal in the Web of Science database, and Borić and Štefić (2018) performed a citation analysis of the same journal on the occasion of the fiftieth anniversary of its publication.

Romić and Mitrović (2017) state that citation analyses in the field of social sciences are rare, and they see the reason for this in the possible greater importance of books as a communication channel in most social and humanistic fields. From today's perspective, eleven journal studies in the field of natural and technical sciences and biomedicine and health have been conducted in Croatia, and the research included a total of seven journals. In the field of social sciences, nine studies have been conducted on seven journals.

To date, an extensive bibliometric analysis of the journal *Kinesiology* has not yet been made. Jaklinović-Fressl et al. (2000) have made a content review and analysis of certain data regarding editing and publishing trends in the 30 years of journal *Kinesiology*'s existence, with an emphasis on the review of 32 volumes and 50 issues of the journal.

Later, Omrčen and Leščić (2011) conducted research related to language profile of sources cited in the journal *Kineziologija/Kinesiology* from 1971 to 2010, with the aim of giving an overview of the language of sources cited in the journal. The research was conducted to determine the possible connection between different aspects of scientific papers such as: year of publication, language, refer-

ences and their number, the authors' gender, and country of origin. The results showed that most of the used references were written in English and that most of the authors were from the Slavic countries.

In the present paper, the authors intend to analyze the articles published in *Kinesiology – International Journal of Fundamental and Applied Kinesiology* from the beginning of its publishing in 1971 until the 52<sup>nd</sup> volume in 2020 by certain categories. The aim of this paper is to show the development of the journal, as well as its impact on the scientific community by presenting bibliometric analysis of its production.

The analysis of cited references (books, articles, and other references) indicates patterns of scientific communication in kinesiology. The aim of the citation analysis of the published articles was to determine the recognizability of published papers at the international level, in accordance with data obtained from the Web of Science, Index Core Collection and Scopus databases. The results of the study may be useful to the journal's Editorial Board for decision making on its further development, as well as to researchers and practitioners interested in the field of kinesiology (Knudson, 2014; Mraković, 1971).

## Kinesiology: International Journal of Fundamental and Applied Kinesiology

Twice a year the journal *Kinesiology* publishes articles, in open access, that deal with alterations in abilities, motor knowledge and skills induced by the systems of programmed physical exercise. Kinesiology studies investigate different biological, medical, psychological, social, educational, ethical, economic, and historical aspects, which are examined and evaluated from the cellular level to wider socio-cultural levels. The journal covers the following categories: sport and sporting activities, physical education, physical recreation and recreational sport, kinesiological anthropology, training methods, biology of sport and exercise, sports medicine and physiology of sport, biomechanics, and history of sport. All papers are subjected to a double-blind review by domestic and foreign reviewers.

Since 1971, the title of the journal has changed as follows:

<i>Kineziologija: časopis za znanstvena i stručna pitanja iz područja kineziolojske znanosti</i> [ <i>Kinesiology: Journal for Scientific and Professional Issues in the Field of Kinesiology</i> ]	from 1971 (Volume 1, Issue 1)
<i>Kineziologija: jugoslavenski časopis za znanstvena i stručna pitanja iz oblasti kineziologije</i> [ <i>Kinesiology: Yugoslav Journal for Scientific and Professional Issues in the Field of Kinesiology</i> ]	from 1974 (Volume 4, Issue 1)
<i>Kineziologija: jugoslavenski časopis za znanstvena i stručna pitanja iz područja kineziologije</i> [ <i>Kinesiology: Yugoslav Journal for Scientific and Professional Issues in the Field of Kinesiology</i> ]	from 1979 (Volume 9, Issue 1-2)

<i>Kineziologija: hrvatski časopis za znanstvena i stručna pitanja iz područja kineziologije</i> [ <i>Kinesiology: Croatian Journal for Scientific and Professional Issues in the Field of Kinesiology</i> ]	from 1990 (Volume 22, Issue 1-2)
<i>Kineziologija: hrvatski časopis za znanstvena i stručna pitanja iz kineziologije i športa</i> [ <i>Kinesiology: Croatian Journal for Scientific and Professional Issues in Kinesiology and Sports</i> ]	from 1994 (Volume 26, Issue 1-2)
<i>Kineziologija: hrvatski časopis za znanstvena i stručna pitanja iz kineziologije i sporta</i> [ <i>Kinesiology: Croatian Journal for Scientific and Professional Issues in Kinesiology and Sports</i> ]	from 1995 (Volume 27, Issue 2)
<i>Kinesiology: International Scientific Journal of Kinesiology and Sport</i>	in 1996 (Volume 28, Issue 1)
<i>Kineziologija: međunarodni znanstveni časopis iz područja kineziologije i sporta</i>	in 1996 (Volume 28, Issue 2) and in 1998 (Volume 30, Issue 2)
<i>Kinesiology: International Scientific Journal of Kinesiology and Sport</i>	from 1997 (Volume 29, Issue 1) until 2000 (Volume 32, Issue 1)
<i>Kinesiology: International Journal of Fundamental and Applied Kinesiology</i>	since 2000 (Volume 32, Issue 2) until today

Besides categorized articles: original scientific paper, short communication, preliminary communication, review article, professional paper and conference paper, the journal publishes meta-analyses, case studies, brief reports, narrative reviews, commentaries, and letters to editors. *Kinesiology* has been published continuously since 1971 with a three-year discontinuation in the regularity of publishing due to the well-known turbulent, growing political and macrosocial tensions within the former Yugoslavia at the end of the 80's and in the first five years of the 90's (Jaklinović-Fressl, et al., 2000). Luckily, during 1992, the members of the new Editorial Board, under the leadership of Editor-in-Chief Dragan Milanović, managed to restore the publication of the journal. Volumes 11 (1981) and 16 (1984) had a special issue, while volumes 46 (2014) and 50 (2018) have supplements.

### Sample and research methodology

The journal *Kinesiology* was analyzed by applying certain bibliometric parameters to the journal's contents published over the period from 1971 to 2020. The analysis included original scientific articles, review articles, professional papers, short communications, preliminary communications, and conference papers, while other contributions were not assessed. The categorization of the analyzed articles was presented in the form determined by the Editorial Board of the journal that followed the categorization proposed by the reviewers. Bibliometric parameters used in the analysis were:

- the number of issues per year,
- the number of articles per type and year,
- the language of categorized articles,
- the language of abstracts,
- the total number of authors,
- the number of authors per article and year of publication,

- the number of authors per article categorization,
- the number of references,
- the representation of authors' affiliations per country,
- the citations according to Web of Science and Scopus,
- visibility of the journal in other databases
- reference analysis (the number, type, language, and the age of the references).

The citation analysis was made based on the data available in the Web of Science Core Collection and Scopus databases and the Journal Citations Reports and SCImago Journal Rank. The data for all 52 volumes of the journal were manually collected and transferred to Microsoft Excel spreadsheets and then processed using the method of descriptive statistics.

## Results and discussion

### Analysis of articles

In the 50 years of the journal's existence, 92 issues and a total of 1,083 articles were published. The dynamics of publishing the journal is two issues a year, either in two separate volumes or as a double issue, with issue 1 of volume 1 in 1971 being an exception as a single issue. On average, 21.66 articles were published annually, i.e., 12 articles per issue.

The largest number of published papers are original scientific papers (854; 78.86%), followed by review papers (70; 6.46%), preliminary communications (68; 6.28%), professional papers (66; 6.09%), short communications (13; 1.20%), conference papers (11; 1.02%) and a technical note (1; 0.09%). The fewest number of papers were published in 1975 and 1991. In 1975, the first and only published issue that contained eight original scientific papers, and, in 1991, a double issue consisted of five original scientific articles, two professional papers and

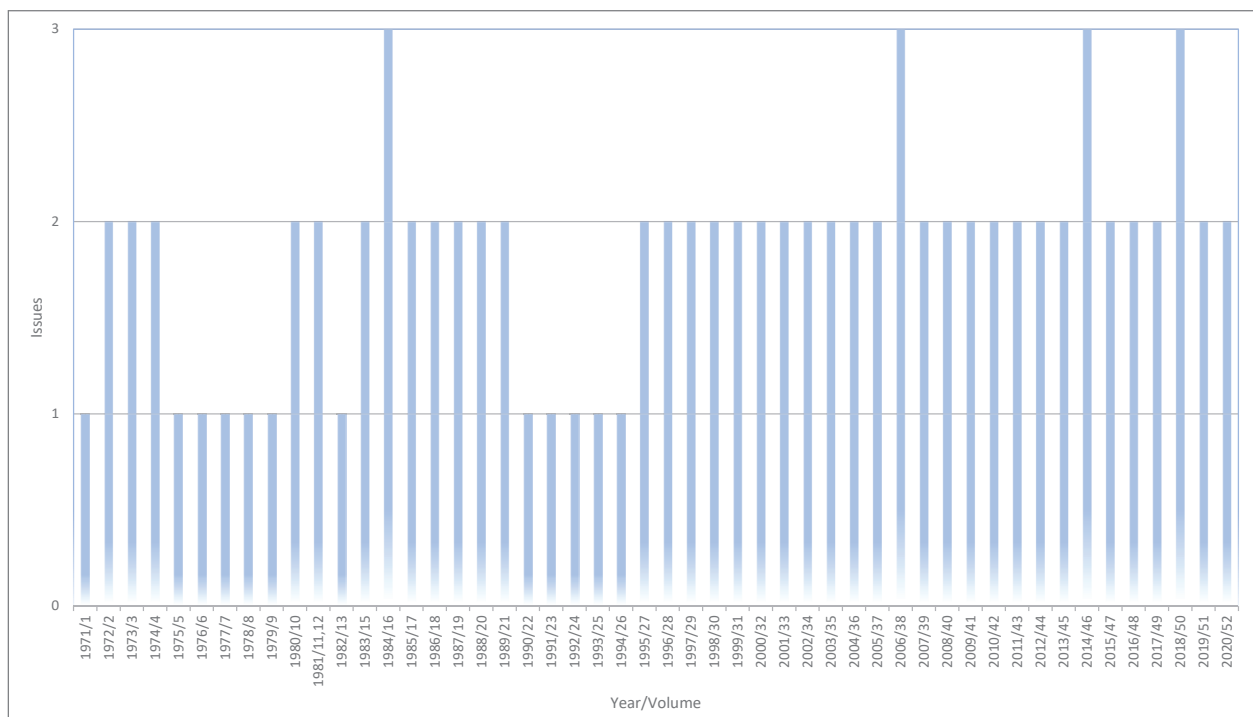


Figure 1. Number of issues per year.

a review. The largest number of articles (50) was published in volume 50 in 2018: 15 papers were in issue 1, 18 papers in issue 2, and 17 of them in issue Suppl. 1.

In the last decade of publishing the journal, from 2011 to 2020, the largest number of published papers were original scientific papers, 305 (35.71%), which was also the period in which no professional paper or conference paper was published. Although original scientific papers dominate in the total number of published papers, the fewest (105

papers) were published in the first decade of the journal's publication, from 1971 to 1980 (12.30%). In the same period, the highest number of review papers was published, 19 (27.14%). The largest number of papers categorized as professional ones were published from 1991 to 2000, 26 (39.39%), while the largest number of preliminary communication papers was published from 2001 to 2010, 22 papers (32.35%). Overall, the fewest papers were published in the categories of short communication, conference paper and technical note.

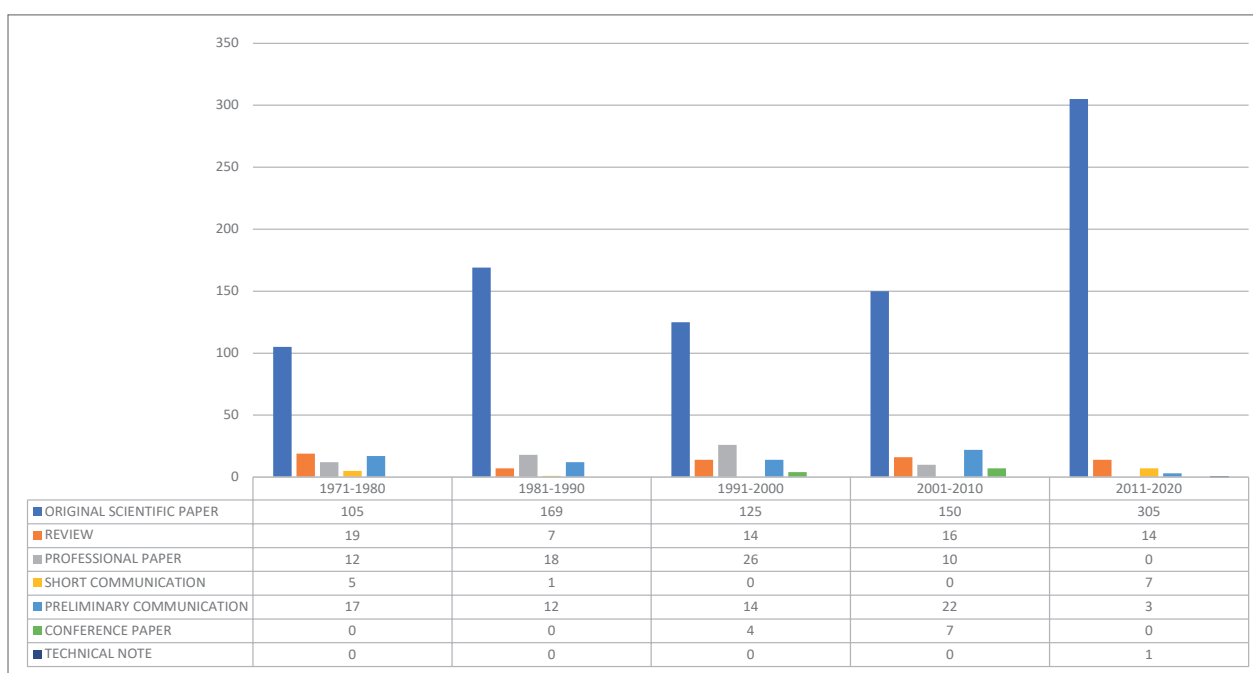


Figure 2. Number of papers per article category over publication decades.

### Language of articles

The influence of language on the visibility of papers in the international scientific community is undeniable, which the journal's Editorial Board was aware of from its very beginnings. Thus, the largest number of articles (627; 57.89%) was written in English (since 1996 onwards), which shows the international character of the journal. The following prevailing language of the articles is Croatian with 452 articles or 41.74% that were published from 1971 to 1995. A bibliometric analysis of the journal *Sociologija sela [Sociology of Village]* (later *Sociologija i prostor [Sociology and Space]*), conducted by Jokić and Zauder (2013), showed that, considering the circumstances in Yugoslavia in the 1960s, the journal was unusually professional, given that it had abstracts in English, French and Russian. Our analysis also established high quality in the context of former Yugoslavia; namely, all papers since 1971 had abstracts and key words in English, and the articles from 1972 to 1989 also had abstracts in Russian. From volume 10, issue 1-2 in 1980, to volume 46, issue 1 in 2014, papers had abstracts and key words in Croatian, and from volume 23, issue 1-2 in 1991, to volume 38, issue 1 in 2006, abstracts and key words were also written in German.

### Authorship analysis

A total number of authors who published their articles in *Kinesiology* is 3,120. Out of the overall sample of 1,083 articles, most papers were written by one author (307; 28.37%), whereas a total of 443 (223 and 220, respectively) or 40.90% were signed by two or three authors. A total of papers signed by four to eight authors was 325 (30%; 137, 101, 55, 19, and 13 respectively). The smallest number of papers was signed by nine or more authors – only eight papers (0.73%). The average number of authors per article was 2.88.

Given the specificity of contemporary academic and research production characterized by collective authorship (Mitrović & Romić, 2018), it was to be expected that the number of papers signed by multiple authors would grow over the years. The analysis showed that, in a total of 25 volumes from 1971 to 1995, single-author papers were in majority in 11 volumes; in nine volumes the number of multi-author papers was higher than the number of one-author papers, and in five volumes the number of single-author and multi-author papers was in balance. Therefore, in the observed period, 72% of the volumes had half or more papers signed by one author. In the period from 1971 to 1995, the largest

Table 1. Language of articles

LANGUAGE OF ARTICLES	FREQUENCY	CONTRIBUTION
Croatian	452	41,73
English	627	57,89
Serbian	1	0,09
Slovenian	1	0,09
Russian	2	0,18
<b>TOTAL</b>	<b>1083</b>	<b>100%</b>

Table 2. Number of authors per article

NUMBER OF AUTHORS	FREQUENCY	CONTRIBUTION	TOTAL NUMBER OF AUTHORS
1	307	9,84	307
2	223	14,29	446
3	220	21,15	660
4	137	17,56	548
5	101	16,18	505
6	55	10,58	330
7	19	4,26	133
8	13	3,33	104
9	2	0,58	18
10	3	0,96	30
13	3	1,25	39
<b>TOTAL</b>	<b>1083</b>	<b>100</b>	<b>3120</b>

deviation occurred in volume 5 (1975), where, out of 19 published papers, there was only one single-author paper, and in volume 2 (1972), where, out of the 24 published papers, as many as 62.5% were the single-author articles. Since 1996, the trend of writing single-author papers has changed and continues to this day. For example, volume 28 (1996) had only nine single-author papers out of the 24 published. Volumes 39 (2007), 48 (2016) and 49 (2017) did not have any single-author papers. Volume 52 published in 2020 had only one single-author article out of a total of the 35 published papers.

It is noticeable that the number of single-author papers has decreased over decades. Namely, it was the highest in the period from 1981 to 1990, amounting to 92 (29.97%), compared to the lowest number of single-author papers in the period from 2011 to 2020, only 18 papers (5.86%). From the beginning of the journal until 2020, the lowest number of published papers were signed by seven to 13 authors, a total of 40 papers (3.69%).

The same conclusions were reached by Jokić, Zauder, and Letina (2012) who analyzed the scientific production of Croatian sociologists in the period from 1991 to 2005. Their results showed that, in the observed period, there were 76.6% of single-author papers. Jelaska Marijan (2019) came to the same conclusion through the bibliometric analysis of

*Časopis za suvremenu povijest [Journal of Contemporary History]*; in half a century of publishing the journal, single-author papers are in majority. She also concludes: “[...] which is not at all surprising because it is still one of the characteristics of papers in the field of history. And not only in history, but also in social sciences and humanities in general.” (Jelaska Marijan, 2019, p. 77).

Considering the number of authors and categorization of the published papers, it is discernible that 22.6% of original scientific articles were single-author papers. In the same category, the average number of authors per article was 1.27, which makes single-author papers the most represented in the original scientific papers category. On the contrary, the least single-author papers appeared in the category of short communication, conference papers and technical note (6, 9 and 1, respectively).

Looking at the countries of the authors’ affiliations, most authors (34.2%) were, expectedly, from the institutions located in the Republic of Croatia, then from Slovenia 9.81%, Spain 7.15%, the United States 6.54%, and Brazil 6,51. The fewest authors belonged to institutions from Cyprus, Czechoslovakia, Latvia, Mexico, Montenegro, South Korea, Sweden, and Ukraine, one author from each institution in a country. There were also 152 authors with no reported affiliation, and 37 authors with affiliations in two or more countries.<sup>1</sup>

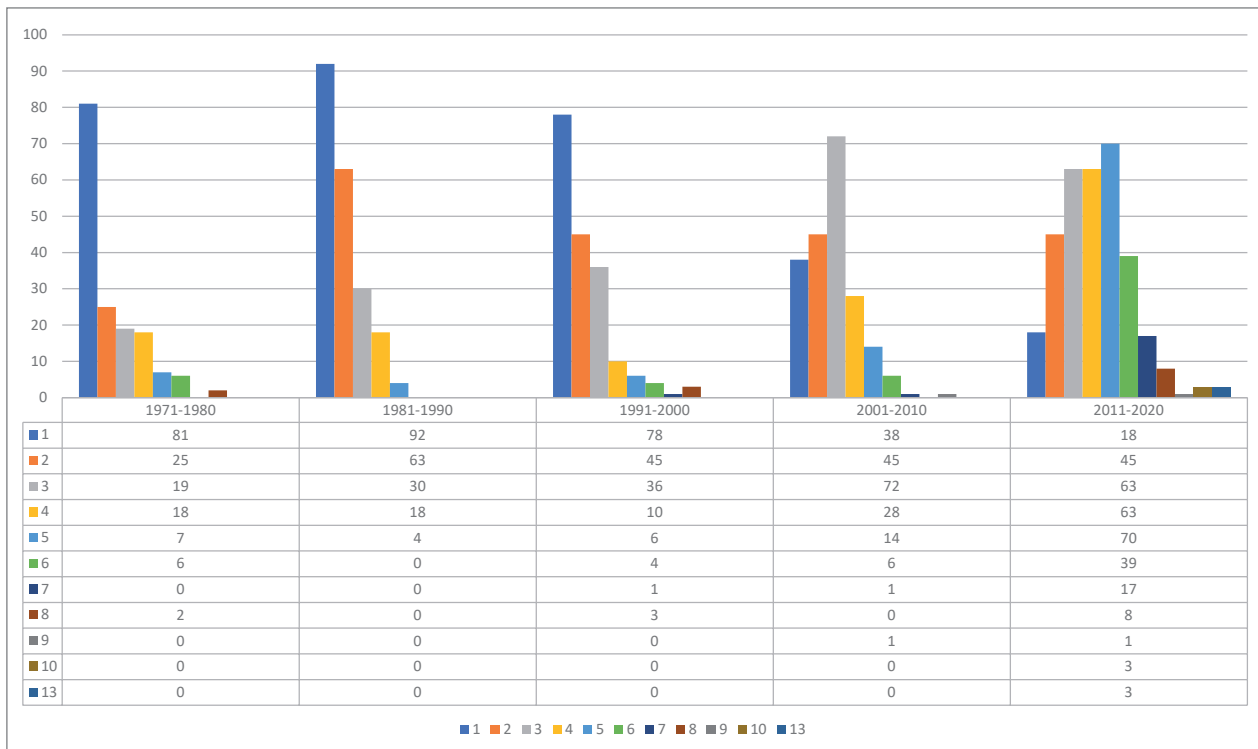


Figure 3. Number of authors per article over publication decades.

<sup>1</sup> When counting affiliations in the statistics of the number of countries, the first listed country was taken as a reference.

Table 3. Number of authors per paper category.

PAPER CATEGORY	NUMBER OF AUTHORS											TOTAL
	1	2	3	4	5	6	7	8	9	10	13	
Original scientific paper	193	177	183	124	90	51	19	10	2	3	2	<b>854</b>
Review	34	15	9	4	3	2	0	3	0	0	0	<b>70</b>
Professional paper	41	13	9	3	0	0	0	0	0	0	0	<b>66</b>
Short communication	6	3	2	0	0	1	0	0	0	0	1	<b>13</b>
Preliminary communication	23	15	17	5	8	0	0	0	0	0	0	<b>68</b>
Conference paper	9	0	0	1	0	1	0	0	0	0	0	<b>11</b>
Technical note	1	0	0	0	0	0	0	0	0	0	0	<b>1</b>
<b>TOTAL</b>	<b>307</b>	<b>223</b>	<b>220</b>	<b>137</b>	<b>101</b>	<b>55</b>	<b>19</b>	<b>13</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>1083</b>

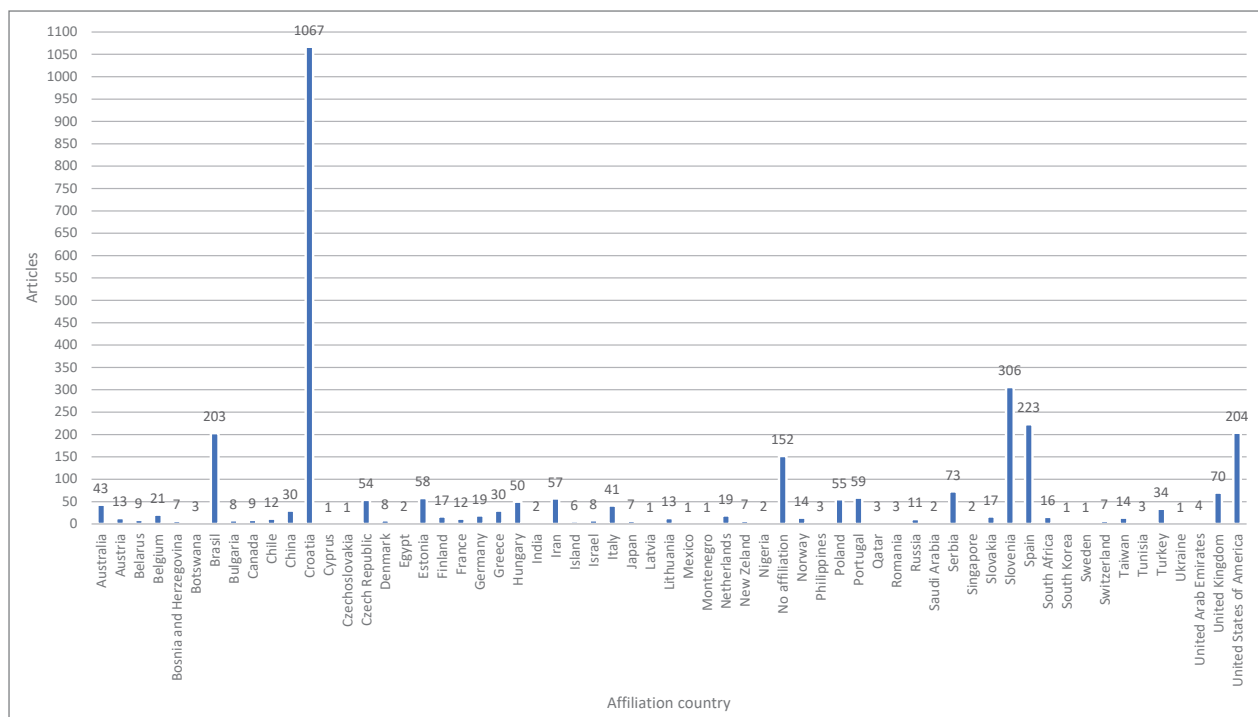


Figure 4. Authors by countries of affiliation.

Looking at the countries of the authors' affiliations according to the decades of publishing the journal, in the first decade of publishing, since 1971 to 1980, the predominance of authors from Croatia was noticeable – out of 344 authors, 277 (95.29%) were from Croatia. The same trend continued in the period from 1981 to 1990, where out of a total of 400 authors, 341 (85.25%) were from Croatia. From 1991 to 2000, the trend of predominance of authors' affiliations from Croatia changed and affiliations became more diverse. Thus, in the mentioned period, out of a total of 403 authors, 252 were from Croatia (63.00%), 71 from Slovenia (17.62%), and there were also, although in small numbers, authors from Brazil (1.99%), Finland (1.99%) and the United Kingdom (1.49%).

In the period from 2001 to 2010, the number of authors signed by affiliates from Slovenia increased significantly – from a total of 579 authors, 134

were from Slovenia (23.14%) – and there were also authors from Hungary, 35 authors (6.04%), Estonia, 30 (5.18%), Greece, 22 (3.80%) and Poland, 21 (3.63%). From 2011 to 2020, the number of authors from all over the world increased, possibly due to the inclusion of the journal in the Web of Science and Scopus databases, which significantly increased the visibility of the journal on the international scientific scene. Unlike in the first decade, where Croatian authors predominated, in the last decade of the observed period, most authors were from Spain, 214 authors (15.35%), followed by 191 authors from Brazil (13.70%), 181 from the United States of America (12.98%) and 162 from Croatia (11.62%). In the period from 2001 to 2010, the number of authors from Slovenia was quite large, 134 authors (23.14%), but in the last decade this number decreased significantly – out of a total of 1,394 authors, only 78 were from Slovenia (5.59%).

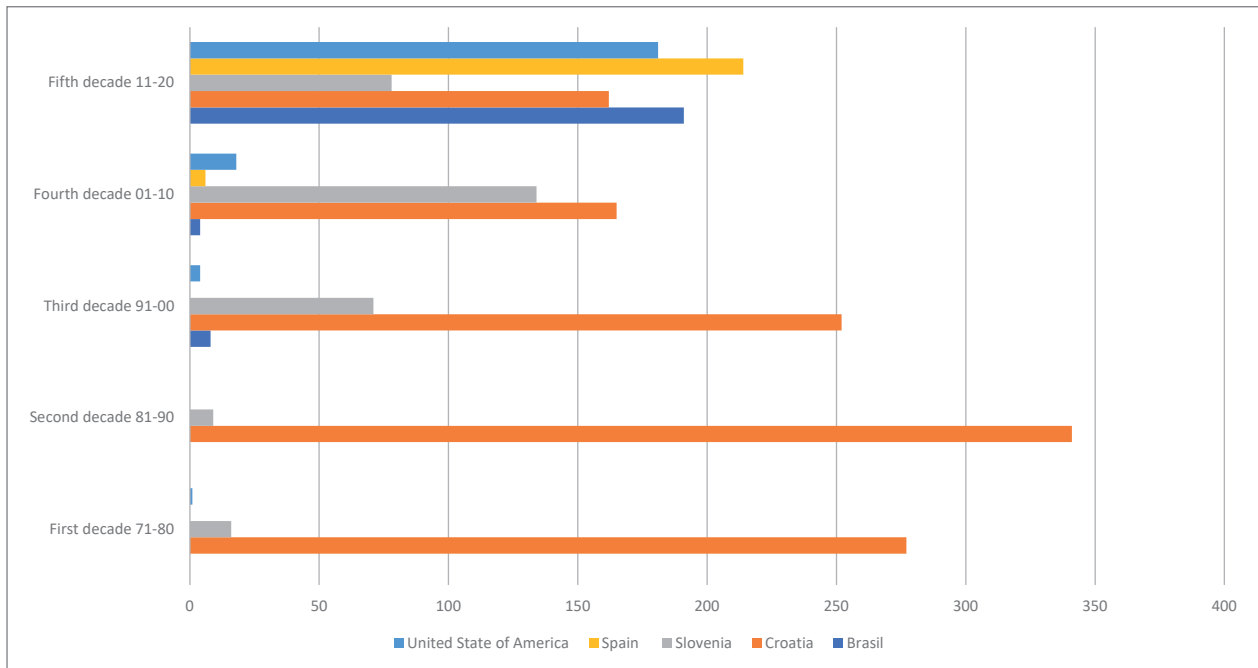


Figure 5. Top five countries affiliation over publication decades.

### Reference analysis

By citing scientific and professional texts when writing a paper, in addition to avoiding plagiarism, we give our research a scientific basis, acknowledge authorship and instruct the reader to find additional information to verify the authenticity of what is written. In their research, Zabjan Bogut and Krajna (2011) convey the minimum of references that establish a scientific paper: either five (as cited in Maričić, Sorokin, & Papeš, 1992) or more than ten references (as cited in de Solla Price, 1965). The total number of references in the 50 years of publication of the journal *Kinesiology* was 27,418, which means that the average number of references per article was 25.32. An entire volume 23 (1991) had 58 references, the fewest, while volume 50 (2018) had the most, with 1917 references in 50 articles, averaging 38.34 references per article.

The number of references per article has been increasing over the years, except in the period from 1991 to 2000, when the number of references decreased and amounted to 2481 references or 13.56 references per paper, probably due to the discontinuation and restoration issues as well as issues related to a macro-social and political situation in the wider region (Jaklinović-Fressl, 2000). The largest number of papers was published in the period between 2011 and 2020 – 330 papers with 12,450 references or 37.23 references per article.

#### Reference analysis (2011 – 2015)

In the period from 2011 to 2015, in papers published in the journal *Kinesiology*, a total of 5,366 papers were cited, out of which the most often cited

were journals (4,375 citations from 1,362 journals or, without self-citations, 4,299), books (663 citations from 579 titles) and other materials (317 citations). In the observed period, there were only 12 incomplete references that have not been included in further analysis. The average age of the cited journals was 9.89 years; the oldest cited journal was from 1875, a journal in the Croatian language *Narodne novine* (in English Official Gazette; the article dealt with the history of physical education, more precisely with the introduction of mandatory classes of PE in the then Croatian schools). The average age of the cited books was 17.09 years; the oldest cited book being from 1852, *Medicinishe Psychologie oder Physiologie der Seele [Medical Psychology or Physiology of the Mind]* in German.

The largest number of cited papers were, as expected, in English (4,276 or 79.69%), 39 in Spanish (0.73%), nine in Croatian (0.17%), eight in German (0.15%), seven in Portuguese and Slovenian (0.13%), six in Polish (0.11%), five in French and Serbian (0.09%), four in Lithuanian (0.07%), three in Turkish (0.06%), two in Russian (0.04%) and one paper in Chinese, Hungarian, Slovak, and Italian (0.01%).

Of the 633 cited books, the largest number was written in English (546 or 86.26%), 28 in Croatian (4.42%), 21 in Spanish (3.32%), 19 in Slovenian (3.30%), 12 in German (1.90%), 11 in Russian (1.74%), eight in Polish and Serbian (1.26%), three in Czech (0.47%), two in French and Portuguese (0.32%), and one cited book was written in Bulgarian, Lithuanian and Turkish. (0.16%).

Regarding other sources, the most used were online sources (127 or 40.06%), followed by proceed-



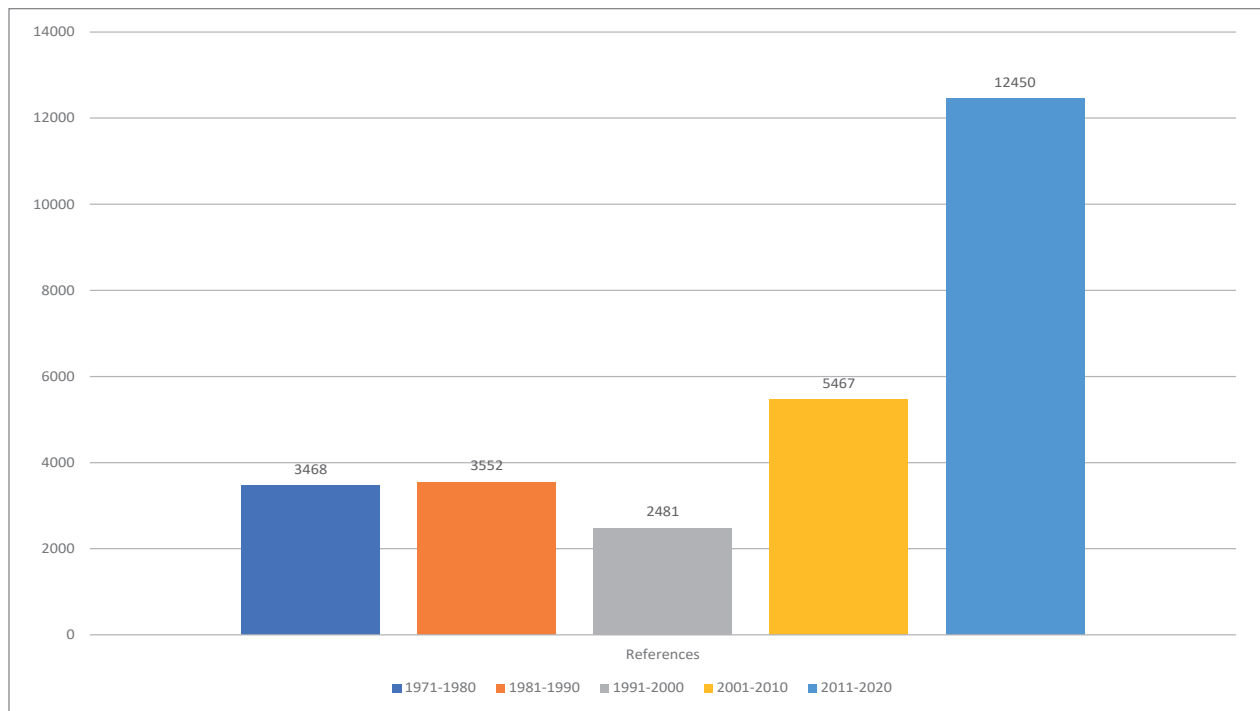


Figure 6. Number of references per article over publication decades.

Table 4. Type and age of references (2011 – 2015).

Age in years	Journals	Books	Total
Current year	70	5	75
1-5	1557	109	1666
6-10	1208	152	1360
11-20	1064	209	1273
More than 20	476	188	664
Total	4375	663	5038

ings (99 or 31.23%) and theses (62 or 19.56%), while the rest were encyclopedias, manuals, scripts, and standards (29 or 4.58%). Most of the above-mentioned sources were written in English (239 or 75.39%), followed by Slovenian (21 or 6.62%) and Croatian (20 or 6.31%).

The analysis found that, in the period from 2011 to 2015, in the scientific field of kinesiology, the most important information sources were journals, represented by more than 80%, followed by books (12.36%), whereas the rest were online sources, proceedings and theses. In the analyzed period,

Table 5. Ten most cited journals (2011 – 2015).

Name of the journal	Publisher	Number of citations
The Journal of Strength and Conditioning Research	Lippincott Williams & Wilkins	231
Journal of Sports Sciences	Taylor & Francis Ltd	142
Medicine and Science in Sports and Exercise	Lippincott Williams & Wilkins	130
Sports Medicine	Adis Int Ltd	99
European Journal of Applied Physiology	Springer	86
Kinesiology	University of Zagreb, Faculty of Kinesiology	73
International Journal of Sports Medicine	Georg Thieme Verlag KG	70
British Journal of Sports Medicine	BMJ Publishing Group	67
Journal of Applied Physiology	American Physiological Society	65
Research Quarterly for Exercise and Sport	Routledge Journals, Taylor & Francis Ltd	64

references up to 11 years old predominated (61.55%), and the most used books and journals were from one to five years old (33.09%) (see Table 5).

In Table 5 the ten most cited journals, all ten indexed in the Web of Science database, are presented.

**Reference analysis (2016 – 2020)**

In the period from 2016 to 2020, a total of 7,033 papers were cited, most of which were journals (6,161 citations from 1,457 journals; out of which 6,071 without self-citations), books (597 citations from 462 books) and other sources (273). There were 15 incomplete references in the observed period. The average age of the journal was 10.78 years; the oldest cited journal was from 1866, *Journal of Anatomical Physiology* in English. The average age of the cited books was 17.22 years; the oldest cited book was from 1923 and it was a book in the Slovenian language, *Spomenica o I. jugoslovanskem vsesokolskem zletu 1922 [Memorial on the First Yugoslav All - Falcon Rally in 1922]*.

The most cited articles were in English (5,994 or 97.31%), 92 in Spanish (1.49%), 43 in Portuguese (0.70%), 13 in Slovenian (0.21%), six in Greek (0.09%), four in German. (0.06%), three in French and Croatian (0.05%), and one in Hungarian and Swedish (0.02%).

Out of the 598 cited books, most were written in English (527 or 88.27%), 17 in Croatian and Slovenian (2.85%), 12 in Spanish (2.01%), ten in Portuguese (1.68%), three in Russian, Serbian and German (0.50%), two in French (0.34%), and one in Slovak and Italian (0.17%).

Regarding other sources, the most used were proceedings (98 or 35.90%) followed by online sources (84 or 30.77%) and theses (26, 9.52%), whereas the rest were encyclopedias, manuals, scripts, and standards (66 or 24.09%). Most other sources used were written in English (234 or 85.71%), Spanish (10 or 3.66%) and Croatian (9 or 3.30%).

In the period from 2016 to 2020, journals were also the most important information source, represented by more than 90%, followed by books (8.83%), online sources, proceedings, and theses (1,17%). In the analyzed period, references up to 11 years old predominated (59.63%), and the most used books and journals were from one to five years old (33.73 %).

Table 7 shows the ten most cited journals that are all indexed in the Web of Science database. In the last ten years (2010-2020) of publishing the journal, the most cited source in papers published in the journal *Kinesiology* was *The Journal of Strength and Conditioning Research*, published by Lippincott Williams & Wilkins, with 753 citations.

Table 6. Type and age of references (2016 – 2020).

Age in years	Journals	Books	Total
Current year	51	4	55
1-5	1980	97	2077
6-10	1789	109	1898
11-20	1711	196	1907
More than 20	630	191	821
Total	6161	597	6758

Table 7. Ten most cited journals (2016 – 2020).

Name of the journal	Publisher	Number of citations
The Journal of Strength and Conditioning Research	Lippincott Williams & Wilkins	522
Journal of Sports Sciences	Taylor & Francis Ltd	290
Medicine and Science in Sports and Exercise	Lippincott Williams & Wilkins	243
Sports Medicine	Adis Int Ltd	185
International Journal of Sports Physiology and Performance	Human Kinetics Publ. Inc.	167
European Journal of Applied Physiology	Springer	123
International Journal of Sports Medicine	Georg Thieme Verlag KG	111
British Journal of Sports Medicine	BMJ Publishing Group	103
International Journal of Performance Analysis in Sport	Routledge Journals, Taylor & Francis LTD	102
Kinesiology	University of Zagreb, Faculty of Kinesiology	88

### Indexing of Kinesiology in bibliographic databases Web of Science and Scopus

Indexing of the journal in database such as Web of Science and Scopus contributes to a better visibility of the journal in the scientific, international community. Field of kinesiology is variously indexed as an academic subject area in the above-mentioned citation databases. Therefore, journals associated with human movement are indexed in great number of subject categories. The absence of consolidated focus has culminated in a fairly vague, general understanding of what kinesiology faculty and librarians might consider a kinesiology journal (Knudson, 2014). Since the 40th volume in 2008 to date, the journal has been indexed in Web of Science Core Collection (WoSCC) and in Scopus. The current analysis was made on May 26<sup>th</sup>, 2021.

Web of Science (WoS) is a platform published by Clarivate Analytics (formerly Thomson Reuters Intellectual Property and Science business). The platform contains more than 33,000 indexed journals and nearly a billion records of cited references. It includes articles, conference proceedings, reports, and patents (Clarivate, 2021). In the Web of Science Core Collection there were 399 records of the references cited in Kinesiology, from 2008 to 2020, out of which 374 were articles, 17 reviews, three editorial materials, two letters, two news items and one book review. All of them were written in English and categorized in research areas of rehabilitation and sports sciences.

The number of article records by year is as follows: 21 (2008), 23 (2009), 21 (2010), 21 (2011), 25 (2012), 29 (2013), 47 (2014), 30 (2015), 30 (2016), 32 (2017), 51 (2018), 34 (2019) and 35 (2020).

From the point of view of the author’s institutional affiliation, the largest number of citation records were affiliated with: University of Zagreb – 67 records, University of Zagreb Faculty of Kinesiology – 64 records, University of Ljubljana – 36 records and Universidad Politécnica de Madrid – 15 records. The least records, one record each, have been affiliated with: You Cheng Orthopaedic Clinic, Zagreb Studentski centar, Zentrum Baranain, Zentrum Rehabilitation and Performance Center, Department of Physical Therapy and The Zinman College of Physical Education and Sport Sciences at the Wingate Institute. The analysis showed that the majority of authors were from Croatia (78 authors), Spain (71 authors), the United States of America (58 authors), Brazil (45 authors) and Slovenia (42 authors), while the smallest number of authors was from Romania (1), Saudi Arabia (1), Switzerland (1), the United Arab Emirates (1) and Wales (1).

H-index of the journal was 23, average citation per item was 6.69. There were 2,671 citations and 2,379 citing articles in total, out of which 2,542 citations and 2,294 citing articles without self-citation. Articles were cited from 0 to 116.

According to the InCites Journal Citation Reports Journal Impact Factor (hereinafter IF) was 0.525 in 2010; in 2011 IF decreased and was 0.238, while in 2012 it was 0.405. In 2013 IF was 0.333 and has been increasing since, so in 2014 it was 0.585, in 2015 0.553, in 2016 0.961, in 2017 0.767, in 2018 1.383 and in 2019 1.225. The IF for 2020 at the moment of the analysis has not yet been calculated.

The number of cites per year was as follows: 61 (2010), 96 (2011), 103 (2012), 141 (2013), 155 (2014), 177 (2015), 292 (2016), 356 (2017), 437 (2018), and 474 (2019).

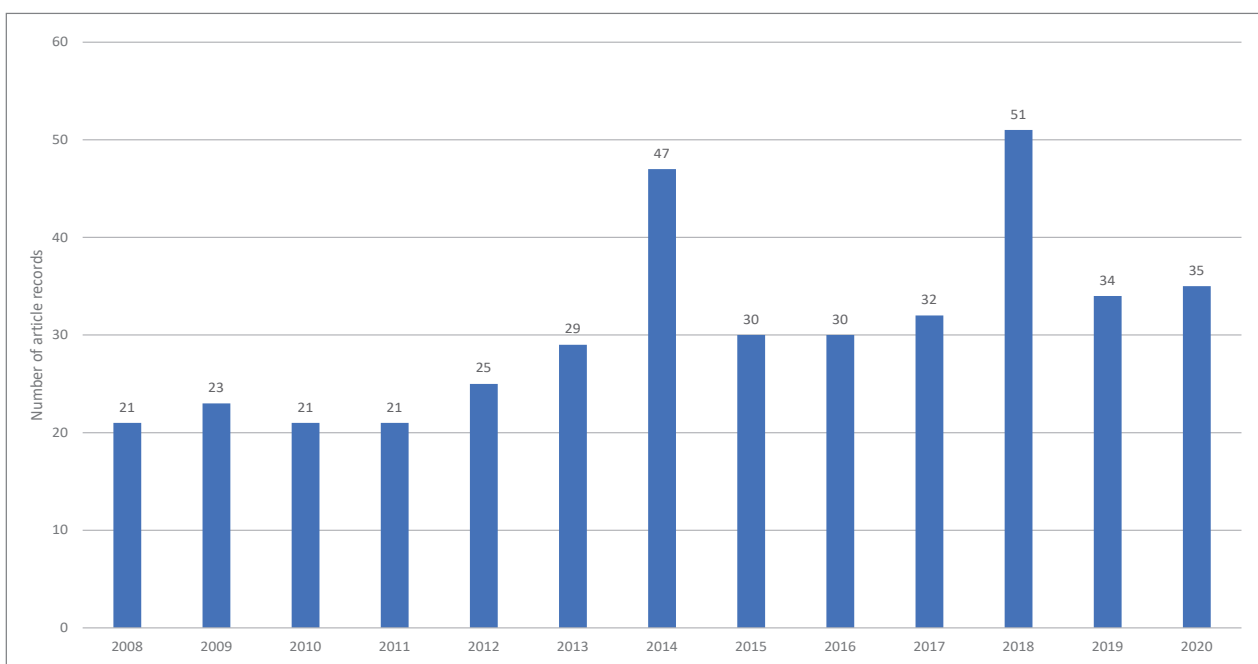


Figure 7. Number of article records in Web of Science.

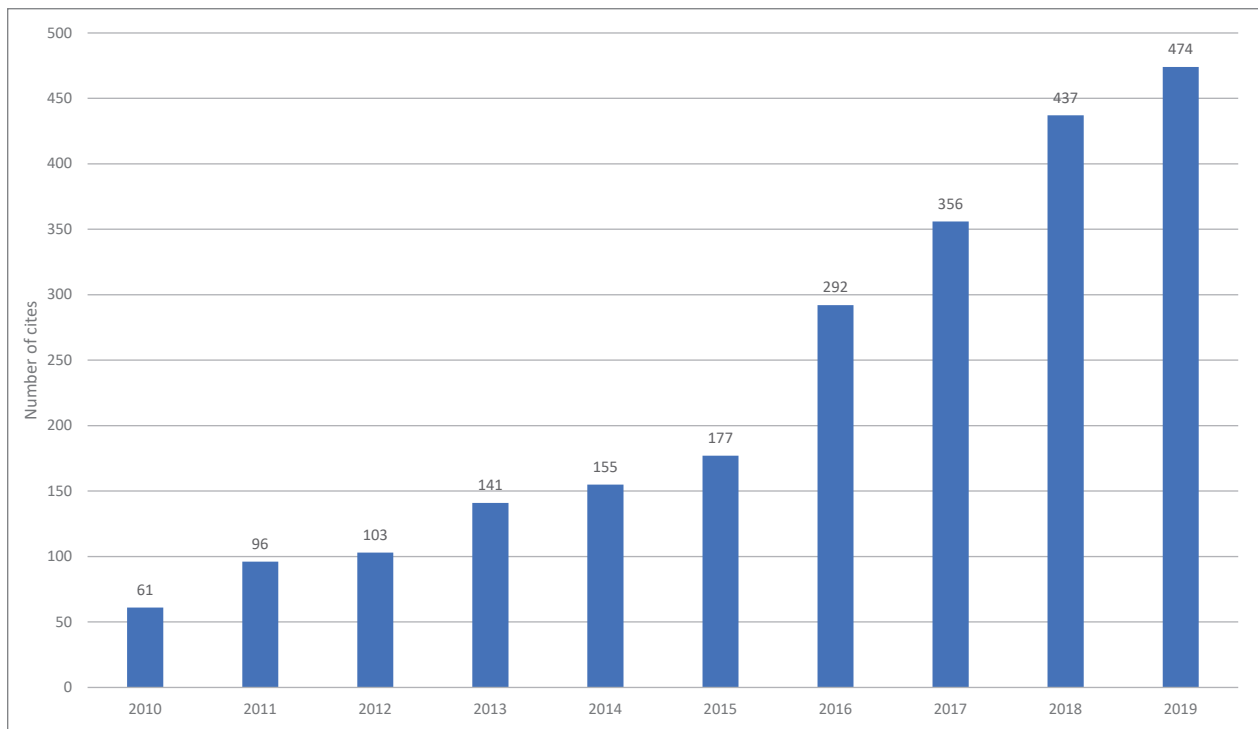


Figure 8. Number of citations in InCites Journal Citation Reports.

In Journal Citation Reports from 2010 to 2019, the journal was ranked in category rehabilitation in the 4<sup>th</sup> Quartile (Q4), except for the year 2018 when it was in the 3<sup>rd</sup> Quartile (Q3). In category sport sciences it was in the 4<sup>th</sup> Quartile (Q4) during all the mentioned years.

Scopus is a citation database that indexes sources from around the world and includes more than 70 million records for more than 23,700 peer-reviewed journals (out of which more than 4,000 are in open access), 300 trade journals from almost all fields of science, more than 600 publishers, 8 million conference papers and more than 1.4 billion cited references since 1970 (Elsevier, 2021).

The journal *Kinesiology* has been indexed in Scopus since 2008 with 395 documents: 366 articles (92,7%), 16 reviews (4,1%), 11 editorial materials (2,8%) and two letters (0,5%). The analysis showed that the number of cited documents increased from 2008 to 2014: 20 documents in 2008, 22 documents in 2009, 23 documents in 2010, 24 documents in 2011, 26 documents in 2012, 29 documents in 2013 and 39 documents in year 2014. In 2015 and 2016, the number of cited documents decreased to 30. In 2017, the number grew to 51, followed by a decreasing trend in 2019 with 34 documents and in 2020 with 35 documents. All documents by subject area are placed in the health professions category.

The observed articles were cited in range from 0 to 111. A total number of citations was 2,833, which means that each of the 366 articles have been cited on average of 7.74 times. H-index of the journal was 23. From the point of view of the author's institutional affiliation, the largest number of articles was

affiliated with: University of Zagreb (49 documents), University of Zagreb, Faculty of Kinesiology (39 documents), Univerza v Ljubljani (36 documents), Universidad Politécnica de Madrid (16 documents) and Universidade de Sao Paulo – USP (13 documents). Accordingly, the largest number of authors was from Spain (71), Croatia (70), the United States of America (57), Brazil (45) and Slovenia (42), while the smallest number of authors, only one from each country, were from the United Arab Emirates, Switzerland, Saudi Arabia, Romania, and the Philippines.

SJR indicator have increased from year to year: in 2009, SJR was 0.119, in 2010 it was 0.179, then it was 0.209 in 2011, 0.199 in 2012, 0.228 in 2013, 0.253 in 2014, 0.305 in 2015, 0.372 in 2016, 0.437 in 2017, 0.475 in 2018, whereas in 2019, SJR decreased slightly to 0.454 and the following year it increased again to 0.530. The journal is classified in two categories: physical therapy, sports therapy and rehabilitation, and sports science. In 2019, according to SJR, the journal was ranked in the 4<sup>th</sup> Quartile (Q4) in both categories. From 2010 to 2016, it was in the 3<sup>rd</sup> Quartile (Q3) in physical therapy, sports therapy, and rehabilitation category and from 2017 to 2020, it was in the 2<sup>nd</sup> Quartile (Q2) in the same category. In the sports science category, the journal was placed in the 4<sup>th</sup> Quartile (Q4) from 2009 to 2015 and in the 3<sup>rd</sup> Quartile (Q3) from 2016 to 2020. Out of 165 Croatian journals indexed in the Scopus database, the journal *Kinesiology* is in the 7<sup>th</sup> place. Observing only Croatian open access journals, out of 108 journals, *Kinesiology* is in the 5<sup>th</sup> place.

## Visibility of the journal in other databases

Visibility of the journal has been enhanced since 2006, when *Kinesiology* became a part of the aggregator *Hrčak: portal of Croatian scientific and professional journals* which brings together scientific and professional open access journals in the Republic of Croatia. Articles from volume 39 in 2007 to volume 49 in 2017 were placed on the portal in digital version immediately after the release of the printed version of the journal. Since 2017, the journal's Editorial Board has been using the Open Access Journal System (OJS) tool for editing and publishing open access journals, which enables the synchronization of OJS papers in *Hrčak*. The older issues of the journal, from 1971 to 2006, were digitized by the professional library staff of the Faculty of Kinesiology, University of Zagreb in the period from 2019 to 2021.

Conducting the survey of journal attendance on the *Hrčak* portal between March 2007 and July 2021, with 1,385,375 views, *Kinesiology* is ranked 42<sup>nd</sup> out of the total of 507 journals, and 17<sup>th</sup> out of 220 journals in the field of social sciences. The total number of visits to the site of the journal is 76,044, the views of the issues 130,075, the pages of articles 486,664 and article attachments 692,592. The large number of visits supports the fact that the topics covered by scientists in the field of kinesiology are of significance to many interested parties.

As of 2018, the journal has also been visible in the Directory of Open Access Journals (DOAJ) where the access to the full texts is provided via a link to *Hrčak*. DOAJ is a database containing over 16,000 open access journals covering all areas of science and its task is to increase the visibility of open access scientific journals (DOAJ, 2021).

Since 2016, the journal has also been available in Index Copernicus International, a database that gathers information on scientific journals from various parts of the world in one place. It enables users, in the so-called passport of the journal, to see a link to the full texts of a journal, general and metric data (Index Copernicus International, 2021). Since volume 35 in 2003, *Kinesiology* has been a part of the EBSCO database SPORTDiscuss with Full Text. EBSCO is a bibliographic database with full texts that are available exclusively by subscription. It contains full texts of all volumes since 2000, with selective coverage back to 1973 (EBSCO, 2021).

## Conclusion

*Kinesiology: International Journal of Fundamental and Applied Kinesiology* (short name *Kinesiology*) has been published continuously since 1971, covering a wide scope of scientific interests

and research findings in the area of kinesiology. It focuses primarily on sport and exercise, sporting activities, physical education, physical recreation/leisure-time activities, recreational sports, kinesiological anthropology, training methods, performance analyses, sports medicine and physiology of sport, biomechanics, and history of sport.

The journal is indexed in several bibliographic databases ensuring international visibility. Besides indexation in world-renowned databases, such as Web of Science and Scopus, it should certainly be pointed out that the journal has been indexed in EBSCOhost database SPORTDiscuss with Full Text and Index Copernicus International. All the articles published in the journal are digitized and available on portal *Hrčak: portal of Croatian scientific and professional journals*, as well as on the official website of the journal.

SJR indicator, as well as IF, have been increasing, which means that the selection of articles is fairly strict, and the journal is considered as a quality journal in the areas of physical therapy, sports therapy, rehabilitation, and sports science. Keeping in mind that researchers who publish in international-level publications receive greater recognition, the journal's Editorial Board constantly worked on how to make the journal more visible at the international level. Therefore, all the articles from the first issue onwards have abstracts or keywords in foreign languages, either in English, German or Russian, and, in addition, since 2000, the journal has been published only in English, and had extended abstracts in Croatian till 2014, vol. 46. no. 2, thus demonstrating that the English language is *lingua franca* in contemporary science.

The positive changes that the journal has experienced in the fifty years of publication are reflected in the publication of the journal online, the digitization of all published issues and the fact that all papers are available for free in open access. The increased visibility of the journal at the international level got an extraordinary impetus by inclusion in the Web of Science and Scopus databases. In turn, indexation in these databases is an indirect indicator of the quality of journals, given that they need to meet strict criteria to being assessed by each database. The future of the journal *Kinesiology* could be greatly influenced by the decision of the Editorial Board in 2021 regarding the verification of the authenticity of the received papers, performed by the PlagScan software. The software facilitates the identification of plagiarized parts of the submitted articles and rejecting papers of questionable authenticity, thus contributing to a great extent, apart from the engagement of the world-renowned reviewers to the further development of the journal.

## References

- Borić, V. (2008). Analiza citata radova objavljenih u časopisu *Acta stomatologica Croatica* zabilježenih u bazi podataka Web of Science. [Citation Analysis of the Papers' Published in *Acta Stomatologica Croatica* using Web of Science Database.] *Acta stomatologica Croatica*, 42(2), 123-139.
- Borić, V., & Strujić, M. (2006). Bibliometrijska analiza *Acta stomatologica Croatica* za razdoblje od 1987. do 2006. godine. [Bibliometric Analysis of *Acta Stomatologica Croatica*: 1987-2006.] *Acta stomatologica Croatica*, 40(4), 336-346.
- Borić, V., & Štefić, L. (2018). Prvih pedeset godina časopisa *Acta Stomatologica Croatica* (1966.-2016.): Citatna analiza. [The First Fifty Years of the Journal *Acta Stomatologica Croatica* (1966 - 2016): Citation Analysis.] *Acta stomatologica Croatica*, 52(4), 348-357. doi: 10.15644/asc52/4/9
- Clarivate. (2021, May 26). Web of Science Platform. Retrieved from <https://clarivate.com/webofsciencgroup/solutions/webofscience-platform/> on May 26, 2021.
- de Solla Price, D. (1965). Networks of scientific papers. *Science*, 149(7), 510-515.
- DOAJ: The Directory of Open Access Journals. (2021, May 26). About DOAJ. Retrieved from <https://doaj.org/about/> on May 26, 2021.
- Dukić, Z. (1990). Mjesto sociologije u sistemu znanosti: Citatna analiza triju domaćih socioloških časopisa. [The Position of Sociology in the System of Science: The citation analysis of three domestic sociology journals.] *Revija za sociologiju*, 21(3), 455-465.
- EBSCO. (2021, May 26). SPORTDiscus with Full Text. Retrieved from <https://www.ebsco.com/products/research-databases/sportdiscus-full-text> on May 26, 2021.
- Elsevier. (2021, May 26). About Scopus. Retrieved from [https://www.elsevier.com/solutions/scopus?dgcid=RN\\_AGCM\\_Sourced\\_300005030](https://www.elsevier.com/solutions/scopus?dgcid=RN_AGCM_Sourced_300005030) on May 26, 2021.
- Hrčak: Portal of Croatian Scientific and Professional Journals. (2021, May 26). About Hrčak. Retrieved from <https://hrcak.srce.hr/?lang=en> on May 26, 2021.
- Hrčak: Portal of Croatian Scientific and Professional Journals. (2021, May 26). Kinesiology. Retrieved from <https://hrcak.srce.hr/kineziologija> on May 26, 2021.
- Index Copernicus International. (2021, May 26). Retrieved from <https://journals.indexcopernicus.com/> on May 26, 2021.
- Jaklinović-Fressl, Ž., Horga, S., Milanović, D., Heimer, S., Andrijašević, M., Medved, R., ..., & Jukić, I. (2000). The journal „Kinesiology“ is thirty years young (1971-200) and ten years old (1990-1999). *Kinesiology*, 32(2), 5-30.
- Jelaska Marijan, Z. (2019). Pedeset godina Časopisa za suvremenu povijest: Bibliometrijska analiza (1969. – 2018.). [Fifty Years of the Journal of Contemporary History: A Bibliometric Analysis (1969–2018).] *Časopis za suvremenu povijest*, 51(1), 59-94. doi: 10.22586/csp.v51i1.8471
- Jokić, M. (2005). *Bibliometrijski aspekti vrednovanja znanstvenog rada*. [Bibliometric Aspects of Scientific Work Evaluation.] Zagreb: Sveučilišna knjižara.
- Jokić, M. (2001). Časopis Tekstil u pedesetogodišnjem razdoblju od 1952. do 2000. godine – neki od bibliometrijskih pokazatelja. [The Journal Textile in Five Decades (1952-2000) – Certain Bibliometric Indicators.] *Tekstil : časopis za tekstilnu tehnologiju i konfekciju*, 50(12), 614-622.
- Jokić, M., Andreis, M., & Klaić, B. (2002). Pedeset godina Kemije u industriji – Bibliometrijski i scientometrijski prikaz. [Fifty years of Chemistry in Industry – Bibliometric and Scientometric review.] *Kemija u industriji: časopis kemičara i tehnologa Hrvatske*, 51(3), 116-122.
- Jokić, M., & Borić, V. (1992). Znanstvena aktivnost na području botanike mjerena kroz časopis *Acta botanica Croatica*. [Scientific Research in Botany According to *Acta Botanica Croatica*.] *Acta botanica Croatica*, 51, 169-176.
- Jokić, M., & Sirotić, G. (2002). The communicability of the journal *Acta botanica Croatica* over the 1991-2000 period. *Acta botanica Croatica*, 61(2), 221-230.
- Jokić, M., & Zauder, K. (2013). Bibliometrijska analiza časopisa Sociologija sela / Sociologija i prostor u razdoblju 1963. – 2012. [Bibliometric Analysis of Rural Sociology / Sociology and Space from 1963 - 2012.] *Sociologija i prostor*, 51(196[2]), 331-349. doi: 10.5673/sip.51.2.11
- Jokić, M., Zauder, K., & Letina, S. (2012). *Karakteristike hrvatske nacionalne i međunarodne znanstvene produkcije u društveno-humanističkim znanostima i umjetničkom području za razdoblje 1991-2005*. [Characteristics of the Croatian National and International Scientific Production in the Area of Social and Humanity Sciences and Arts.] Zagreb: IDIZ.
- Knudson, D. (2014). What is a kinesiology journal? *Comprehensive Psychology*, 3, 20. doi: 10.2466/03.CP.3.20
- Krajna, T., & Petrak, J. (2004). Bibliometrijske značajke časopisa *Strojarstvo* u razdoblju od 1992. do 2001. godine. [Bibliometric Characteristics of the journal *Strojarstvo* in the Period 1992 – 2001.] *Strojarstvo : časopis za teoriju i praksu u strojarstvu*, 46(1-3), 19-23.
- Macan, B. (2011). Bibliometrijska analiza časopisa *Kemija u industriji* za razdoblje od 2000. do 2009. godine. [Bibliometric Analysis of the Journal *Kemija u industriji* for the Period 2000–2009.] *Kemija u industriji : časopis kemičara i tehnologa Hrvatske*, 60(2), 81-88.

- Maričić, S., Sorokin, B., & Papeš, Z. (1992). Pokazatelji znanstvene komunikabilnosti časopisa iz Hrvatske bibliografije, Niz B. [Indicators of Scientific Communicability of the Journals from the Croatian Bibliography, Series B.] *Informatologia*, 24(3-4), 109-128.
- Martek, A., & Šute, S. (2010). Bibliometrijska analiza časopisa Arhivski vjesnik u razdoblju od 2001. do 2009. [Bibliometric Analysis of the Journal Archival Gazette in the period 2001 – 2009.] *Arhivski vjesnik*, 53, 165-176.
- Mitrović, G., & Romić, K. (2018). Bibliometrijska analiza časopisa „Sigurnost“ od 2005. do 2015. godine. [Bibliometric Analysis of the Journal Safety from 2005 to 2015.] *Sigurnost : časopis za sigurnost u radnoj i životnoj okolini*, 60(1), 25-35. doi: 10.31306/s.60.1.3
- Mraković, M. (1971). Kineziologija. [Kinesiology.] Editorial. *Kineziologija*, 1(1), 2-5.
- Munjiza, E., & Dubovicki, S. (2012). Šezdeset godina Života i Škole 1952. – 2011. [Sixty Years of Život i škola (1952 – 2011).] *Život i škola: časopis za teoriju i praksu odgoja i obrazovanja*, 58(27), 11-36.
- Omrčen, D., & Leščić, S. (2011). A language profile of sources cited in the journal Kineziologija/Kinesiology from 1971 to 2010. *Kinesiology*, 43(1), 7-24.
- Romić, K., & Mitrović, G. (2017). Bibliometrijske značajke kategoriziranih radova na primjeru časopisa Medijska istraživanja (1995.-2015.). [Bibliometric Characteristics of Categorized Papers on the Example of the Journal Media Research (1995.-2015.).] *Vjesnik bibliotekara Hrvatske*, 60(4), 197-220.
- Švenda-Radeljak, K. (2006). Časopis „Socijalni rad“ – Prvih 10 godina (1960.-1969.). [Journal Social Work – The First Decade (1960-1969).] *Ljetopis Studijskog centra socijalnog rada*, 13(1), 115-132.
- Švenda-Radeljak, K. (2010). Revija za socijalnu politiku petnaest godina kontinuiranog izlaženja (1994.-2008.). [Journal of Social Policy – Fifteen Years of Continuous Publication (1994-2008).] *Revija za socijalnu politiku*, 17(1), 155-170. doi: 10.3935/rsp.v7i1.805
- Vejmelka, L., & Švenda Radeljak, K. (2014). Ljetopis socijalnog rada (1994.-2013.). – Dvadeset godina kontinuiranog izlaženja. [Annual of Social Work (1994.-2013.). – Twenty Years of Continuous Publishing.] *Ljetopis socijalnog rada*, 21(2), 313-333. doi: 10.3935/ljsr.v21i2.33.
- Zabjan Bogut, A., & Krajna, T. (2011). Trideset godina časopisa Polimeri: Bibliometrijske značajke kategoriziranih časopisa. [Thirty Years of the Journal Polimeri: Bibliometric Features of Categorized Articles.] *Polimeri*, 32(2), 81-87.

Submitted: March 31, 2022

Accepted: April 24, 2022

Published Online First: June 10, 2022

Correspondence to:

Ivan Čolakovac, mag. educ. phil. et mag. bibl

Faculty of Kinesiology, University of Zagreb

Horvaćanski zavoj 15, Zagreb, Croatia

Phone: +385 1 3658 622

E-mail: ivan.colakovac@kif.unizg.hr