

Nikolovski, D., Matic, B., Nikolovska, M. (2011): Assessment of Scientific Research of Yoga in Medicine. In: P.Nikic, ed. *Proceedings "Yoga – the Light of Microuniverse" of the International Interdisciplinary Scientific Conference "Yoga in Science – Future and Perspectives"*, September 23-24, 2010, Belgrade, Serbia. Belgrade: Yoga Federation of Serbia, p. 81-89

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ASSESSMENT OF SCIENTIFIC RESEARCH OF YOGA IN MEDICINE

Summary: *In the last decade yoga has taken an important place in research work in the field of medicine. The objective of this study was to assess its value based on the journal's impact factor and on the author's citation. The methodology used index databases are available through KoBSON service. The results show that from 1130 reviewed papers from 160 different journals, leading papers are from India, but they are not in the Science Citation Index. Prestigious medical journals with IF higher than 30, such as Lancet and Nature have a slightly less number of papers. More than half (57.9%) of the journals are in the range of the first 30% of the subject area. According to the citation and the number of papers, the authors retain the supremacy of Swami Vivekananda Yoga Research Foundation, India. Conclusion: There is a need to improve the education of health workers in the field of yoga, and yoga practitioners in the field of scientific medical research methodology aiming to give yoga's full contribution in the field of medicine.*

Keywords: *yoga, medicine, validity of scientific research*

Introduction

Science is identified in the broadest sense with knowledge, but not all knowledge could be named as scientific. In addition to science, knowledge can be a healthy-rational (experienced), aesthetic, mythical, religious or an attitude. By its manner, scientific knowledge is distinguished from other knowledge, with the use of scientifically verified methods, as systematic, tested, development, objective and expressed in the form of theories and scientific laws. Science is constantly a critical search for the truth, and just their quest for the truth and deals with yoga.

One of the definitions of yoga says it is the science of health. Probably no one has ever questioned whether the medicine is a science. On the Internet pages of our area can be found that the definition of "Medical science is a science of the disease, and that yoga is a science of health"² However, medicine also covers areas such as preventive medicine, traditional medicine, complementary, integrative medicine, quantum medicine, public health and now days more popular - Lifestyle medicine. All these areas have in focus the research and improving health, but with therapeutic effects too. If we talk in the field of health technologies that are applied in medicine, we will see that the above-mentioned areas also include preventive health technologies that are present in yoga. What makes medicine a science? Scientists, scientific papers, scientific technologies,...? Medicine, like yoga too, has the aim to discover the essence of natural phenomena, to find out their laws and to provide scientific explanation of their practical use. Verifiable results, and their ability to be explained as part of scientific knowledge are some criteria of scientific objectivity, which is exactly what scientists do in the papers. Paper can bring the epithet "scientific" if it is published in the journal in the Science Citation Index (SCI list). Its scientific value is greater if it is published in the journal with higher factor of influence and if the author of highly cited.

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This work will be limited to the evaluation of scientific studies that have used yoga techniques in the field of medicine (which definitely is a science), not forgetting that yoga in a broad sense includes practically the overall human knowledge and existence. Today, there is knowledge which can not be explained objectively, or be classified as science, but it does not mean that this knowledge does not exist or that it has less "scientific" value.

The aim

The aim of this paper was to assess the value of scientific research of yoga in medicine. It has researched into the presentation of scientific papers on medical research of yoga in the world, it has determined the impact factor of journals at the scientific thought and the number of authors citations.

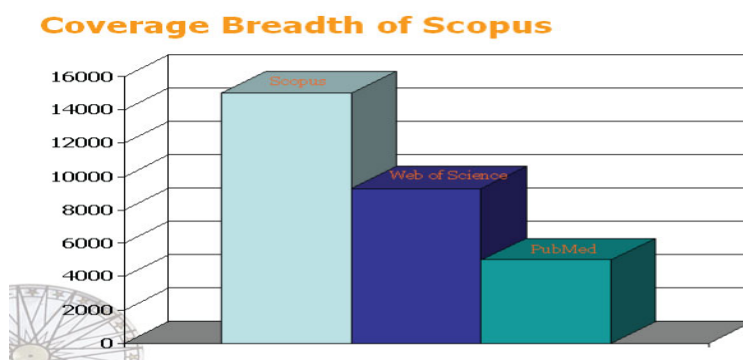
Metodology

The research was undertaken in august 2010. The search was done with indexed databases: SCIndex, MEDLINE, SCOPUS and Web of Science via Serbian National library consortia (KoBSON). The keyword was „yoga“.

Searching the Serbian citation index (SCIndex) we got data about number of papers in Serbian language. Searching through MEDLINE resulted in data about number of references, review articles and full text articles.

Searching through SCOPUS resulted in data about number of journals with joga investigations, authors productivity, number of articles, affiliations, and research areas. The reason for choice the SCOPUS for searching was that this database has a wide coverage.

Figure 1. Number of articles that cover SCOPUS, WoS and PubMed



Via KoBSON service journal availability in Serbia was searched, which are referred in Journal Citation Reportu and impact factor (IF) in the last 10 years. Journals were ranged by IF for 2009. year and by the highest IF in the last 10 years. Journal availability via KoBSON is enabled through KOBSON project that is financed by Ministry for science and technology development of Republic of Serbia and refers to the open access journals, journals that exist in a print version in National Library of Serbia since 1984. and all journals with IF from 1981.

Impact factor of scientific journal is a measure of citation of the articles - the numeric value that is obtained by the number of citations for the last two years divided by number of published papers in that journal in those two years. The rankings published by IF was done in tree grades³: M21 category includes top international journals that are in their specialty classified among the top 30%, M22 category includes

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prominent international journals that are classified in their discipline between 30% and 50%, and the M23 category includes international journals with IF, which are not classified in the top 50% of its discipline.

Searching Web of Science and SCOPUS databases we obtained number of cited authors. Papers published after 1996 may be searched only by SCOPUS. Papers published before the 1996th could be searched through cited authors by both of databases⁴. For statistics evaluation it was used Microsoft Office Excel 2003 and SPSS v. 13.0.

Results and discussion

Results of search of SCIndex show that there were published only two papers in the Serbian language pokazuju da su objavljena samo dva rada na srpskom jeziku, od čega jedan nije iz oblasti medicine, of which one is in the field of medicine. Search results in MEDLINE database was given 1432 articles, of which 212 were review articles, 170 articles in full texts and others in the form of abstracts. Search results SCOPUS databases were included 1130 articles from 160 different magazines which cover nine biomedical fields: Medicine, Biochemistry, Genetics and Molecular Biology, Nursing, Psychology, Pharmacology, Toxicology and Pharmaceuticals, Neuroscience, Medical profession, Immunology and Microbiology and multidisciplinary areas. Table 1. shows the top 12 journals with the greatest number of papers in the yoga research field. The leading journal is Indian Journal of Physiology and Pharmacology with 91 published papers.

Table 1. Journal distribution by number of papers with yoga topics.

	Name of journal	Number of papers	IF max	IF 2009	Rang for IF max
1	Indian Journal of Physiology and Pharmacology *	91			
2	Journal of Alternative and Complementary Medicine	71	1.685	1.685	M21
3	Alternative Therapies in Health and Medicine **	44			
4	Lancet	29	30.758	30.758	M21
5	Journal of Bodywork and Movement Therapies	23			
6	Indian Journal of Medical Research **	23	1.883	1.516	M22
7	Complementary Therapies in Medicine	23	1.950		M21
8	Perceptual and Motor Skills	22	0.552	0.552	M23
9	Annals of the New York Academy of Sciences	18	2.670	2.670	M21
10	Indian Journal of Medical Sciences **	14			
11	Integrative Cancer Therapies	14	2.264	1.508	M21
12	Alternative and Complementary Therapies *	14			

* Not available via KoBSON. Indian Journal of Physiology and Pharmacology has open access.

** Available, but without impact factor (IF).

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Journal with high IF and most published works is Lancet (IF2009 = 30,758) in which are 29 works. IF values ranged from minimum 0.231 to 34.480 (IF2009medium = 4989 ± 7199; IFmax mean = 5195 ± 7333). Other journals with high IF2009 are Nature, Journal of the American Medical Association, Journal of Clinical Oncology and Circulation (Table 2).

Table 2. Journal with the highest IF in 2009.

	Name of journal	IF 2009	number of articles
1	Nature	34,480	9
2	Lancet	30,758	29
3	Journal of the American Medical Association	28,899	11
4	Journal of Clinical Oncology	17,793	4
5	Circulation	14,816	3

From the total of 160 journals, 84 (52.5%) are available via KoBSON. 27 (32.1%) of them has not IF, but they are on the SCI list. 38 (66.7%) journals of others 57 journals in the period 2000-2009. had maximal IF and they were located in the range of M21, 10 (17.5%) in the M22 and 9 (15.8%) in the range of M23 (Figure 2a). The drop from the maximum IF rank during the 10 years observed interval in relation to the rank in 2009. was in 6 (10.5%) journals, so in 2009. there were 33 (57.9%) journals in the rank of M21, 14 (24.6%) in the M22 and 10 (17.5%) in the M23 (Figure 2b).

Figure 2a. Journal distribution by international rank in their discipline based on IF max during the period 2000-2009.

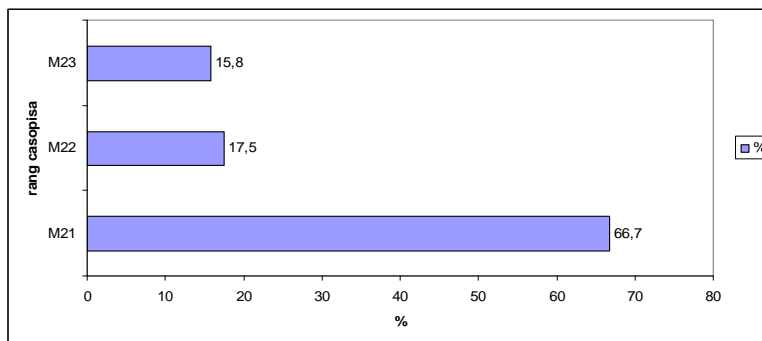
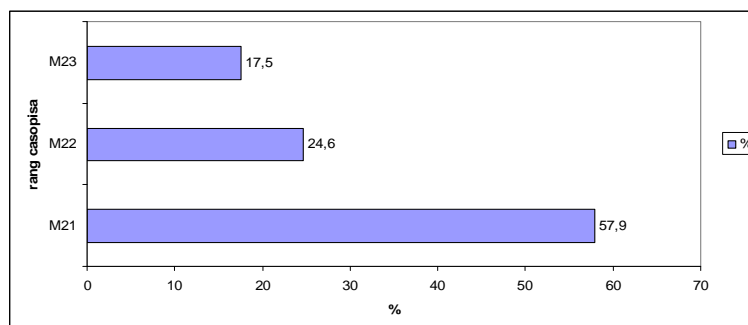


Figure 2b. Journal distribution by international rank in their discipline based on IF in 2009. year.



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Most scientific research was published by Swami Vivekananda Yora Research Foundation in India (Table 3), which team and a large number of associates across India hold primacy in scientific yoga research in medicine. At the same time, they are the most cited authors and their affiliations are the most productive in terms of papers on yoga subject (Table 4).

There are also the authors from America, with high citation rate achieved thanks to one well-cited article and who were very active in the research twenty years ago.

Table 3. Productivity and author citations

Autor	Broj članaka	Citiranost	Afilijacije
1 Telles, S.	68	606	Swami Vivekananda Yoga Res Fdn, Bangalore, Karnataka India
2 Nagendra, H.R.	29	188	Swami Vivekananda Yoga Anusandhana Samsthana, Bangalore, India
3 Nagarathna, R.	27	143	Swami Vivekananda Yoga Res Fdn, Bangalore, India
4 Nespor, K.	15	99	Charles Univ, Fac Med 1, Prague, Czech Republic
5 Dostalek, C.	11	69	Institute of Physiological Reg. Czechoslovak Academy of Sciences, Prague.
6 Ernst, E.	11	113	Univ Exeter, Dept Complementary Med, Exeter, Devon England
7 Naveen, K.V.	10	56	Swami Vivekananda Yoga Res Fdn, Bangalore, Karnataka India
8 Raghuraj, P.	10	52	Patanjali Yogpeeth, Haridwar 249402, Uttarakhand India
9 Benson, H.	8	247	Division of Behavioural, Medicine Beth Israel Hospital, Boston, United States
10 Bhavanani, A.B.	8	41	Department of Physiology, Jawaharlal Inst. Postgrad. Pondicherry, India
11 Phillips, R.S.	7	422	Div. of Gen. Med. and Primary Care, Harvard Medical School
12 Ikemi, Y.	7	17	Institute of Psychosomatic Medicine, Fukuoka City, Japan
13 Schumacher, H.R.	7	242	University of Pennsylvania, Philadelphia, United States
14 Singh, S.	7	69	Department of Phys., University College of Medical Sciences, Delhi, India
15 Manjunath, N.K.	7	52	Swami Vivekananda Yoga Res Fdn, Bangalore, Karnataka India
16 Udupa, K.N.	7	107	Surg. Res. Lab., Inst. Med. Sci., Banaras Hindu Univ., Varanasi, India
17 Bijlani, R.L.	7	127	Department of Phys., University College of Medical Sciences, Delhi, India
18 Emery, C.F.	6	428	Department of Psychiatry, Duke University Medical Center, Durham, US
19 Desiraju, T.	6	53	Vivekananda Kendra Yoga Res Found, Bangalore, India
20 Blumenthal, J.A.	6	428	Duke University Medical Center, Durham, US

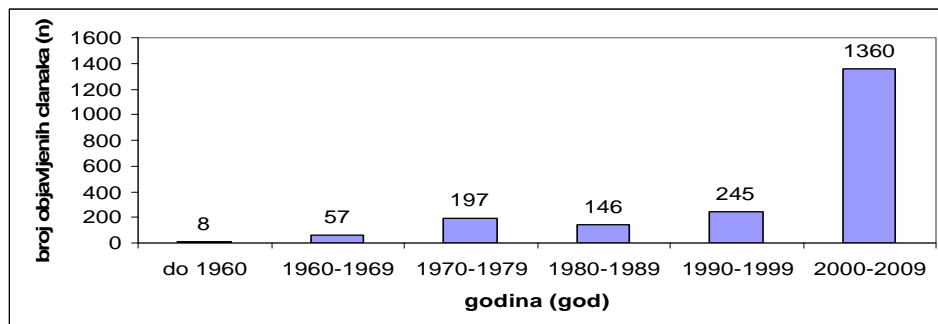
Table 4. Affiliations productivity

Afilijacija	Broj radova
1 Swami Vivekananda Yoga Research Foundation	40
2 Harvard Medical School	28
3 All India Institute of Medical Sciences	26
4 University of California, San Francisco	24
5 VA Medical Center	23
6 University of Exeter	23
Jawaharlal Institute of Postgraduate Medical Education and	
7 Research India	22
8 David Geffen School of Medicine at UCLA	21
9 University of California, San Diego	16
10 Vivekananda Kendra Yoga Research Foundation	15
11 National Institute of Mental Health and Neuro Sciences	15
12 University of Toronto	14
13 University of Pennsylvania	13
14 The University of British Columbia	13
15 University of Washington Seattle	13
16 University of Calgary	12
17 Columbia University, College of Physicians and Surgeons	12
18 Oregon Health and Science University	12
19 UCL	12
20 Duke University School of Medicine	11

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Regarding to the publishing year, there were an increase in research interest for yoga in the last decade (Figure 3). The last data shows that in the first six months in 2010. were published 120 articles in the world.

Figure 3. Distribution of published articles by year of publishing



In the last 20 years after the pause of 15 years during the decade of 1970s „Lancet“ began again to publish research in the field of yoga (Table 5). Very slowly, here and there, some articles were published every few years, but here presented authors origine mostly from United States and Europe.

Table 5. Authors and institutions who have published research in „Lancet“ in the last 20 years

Author	Year	Affiliation
Spicuzza L. (3)	2010 (1)	Universita degli Studi di Pavia (2)
Gabutti A. (2)	2004 (1)	Municipal Hospital of Neunkirchen (1)
Montano N. (2)	2001 (1)	Indian Institute of World Culture (1)
Wisniewski A. (1)	2000 (3)	John H. Stroger Jr. Hospital of Cook County (1)
Turner J.A. (1)	1999 (1)	Universita degli Studi di Catania (1)
Tattersfield A. (1)	1998 (1)	Cliniques Universitaires Saint-Luc, Brussels (1)
Subbarazappa B.V. (1)	1997 (1)	University of Washington Seattle (1)
Stanescu D. (1)	1990 (2)	Nottingham City Hospital (1)
Singh V. (1)		University of Washington School of Medicine (1)
Sharma D. (1)		Universita degli Studi di Milano (1)
Sequeira W. (1)		
Roggla H. (1)		
Roggla G. (1)		

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Portal C. (1)		
Morris K. (1)		
Kliot M. (1)		
Kapiotis S. (1)		
Jarvik J.G. (1)		
Heagerty P.J. (1)		
Comstock B. A. (1)		
Britton J. (1)		
Bernardi L. (1)		

Conclusion

Yoga in the last decade has taken an important place in medical science and scientific research with results published in prestigious scientific journals. Most productive researchers are from India, but their work does not meet the strict criteria for journals with high IF. The other centers that are seriously engaged in exploring yoga are on the American continent. It is, therefore, important to pay special attention to education, medical staff in the field of yoga, and yoga practitioners in the field of scientific research methodology, the way of paper publishing, as well as using modern Internet technologies for knowledge dissemination and use.

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1. Savić, J. (1999): Kako stvoriti naučno delo u biomedicini. Stara Pazova: SAVPO, str.5-12.
2. Pravilnik o postupku, načinu vrednovanja i kvantitativnom iskazivanju naučnoistraživačkih rezultata istraživača (Službeni glasnik RS, 38/2008).
3. <http://www.med.yale.edu/library/education/guides/screencasts/ca/scopus/>