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A Bibliometric Analysis on China Sport Science (2001-2010) Based on CSSCI Literature

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Abstract

The past 30-year history of China Sport Science (CSS for short) is also the rise and development history of the subject of physical education in China. Based on the bibliography source from CSSCI (2001 - 2010), this paper does some research about the journal in terms of their authors and topics, as a review and forecast for this journal. SPSS17.0 and ROST CM are used. The result shows that: there is a decline trend about the quantity of published articles on the journal after 2005. The rate of CSS papers sponsored by fund is far more than that of similar journals; It has a stable high-level authors. What's more, an article published on the journal often has more than one author, they may come from the same agencies or different agencies, and the number is more or less. "sports training", "animal experiments", "sports medicine", "sports economy" and "physical education" are the most hot topics of the journal.

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Keywords: sport science; bibliometric analysis; physical education

1. Introduction

As a professional journal about sport science, which was created by China Sport Science Society early after the foundation of People's Republic of China, and is now still edited and published by it, *China Sport Science* plays an important role in the enrichment of theories about sport science and the development of sport practices and make a great contribution to them. Just as Ma Tie pointed out, "it (the journal) has fully fulfilled its role in its era." The newly past 2010 is the 30th anniversary of its creation. This paper tries to make a statistic analysis of its latest ten years' papers by a bibliometric analysis method, so as to review its 30 years' development and achievements and look into the future.

In China, the literature analysis about the journal is mainly made in the following aspects: (1) Observing the development of the subject in terms of the quantity of published articles on the journal; one of the representatives is Ma Tie. But because of the restriction of the selected samples (1981-1990), the research can't reflect the latest development of *China Sport Science*. (2) The time lag analysis about the journal made by scholars such as Xu Hongfeng. It is noticeable that the researches only aimed at one aspect, namely, the time lag of the published articles but failed to show the whole development of the journal such as its quotation and the distribution of its authors and so on. (3) the statistic analysis of the

quotations in the articles including the analysis of articles, distribution of authors and quotation, etc. The representative scholars are Wang Ning, Yang Junlin and Zhang Cuiling. Among them, Wang Ning made an analysis on the authors but his sample covered a shorter time span, say only two years. Yang Junlin made a relatively comprehensive study about the both the articles and quotations. However, the sample was based on the data before 1997, therefore, his study also couldn't reflect the new development of the journal because of the time lag. Zhang Cuilin selected the articles from 1999-2009 as her sample, but didn't touch upon the topic of the articles and the development, moreover, failed to give an in-depth analysis on the academic cooperation of the literature.

2. Data source and methodology

This paper collected the articles published on *China Sport Science* from 2001 to 2010 as its sample and tried to analyze the following questions and answer them:

- a. What are the major subjects the studies from 2001 to 2010 and what are the changes?
- b. Is there any change in the annual number of the published articles in the 10 years? If any, how does it change?
- c. How does the fund sponsorship of the articles in the 10 years change? What are trends of the ratio of the funded articles?
- d. How is the rate of coauthoring in the ten years and the frequency of the major authors and their workplace?

The data was collected by Chinese Social Sciences Citation Index (abbreviated as CSSCI) designed and developed by the Research and Evaluation Center of Chinese Social Science, Nanjing University. The author set *China Sport Science* as the name of the journal to be searched and selected the 2001-2010 database, and finally had 1999 samples. On the basis of these samples, this paper disposed the data by Excel 2003, described and processed the data by SPSS17.0. The construction of the social network diagrams is made by ROST CM Software designed and developed by Professor Shen Yang and his team in Wuhan University.

3. An analysis of the published articles on CSS

3.1 An analysis on the quantity of published articles on CSS

The influence of a journal can be measured from two aspects: data input and data output. The quantity of the published articles, an important form of data output for a journal, is a major index to evaluate its influence. Some scholars even stressed that the quantity of published articles not only reflected the quantity of information included in a journal but also served as a fundamental index for library purchase and collection, which showed the specific contribution of the journal and its academic influential power. The author collected 1999 articles by CSSCI data base. Diagram 1 illustrates the change of the annual quantity of published articles of CSS from 2001 to 2010. The diagram shows double peaks, respectively 248 in 2002 and 264 in 2005. It is clear that the quantity of published articles shows a decline trend after 2005 until it reaches 149 in 2010, an equivalent to that of 2001. It is also found by searching the data base that the annual average quantity of published articles of CSS from 1998 to 2001 remains to be about 140-150.

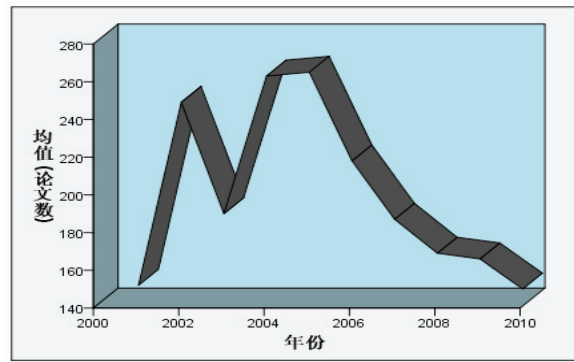


Diagram 1 distribution of the quantity of published articles from 2001 to 2010

3.2 An analysis of the fund sponsorship

The proportion of funded articles is an important index to measure the quality of an academic journal. The journal with a big proportion of funded articles has better quality. The annual fund sponsorship can be obtained through SPSS statistics. The following diagram shows that four years' funded articles are more than 120, respectively, 125 in 2005, 133 in 2006, 128 in 2009 and 128 in 2010.

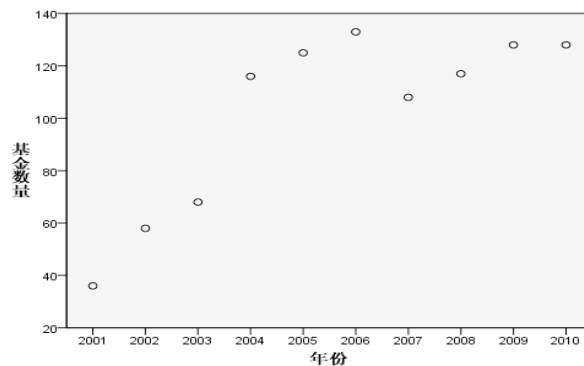


Diagram 2 distribution of the quantity of funded articles from 2001 to 2010

In total, 1017 out of 1999 articles were funded. Some of them were even sponsored by two to four fund items, as shown in Table 1. According to the table, the number of articles sponsored by one fund item dominates and it is above 80 in three years, namely 88 articles in 2004, 98 in 2005, and 84 in 2006. There is a general increase tendency in the number of articles sponsored by two fund items, from two in 2001 to 28 in 2010. In ten years, the articles with three fund items are few, at most 6 both in 2007 and 2008. After the recalculation, the total funded articles are 839. And the figure 839 dividing the total number of sample 1999 is the average rate of fund sponsorship in ten years, that is, 41.97%. Ran Qianghui and Zhang Ye'an pointed out in their study that the rates of funded articles in Chinese key sports journals are significantly different. Only two journals owned a better rate above 40%. Therefore, the rate of fund sponsorship of CSS leads in the field. Diagram 3 shows the trend of the rate of funded articles from 20001 to 2010. According to the diagram, there is a general uptrend in the rate of overall fund sponsorship and that of the sponsored articles with two fund items whereas in the uptrend of articles with

one fund item appears a turning point, and it begins to decline.

Table 1 Distribution of the quantity of funded articles from 2001 to 2010

years	Articles with One fund items	Articles with two fund items	Articles with three fund items	Funded articles in total	In total
2001	32	2	0	34	151
2002	54	2	0	56	248
2003	57	4	1	62	189
2004	88	11	2	101	262
2005	98	12	1	111	264
2006	84	18	4	106	217
2007	65	12	6	83	186
2008	72	13	6	91	168
2009	78	19	4	101	165
2010	63	28	3	94	149

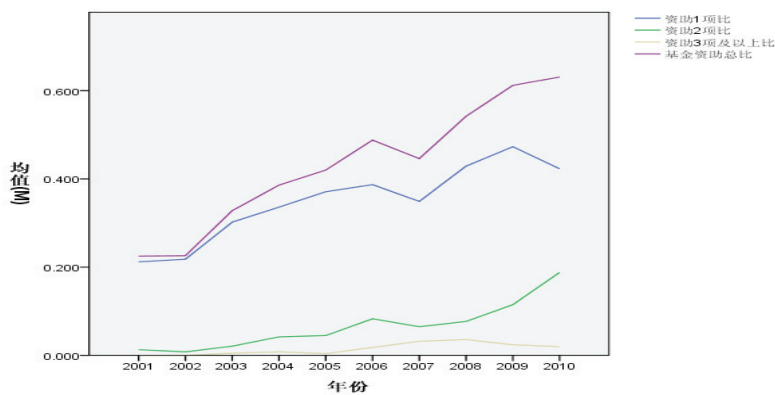


Diagram 3 the ratio chart of funded articles from 2001 to 2010

3.3 An analysis of the related subjects

Interdiscipline is a major feature of the development of science. The integration of sports science and other subjects is a characteristic of the times for the development of sports science. Though the journal belongs to sports science when classified in CSSCI, its articles are not confined to the category of sports science. CSSCI classifies every article through the work of the editors of the journal by following Chinese Library Classification, thus, each article might be classified into two or more subjects. In this way, we collected the classification of subjects of the articles on the journal (see table 2). Table 2 shows the wide field covered by the articles on the journal besides sports, but it mainly relates to education and journalism and communication, which suggests that as a key journal of Chinese sports science, CSS embraces the study of related subjects and doesn't lose its own study field in its interdisciplinary development.

Table 2 the subjects that articles belong to

subjects	Quantity of articles	subjects	Quantity of articles
Sports science	1963	economics	2
education	17	management	2

Journalism and communication	8	Chinese Culture	1
Library, information and bibliography	5	linguistics	1
psychology	2	history	1
culturology	2	Industrial technology	1
biology	2	law	1

4. An analysis of the researchers

4.1 An analysis of the quantity of articles researchers published

The quantity of articles a researcher published can reflect his research level. A high-level researcher is an essential requirement to support the development of the subject and a basis for the journal to lead the academic study. The top 20 researchers' quantity of articles from 2001 to 2010 and their work place are listed in the table 3. In total, all the 20 productive authors published 347 articles, accounting for 17.4% of the sample, which suggests a high concentration ratio of these authors' publication. However, the total number of published article per author doesn't coincide with that of the first author, for instance, Hu Yang is number one with his 37 articles in total, but Wang Jin ranks first because of his 23 articles with his name as the first author. To further investigate these authors' work place, it is found that nearly half of them come from two institutions, five of them from China Institute of Sport Science and four of them from Shanghai University of Sport.

Table 3 2001-2010 productive authors' situations

No.	author	Total number of articles	Number As the first author	Workplace
1	Hu Yang	37	7	Beijing Sport University
2	Tian Ye	25	8	China Institute of Sport Science
3	Wang Jin	27	23	Zhejiang University
4	Feng Lianshi	22	4	China Institute of Sport Science
5	Chen Xiaoping	19	15	Tsinghua University
6	Zhang Liwei	19	10	Beijing Sport University
7	Shi Yan	18	11	Shanxi University
8	Chen Peijie	18	3	Shanghai University of Sport.
9	Qiu Jun	17	11	Tsinghua University
10	Yu Chonggan	16	7	Shanghai University of Sport.
11	Gao Binhong	15	9	Shanghai Research Institute of Sport Science
12	Zhao Jiexiu	15	7	China Institute of Sport Science
13	Zhou Chenlin	14	7	Shanghai University of Sport.
14	Luo Binqun	14	12	Capital Institute of Physical Education
15	Zhan lin	13	5	Shanghai University of Sport.
16	Cong Hupin	13	9	Ningbo University
17	Li Jianshe	12	5	Ningbo University
18	Jiang	11	7	China Institute of Sport Science

	Congmin			
19	Chang Yun	11	10	China Institute of Sport Science Zhejiang University
20	Wang Jin	11	5	
total		347	175	

4.2 An analysis of co-authoring situation

Of 1999 articles, 644 are written by only one author, whereas the rest 1355 are co-authored. Judged from their post code, the co-authored papers can be divided into inter-institute and multi-institution collaboration. There are 695 multi-institution collaborated articles and 660 inter-institute ones. The detailed distribution is in Table 4. In the table, the most inter-institute collaborated articles are 95 in 2004, and the most multi-institution ones are 101 in 2005. The co-authoring rate is that of the number of literature by non-individual author to the total number of literature, which suggests the depth of the study. The average co-authoring rate of the ten years is 67.8%, more than 54.1%, the average co-authoring rate of sport science research in five years from 2000 to 2004, and far more than 26.9%, the average co-authoring rate of researchers of humanities and social sciences. The comparison shows that the authors of the journal have a higher co-authoring or collaboration level. This has something to do with the special feature of sport science, in that the study of sport science often borrows some analysis theories and methods from other scientific fields, thus it has more interactions and communications with other subjects. In table 4, in terms of annual co-authoring rate, the year 2004 witnesses the highest inter-institute one, 0.4, and 2010 the highest multi-institute one, 0.42. Diagram 4 describes the trend of annual co-authoring development. The general trend of co-authoring rate per year is upward, and inter-institute co-authoring rate starts to decline in 2009 whereas multi-institute co-authoring rate begins to climb up after 2009.

Table 4 distribution of 2001-2010 co-authoring situation

	Inter-institute co-authoring	Multi-institute co-authoring	Co-authoring	Amount of co-authoring articles	Inter-institute co-authoring rate	Multi-institute co-authoring rate	Co-authoring rate
2001	49	53	102	151	0.33	0.35	0.68
2002	87	63	150	248	0.35	0.25	0.6
2003	58	73	131	189	0.32	0.37	0.69
2004	95	79	174	262	0.36	0.3	0.66
2005	76	101	177	264	0.29	0.38	0.67
2006	68	79	147	217	0.32	0.36	0.68
2007	59	67	126	186	0.32	0.36	0.68
2008	51	65	116	168	0.3	0.39	0.69
2009	66	52	118	165	0.4	0.32	0.72
2010	51	63	114	149	0.35	0.42	0.77

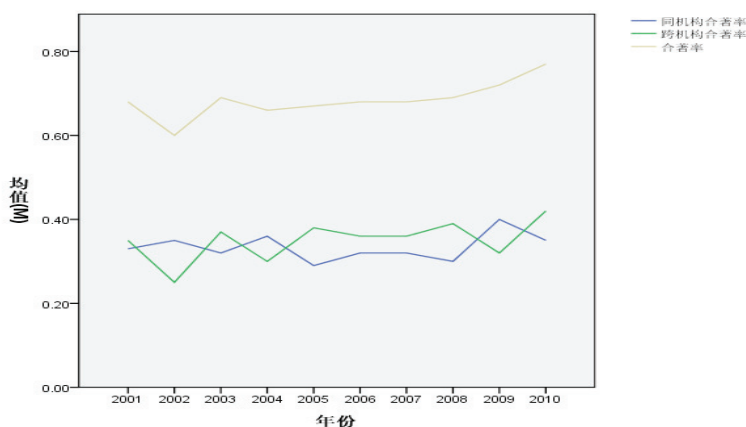


Diagram 4 trend of 2001-2010 co-authoring rates

After close analysis of the literature, we find the following phenomena in the co-authored papers on the journal.

Firstly, in general, the co-authoring level of CSS is above the average one of other journals in sport science. Shanghai University of Sport and Beijing Sport University are major co-authoring bodies due to their advantages in the subject. 169 articles are co-authored by Shanghai University of Sport and 172 by Beijing Sport University. Up to Aug, 12, 2001, among all the samples, the coauthored article by Beijing Sport University *Development Trend of World Basketball --- Discussion on the Current Situation and Development Strategy of Chinese Basketball* has been cited 207 times, ranking second; the co-authored article by Shanghai University of Sport *the Combination of Sports and Education and Construction of High Level Sports Teams* has been cited 154 times, ranking the sixth.

Secondly, unlike *Chinese Public Administration*, whose co-authoring type is dominated by that of inter-institute collaboration, CSS shows a different one, that is, the inter-institute co-authoring articles share the same proportion as the multi-institute ones. And the latter seems to be a little more than the former. As we know, multi-institute cooperation can promote the development and communication of subjects and accelerate the wide spread of cutting-edge theories and research methods while inter-institute cooperation is beneficial to the establishment and development of internal research teams and the cultivation of young scholars so as to form a certain influence in the field. By observing the inter-institute and multi-institute co-authoring situations of CSS, we find that CSS plays a role of guide in ten years' development. It focuses on guiding inter-institute cooperation and multi-institute one to a balanced development road. It is noticeable that the top 20 productive authors cooperated a lot, for example, Tian Ye has written 21 articles together with other writers, to be more specific, 11 with Zhao Jiexiu accounting for 44% of all his papers published on CSS, 5 with Hu Yang, 3 with Feng Lianshi and 2 with Zhang Li. Among all these co- authors, Zhao Jiexiu and Tian Ye come from the same institution. To some extent, this shows that productive authors from the same institute are more likely to co-author.

5.An analysis of the topics of study

CSS is an authoritative sport journal, ranking the first of the sport category in CSSCI. Therefore, it is accessible to know the change of the journal's focus and explore the new move and the latest hot topic of study in domestic sport science development by the close observation of its articles. Key words of an article are the refinement of its content and can directly reflect the theme of the study. We get the

following social network (diagram 5) of key words of the 2001-2010 articles in CSS by ROST CM developed by Professor Shen Yang and his team in Wuhan University. From Diagram 5, we find that such topics as athletes, sport, experiments, training and exercising and so on are major themes of study of the articles published in CSS. It has a close relation to the journal's orientation to explore the nature and law of sport in a scientific way. Diagram 6 shows the top 20 key words of the CSS articles. As high-frequency words, they represent the general layout of the themes of study in sport field in ten years. The first two key words, sport training and animal experiment, fully reflect the tenet of the journal: explore the nature and law of sport in a scientific way. Furthermore, sport training is also a major column of the journal. And other topics like athletes, physical education, sport economy and sport medicine are often seen as the hot topics in the field of sport science.

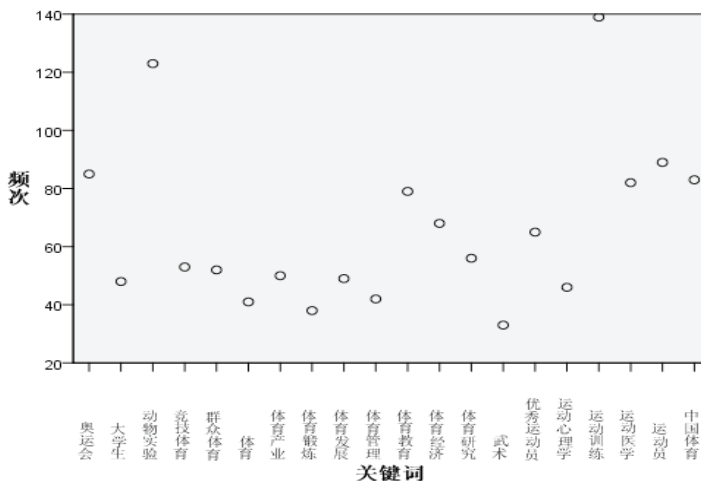


Diagram 5 the social network of key words of 2001-2010 CSC articles

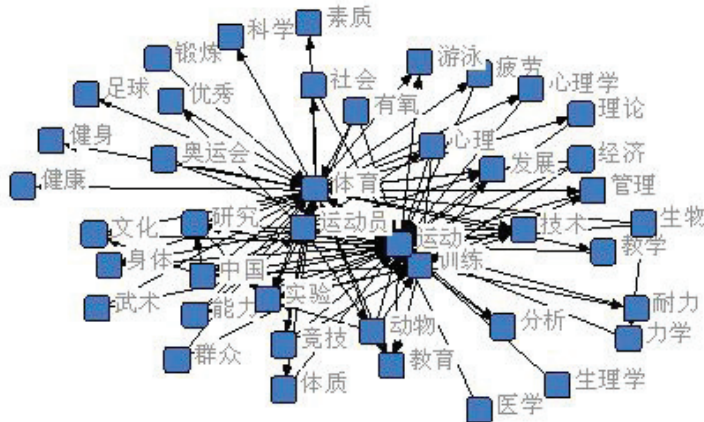


Diagram 6 the distribution of top 20 key words of 2001-2010 articles

Diagram 5 lists the top 10 high-frequency key words per year from 2001 to 2010 to closely review

the change of hot topics in ten years and outline the network of sport study development. By observing diagram 5, we can come to the following conclusion: firstly, sport study put more and more focuses on the norm of research methods in its ten years' development. Among them, animal experiment is comparatively more widely used, and it remains to be the top one highly on the high-frequency list for three consecutive years (2008-2010). Secondly, sport study always closely relates to the development of times, and probes into hot issues of current society. For example, Olympic Games became a key matter of sport researchers' concern before and after China holding the 29th Olympic Games in 2008 and remained to be one of high-frequency key words for five consecutive years (2005-2009). Thirdly, in sport study, athletes are always an important research target, and remain to be high-frequency key word for seven consecutive years (2003-2009).

Diagram 5-1 top 10 high-frequency key words per year

2001		2002		2003		2004		2005	
Key words	Frequency	Key words	Frequency	Key words	Frequency	Key words	Frequency	Key words	Frequency
Sport medicine	31	Sport training	39	Sport training	33	athletes	18	Animal experiment	29
Sport training	20	Sport medicine	37	Sports economy	25	College students	12	Excellent athletes	16
Physical education	15	PE teaching	33	PE teaching	18	Martial arts	12	Olympic Games	13
Sport management	13	Sports economy	24	Mass sport	13	sport	9	College students	12
Sport psychology	13	Mass sport	19	Sports management	11	Sport exercise	9	Exercise physiology	12
Sports economy	11	Sport psychology	12	Excellent athletes	10	School sport	9	Sports training	10
Sports biomechanics	11	Sports biomechanics	12	Computer technology	10	Excellent athletes	9	sport	10
Mass sport	8	Sport management	11	School sport	9	swimming	9	Competitive sports	9
PE teaching	7	Sports industry	9	Sports industry	7	Competitive sports	9	Athletes	8
Sport consumption	5	PE teaching	8	Track and field sport	5	Physical fitness	8	Chinese sports industry	8

Diagram 5-1 top 10 high-frequency key words per year

2006		2007		2008		2009		2010	
Key words	frequency	Key words	frequency	Key words	frequency	Key words	frequency	Key words	frequency
Olympic Games	19	Chinese sport	23	Animal experiment	21	Animal experiment	19	Animal experiment	16
athletes	18	Sports study	20	Sports study	13	Athletes	10	sports	7
Chinese sport	13	Animal experiment	20	Athletes	12	Sports study	8	Chinese sport	4
Animal experiment	11	Sports training	13	Olympic Games	11	Olympic Games	7	Competitive sports	4
Sports development	11	Athletes	12	Chinese sport	9	Chinese sport	7	body	4
Sports study	11	Olympic Games	11	Excellent athletes	7	Sports development	6	Skeletal muscle	3
Sports exercises	10	Sports development	11	Skeletal muscle	5	Excellent athletes	5	philosophy	3
Sports training	10	Sports culture	7	Sports development	4	Competitive sports	5	Endurance training	3
Sports industry	9	Exercise physiology	7	Martial arts	4	sports	5	swimming	3
Competitive sports	8	Excellent athletes	7	exercise	4	Hypoxic training	4	Aerobic exercise	3

6. Conclusions and prospects

As an authoritative journal, *China Sport Science* adheres to probe into the nature of sport in a scientific way, keeps in line with the development of times, pay much attention to hot issues in the development of sports theory and practice, and highlights its academic, timely and practical feature. The following conclusions are made based on the above bibliometric analysis: first, *China Sport Science* has its own influential power all around the country and takes the lead in terms of its quality in comparison with its similar journals and periodicals. This can be best illustrated by its average rate of fund sponsorship in ten years, that is, 41.97% and its ranking the first in the list of sports category by the authoritative data base CSSCI. Second, CSS plays an important role in guiding the development of the subject in terms of the standardization of research methods in that the articles about animal experiments enjoy a big pie in its publication. The journal keeps introducing the cutting-edge theories both in china and from abroad, making the domestic sports study keep pace with or even surpass the international study level. Third, CSS has its own stable popularity among its high-level readers and authors. Its published articles have a higher rate of coauthoring. And the balanced development of inter-institute and multi-institute coauthoring is beneficial to the cultivation of academic teams for institutes themselves and the spread of cutting-edge theories to other institutes. Fourth, CSS keeps addressing much importance to the practice of sport, which can be illustrated by the samples of athletes and the Olympic Games related issues as the theme of studies. 30 years flew by. The journal will still make a great contribution to the standardization of research methods, the exploitation and development of hot issues and the cultivation of new academic talents, thus, to promote the prosperity of sports theories and the development of practice.

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