



Original article

Information visualization analysis on *Advances in Psychological Science*: 1983–2014[☆]Xiao-Jie Pan^a, Hui-Ning Zhao^b, Mi-Mi Li^b, Li-Hong Hou^b, Yan-Qing Guo^a, Xiao Zheng^b, Ya-Qing Xue^b, Chi-Chen Zhang^{b,*}^a School of Public Health, Shanxi Medical University, Taiyuan, Shanxi 030001, China^b School of Management, Shanxi Medical University, Taiyuan, Shanxi 030001, China

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ABSTRACT

Objective: To describe the revolution and research status of *Advances in Psychological Science*.**Methods:** A total of 3060 articles published in *Advances in Psychological Science* from 1983 to 2014 were analyzed with the information visualization method using Citespace software from the aspects of publications, cited frequency and downloads, funding, organizations, authors and keywords.**Results:** The results showed that the amount of literature published annually had an upward tendency, and 49.4% of the papers were supported by national or provincial projects. Institutions such as the Chinese Academy of Sciences (CAS) and the normal universities were rated in the forefront of the scientific research output. Xiting Huang, Hong Li and Yuejia Luo were at the top of the list of prolific authors.**Conclusions:** A new pattern of cooperative development of the theory and application in the field of psychological research is forming.© 2017 Shanxi Medical Periodical Press. Publishing services by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

Advances in Psychological Science commenced publication in 1983 as the *Journal of Developments in Psychology*, and it changed to its current name in 2002. A monthly academic journal, it is sponsored by the Institute of Psychology, at the Chinese Academy of Sciences (CAS). The publication mainly reflects the new advances, new tendencies and new achievements in the field of psychology. It was listed by CSSCI, and has been admitted into the source of Chinese core periodicals. To show the developing trends of the journal, help readers understand the internal rule and relationship of journal literature, and learn the development and research status in domestic psychology research,¹ we drew a knowledge map to analyze the literature published in *Advances in Psychological Science* based on the methods of bibliometrics. Citespace software was

used to illustrate the research status and hotspots in the field of psychology and to provide a reference for the researchers to carry out related research.^{2–5}

2. Materials and methods

2.1. Data source

The bibliographic records for this study were taken from “China National Knowledge Infrastructure (CNKI)”. All documents which were published in the *Journal of Developments in Psychology* or *Advances in Psychological Science* until 2014 were included. A total of 3255 pieces published in the journal from 1983 to 2014 were downloaded before April 5, 2015.

2.2. Data processing

After artificial screening of the literature in the database, and the removal of non-academic literature such as journal introductions, subscription descriptions, lists of experts and meeting information, 3060 pieces of data remained. The data disposal was completed on April 11, 2015.

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2.3. Study methods

Valid data were formatted and inputted into the visual Citespace software to draw up the knowledge map of *Advances in Psychological Science*. The analysis period was set from 1983 to 2014, which yielded 31 time-slices.^{6–8} The relevant nodes were selected for correlated analyses on institutions, authors and keywords. In the knowledge map, each node represents different analyzed content. The size of the nodes represents the amount of literature that authors published or the frequency with which keywords appear, the circle's color represents the publication year, and the color of the line represents the first year in which they collaborated; the degree of co-operation between the two was proportional to the thickness of the connection.^{9,10}

3. Results

3.1. The basic situation analysis

3.1.1. Analysis of the number of articles published annually

The number of articles is an index reflecting the information content of the periodical carrier, which is used as an auxiliary index to evaluate the core journals.¹¹

Through the analyses of the annual published articles, it can be found that the overall trend of publications in *Advances in Psychological Science* was increasing from 1983 to 2014. Initially, the trend of the amount of literature from 1983 to 2002 is relatively gentle and fluctuates within 100 articles. In a period of rapid development, the number of research articles increased from 2003 to 2010, with the largest amount of 244 articles in 2010, which accounted for 7.97% of the total literature. This was also the peak of the journal since it began publication. At the steady development stage from 2011 to 2014, publication declined slightly and stabilized, where the amount of annual publication maintained at approximately 200 articles (Fig. 1).

3.1.2. Analysis of documents cited and downloaded

The cited frequency and the number of downloads are important criteria for measuring the quality of a journal. In this study, mathematical, statistical and logical methods were used to analyze the cited frequency and downloads of the literature, thus revealing the quantitative and inherent patterns in these articles. Table 1 lists only the cited frequency and downloads of the top 30 articles, arranged by the cited frequency, including 13 articles. Before the journal changed its name, the 3 articles written by Mingxia Wu, Dingkun Zhang and Jianhua Duan ranked at the forefront of highly cited frequency and high downloads, and all of them were theoretical studies. The other 10 articles appeared in the journal after it was renamed. There were 13 papers that cited frequency and

downloads located in the top 30, with 3 articles on subjective well-being and 3 other articles related to work and human resources. Due to the quality of literature and hotspots differing in various periods, the ranking of cited frequency and downloads was inconsistent.

3.1.3. Analysis of funding and related subjects

There were 1511 articles that were supported by national, provincial and ministerial level fund projects, accounting for 49.4% of the 3060 articles. Among them, the National Natural Science Foundation of China accounted for the largest proportion, reaching 52.4%, followed by the Projects of the National Social Science Foundation of China. In addition, part of the study was supported by the United States National Science Foundation (NSF). The main disciplines involved in the literature were psychology, sociology and statistics, educational theory and educational management, psychiatry, management, basic medicine and so on, of which psychology accounted for the largest proportion, reaching 88.7%.

3.2. The network map and analysis of institutions' collaboration

In view of the complicated setting of all institutions, the research integrated the institutions of the data samples. We combined the various branches within institutions according to the name of the institution, for example, Institution of Psychology, CAS and University of Chinese Academy of Sciences were unified into CAS. The various departments and subsidiary bodies of the colleges and universities were unified under their school name. For example, the School of Psychology, Central China Normal University and School of Psychology, Central China Normal University, Hubei Key Laboratory of Human Development and Mental Health were unified into Central China Normal University. The old school names in the early years of school foundation were unified into the latest school names on the official websites, for example, Southwest Normal University was listed as Southwest University.

As shown in Table 2, the publication of the CAS was the highest in the top 10 prolific institutions, accounting for 31.4%, and the remaining 9 schools were mainly well-known domestic normal colleges and universities. The network map of institutions' collaboration contained 458 nodes (research institutions) and 187 lines in total. Fig. 2 shows institutions with 9 or more publications. According to the size of nodes, prolific institutions included CAS, Southwest University, Beijing Normal University, Central China Normal University, and so on. The colors of the circular rings indicate that most of the institutions published in the recent term. With reference to the line connecting both nodes in the map, the main academic teams were Southwest University and Nankai University research team, Beijing Normal University and South China Normal University team, etc.

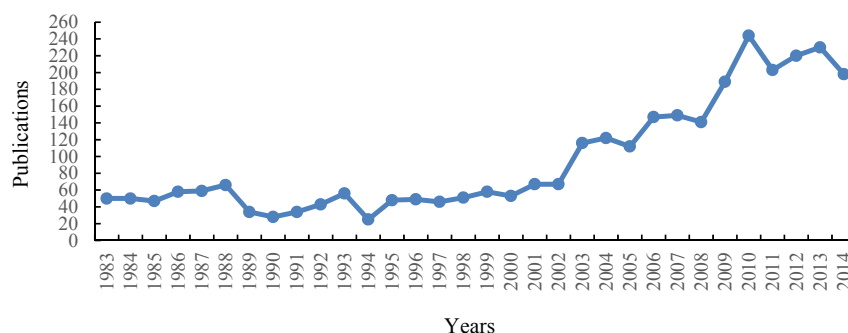


Fig. 1. Evolution of publications in *Advances in Psychological Science* from 1983 to 2014.

Table 1
The top 30 cited and downloaded articles in *Advances in Psychological Science*.

Rank	Author	Title	Year	Cited frequency	Downloads
1	Xiaochun Wang	Review of foreign studies on what causes job burnout	2003	851	5030
2	Mingxia Wu	The theoretical development of subjective well-being in the west in the past 30 years	2000	850	5992
3	Dingkun Zhang	Theory of self-efficiency and present condition	1999	792	7586
4	Jianhua Duan	Overview of subjective well-being	1996	625	6155
5	Yingrui Zhang	Social identity theory and its development	2006	616	12272
6	Wenting Duan	A review of the theory of planned behavior	2008	459	5823
7	Jinzheng Li	Positive psychology: a new trend in psychology	2003	446	7996
8	Jiazhou Chen	Content, dimension, and type of psychological contract	2003	399	5242
9	Kan Shi	Human resource development based on competency model	2006	333	5565
10	Lifeng Zhong	Review of psychological capital research	2007	328	6624
11	Xinhua Ding	A review on the studies about subjective well-being of adolescents	2004	321	5296
12	Rui Li	A review of the research on work/job engagement	2007	242	4321
13	Xiaoyi Fang	Family functioning: theory, influencing factors, and its relationship with adolescent social adjustment	2004	228	4630

3.3. The network map and analysis of authors' collaboration

Given the phenomenon of homonymic authors in the same or different institutions, we screened and distinguished all the authors that appeared in the literature. For example, Minqiang Zhang from South China Normal University was indicated as Minqiang Zhang¹ and Minqiang Zhang from Sun Yat-sen University was indicated as Minqiang Zhang², but the author published documents in different institutions due to various reasons that were neither distinguished nor indicated.^{12,13}

The publication listed in Table 3 include all of the authors in a sequence, for example, the first author, the second author, etc. In view of the limited space, we only listed the top 10 authors. Among the prolific authors, there were three scholars in Southwest University at the top 10, except for Wenquan Ling in Jinan University; the remaining ten authors' units all corresponded to the top 10 productive institutions.

The result of the analysis using Citespace software showed that there were 1064 nodes (researchers) and 552 lines (co-author frequency) in total. Given the large amount of data, Fig. 3 includes only authors with 60 or more publications. The main academic teams were Xiting Huang and Wei Shi¹ team, Erping Wang and Chang Liu team and Jianxin Zhang and Shu Li team, among others.

3.4. The network map and analysis of keywords' coexistence

Keywords indicate the content of an article, and are the quintessence of an article. The existence of different expressions in the literature affected the accuracy of the results to a certain degree. We unified the keywords by merging Chinese and English, for example, "ERP" was merged into "Event Related Potential", "Model (English)" was merged into "Model (Chinese)", and prepositions, articles, and conjunctions were eliminated, such as "of", "the", etc.

As shown in Table 4, among the top 10 keywords of appearance frequency, the keyword "Emotion" appears with the highest frequency, approximately 65 times. There were 60% high frequency keywords appearing in the early years of journal foundation,

whereas other frequently used terms, such as 'Decision-Making', gradually appeared with the change of times.

In this research, the keywords co-occurrence network was structured by data analysis which contained 1131 nodes (keywords) and 372 lines (frequency of co-occurrence) in total. The knowledge map seen in Fig. 4 includes keywords with an appearance frequency of 14 or higher. The relationship between keywords was tight and stable and formed a complicated map of coexistence which had enormous structure and an obvious time feature. "Children" and "Adolescent" were main research objects. Research methods mainly involved "Model", "Meta-analysis", "Functional Magnetic Resonance Imaging", "Intervention", etc. "Major Depression" and "Posttraumatic Stress Disorder" were main diseases and attracted more attention.

4. Discussion

There has been an overall rising trend of the papers in journals since *Advances in Psychological Science* started publishing. Since the journal changed from quarterly to bimonthly publication in 2003, the average amount of annual published articles has increased significantly. In 2008, psychological workers from all parts of the country rushed to Sichuan, China and provided psychological aid to victims of the Wenchuan earthquake. The journal published literature of disaster psychology so that the related managers and scientific researchers could recognize the importance of psychological aid and note the necessity of establishing and improving the emergency response mechanism of national psychological crisis intervention. The column on disaster psychology and psychological crisis intervention was first published in *Advances in Psychological Science* in 2009 and beat with the pulse of the times and promoted the development of the journal. The journal became a monthly in 2010 and provided a broader research platform for more psychologists. In recent years, the total amount of the documents published declined slightly but were relatively stabilized, which may be a result of more stringent requirements for the draft.

Table 2
The top 10 prolific institutions in *Advances in Psychological Science*.

Rank	Institution	Frequency	Year
1	Chinese Academy of Sciences	623	1983
2	Southwest University	303	1991
3	Beijing Normal University	293	1984
4	Central China Normal University	161	2000
5	Peking University	141	1985
6	South China Normal University	130	1983
7	Nanjing Normal University	104	1984
8	Zhejiang University	96	1986
9	Capital Normal University	79	1993
10	Renmin University of China	56	2004

Comprehensive analysis of high cited frequency and downloads found that the download frequency of some literature was far higher than its cited ones. To some extent, this illustrated that such documents can keep up with the trend of the times and can meet the demand of readers, but the literature with the most cited frequency were classical literature. There were fewer articles with high cited frequency and downloads until the journal changed its name, accounting for 76.9%. The literature with the most cited frequency and the largest number of downloads were in the journal after it was renamed, which indicated that *Advances in Psychological Science* had entered into a stage where it became both multi-layered and high-level. Regarding literature research, the hotspots were industrial and organizational psychology, personality psychology, social psychology and developmental psychology.

The journal covers a wide range of subjects and stresses key points, and nearly half of its articles are supported by national or provincial funding projects. On the one hand, this indicates that the articles were of high quality, innovation and practicality. On the other hand, it reflects the degree of the attention of management departments at all levels related to psychology and development orientation.

Table 3
The top 10 prolific authors in *Advances in Psychological Science*.

Rank	Author	Frequency	Year	Author's unit
1	Xiting Huang	67	1985	Southwest University
2	Hong Li	44	2000	Southwest University
3	Wenquan Ling	34	1984	Jinan University
3	Xiaolan Fu	34	1989	Chinese Academy of Sciences
3	Yuejia Luo	34	1993	Beijing Normal University
6	Jianxin Zhang	32	1985	Chinese Academy of Sciences
6	Qinglin Zhang	32	1995	Southwest University
6	Yongyu Guo	32	1997	Central China Normal University
9	Fuming Xu	31	2009	Central China Normal University
10	Erping Wang	30	1990	Chinese Academy of Sciences
10	Chang Liu	30	1995	Nanjing Normal University

In this research, we analyzed the distribution and the cooperation of the research institutions, and we determined the research status, the distribution within the institutions and communication between disciplines, to clearly identify the core institutions in the field of psychology.¹⁴ The publications were not balanced from place to place, and CAS issued the highest number of articles. On the one hand, its subordinate, the Institute of Psychology, has several advantages at issuing articles as a journal sponsor. As a core institution in the field of psychology, the Institute of Psychology, CAS has cooperated with many scientific research institutions at home and abroad. On the other hand, given its excellent research team and formidable scientific research strength, the Chinese Academy of Sciences University has rich scientific research output. On the other hand, some provinces have issued a small number of articles, such as Jiangxi and Hebei provinces. Represented by Southwest University and Beijing Normal University, the colleges and universities will gradually become a new growth point in the field of psychology. It is important to note that the CAS, Southwest University, and Beijing Normal University, as representatives of prolific institutions, had limited cooperation with other

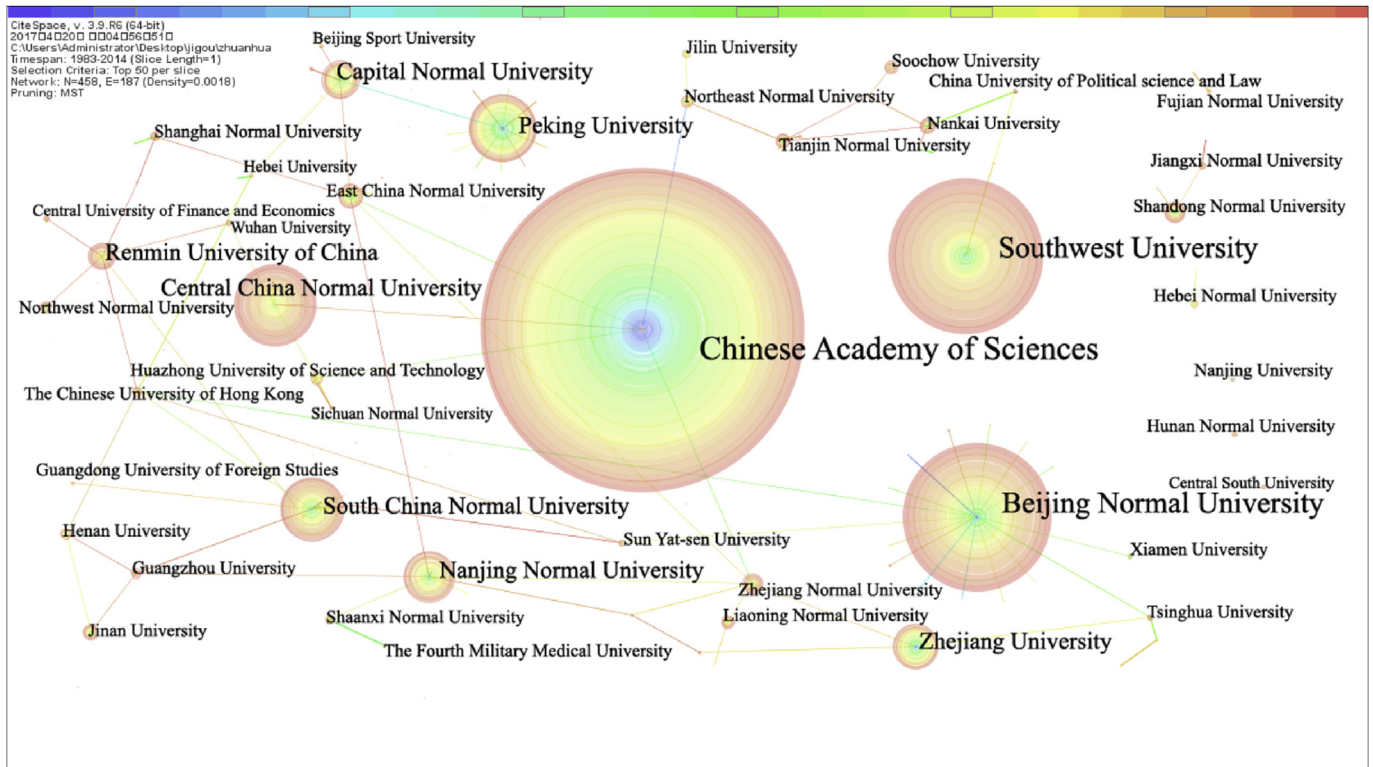


Fig. 2. The cooperative network map of institutions in *Advances in Psychological Science*.



Fig. 3. The author collaboration network of *Advances in Psychological Science*.

Note: Minqiang Zhang1 (South China Normal University), Wei Shi1 (Southwest University), Ming Zhang1 (Northeast Normal University), Li Liu1 (Beijing Normal University).

institutions. The links across disciplines, institutions and regions need to be strengthened.

Professional, prolific and active research teams contribute to the institutions recruiting, cohesion and carrying out of more in-depth, higher-level research. Distinguished authors also help to guarantee the quantity and quality of manuscripts, and they are the motivational force for the continuous development of relevant research fields. The analysis of the authors' cooperative network map revealed that the distribution of journal's authors in the network map was dispersed and that international cooperation was lacking. As representatives of the early research scholars, Lianrong Guan, Deming Li, and Zhongli Xia laid the foundation for the development of the field of psychology. Jianxin Zhang's team for personality psychology, psychological measurement and health psychology established a link with the economic psychology research team where Mouchao Ma is one of the memberships and showed a greater network of scientific research cooperation, which promoted cross-subject and integration of all branches of psychology. Hong Li's team was mainly engaged in cognitive psychological research in the medium-term stage and continued till now. In addition, the team is now really gaining momentum. An increasing appearance of articles published in this journal were from Yongyu Guo's team and Qinglin Zhang's team, emerging for the first time, and their research teams were respectively engaged in the research of personality psychology and learning, creativity, social cognition as well as brain science.

Combined with the distribution of high frequency keywords in the map, this study clearly paid attention to hotspots in the field of psychology. "Subject" had the highest frequency in the early period of the keywords but recently has appeared less often. This might be because early psychology research focused on psychological phenomenon and behavioral characteristics, but later research has paid

more attention to the phenomenon of mechanism research, such as "Brain Mechanism" and "Neural Mechanism". Research methods changed from varied questionnaires to "Model", "Meta-Analysis" and other statistical analysis and related experimental studies, such as "Event Related Potential", "Eye Movement" and "Functional Magnetic Resonance Imaging". In study participants, because of the methods of the functional magnetic resonance imaging, Event Related Potential was more likely to be used in children and adolescents, and they were the main research subjects of education psychology, psychological problems of children and adolescents were becoming the research focus of this journal. In the area of research content, this research not only studied basic content such as "Attention", "Memory", and "Well-being" but also "Major Depression" and "Posttraumatic Stress Disorder" in the field of clinical psychology, and health-related problems such as "Emotion" and "Mental Health", which were related to the quick rhythm of life and the higher pressure. In addition, "Job Performance" in the field of industrial and organizational psychology was gradually becoming a research hotspot.

Table 4

The top 10 keywords in *Advances in Psychological Science*.

Rank	Keyword	Frequency	Year
1	Emotion	65	1992
2	Subject	59	1983
3	Working Memory	56	1985
4	Event Related Potential	47	1984
4	Neural Mechanism	47	1989
4	Cognition	47	1993
7	Mental Health	42	1985
8	Model	37	1993
9	Cognitive Psychology	36	1983
10	Decision	34	2003

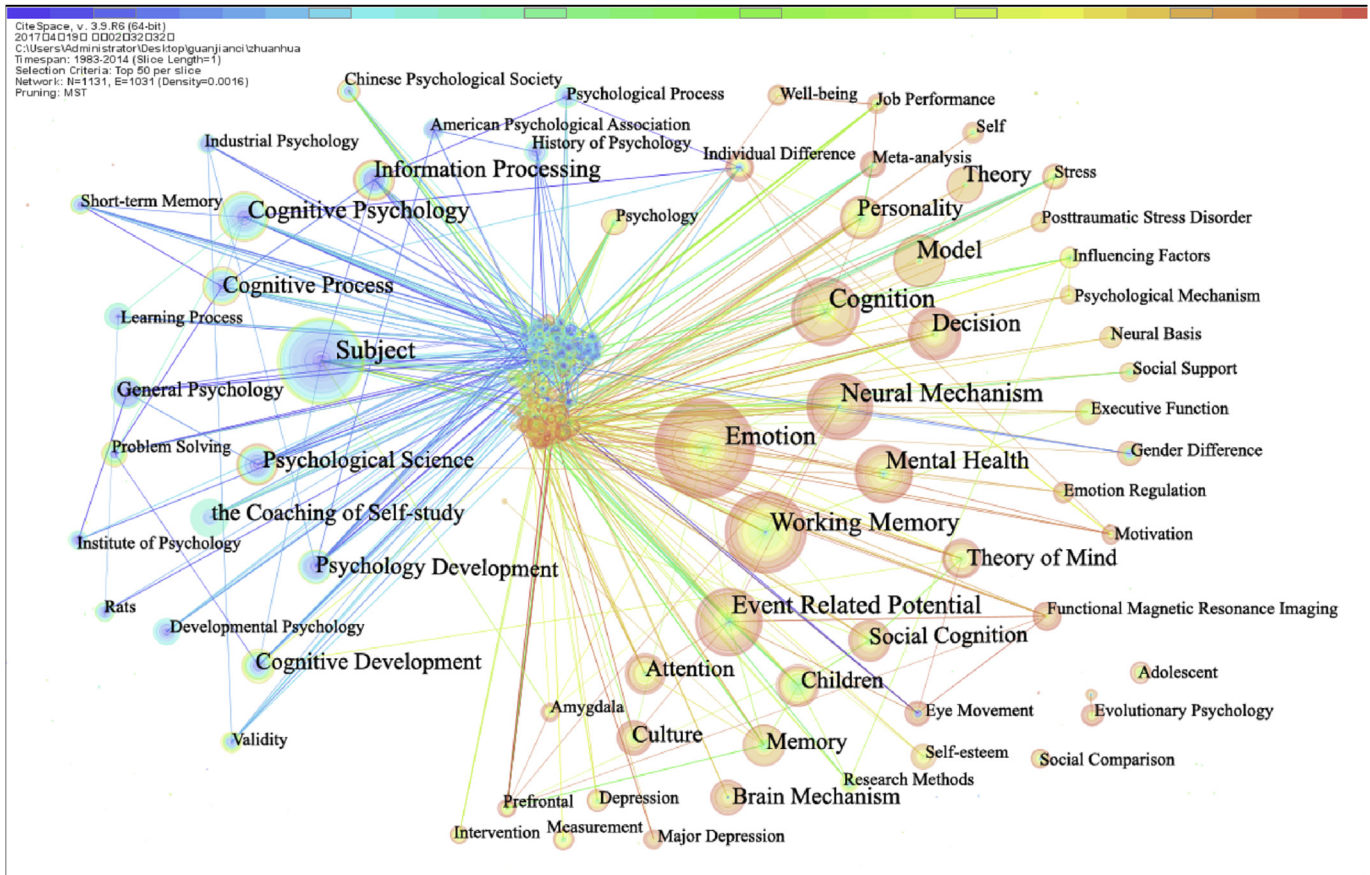


Fig. 4. The keywords co-occurrence network map of *Advances in Psychological Science*.

5. Conclusions

The visualization analysis of all literature in *Advances in Psychological Science* from 1983 to 2014 suggested that all the articles published were high-level, wide-spread, and applicable and had novel content. However, the cooperation between scholars and institutions was weak. The agencies with higher publication should exert their influence, rely on their own, play their respective advantages, strengthen exchange of visits between scholars, and have an academic impact on national institutions or universities as well as the surrounding area. In addition, the agencies should also pay attention to international exchanges and cooperation, gradually form a close cooperation, high output for scientific research, flourishing scientific-research pattern, which finally can effectively promote the continuous and healthy development of the domestic psychological field.

Conflicts of interest

All authors have none to declare.

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