

A CiteSpace-based Analysis of Research Hotspots on Visual Impaired Community

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Abstract

With the development of science and technology and the increase of attention to visual impaired people, related research on visual impaired people has been emerging. In this paper, we use the visualization software CiteSpace to map the scientific knowledge and interpret the literature on the visual impaired community in China from 2000 to 2021, and explore the current status of research and research hotspots related to the visual impaired population in China. The study found that the hotspots of research related to visual impaired people are: (1) research related to education and teaching strategies and evaluation of visual impaired children, especially at the compulsory education level and higher education level; (2) research on library resources construction and services. Libraries are especially important to the blind as a primary means of knowledge acquisition; (3) research on the construction of Braille corpus and Braille abbreviations. Braille is the primary mode of learning and cognition for the visual impaired community.

Keywords

Visual Impaired Community, CiteSpace, Visual Analytics, Knowledge Graphs, Research Hotspots

1. Introduction

People with visual impairment (referred to as visual impaired) are those who have difficulty working, learning and participating in other activities etc. normally due to the effects of vision loss (Chen Li & Zhang Haiyan, 2015). According to data released by the China Disabled Persons' Federation, the total number of people with disabilities in China is currently over 85 million, of which more than 12 million are visual impaired (Jiao Hui, Mihaela Liu, & Liu Xinyou, 2019). This shows that the number of this group of people is still relatively large, and they have great inconvenience both in life and in learning. With the continuous development of technology and the increasing attention of the state to special education, the visual impaired group has gradually entered the public eye, gaining the attention of all sectors of society and attracting the attention of scholars, resulting in a number of research results. In view of this, this paper will use the information visualization tool CiteSpace software to systematically and comprehensively comb through the research literature related to the visual impaired group included in the CNKI journal database between 2000 and 2021, and explore the current situation, research hotspots and development trends of the visual impaired group in China, so as to provide a more intuitive and effective reference basis for relevant researchers.

2. Research Tools and Data Sources

2.1. Research Tools

In this paper, literature data is analysed using CiteSpace (version 5.8.R3), an information visualisation software developed by Professor Chao-Mei Chen of Drexel University, U.S.A. The CiteSpace software was initially dedi-

cated to the analysis of co-citation of literature and mining the knowledge clustering and distribution of citation spaces. However, as it has been continuously updated, it has provided not only citation space mining, but also co-citation analysis functions between other knowledge units, such as author, institution, country/region collaboration, etc.

2.2. Data Sources

In this paper, CNKI (www.cnki.net) was used as the literature search platform. In the professional search field, "SU=('visual impairment'+ 'visual impaired'+ 'blind students'+ 'blind people'+ 'Braille'+ 'blind children')" as the literature search formula, and "2000-2021" as the literature sources were "core journals + CSSCI + EI source journals + SCI source journals + CSCD". A total of 500 valid documents were obtained by manually eliminating irrelevant documents, duplicate documents, reports, journalist interviews, medical documents, etc. All these documents were exported in Refworks format and renamed as download.

2.3. Data pre-processing

Since the CiteSpace software cannot recognize the data in the CNKI database, it is necessary to format this part of the data. Put the previously exported data files into the folder named input for format conversion in CiteSpace software. We select "Data" option, click "Import/Export", open the literature data converter, select CNKI and click CNKI Format Conversion for conversion. In this way, we get the CiteSpace software can directly analyze the data.

3. Analysis of Research Hotspots in Areas Related to visual impaired community

The frequency and centrality of the keywords, as a condensation of the research content of the literature, can reflect the research hotspots in the relevant research areas (Bu Fanshuai, Xu Sheng, & Zhao Wei, 2015). In CiteSpace, "Keywords" was used as the analysis node, the time slice was 1, and the calculation method was chosen from Minimum Spanning Tree and Pruning Sliced networks. The cooccurrence map of keywords for the study of visual impaired community was obtained by merging. There are 482 nodes and 357 connected lines in the graph, with a network density of 0.0031, which is a loose network structure and low network density. By counting the word frequencies of keywords for research related to the visual impaired population in China, it can be seen that there are 6 keywords with word frequency greater than or equal to 10 for research related to the visual impaired population in China from 2000 to 2021, and the top 20 subject terms are listed and their related information is obtained by using CiteSpace, as shown in Table 1.

As can be seen from the data in Table 1, the high-frequency subject terms in the literature related to the visual impaired population in China are mainly focused on children and students and visual impaired readers in the visual impaired group, and after removing the search terms, the top ranking keywords are "library (19)", "visual impaired readers (15)", "mental health (7)", "accessibility (6)", "product design (6)", "visual impaired Services (6)", "Vulnerable Groups (5)", "Orientation and Mobility (5)", "Information Needs (5)", and "homophones (4)", "abbreviations (4)", etc.

Table 1. Statistics of high frequency subject terms in the field of research related to visual impaired people

No.	Keyword	word frequency	centrality	No.	Keyword	word frequency	centrality
1	Blind	43	0.25	11	Blind children	6	0.03
2	Braille	20	0.14	12	Services for the visual impaired	6	0.01
3	Library	19	0.13	13	Visual impaired	6	0.08
4	Visual impaired readers	15	0.02	14	Visual impaired students	6	0.02
5	Visual impaired children	13	0.06	15	Disadvantaged groups	5	0.03
6	Visual impaired	10	0.06	16	Orientation and Mobility	5	0.04
7	Blind students	9	0.08	17	Information needs	5	0.05
8	Mental health	7	0.09	18	Homophones	4	0.06
9	Accessibility	6	0.02	19	Abbreviations	4	0.06
10	Product design	6	0.01	20	Blind readers	4	0

In order to better categorise and classify the keywords, the keywords were clustered and analysed in CiteSpace, and the algorithm chose LLR to obtain a clustering map of keywords for research related to the visual impaired group in China, see Figure 1.

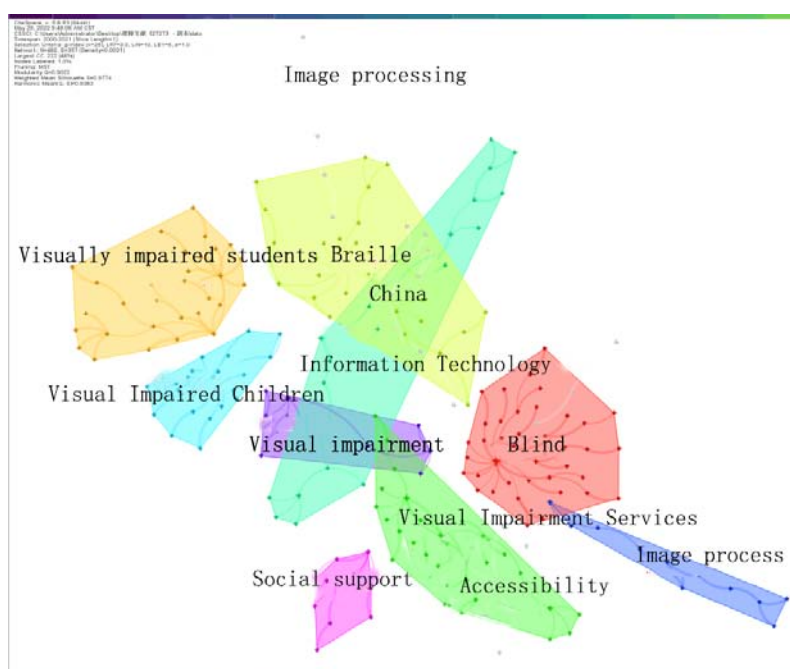


Figure 1. Cluster mapping of keywords for research related to the visual impaired community.

From the data in Figure 1, it can be seen that the clustering module value $Q=0.9022>0.3$, which can be said that the obtained clustering structure is very significant, and the average profile value of the clusters $S=0.9774>0.5$, which can be said that this clustering is very convincing. A total of 13 clusters were obtained for this profile, and some of the clusters with smaller class groups have been hidden.

Through a comprehensive analysis of Figure 1 and Table 1, and summarising the findings, the research hotspots in the field of research related to visual impaired community in China from 2000 to 2021 are mainly focused on the following areas.

3.1. Research related to visual impaired children

1) Research on the education and teaching of visual impaired children

The education of visual impaired students covers different stages of education, such as pre-school education, compulsory education and higher education, with the compulsory education stage and higher education stage being the main ones. Guo Ge proposed that information technology should be integrated into teaching for the visual impaired in accordance with the requirements of the times, and that a teaching platform for the visual impaired should be built, and that good teaching effects have been achieved through teaching practice (Guo Ge, 2003); Li Jia pointed out the important auxiliary role of CAI teaching in English teaching in blind schools, which has good effects in enhancing the vocabulary memory of visual impaired students, giving feedback on teaching effects, and priming teaching situations (Li Jia, 2001). A number of these researchers have explored more suitable teaching or teaching strategies for visual impaired students by comparing visual impaired students under the same conditions to provide further reference basis for visual impairment education. Liu Yanfang compared the similarities and differences between visual impaired students and ordinary students in their conceptions of English learning and the use of learning strategies, and proposed corresponding strategies and suggestions for teaching English in blind schools (Liu Yanfang, 2016); Zhang Yushuang et al. explored the differences in English learning strategies between visually impaired students and ordinary students, explored the reasons for the differences, and made constructive suggestions such as teaching should not be confined to the syllabus (Zhang Yushuang & Wang Aiguo, 2006); Zhang Haicong et al. found that hearing-impaired students have certain specificities compared with ordinary stu-

dents, and therefore educators should pay attention to this group of students, which provides an effective reference for the development of higher education (Zhang Haicong & Bian Li, 2008). Ma Hongying et al. made an observation and analysis of various aspects of the oral expression of visual impaired children, analysing the strengths and blind spots of this group of children, and based on this, made a reference recommendation for the teaching of oral expression in blind schools (Ma Hongying & Liu Chunling, 2002).

2) Research on assessment training for visual impaired students

Many scholars have focused on the assessment of the abilities of visual impaired children, such as orientation and mobility training, tactile skills training and life skills training. Unlike ordinary students, visual impaired children (students) rely on their sense of hearing and touch to learn and perceive, so the development and application of assistive devices is particularly important for them. The use of assistive devices enables them to develop their abilities even further. On this basis, the production of play and teaching aids for this group has received the attention of several researchers. Hu Xinmin et al. designed play and teaching aids for visual impaired children based on tactile perception, and achieved good results in stimulating children's tactile perception (Hu Xinming, Xu Lingli, Fan Ziyi, & Lin Feng, 2021); Wang Xihong et al. innovated the design of play and teaching aids for visual impaired children based on TRIZ and QFD theory, and proposed a concept that could meet the training needs of visual impaired children in various aspects and verified good results (Wang Xiuhong, Tang Shuzhen, Li Shufang, Zhou Siyang, & Xu Qianqian, 2019). He Hui et al. explored the cognitive characteristics of visual impaired children and their causes in terms of spatial perception, attention, memory, thinking and intelligence, and proposed teaching strategies based on early intervention and the use of visual aids (He Huizhong & Fang Junming, 2003).

3.2. Library-related research

Among libraries, public libraries and libraries for the blind are the main subjects of research. The digitalization of public libraries has further widened the gap between this group of people and the normal population. With the rapid development of society, the social effect played by public libraries has been greatly enhanced, both in terms of helping the weak and the poor, as well as the inclusion of the disadvantaged level has a huge impact. Libraries, as a major means of knowledge acquisition, are also particularly important for blind people. The expansion of audio books, the construction of reading rooms for the blind and the continued maturation of accessible information interaction have greatly facilitated the reading experience of blind people, and their research includes the following aspects.

1) Research on services for visual impaired readers

First, foreign experience in services related to visual impaired readers. Many foreign countries have relatively advanced experience in services for visual impaired readers, which has attracted many scholars to rely on the experience of foreign countries (mainly the United States, Russia, South Korea, Japan, etc.) to explore relevant research on library services for visual impaired groups in China, and make corresponding suggestions for improvement to promote further development in this field in China. By referring to Russia's leading experience in building literature resources in library collections, its interviewing literature according to readers' information needs, purchasing literature for the blind, reproducing lithographically printed books, publishing magazines and books for the blind, and promoting the construction of digital libraries, Wang Linjun puts forward effective suggestions and considerations for how to build literature resources for the blind in public libraries in China (Wang Linjun, 2013); Liang Wenjing et al. by investigating the American public library blind. The current situation of services for the blind in public libraries in the United States was investigated by Liang Wenjing et al. who proposed corresponding improvement measures in terms of service content, service methods and resource construction, such as diversified services for the blind and refined management of volunteer services, providing an effective reference and basis for future research (Liang Wenjing & Wang Pinyin, 2019).

2) A study of domestic reading materials for visual impaired readers

Researchers' services related to visual impaired groups in China have mainly focused on audiobooks and audio descriptions. Lin Junrong et al. discussed the principles of services for visual impaired readers in public libraries and proposed three core principles of services for visual impaired readers, namely accessibility, equal treatment and inspiration (Lin Junrong, Wei Na, & Ren Bijun, 2015); Junjiao et al. conceptually defined audiobook libraries, clarified their differences from libraries for the blind, pointed out four advantages of their services for visual impaired readers, and proposed an independent establishment and management system—The construction model of an independent establishment and management system was proposed by Fu Yi (Jun Jiao, Zhao Yuan, & Xue Xiaojie,

2010); Starting from the necessity of audio-visual services in public libraries, Fu Yi discussed the current situation of audio-visual services in public libraries, and based on this, proposed several thoughts on developing audio-visual services in public libraries (Fu Yi, 2014). Some scholars have also explored the current situation of services for visual impaired readers, for example, Liu Lei et al. analyzed the current problems in China by conducting a survey on the situation of blind readers in more than five hundred public libraries in China, and put forward suggestions for establishing a comprehensive service system for the blind, improving lending and returning services for the blind, and strengthening library hardware facilities (Liu Lei & Yang Feng, 2006); Chen Yanwei analyzed the current situation of public library services for the visual impaired from four aspects: service concept and environment, service content, funding collection and external cooperation, and proposed to introduce CS strategy to establish a service system, integrate service resources and strengthen social cooperation (Chen Yanwei, 2013); In the context of the full media environment, Zhang Bingmei et al. analyzed the current reading situation of visual impaired readers in Chongqing, and proposed to strengthen the construction of digital literature in libraries, and the service mode should be shifted from passive to active and cooperation (Zhang Bingmei, Yi Hong, Liu Xiaojing, & Chen Xiangjuan, 2013).

3) Research on the construction of digital libraries for the blind

With the increasing maturity of Internet technology, the construction of digital libraries to provide accessible services and assistance to the visual impaired groups is an inevitable result of library development in the context of information technology. Since the trial run of the China Library for the Blind in 2008, this field has received more and more attention from researchers and has been put into research. Guo Zhi put forward his ideas on the construction of websites for visual impaired reading rooms in public libraries from different perspectives such as content, functions and hardware and software environments (Guo Zhi, 2010); Gao Enze et al. analyzed the characteristics and effectiveness of the services of the Chinese Digital Library for the Blind, the cooperation with society, industry and social groups, summarized the problems existing in the services of the Chinese Digital Library for the Blind and proposed suggestions for services and improvements in terms of user needs, communication and cooperation, policy support, website optimization, platform construction and resource sharing, providing an effective basis and foundation for subsequent research (Gao Enze, Mao Yajun, & Li Jian, 2016); Huang Xueqi argued that using speech recognition technology and speech synthesis technology to build a digital library for the blind could enhance their access to information and allow them to participate equally in social life (Huang Xueqi, 2011).

3.3. Braille-related research

As with sign language for the hearing impaired, Braille has naturally become a hot issue in research related to the visual impaired community as a major aid to learning and cognition. The ability to process information quickly is also an immediate need for blind people. By implementing Braille abbreviations, not only can the distance between them and ordinary people be reduced, but paper can also be saved to a certain extent, thus achieving a win-win situation. One of the main research directions is the study of implicit Braille transcriptions. At the same time, relying on the information environment, the research and implementation of efficient Braille translation system is a must, thus, the construction of a strong Braille corpus (database) has become a research hotspot, which can improve the accuracy of Braille translation to a certain extent, and the team of Beijing Union University, mainly Zhong Jinghua, has carried out a lot of research in this field, which has laid a strong research. The foundation for many researchers has been laid.

3.4. Research related to intelligent navigation products

As the number of visual impaired people continues to expand, the issue of mobility for the blind has become a hot issue to be addressed. How to help the blind to travel safely in the ever-changing and complex environment of society is a research direction that many people are pursuing. As smart technology continues to develop, many scholars are focusing on the development of intelligent devices and systems to assist visual impaired people in their daily travels. Within the research direction, the study of navigation systems for the blind is one that many are doing. Mei-Luan Chen et al. proposed a new intelligent navigator for the blind that can send out different alarm signals for both visual and hearing-impaired users (Chen Meiluan, Yin Hao, Li Piao, & Dong Boran, 2006); and Hundred War et al. combined the advantages of inertial navigation and RFID to propose a solution that combines the two, achieving good results in terms of path planning and navigation reminders (Zion War, Chen Xuejie, & Liang Jiuzhen, 2019).

4. Conclusions

Using journal papers in CNKI as the data source and CitsSpace software developed by Dr. Chaomei Chen as a visualization tool, this paper provides an all-round overview of the development status and research dynamics of the research field related to visual impairment and research hotspots in China from 2000-2021, presenting a panoramic view of scientific knowledge in the research field related to visual impairment from multiple perspectives. It is summarized as follows: (1) In terms of institutions and authors, most of the highly productive authors in the field of research on visual impaired community in China come from the field of special education; most of the institutions with more publications in this field are located in East China, South China and North China (2) In terms of research hotspots, the main research hotspots in the field of research related to visual impaired community in China are education and teaching of visual impaired children, construction of library-related resources and service research, and (2) In terms of research hotspots, the main research hotspots in China are the education and teaching of visual impaired children, the construction of library-related resources and services, the construction of Braille corpus and the study of Braille abbreviation.

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References

- Bu Fanshuai, Xu Sheng, & Zhao Wei. (2015). The International Frontier Research on Autism Spectrum Disorders. Based on the Bibliometrics Analysis of SSCI Autism Spectrum Disorders Journal. *Modern Special Education*, 18, 22-29+65.
- Cui Wangwei. (2018). The domestic status, international perspective and legislative improvement of the protection of the right to read for the visual impaired - based on the third revision of China's Copyright Law in the context of the Marrakesh Treaty. *Library Studies*, 3, 90-95+24.
- He Huizhong & Fang Junming. (2003). Cognitive Characteristics of the Visual Impaired Children and Education Strategies. *Chinese Special Education*, 2, 43-46.
- Jiao Hui, Mihaela Liu, & Liu Xinyou. (2019). Analysis and application of perceptual behaviour of visual impaired people. *Art Technology*, 9, 244-245.
- Li Jie & Chen Chaomei. (2017). *CiteSpace Technology Text Mining and Visualization* (2th ed.). Beijing: Capital University of Economics and Business Press.
- Lin Min. (2014). The Impact of New International Copyright Legislation on Library Services for Visual Impaired People-Ponder over the Marrakesh Treaty. *Library and Information Work*, 10, 74-78.
- Ma Hongying & Liu Chunling. (2002). A Preliminary Analysis of Spoken Language Ability on Children with Visual Handicap. *Chinese Special Education*, 2, 54-57.
- Xiao Yangmei, Guo Liang, Lv Ming, Gao Xuezheng, & Zhong Jinghua. (2020). A Corpus-Based Quantitative Study of the Chinese Common Braille. *Chinese special education*, 4, 25-32.
- Zhang Yushuang & Wang Aiguo. (2006). Comparative Study on College English Learning Strategies between Visual Impaired Students and Physically Sound Students. *Chinese Special Education*, 4, 35-38.
- Zhong Jinghua, Han Ping, Xiao Hang, Dai Hongliang, & Yan Jia. (2014). Optimization in Designing Hidden Tones in Current Chinese Braille. *Chinese special education*, 3, 30-35.
- Zhuan Zhan, Chen Xuejie, & Liang Jiuzhen. (2019). Design and implementation of blind-navigation system based on RFID and smartphones' inertial navigation. *Journal of Intelligent Systems*, 3, 491-499.