

# Ranking of Polish higher schools based on articles published in Polish sports science journals indexed by the Polish Ministry of Science and Higher Education

## Authors' Contribution:

- A** Study Design
- B** Data Collection
- C** Statistical Analysis
- D** Manuscript Preparation
- E** Funds Collection

**Bartłomiej Jan Barczyński**

Index Copernicus International S.A.

**Source of support:** "Young Researcher 39 ½" Grant funded by the Archives of Budo

**Received:** 22 October 2009; **Accepted:** 8 December 2009; **Published online:** 16 December 2009

## Abstract

### Background and Study Aim:

We can distinguish a few systems used in the world for evaluating and funding science that differ significantly in purpose, organization, and methodology. The principles of the functioning of higher education institutions and the funding of science in Poland are regulated by acts and their executive regulations. Academic units applying for funds must meet several criteria specified in the regulations of the Minister of Science and Higher Education. In national systems of the distribution of funds for education, a key parameter is scientific articles published in international journals with peer review. Regardless of the indicators used (IF, H, etc.), it seems more relevant to say that objective indicators for universities with a sports science profile are the number of points assigned to them in journals related to this discipline of science. The aim of this paper was to test the hypothesis that Polish academies of physical education are accomplishing their statutory mission. The verification tool was their ranking.

### Material/Methods:

Publication in journals indexed by Polish Ministry of Science and Higher Education was adopted as the basic criterion for qualifying for ranking. Identification was based on the compliance of the title of the journal with issues appropriate to sports sciences in the most recent complete publishing cycle, i.e. 2008. A major indicator of ranking the Polish higher schools was assumed to be the sum of the points resulting from the accumulated number of articles published in journals obtained by the individual schools.

### Results:

Of all Polish public and non-public higher schools (n=440), the academics of 67 (15.2%) published scientific articles in 2008 in sports science journals. Among the 67 higher schools, academies of physical education, directly identified with sports sciences, occupied the first six positions of the ranking.

### Conclusions:

The evaluation of scientific achievement, measured by the number of publications and assigning them points, enables an accurate classification of higher schools in terms of specific aspects of their scientific potential. The results presented here provide direct empirical evidence that the academies of physical education fulfill their statutory and social mission. The high interest in issues of sports sciences shown by academics of many different types of Polish higher schools may have a significant impact on the cognitive and applications sphere of this field of science.

### Key words:

evaluation • ranking • sports science • physical education • Academy of Physical Education

### Author's address:

Bartłomiej Barczyński, Index Copernicus International S.A., Al. Jerozolimskie 146 C, 02-305 Warsaw, Poland, e-mail: barczynski@wp.pl

## BACKGROUND

The principles of the functioning of higher education institutions [1] and the funding of science in Poland

[2] are regulated by acts and their executive regulations. Academic units applying for funds must meet several criteria specified in the regulations of the Minister of Science and Higher Education concerning the rules and

**Evaluation** – a process of examining parameters applied to methodology

**Ranking** – a classification of performance arranged in descending order

**Sports science** – a discipline that deals with human activity aimed at improving sport abilities or performance

procedures for the government funding of science [3]. When granting funds, the previous activities of research units are evaluated considering such criteria as the activities of the scientific units, the results of the activities, and the practical results of research and development findings. One of the most important indicators of scientific activity is the number of publications (and the points assigned to them) in scientific journals. On this basis, the Ministry of Science and Higher Education sent a letter on October 30, 2006, to editors-in-chief and publishers notifying them that “for purposes of the future parametric evaluation of scientific units, according to section §7, paragraph 4, point 2 of the regulations of the Minister of Science and Informatization of August 4, 2005, on the criteria and procedure for granting and settling funds for science, action was taken to draw up a list of journals for parametric evaluation as well as the way of assigning the number of points to them for scientific publications” [4].

To add a journal to the journal index of the Minister of Science and Higher Education, it is evaluated by a relevant expert group. The evaluation is conducted within two categories: (A) journals indexed in the Journal Citation Reports (10–30 points) and (B) Polish or foreign journals listed in the “ministerial list” (1–6 points). As a result of the established methodology of journals, the evaluation is a discontinuous variable of points. In category (A), 10, 15, 20, 24, and 30 points are possible and in category (B), 1, 2, 4, and 6 points.

According to the Danish experts report “Research Evaluation: Methods, Practice, and Experience. Research: Analysis and Evaluation 1/2009” [5], a few systems for evaluating and funding science can be distinguished in the world that differ significantly in their purpose, organization, and methodology. It is worth distinguishing three countries (the pathfinders). The Netherlands developed a system based on dialogue and peer review in which those being evaluated are given grades on a number of dimensions, England developed a system based on peer review in which those being evaluated are given grades that are used for the distribution of resources, and Australia developed a system based on indicators which are used for the distribution of resources.

In recent years, global rankings presenting the universities with the highest number of articles or scientific journals with the highest number of citations have become very popular. In Poland, the most popular rankings of national universities are prepared annually by the magazines “Wprost” [6] and “Perspektywy” [7]. In the “Wprost” ranking, universities are evaluated according to “intellectual base” (60 points), the educational process (20 points), career opportunities (15

points), and studying social conditions (5 points) [8]. In “Perspektywy” [7], universities are evaluated according to prestige (30%), the strength of science (40%), the conditions of study (15%), and the internationalization of study (15%) [9]. Another popular type of ranking in Poland is the scientific journal ranking prepared annually by Index Copernicus [10], where journals are evaluated according to scientific quality (58.0%), editorial quality (20.0%), international availability (13.5%), frequency-regularity-stability (5.0%), and technical quality (3.5%) [11]. Besides the above rankings, the first ranking of Polish academies of physical education, based on the number of publications in ISI Web of Science, prepared by Jerzy Popinigis [12] and focusing only on Polish academies of physical education, appeared in 2002. Although seven years have passed since its appearance, Popinigis’ paper is still inspiring.

The problem is not the number of published articles or the value of the IF. They can even be misleading indicators if publications are not directly related to the scientific profile of the university. Therefore a more accurate statement seems to be that objective indicators for universities with a sports science profile are the number of articles and points assigned to them in journals eligible for this discipline of science, which has a direct relationship with scientific promotion within this discipline. In Poland, universities with rights to scientific promotion in sports sciences, from Ph.D. to D.Sc. to a Prof. degree, are still called academies of physical education.

The general objective of this article was to test the hypothesis that academies of physical education are leading institutions of higher education in Poland. The verification tool was a ranking of Polish public and non-public higher schools based on publications appearing in 2008 and the assigned points in journals in the field of sports science.

## MATERIAL AND METHODS

Publications indexed in the unified list of selected journals of the Polish Ministry of Science and Higher Education of May 5, 2009, [13] with amendments [14] was adopted as the basic criterion of qualifying for ranking. The identification was based on compliance of the title of the journal with issues appropriate to sports science and sports medicine. An important condition for qualification was the edition of the journal in 2008 (the last complete publishing cycle). Of the Polish journals of sports science and sports medicine analyzed, 1 journal in category (A) and 29 journals in category (B) fulfilled these criteria fulfilled. For the ordinal variable within both categories, a descending order of points assigned to them was adopted (Table 1).

**Table 1.** Index of selected journals with the number of points for a scientific publication.

<b>(A) Journals indexed in Journal Citation Reports</b>	<b>Number of points for a scientific publication</b>
Biology of Sport	10
<b>(B) Other Polish journals</b>	<b>Number of points for a scientific publication</b>
Folia Turistica	6
Journal of Human Kinetics	6
Antropomotoryka	4
Archives of Budo	4
Fizjoterapia	4
Fizjoterapia Polska	4
Human Movement	4
Medicina Sportiva Supplement	4
Medycyna Sportowa	4
Official Journal of Polish Society of Sports (formerly: Medicina Sportiva)	4
Polish Journal of Sport and Tourism (formerly: Rocznik Naukowy AWF w Warszawie (Zamiejscowy Wydział Wychowania Fizycznego w Białej Podlaskiej)	4
Postępy Rehabilitacji	4
Studies in Physical Culture & Tourism	4
Turystyka i Rekreacja	4
Turyzm	4
Wychowanie Fizyczne i Sport (Physical Education and Sport)	4
Chirurgia Kolana, Artroskopia, Traumatologia Sportowa	2
Medicina Sportiva Practica	2
Research Yearbook. Studies In Physical Education and Sport	2
Rocznik Naukowy Idó - Ruch dla Kultury	2
Rocznik Naukowy - Studia o Wychowaniu Fizycznym i Sporcie	2
Rozprawy Naukowe AWF we Wrocławiu	2
Sport Wyczynowy	2
Aktywność Ruchowa Ludzi w Różnym Wieku	1
Kultura Fizyczna. Edukacja, Zdrowie, Olimpizm, Sport	1
Przegląd Naukowy Kultury Fizycznej Uniwersytetu Rzeszowskiego	1
Roczniki Naukowe Wyższej Szkoły Wychowania Fizycznego i Turystyki w Supraślu	1
Sporty Wodne i Ratownictwo	1
Zeszyty Metodyczno-Naukowe AWF Katowice	1

The sum of the points resulting from the accumulated number of articles (excluding book reviews, announcements, commentaries, reprints) published in various journals obtained by the individual institutions was adopted as the major indicator of ranking of higher education institutions. Regardless of the number of co-authors from the same or different institutions, the evaluated unit received points assigned to the given publication within category (A) or (B) of the ministerial list. The following lists, available on the website of the Polish Ministry of Science and Higher Education, are used in the ranking: public higher schools [15], and non-public higher schools [16]. The following types of institutions in the Polish higher education system are identified: academies of physical education, state higher vocational schools, technical universities, maritime and military higher schools, economic universities, theological higher schools [17], universities, medical universities, pedagogical universities, and non-public higher schools.

Document analysis was used in developing the ranking. Results were saved in a database designed to this purpose in Excel. The data source was the journals' websites with open access to the full texts and printed copies made available by the Polish National Library and the Library of the Academy of Physical Education in Warsaw.

## RESULTS

Of all the Polish public and non-public higher schools ( $n=440$ ), academics of 67 (15.2%) published scientific articles in 2008 in sports science and sports medicine journals (Table 2).

Among the 67 higher schools, academies of physical education, directly identified with sports sciences, occupied the first six positions of the ranking (Figure 1). Scientific papers on sports science were also published by academics of nine other types of institutions (Table 2).

A detailed analysis of the distribution of points for the publications of various types of institutions (Figure 2) reveals a significant disproportion between the extreme positions in the ranking of seven types of institutions (Figures 3A–G). However, in case of three types of institutions, differences were not found.

The difference between the leaders of various institutional types and higher schools closing these detailed rankings is significant. The leader of both the academies of physical education and the composite ranking is the Academy of Physical Education in Warsaw (387 pts); however, of the leaders of the remaining detailed



**Table 2.** Ranking of Polish higher schools on the basis of scientific articles published in 2008 in journals of sports science from the ministerial list.

#	Types of higher schools	Total points
1	Academy of Physical Education in Warsaw	387
2	Academy of Physical Education in Cracow	353
3	Academy of Physical Education in Wrocław	235
4	The Eugeniusz Piasecki University School of Physical Education in Poznań	210
5	Academy of Physical Education in Katowice	195
6	Academy of Physical Education and Sport in Gdańsk	104
7	University of Rzeszów	102
8	Medical University of Silesia in Katowice	72
9	The Jan Kochanowski University of Humanities and Sciences	56
10	Opole University of Technology	50
11	Wrocław Medical University	48
12	Medical University of Warsaw	47
13	University of Łódź	38
14	Jagiellonian University in Cracow	36
15	Medical University of Lodz	32
16	University of Szczecin	27
17	Adam Mickiewicz University in Poznań	22
18	Higher School of Physical Education and Tourism in Supraśl	21
19	University of Warmia and Mazury in Olsztyn	20
20	Jan Długosz Pedagogical University in Częstochowa	18
21	Olsztyn Higher School	18
22	Nicolaus Copernicus University Collegium Medicum in Bydgoszcz	16
23	University of Technology in Radom	16
24	College of Physiotherapy in Wrocław	16
25	Medical University of Gdańsk	12
26	Medical University of Lublin	12
27	Warsaw University	12
28	Higher School of Administration in Bielsko-Biała	12
29	Silesian University of Technology in Gliwice	10
30	Katowice School of Economics	10
31	University of Bielsko-Biała	9
32	"Almamer" University of Economics in Warsaw	9
33	Maria Curie-Skłodowska University in Lublin	8
34	University of Podlasie in Siedlce	8
35	Jan Amos Komeński State School of Higher Vocational Education in Leszno	8
36	College of Computer Science and Business Administration in Łomża	8

**Table 2 continued.** Ranking of Polish higher schools on the basis of scientific articles published in 2008 in journals of sports science from the ministerial list.

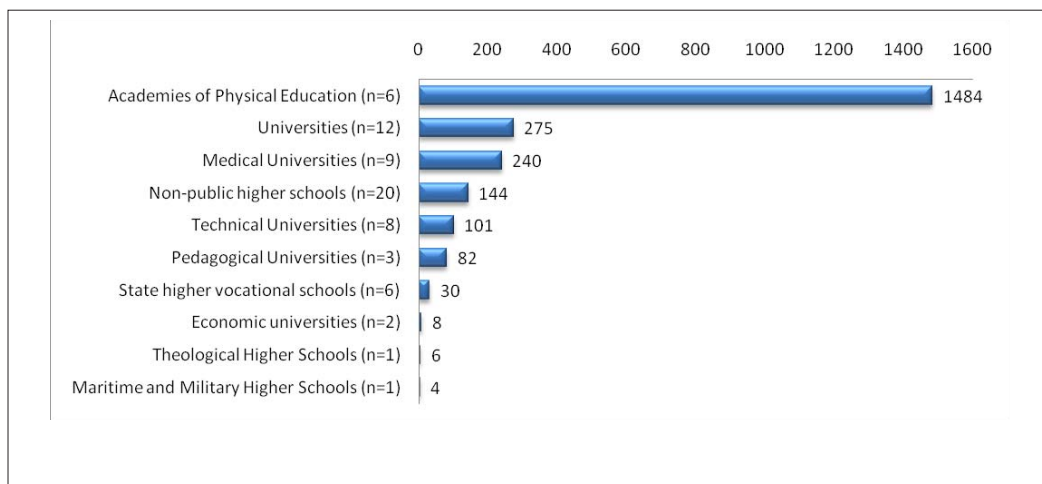
#	Types of higher schools	Total points
37	Higher Vocational School in Tarnow	8
38	Pawel Wlodkowic University College in Plock	8
39	Warsaw College of Economics	8
40	Catholic University of Lublin	6
41	Higher School of Strategic Planning in Dąbrowa Górnicza	6
42	The Warsaw Family Alliance Institute of Higher Education	6
43	University of Information Technology and Management in Rzeszow	5
44	University of Gdańsk	4
45	Białystok Technical University	4
46	Technical University of Częstochowa	4
47	Technical University of Lodz	4
48	Wrocław University of Technology	4
49	The Poznań University of Economics	4
50	The Karol Adamiecki University of Economics in Katowice	4
51	State Higher Vocational School in Biała Podlaska	4
52	College of Computer Science in Lodz	4
53	The Pedagogy Academy in Lodz	4
54	College of Education and Therapy in Poznań	4
55	College of Education and Administration in Poznań	4
56	Independent University of Business and Government in Warsaw	4
57	Higher Officer School of Air Power in Dęblin	4
58	Cardinal Stefan Wyszyński University in Warsaw	2
59	Kazimierz Wielki University in Bydgoszcz	2
60	University of Zielona Góra	2
61	Cracow Higher School of the Health Promotion	2
62	Medical University of Białystok	1
63	State Higher Vocational School in Krosno	1
64	State Higher Vocational School in Racibórz	1
65	Higher Vocational School of Małopolska in Cracow	1
66	The Pultusk School of Humanities	1
67	Academy of Sport Education in Warsaw	1
<b>Total</b>		<b>2374</b>

rankings (Figure 3B–G), the Jan Amos Komeński State School of Higher Vocational Education in Leszno received the lowest score (8 pts). The six higher schools closing the detailed rankings of three types of institutions had 1 point (Figure 3C,D,G).

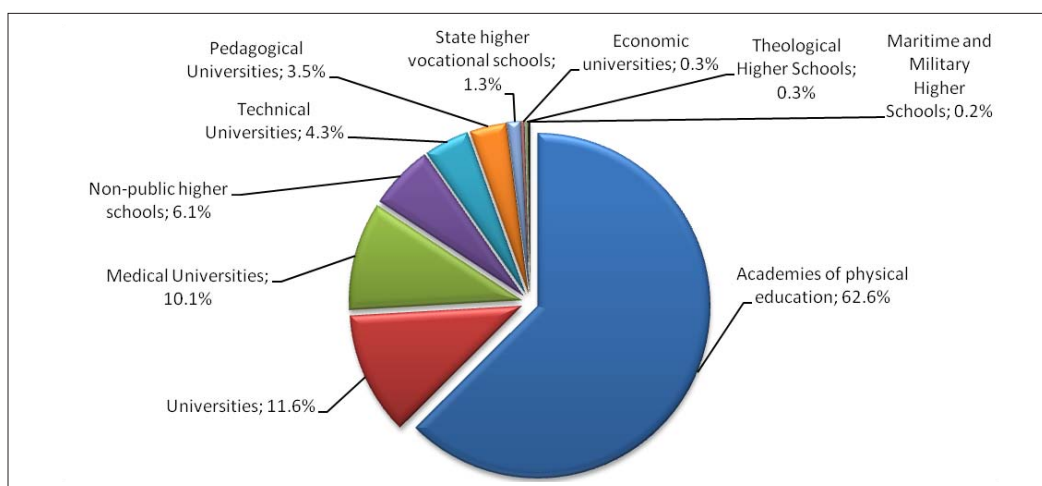
## DISCUSSION

Since 2002, when the ranking of the Polish Academies of Physical Education by Popinigis [12] based on the number of publications in ISI Journals was published

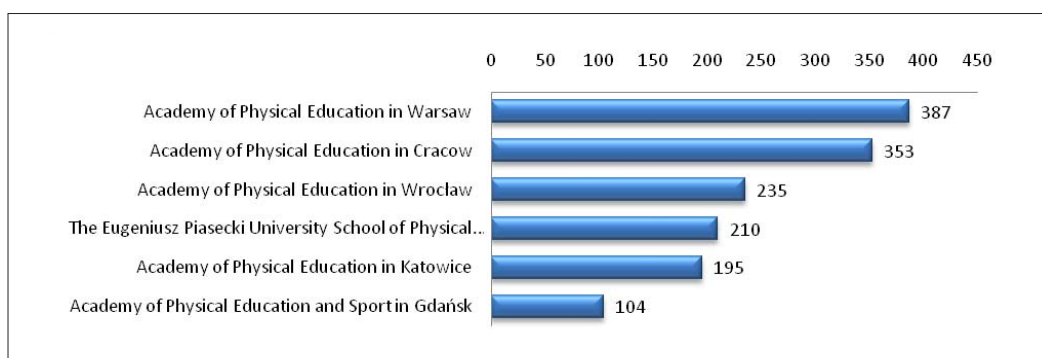




**Figure 1.** Number of points accumulated by the various types of Polish higher schools in 2008.



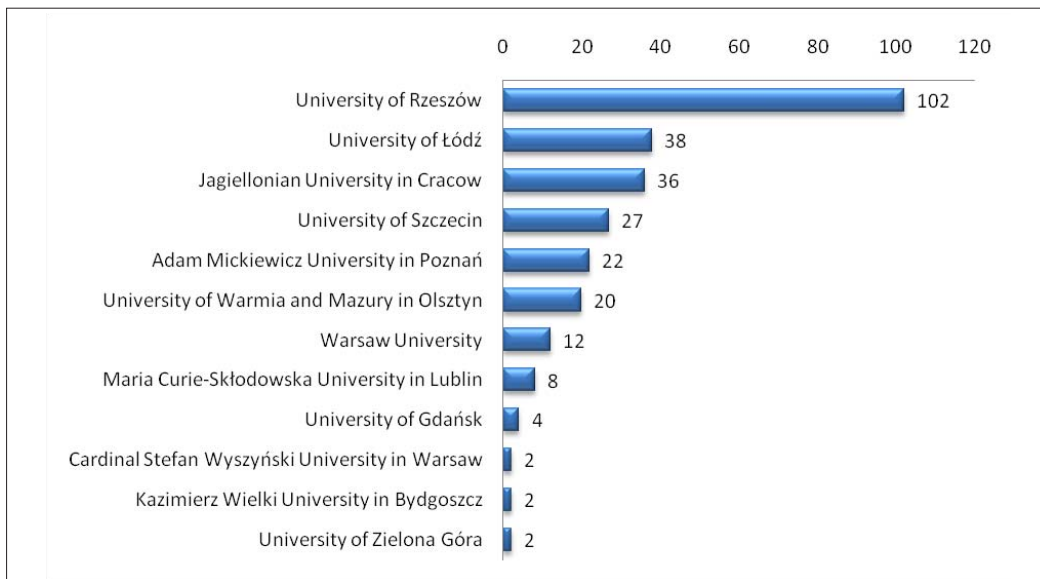
**Figure 2.** Types of Polish higher schools ranked in terms of the percentage of points obtained in 2008 for publication in journals of sports science.



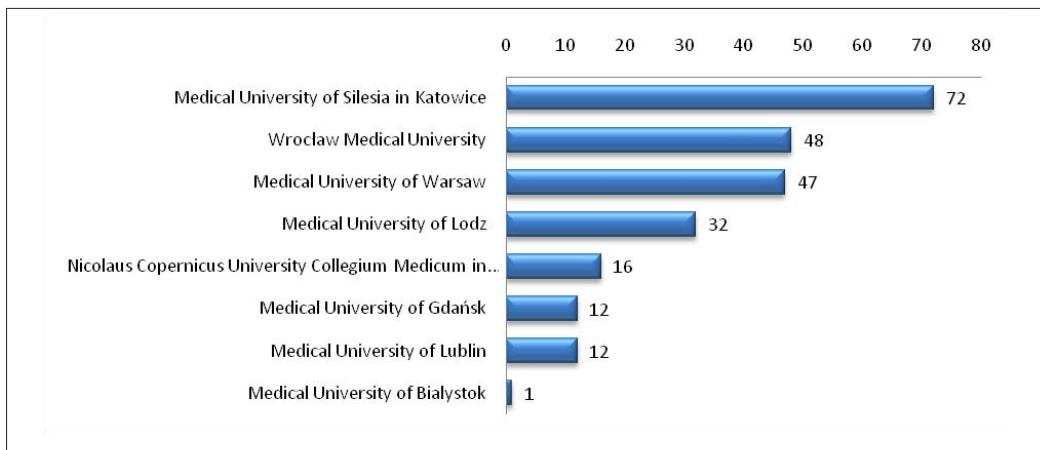
**Figure 3A.** Number of points obtained by the Polish academies of physical education for articles published in journals of sports science in 2008.

(Table 3), there have been no similar studies. It is difficult to make a direct comparison because of the different qualification criteria for publication. However, the Popinigis ranking and the present results provide an overall evaluation of the scientific potential of employees of the academies of physical education during the one se-

lected year for evaluation. The leader of the ranking of the Polish academies of physical education in 2001 (the Academy of Physical Education in Katowice) exceeded the institution closing the ranking (the Academy of Physical Education in Wrocław) by almost four and half times this conventional potential. Furthermore, in the



**Figure 3B.** Number of points obtained by the Polish universities for articles published in journals of sports science in 2008.



**Figure 3C.** Number of points obtained by the Polish medical universities for articles published in journals of sports science in 2008.

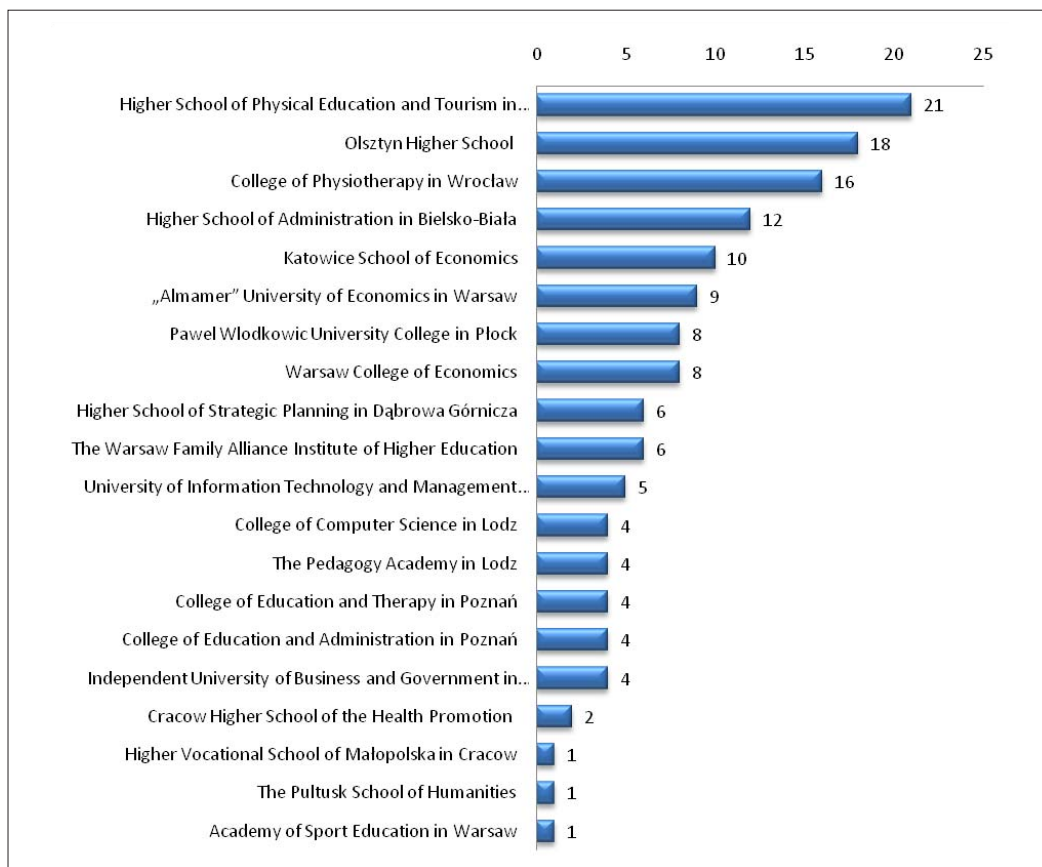
Popinigis ranking the Academy of Physical Education and Sport in Gdańsk is missing, so the potential difference between this academy and the leader is even higher (almost impossible to determine due to the IF criterion). The potential results of the Academy of Physical Education in Katowice and the Academy of Physical Education in Warsaw measured by IF are very similar and differ only insignificantly.

In the ranking of 2008 (Figure 3A), the estimated (in a simplified way) disproportion in the potential of researchers of the Polish academies of physical education is much lower. The Academy of Physical Education and Sport in Gdańsk, which closes the ranking, is inferior to the leader (the Academy of Physical Education in Warsaw) by a factor of almost four.

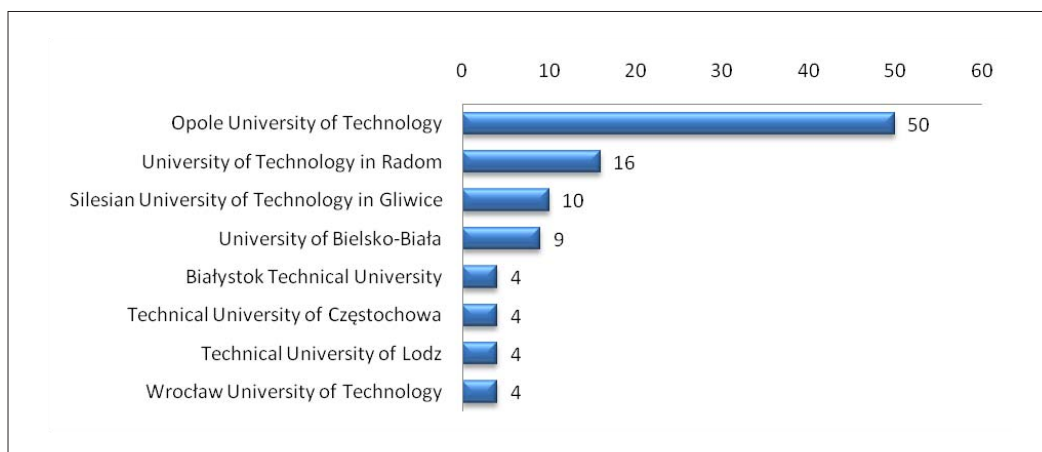
In both rankings, the Academy of Physical Education in Warsaw received a significant number of points and also high positions: in 2001 it placed second and in 2008 first. However, the leader of the 2001 ranking was classified in the penultimate place in the 2008 ranking. Only the Academy of Physical Education and Sport in Gdańsk showed regularity in maintaining the same ranking position: in 2001 it was unclassified and in 2008 it closed the ranking.

Regardless of the simplicity and imperfections of the research method, the evaluation of scientific achievement measured by the number of publications and the points assigned to them enabled a reliable classification of higher schools in terms of specific aspects of their scientific potential. A comparative study of these data related to other detailed criteria (the Impact Factor), but based on similar reasoning, provides empirical proof of





**Figure 3D.** Number of points obtained by the Polish non-public higher schools for articles published in journals of sports science in 2008.



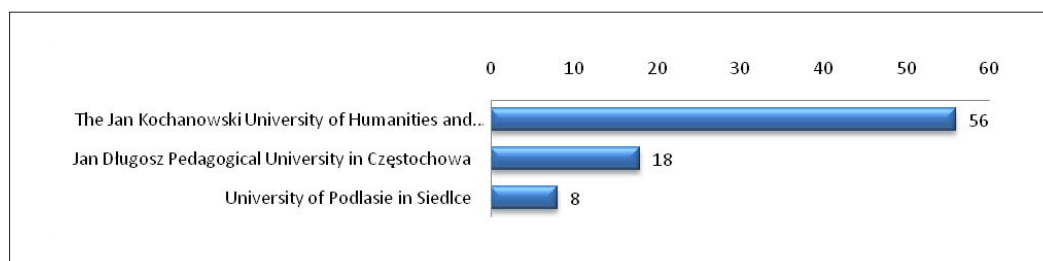
**Figure 3E.** Number of points obtained by the Polish technical universities for articles published in journals of sports science in 2008.

the scientific position given to the type of higher schools in the eight-year cycle. The high position the Academy of Physical Education in Warsaw in the various multiparametric rankings (“Wprost”, “Perspektywy”) authenticates this result. The key issue is that in multiparametric systems, publications are among the most important elements in evaluating the achievements of individual researchers, higher schools, and research in-

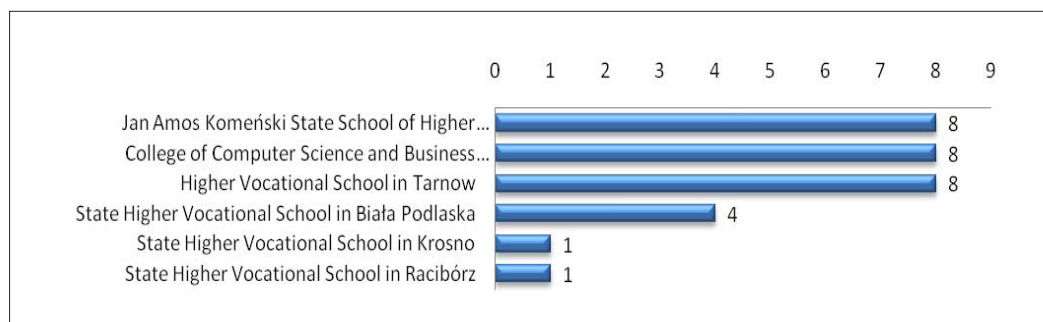
stitutes [5,10]. In national systems of distribution of funds for education, great attention is being attached to scientific publication [2–5]. What is more, academic promotion is almost impossible without evidence of a number of publications in high-rated journals [18].

The research results presented in this paper provide direct empirical evidence that academies of physical ed-





**Figure 3F.** Number of points obtained by the Polish pedagogical universities for articles published in journals of sports science in 2008.



**Figure 3G.** Number of points obtained by the Polish state higher vocational schools for articles published in journals of sports science in 2008.

**Table 3.** Ranking of Polish academies of physical education according to the number of publications in ISI Journals in 2001 [12].

Ranking of Polish Academies of Physical Education in 2001	IF
Academy of Physical Education in Katowice	7.292
Academy of Physical Education in Warsaw	7.042
The Eugeniusz Piasecki University School of Physical Education in Poznań	6.735
Academy of Physical Education in Cracow	4.569
Academy of Physical Education in Wrocław	1.598

ucation (the state's higher sports schools) meet their statutory mission. The academics of higher schools published most of their articles in Polish journals of sports science and sports medicine. Surprising is the relatively large number of authors affiliated with other types of higher schools who published articles in journals of sports science. In some sense, this can be interpreted as a validation of the multi-disciplinary nature of the relatively new field of sports science. It is also proof

that all divisions and classifications of the sciences are in some sense imperfect [19]. One cannot exclude the hypothesis that journals of sport science will play an increasingly important role in the future, integrating various scientific societies and occupational environments apparently distant from the problems of sports in the broader sense.

## CONCLUSIONS

The empirical data of this study allow the statement that the proposed hypothesis is true: Polish academies of physical education and sport colleges fulfill their statutory and social mission. The high interest in issues of sports sciences by the academics of many Polish higher schools of different types may have a significant impact on the cognitive and applications spheres of this field of science. This conclusion leads to the basic implication that the greatest concern of the editors-in-chief and editorial staff of Polish sports sciences journals should be high quality, uniqueness, and international prestige (the criteria being the number of foreign authors, citations, etc).

## REFERENCES:

1. Act of 27 July 2005, Law on Higher Education [http://www.nauka.gov.pl/mn/\\_gAllery/24/36/24364/Law\\_on\\_Higher\\_Education\\_of\\_27\\_July\\_2005.pdf](http://www.nauka.gov.pl/mn/_gAllery/24/36/24364/Law_on_Higher_Education_of_27_July_2005.pdf)
2. Ustawa z dnia 8 października 2004 r. o zasadach finansowania nauki (Dz. U. Nr 238, poz. 2390 i Nr 273, poz. 2703 oraz z 2005 r. Nr 85, poz. 727) [http://www.bip.nauka.gov.pl/bipmein/index.jsp?place=Menu02&news\\_cat\\_id=104&layout=1&page=0](http://www.bip.nauka.gov.pl/bipmein/index.jsp?place=Menu02&news_cat_id=104&layout=1&page=0) [in Polish]
3. Rozporządzenia Ministra Nauki i Informatyzacji z dnia 4 sierpnia 2005 r. w sprawie kryteriów i trybu przyznawania i rozliczania środków finansowych na naukę (Dz.U.05.161.1359 oraz Dz. U. Nr 205, poz. 1488 i 1489 oraz Dz. U. Nr 126, poz. 1044) [http://www.bip.nauka.gov.pl/bipmein/index.jsp?place=Menu02&news\\_cat\\_id=104&layout=1&page=0](http://www.bip.nauka.gov.pl/bipmein/index.jsp?place=Menu02&news_cat_id=104&layout=1&page=0) [in Polish]

4. List w sprawie wykazu czasopism obowiązującego przy przyszłej oceny parametrycznej jednostek naukowych – DBBI 3997/2006 – [http://www.nauka.gov.pl/mn/index.jsp?place=Menu08&news\\_cat\\_id=470&layout=2](http://www.nauka.gov.pl/mn/index.jsp?place=Menu08&news_cat_id=470&layout=2) [in Polish]
5. Research Evaluation: Methods, Practice, and Experience. Research: Analysis and Evaluation 1/2009; Danish Agency for Science, Technology and Innovation; March 2009; p. 31; <http://www.schultz.dk>
6. Ranking Szkół Wyższych; <http://szkoly.wprost.pl/> [in Polish]
7. 90 najlepszych uczelni wyższych akademickich w Polsce; [http://www.perspektywy.pl/index.php?option=com\\_content&task=view&id=1434&Itemid=480](http://www.perspektywy.pl/index.php?option=com_content&task=view&id=1434&Itemid=480) [in Polish]
8. Ranking Szkół Wyższych, edycja 2007/uczelnie techniczne wraz z metodologią punktacji; <http://szkoly.wprost.pl/ranking/ide,18/idk,28/edycja-2007-Uczelnie-techniczne.html> [in Polish]
9. Ranking uczelni akademickich 2009; [http://www.perspektywy.pl/index.php?option=com\\_content&task=view&id=1406&Itemid=479](http://www.perspektywy.pl/index.php?option=com_content&task=view&id=1406&Itemid=479) [in Polish]
10. Index Copernicus Journals Master List; <http://journals.indexcopernicus.com/>
11. Index Copernicus Evaluation Methodology 2009; <http://journals.indexcopernicus.com/info.php>
12. Popinigis J. 1-szy ranking polskich Akademii Wychowania Fizycznego oparty wyłącznie na liczbie artykułów ogłoszonych drukiem w czasopiśmie „Listy filadelfijskiej” w 2001 roku. *Medycyna Sportowa*, 2002, 18(11): 453–61 [in Polish]
13. Ujednolicony wykaz czasopism punktowanych, 5 maja 2009 r. [http://www.nauka.gov.pl/mn/index.jsp?place=Lead08&news\\_cat\\_id=470&news\\_id=8245&layout=2&page=text](http://www.nauka.gov.pl/mn/index.jsp?place=Lead08&news_cat_id=470&news_id=8245&layout=2&page=text) [in Polish]
14. Komunikat nr 16/2009 Ministra Nauki i Szkolnictwa Wyższego z dnia 16 lipca 2009 r. w sprawie uzupełnienia wykazu wybranych czasopism naukowych polskich i zagranicznych, nieposiadających IF (impact factor), wraz z liczbą punktów za umieszczoną w nich publikacją naukową [http://www.nauka.gov.pl/mn/index.jsp?place=Lead08&news\\_cat\\_id=470&news\\_id=8750&layout=2&page=text](http://www.nauka.gov.pl/mn/index.jsp?place=Lead08&news_cat_id=470&news_id=8750&layout=2&page=text) [in Polish]
15. Polish Public Higher Schools [http://www.eng.nauka.gov.pl/ms/index.jsp?place=Menu08&news\\_cat\\_id=443&layout=2](http://www.eng.nauka.gov.pl/ms/index.jsp?place=Menu08&news_cat_id=443&layout=2)
16. Polish non-public higher schools; [http://www.eng.nauka.gov.pl/ms/index.jsp?place=Menu08&news\\_cat\\_id=444&layout=2](http://www.eng.nauka.gov.pl/ms/index.jsp?place=Menu08&news_cat_id=444&layout=2)
17. [http://www.nauka.gov.pl/mn/index.jsp?place=Menu08&news\\_cat\\_id=1079&layout=2](http://www.nauka.gov.pl/mn/index.jsp?place=Menu08&news_cat_id=1079&layout=2) [in Polish]
18. Hackett RD: Editorial. *Can J Adm Sci*, 2008; 25(2): 87–88
19. Barczynski B, Gracynski M, Kalina RM: Budo – a unique keyword of life sciences. *Arch Budo*, 2009; 5: ED117–19

