



Review article

A bibliometrix-based visualization analysis of international studies on conversations of people with aphasia: Present and prospects

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ABSTRACT

In recent years, there has been a rapid increase in the number of people with aphasia due to brain lesions worldwide, which has prompted researchers to carry out in-depth studies on the pathogenesis, inducement and prognosis of aphasia from neurology, clinical medicine, psychology and other disciplines. With the deepening of research and understanding of aphasia, it is generally believed that a single discipline can no longer meet the needs of the academic community. Therefore, multidisciplinary integration has emerged and achieved fruitful results. This paper, based on the biblioshiny package run by R, conducts bibliometric analysis on the international interdisciplinary research status of conversation and aphasia, predicts its future development direction, and provides reference for relevant domestic research from international source journals. The results indicate that led by Australia, the United Kingdom, the United States and other countries, the international conversational aphasia research has formed a complete system, and formed a “descriptive study of patients with language disorders” and “applied study of rehabilitation treatment”. In the future, while continuing to focus on these two categories of research, the empathy ability of conversational partners and medical staff may be taken into account, in order to better contribute to improving patients' quality of life.

1. Introduction

Aphasia is a disorder of the brain tissue related to speech and language. It usually occurs suddenly after a stroke [1]. It can also be caused by other types of damage, such as trauma or neurodegenerative diseases that affect the language network of the brain [2]. People with aphasia (PWA) have difficulties understanding and expressing communicative symbol systems, especially in pronunciation, vocabulary, grammar, language structure, language content, and meaning. Simultaneously, the patient's language cognitive process is functionally impaired.

Neuroscience views the central nervous system (CNS) as containing several regions that are responsible for different language functions, including expression, reception, reading, and writing [3], which has long been the main basis for the study of aphasia [4]. Thus, researchers in clinical, therapeutic, and rehabilitation fields usually focus on specific aspects of PWA's language, explore the mechanisms of aphasia, analyze the processing of spoken and written forms [5], and measure aphasics' language abilities. Although these studies provide a starting point for clinical intervention [6] and lay the foundation for diagnosis, language assessment, and therapy planning [7], most have studied language in isolated and de-contextualized ways, such as picture naming and repetition of

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single words or sentences, to learn the linguistic profile of aphasia.

In the late 1970s, Audrey Holland first emphasized the importance of “functional communication” over “linguistic accuracy” for people with aphasia and claimed that people with aphasia could often “communicate” better than “talk” [8]. Spurred by this approach, many scholars have begun to explore the reasons for this finding and ways in everyday communication.

Moreover, with the deepening of research and the accumulation of practical experience, clinicians, speech and language therapists, and caregivers who are engaged in work related to aphasia realize that paying attention to a certain aspect of language and relying on highly simplified and restrictive tasks to understand the brain may help aphasia patients perform well in language training, but their need for communication in situated and more naturalistic settings remain unsatisfied, which always frustrates them [9–12] and ultimately degrades their quality of life and life satisfaction [13,14].

In 2001, the World Health Organization’s (WHO’s) International Classification of Functioning, Disability, and Health (WHO, 2001) announced that healthcare efforts should be directed to the experiences of people with impairment and the world in which they must function instead of the details of their particular impairment [15]. Therefore, improvements in PWA’s functional communication have become the main desired outcome and central task for speech and language therapists, caregivers, and patients [16].

Functional communication refers to everyday communication activities and situations [17]. Conversation, as one of the important forms of functional communication, is a rather complex activity engaged by all human beings [18], where language, cognition, and sociality meet [19]. Through conversation, people can socialize, develop, and sustain their relationships with each other [18]. Based on carefully transcribed conversation, conversation analysis (CA) initiated by Harvey Sacks, Emanuel Schegloff, and Gail Jefferson in the 1960s focused on the procedural analysis of talk-in-interaction and how participants systematically organized their interactions to solve a range of organizational problems [20]. It originated from the sociological tradition but gradually attracted scholars in many disciplines, including psychology, anthropology, clinical medicine, and some linguistic sub-disciplines.

In recent decades, studies in aphasiology have experienced a “turn to conversation” [21]. People with aphasia and their families demand that speech-language therapy should enable clients to participate in conversations [22]. Several programs have been established to meet clients’ needs for conversation-based rehabilitation, such as Aphasia Couples Therapy (Boles, 2011), Facilitating Authentic Conversation [23–25], and Better Conversations with Aphasia [26–29], which are beneficial for improving the quality of conversations between people with and without aphasia [23].

Approximately one-third of the 25.7 million stroke survivors worldwide experience aphasia [30–32]. Aphasia, which brings great challenge and pressure to patients, their families, and society, has become an urgent social issue [33].

This paper aims to provide a comprehensive review of the research progress, current status, and future development direction of the field of aphasia and conversation analysis through a bibliometric analysis [34]. By effectively deciphering and mapping the subtle differences in scientific knowledge accumulation and evolution in aphasia and conversation analysis from a quantitative perspective [35], this review will enable researchers to better understand the research achievements in this field and accurately identify research gaps. Furthermore, we call on researchers to integrate scientific research with practical needs and make contributions to improving the language abilities and quality of life of individuals with aphasia.

In view of this, this paper takes the publications included in the “Core Collection” of the Web of Science database as the data source, takes the studies on PWAs’ conversation ability published in international journals from 1998 to 2022 as the corpus, and uses bibliometrix in Rstudio environment as the tool. Statistical results of annual scientific production, the most relevant sources, and author productivity provide scholars with an overview of this field. By analyzing the **most local cited references**, scholars can understand the classic literature that plays a fundamental role in the development of this field. By visualizing the collaboration network between countries and collaboration network between authors with VOSviewer, mainstream paradigms and the main academic camps in this field are identified. With the help of the author’s keywords, theme evolution map and theme distribution map, the core theme of the field and its evolution process and development trend are observed cooperatively from the synchronic and diachronic perspectives to have a comprehensive and profound understanding.

The remainder of this paper is organized as follows. Section 2 provides an overview of the research methodology. Section 3 presents findings from the relevant bibliometric variables. Section 4 concludes the paper and discusses the implications for future research.

2. Methodology

Biblioshiny is an open-source online visualization software based on Rstudio. It has many advantages in terms of literature analysis statistics, index computing, network analysis, and knowledge map drawing. It supports the introduction of data from Web of Science (WoS) and Scopus database, and its developer Aria, and other experts have introduced the main function module of the software. Once entering “> install.packages(“bibliometrix”, dependencies = TRUE), >library(bibliometrix), > biblioshiny”, the biblioshiny program can be called. With bibliometrix, pour the required documents and books data from the mainstream database to realize the functions of co-cited reference, coupling, and scientific cooperation analysis to establish a data matrix. The structured and measurement analysis of literature data will help researchers understand the development of certain specific fields, learn past and existing knowledge bases, track themes, predict future trends, and promote the research route.

Therefore, the R package “bibliometrix” was adopted to perform this review analysis. The terms “aphasia” and “conversation” were selected as the primary keywords in the WoS database. WoS was selected as a data source because it is a large, commonly accepted database of abstracts and references from high-quality and impactful scientific papers [36–38] and is the main criterion in academic decision-making [39]. Generally, there are two common methods for selecting keywords according to Chen & Xiao [40]. One is to use high-level publication keywords, and the other is to use important keywords that indicate a large field of study and its micro-level connection. In this study, the second method was used. Data mining was performed from the WoS database on September 12,

2022, using the following search query. The terms “aphasia” AND “conversations” are used as retrieval, which have attracted many scholars’ attention and are related to 517 publications in WoS from January 1, 1998, to January 10, 2022. However, since this study was carried out in the domains of therapy, rehabilitation, and nursing of aphasia, it was necessary to eliminate irrelevant categories in 517 publications. Thus, by using the “WoS categories” as the filter, articles belonging to categories including “rehabilitation,” “linguistics,” “audiology speech language pathology,” “communication,” “language linguistics,” “health care sciences services,” and “nursing” are kept with a total number of 465. After selecting “Article” as the document type and “English” as the language, 409 articles were finally retained.

In addition to bibliometrix, this study also utilized VOSviewer, a visualization tool developed by Van Eck and Waltman in 2010 for analyzing bibliometric networks [41,42]. In order to better present the collaboration networks in aphasia conversation research, I also employed VOSviewer to visualize the author collaboration network and country collaboration network.

This study consists of three main parts. In the first part, performance analysis is carried out based on annual scientific production, most relevant sources, source growth, and author productivity to understand the status quo of international studies on “aphasia” and “conversation,” and then use the most local cited references in citation analysis to track the classic literature that has far-reaching influence on “aphasia” and “conversation” research, thus clarifying the research foundation. The second part, with the help of the collaboration network between authors and the country’s collaboration network, analyses the social structure to understand the main research camps in this field, their respective research directions and the interconnectedness between different camps. The third part uses the author’s keywords, topic dendrogram, thematic evolution, and thematic map to grasp the topic evolution and mainstream topics in this research field from a diachronic and synchronic perspective and predict future research trends.

The following questions will be explored in this research:

- Q1. What is the status quo of international studies on PWAs’ conversations based on scientific publications in this field?
- Q2. What research groups focus on aphasia and conversation? How is the cooperation?
- Q3. What are the development trends and future directions of international studies on the conversations of PWAs?

3. Results and discussion

3.1. Performance and citation analysis

3.1.1. Performance analysis

Performance analysis, treated as the hallmark of bibliometric studies, is descriptive in nature [43]. It occurs in most review articles because it is not only equivalent to the background or profile in empirical research but also has certain analytical functions by mainly

Table 1
Main information of the dataset.

| Description | Results |
|--------------------------------------|-----------|
| Timespan | 1998:2022 |
| Sources (Journals, Books, etc) | 47 |
| Documents | 465 |
| Average years from publication | 10.5 |
| Average citations per documents | 20.84 |
| Average citations per year per doc | 1.742 |
| References | 10168 |
| Document Types | |
| Article | 409 |
| Article; early access | 7 |
| Article; proceedings paper | 41 |
| Document Contents | |
| Keywords Plus (ID) | 707 |
| Author’s Keywords (DE) | 709 |
| Authors | |
| Authors | 780 |
| Author Appearances | 1389 |
| Authors of single-authored documents | 33 |
| Authors of multi-authored documents | 747 |
| Authors Collaboration | |
| Single-authored documents | 53 |
| Documents per Author | 0.524 |
| Authors per Document | 1.91 |
| Co-Authors per Documents | 3.4 |
| Collaboration Index | 2.1 |

examining the contributions of research constitutes to a given field [44].

Table 1 shows the main information of 409 documents between 1998 and January 2022 from the WoS database, which were published in 47 sources, mainly journals. The “Author’s keywords” are the core concepts identified by the author, and there were 709 articles. “Keywords plus” is the number of keywords which often can be seen in the title of the articles, and there are 707. Within the timespan of 1998 and 2022, 53 articles were completed and published by a single author, and most were published by three authors (3.4). The Collaboration Index (CI) is 2.1, which means studies related to “aphasia” and “conversation” are frequently carried out by more scholars. Such a phenomenon is common because it involves various disciplines, including clinical medicine, pathology, rehabilitation, nursing, linguistics, sociology, psychology, and so on, which requires the participation of scholars with their own disciplinary backgrounds.

Over the last 14 years, the overall trend has been increasing in terms of the number of publications, with an annual growth rate of 1.41%. The distribution of the 409 publications included in this study is shown in Fig. 1.

The twelve most relevant journals with the themes of “aphasia” and “conversation” from publication volumes are listed in Table 2. Table 2 shows that 87.8% of the relevant papers are published in these journals. Through the most relevant sources (Table 2), researchers can quickly grasp the types and development trends of related research in this field. On the basis of the subject of the published articles, the twelve most relevant journals in Table 2 can be divided into three categories. Aphasiology, constituting the first category, has published 160 papers in the past fourteen years. It accounts for 39.1% of the total, which is 3.3 times that of the International Journal of Language & Communication Disorders. The reason for such a significant difference is that Aphasiology is a highly specialized publication on aphasia, focusing on all-round research on aphasia. The second category is represented by the International Journal of Language & Communication Disorder, which focuses on the research on the clinical and pathological mechanism, language therapy and rehabilitation of various language disorders. Most of the articles are interdisciplinary and cover a wide range. Therefore, this category contains the largest number of journals but the number of articles published in each journal is not large. There are eight journals belonging to this category in Table 2, with a total of 185 articles accounting for 45.2% of the total publications. The third category, consisting of Research on Language and Social Interaction and Seminars in Speech and Language, mainly conducts research on aphasia from the perspective of linguistics. However, there are only 14 articles accounting for 3.4% of the total publications. It indicates that some linguistic scholars have noticed the language problems of people with aphasia and conducted relevant research.

Except for total publications, Aphasiology ranks first with 3550 citations, 6.8 times that of International Journal of Language & Communication Disorders. This indicates that Aphasiology is highly recognized and instructive in the field of aphasia research. In addition, it is worth mentioning that despite of the total publications is only 8, the average citation of per article is 25.8 in Journal of Communication Disorders, which is higher than other journals, reflecting that most of the articles published in this journal are classics.

The curve on the source growth (Fig. 2) shows the trend in the number of articles published in journals concerning researches on “aphasia” and “conversation” from 1998 to 2022. As a journal specializing in aphasia research, Aphasiology has the largest number of publications in the field and is still on the rise. Other publications, such as the International Journal of Language and Communication Disorders, Clinical Linguistics & Phonetics, and the American Journal of Speech-Language Pathology, have also steadily risen. The study of

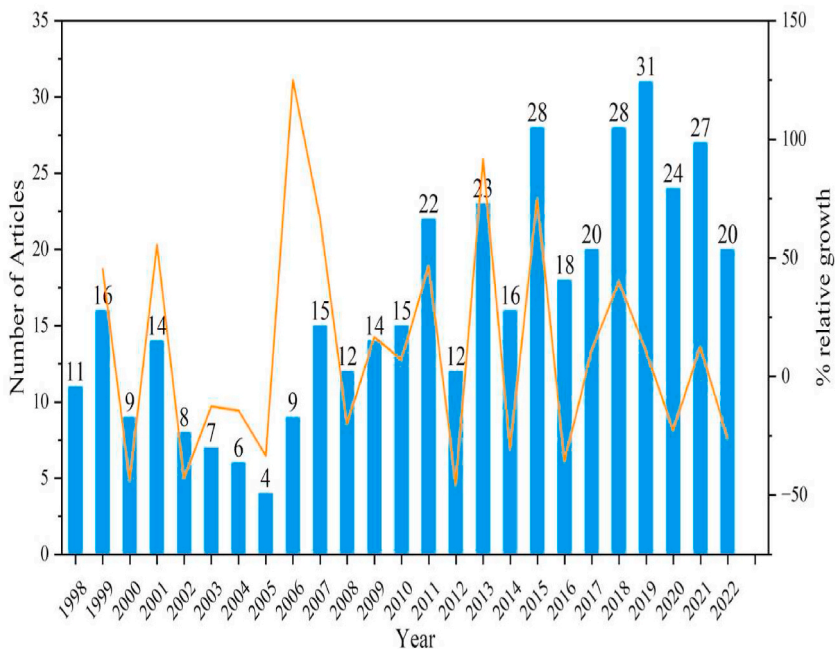


Fig. 1. Annual scientific production.

Table 2
Sources that involve “aphasia” and “conversation”.

| Sources | No. of Items | No. of Citations | Average Citations |
|---|--------------|------------------|-------------------|
| Aphasiology | 160 | 3550 | 22.2 |
| International Journal of Language & Communication Disorders | 48 | 524 | 10.9 |
| Clinical Linguistics & Phonetics | 34 | 305 | 9.0 |
| American Journal of Speech-Language Pathology | 23 | 443 | 19.3 |
| Disability and Rehabilitation | 20 | 322 | 16.1 |
| International Journal of Speech-Language Pathology | 16 | 214 | 13.4 |
| Topics in Language Disorders | 13 | 212 | 16.3 |
| Journal of Speech Language and Hearing Research | 12 | 180 | 15 |
| Journal of Neurolinguistics | 11 | 118 | 10.7 |
| Journal of Communication Disorders | 8 | 206 | 25.8 |
| Research on Language and Social Interaction | 8 | 230 | 28.8 |
| Seminars in Speech and Language | 6 | 149 | 24.8 |

PWAs’ conversation is a promising topic in international publications.

Fig. 3 displays the top ten scholars regarding the number of articles related to “aphasia” and “conversation”. According to Fig. 3, Beeke is the most productive author with 24 papers, followed by Simmons-Mackie, with 23 papers. Wilkonson has 18, and Damico has 16. Best and Power each have 15, and Armstrong and Maxim each have 14. Togher has 12, and Barnes 10. The contribution of these authors was 39.4% of all the documents in the sample. The most productive authors are listed in Fig. 3, along with the number of fractionalized articles. The fractionalized frequency quantifies the individual contribution of each author by assuming equal shares among all co-authors of the affiliated papers.

3.1.2. Citation analysis

Citation analysis is a basic technique for science mapping that indicates the impact of prominent authors, sources, and documents in an academic field, which can be manifested by different means, including the most cited authors, documents, sources, and references.

The content in Fig. 3 displays the top ten authors in terms of output. Here I will take the most cited author to show the most influential authors in this field. In addition, since the most cited sources have already been analyzed in Table 2, they will not appear in the citation analysis; instead, I will use the most local cited references to present the classic literature in aphasia and conversation research. Moreover, other indices, such as the h-index, g-index, and m-index, quantitatively reflect the authors’ impact [45]. The h-index refers to an author’s total number of articles (h) cited at least h times by others [46]. The g-index is the greatest number such that the top g articles are cited at least g² times when articles are ranked decreasingly by number of citations [47]. The m-index is defined as h/n, where h is the author’s h-index, and n is the number of years from the author’s first publication [48].

When analyzing references, it is necessary to know that references can be analyzed from both global and local perspectives in citation analysis. The globally cited references include all citations from any document, while the locally cited references are interpreted as internal citations among the processed sample [49]. To accurately and quickly grasp prior research in related and allied fields that laid the basis for researchers to make new and further research, here we focus on the 409 analyzed articles that contribute to the evolution and development of the studies on aphasia and conversation instead of 10168 references (Table 1) in the bibliography.

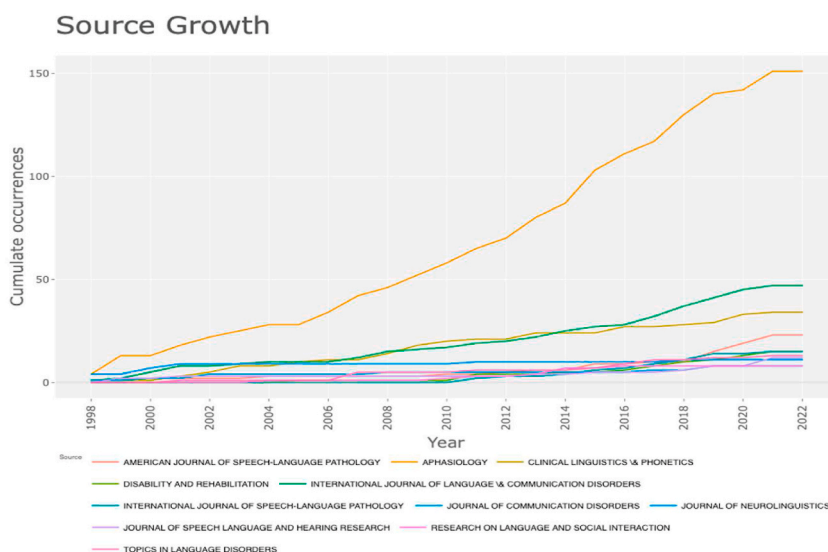


Fig. 2. Source growth.

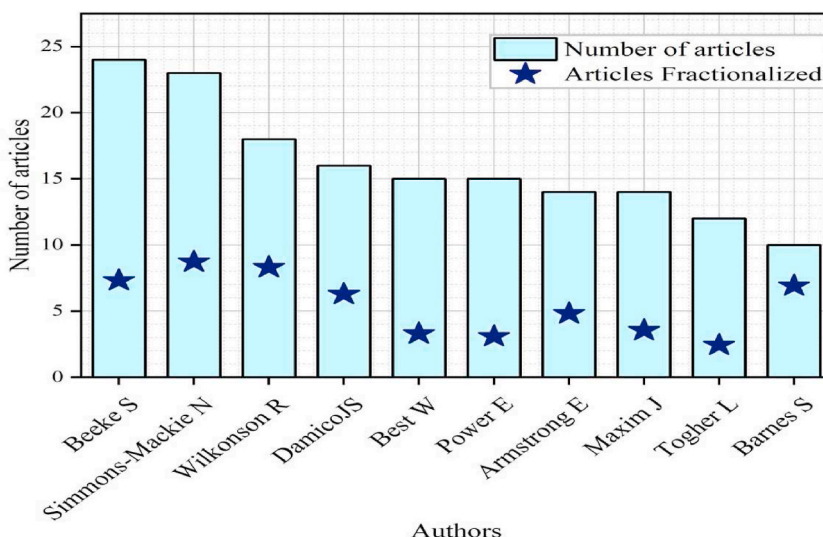


Fig. 3. Author's productivity.

Simmon-Mackie N is the most cited author on all three indices (Table 3), and her first-authored article, *Communication partner training in aphasia: A systematic review in 2010*, is also one of the most local cited references with 64 citations. Other authors include Kagan, Damico, Best, Worrall, Wilkinson, Beeke, Elman, Davidson, and Togher. In Table 3, the three most local cited references are *Training volunteers as conversation partners using "Supported Conversation for Adults With Aphasia" (SCA)* with 105 citations (average 7.50 per year), *Supported conversation for adults with aphasia: Methods and resources for training conversation partners* with 102 citations (average 7.29), and *Co-constructing meaning in conversations with an aphasic man* with 71 citations (average 5.07 per year).

We can identify two main routes that lay a solid foundation for later studies by analyzing the top ten most local cited references.

The first route is based on theories and methodologies of conversational analysis. Schegloff, Jefferson, and Sacks (1977) published an article titled *The Preference for Self-correction in the Organization of Repair in Conversation*, which became a classic of conversational analysis research, marking the beginning of the research on conversational repair. In the article, they explained the meaning of conversational repair, distinguished "repair" from "correction," and analyzed the difference and correlation between "self-repair" and "other-initiated repair" [50]. Sacks (1974) also considers the "turn" in conversation and believes that the features and details of "turn" are worth exploring [51].

The second route centers on the application of conversational theories and methodologies in the study of aphasia. First, we describe and analyze the regular language phenomena in the interaction of aphasia patients to summarize the conversational ability of PWAs. Milroy (1992) used conversational analysis to explore the influence of language disorders on PWAs' participation in dialogue and proposed that the three main factors affecting turn-takings are the interlocutors' common knowledge, the interlocutors' performance of language disorders and their personal discourse styles [52]. Goodwin (1995) observed Rob, who almost lost the ability to use language, using conversation analysis as a method to analyze the conversation he participated in and found that Rob was good at using verbal and non-verbal means to achieve communicative intentions [53]. Laakso (1999) focused on the collaborative nature of aphasic conversations and analyzed in detail the "hint and guess sequence" in conversations, which is often initiated by word search activity [54]. Ferguson (1994) investigated whether factors including aphasia, familiarity, and activity affect conversational repairs in interactions between PWAs and normal people [55]. The study shows that the difference in familiarity did not affect the frequency of

Table 3
Most cited authors, most local cited references.

| Most cited authors | | | | Most local cited references | | |
|--------------------|---------|---------|---------|-----------------------------|---|-----------|
| Author | h_index | g_index | m_index | TC | Cited References (First author, year, source) | Citations |
| Simmons-Mackie N | 17 | 21 | 0.654 | 1025 | Kagan A, 2001, J SPEECH LANG HEAR R, V44, P624 | 105 |
| Damico JS | 14 | 16 | 0.538 | 565 | Kagan A, 1998, APHASIOLOGY, V12, P816 | 102 |
| Wilkinson R | 13 | 18 | 0.52 | 522 | Goodwin C, 1995, RES LANG SOC INTERAC, V28, P233 | 71 |
| Beeke S | 13 | 22 | 0.565 | 508 | Sacks H, 1974, LANGUAGE, V50, P696 | 66 |
| Kagan A | 5 | 7 | 0.2 | 475 | Simmons-Mackie N 2010, ARCH PHYS MED REHAB, V91, P1814, | 64 |
| Maxim J | 13 | 14 | 0.565 | 451 | Schegloff EA, 1977, LANGUAGE, V53, P361 | 62 |
| Best W | 12 | 15 | 0.522 | 401 | Laakso M, 1999, APHASIOLOGY, V13, P345 | 53 |
| Elman RJ | 5 | 6 | 0.2 | 335 | Milroy L, 1992, CLIN LINGUIST PHONET, V6, P27 | 52 |
| Rose ML | 7 | 9 | 0.412 | 312 | Kertesz, 2007, W APHASIA BATTERY RE | 50 |
| Worrall L | 9 | 9 | 0.5 | 306 | Ferguson A, 1994, APHASIOLOGY, V8, P143 | 38 |

interactive trouble-indicating behavior, but “other repair” was made more use of by less familiar communication partners.

Conversation analysis is then used as a tool to seek effective intervention and treatment paths based on language analysis. Based on the concept that PWAs’ inherent ability can be demonstrated through communication partners’ skills, Kagan (1998) proposed an intervention project called “Supported Conversation for Adults with Aphasia (SCA),” aimed at reducing the psychosocial outcomes of aphasia [56]. The focus of SCA is to provide PWAs with the opportunity to participate in authentic interactions rather than to emphasize their usage of communication skills. Kagan (2001) evaluated SCA and further demonstrated its impact on the treatment of aphasia [57]. Simmons (2010) reviewed the effects of conversational partner training on aphasia patients and their partners [58]. Through a series of studies, such as the extensive collection of relevant literature and the establishment of corpora, it was found that conversational partner training was effective in improving the performance of PWAs in interactions. After referring to the Boston Diagnostic Aphasia Test (BDAT), Kertesz (1982) developed the Western Aphasia Battery (WAB). The WAB is an assessment tool used to classify the subtypes of aphasia and rate the severity of impairment caused by aphasia. The WAB evaluates patients from four linguistic dimensions and three performance dimensions, calculates the aphasia index, manipulation index, and cerebral cortical index from the results of the aphasia tests, and can classify aphasia based on the test results on the linguistic dimension [59]. Kertesz revised the original version after the practice session. Both versions of the test focus on patients’ language ability, which has become an important tool for subsequent research and clinical practice.

In summary, international studies on PWAs’ conversations were initially descriptive concerning PWAs’ language performance in interaction. The study then shifted to applications with the continuous and extensive integration of various disciplines. With a growing number of clinicians, speech-language therapists (SLTs) have started to train PWAs’ communication partners with conversational analysis as a tool to improve the effectiveness of therapy and intervention.

3.2. Social structure analysis

Combining the fractionalized frequency and two indexes in Table 1 (Co-Authors per Document and Collaboration Index), it can be estimated that the research on “aphasia” and “conversation” is mainly collaborative. This is also shown in Fig. 4. The collaborative team, represented by Professor Nina Simmons-Mackie of Southeastern Louisiana University in the USA and Dr. Jack S. Damico of the University of Colorado Boulder, USA, aims to enable patients to overcome communication difficulties with the help of real experiences in their social environment. Researchers led by Suzanne Beeke from the Department of Psychology and Language Sciences, University of London, UK, focused on assessing communication skills interventions for patients with aphasia and dementia after stroke through qualitative methods, conversational analysis combining interviews and focus group data, and quantitative techniques in psycholinguistic research. At the same time, communication skills training should be emphasized for professional treatment and rehabilitation personnel to improve the therapeutic effects. Academics represented by Professor Leanne Togher from the University of Sydney and Professor Emma Power from the University of Technology Sydney developed a training program for communication partners for people with aphasia, such as the Communication Training Program for Traumatic Brain Injuries (TBI Express), which provides resources for families, caregivers, caregivers, and community agencies, and helps improve daily communication for people with brain injuries.

The three teams, their team members and other scholars who specialize in their respective fields, engaged in in-depth interdisciplinary collaboration to conduct research on the issue of aphasia. This collaboration facilitated the integration of disciplines such as

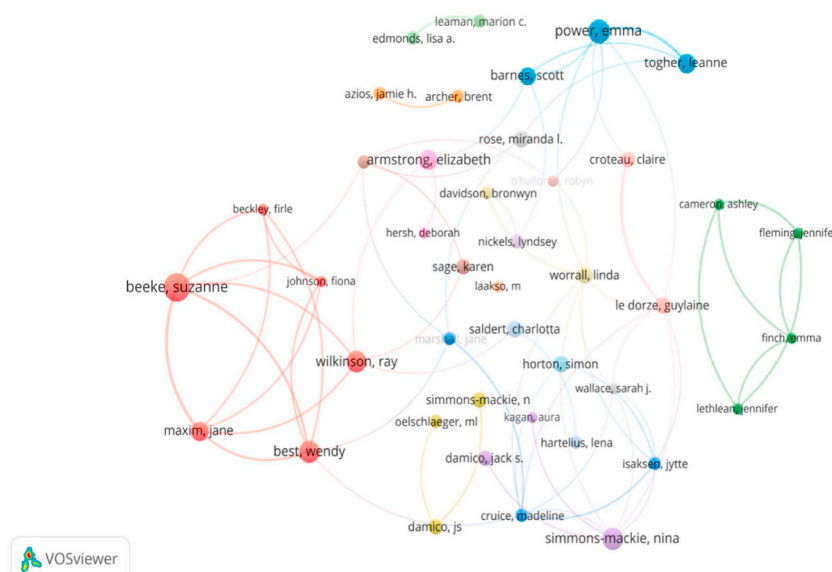


Fig. 4. The visualization of a collaboration network between authors.

linguistics, nursing, sociology, and medicine, ensuring the research was validated and applied in medical practice, while also fully acknowledging the theoretical and applied value of linguistics. The close collaboration between these teams, rather than isolated research, reflects the interdisciplinary nature of this field and the importance placed on the value of linguistics. Relevant universities, hospitals, and rehabilitation centers conducted research based on specific professional fields, fully demonstrating the close integration of linguistics and medicine, ensuring the feasibility and sustainability of the research in practice.

The increasing number of people with aphasia and the attention paid to the language ability of individuals with aphasia have made aphasia conversation a global concern. In order to make the collaboration between countries more intuitive, VOS viewer was used as a tool to visualize the country collaboration network and generate Fig. 5, where nodes represent countries and links represent cooperation between the countries. The size of each node is usually indicating the importance and contribution of a country in the collaboration network. The thickness of links represents the strength or frequency of cooperation between countries. The country collaboration network map reflects the current state of international collaboration and the distribution of research institutions in this field, allowing for more accurate tracking of research frontiers [60].

As shown in Fig. 5, the United States, Australia, and the United Kingdom have been the most active in aphasia conversation research over the past two decades. In addition to cross-national collaborations, they have individually taken the lead in publishing 35, 33, and 25 papers respectively. Furthermore, three cross-national collaborative groups have formed with these three countries at their core: USA - Canada - South Korea, UK - Australia - German - Ireland, and Australia - UK - Netherlands - Singapore - New Zealand. In addition, the Nordic countries of Sweden, Netherlands, Denmark, and Norway have also made many achievements in this field and formed a relatively stable cooperative group.

According to Fig. 5, the trend of cross-national collaboration in aphasia conversation research is becoming more significant, with more countries participating worldwide, including China, South Africa, and Greece, etc. Various countries have relied on relevant disciplines in universities, such as linguistics, nursing, psychology, as well as hospitals and rehabilitation institutions, to conduct research in this field.

3.3. Conceptual structure analysis

Keywords were set as “author’s keywords”, and the top 50 keywords were automatically listed in terms of frequencies (sizes of cubes) in Fig. 6. It reflects that the top 50 keywords with frequency rates higher than 2% account for 14% and they are “aphasia” (n = 204, 30%), “conversation” (n = 44, 7%), “conversation analysis” (n = 40, 6%), “stroke” (n = 24, 4%), “communication partner training” (n = 21, 3%), “communication” (n = 20, 3%), and “rehabilitation” (n = 18, 3%).

Keywords with high frequencies can clearly reflect some characteristics of the study. However, if we look closely at Fig. 6, we can generally summarize the main features of aphasia conversation research in recent years, which are as follows: (1) focus on PWAs’ language impairment in the interaction, such as anomia and agrammatism; (2) focus on PWAs’ communication strategies such as repair and gesture; (3) focus on aphasia assessment, intervention, rehabilitation, therapy, treatment, attaching importance to communication partner training; (4) the research methods were mainly qualitative, including conversation analysis and discourse analysis.

The function of topic dendrogram (Fig. 7) is to show the hierarchical order and relationships between the authors’ keywords spotted by hierarchical clustering. Each item in essentially a set of keywords related to “aphasia” and “conversation”. The above figure

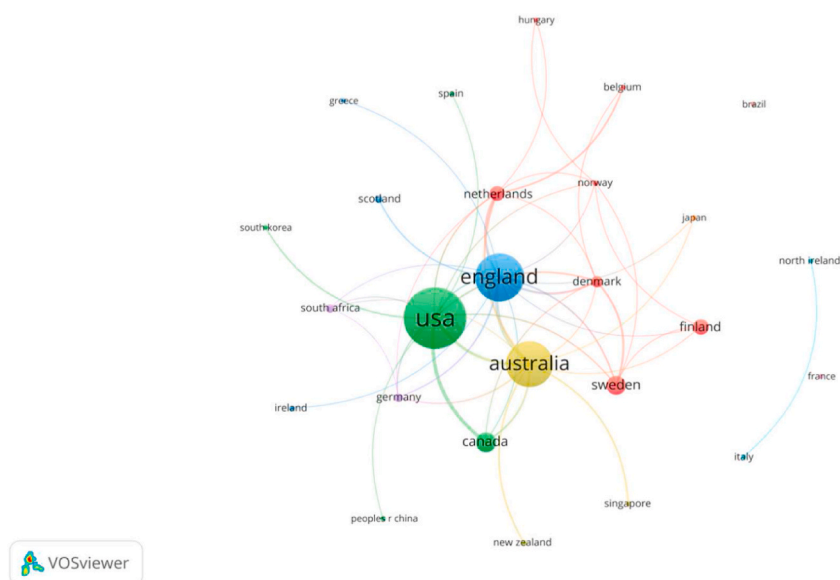


Fig. 5. The visualization of a collaboration network between countries.



Fig. 6. Author's keywords in "aphasia" and "conversation".

clearly demonstrates that studies in the field of aphasia conversation consist of two categories. The first category generates two strands, one strand is concerned more with the measurement of PWAs' communication disabilities, and the second strand more with aphasia therapy. In the second category, there are two strands. The first strand has been further divided into two sections. One section is linked to the language performance of people with aphasia, such as word retrieval, when they become involved in conversations. Through participation in language therapy and treatment in the form of conversation, their quality of life might be improved. In the second section, PWAs can join the process of language therapy mainly in the form of conversation; for another thing, partner training is regarded as a good way for those communication partners to understand the verbal and non-verbal language of PWAs, so as to provide better support for PWAs. In the second strand, progressive aphasia, PWAs' linguistic and pragmatic ability, and relationships between aphasia and dementia are the main research focus.

From author's keywords (Fig. 6) and thematic evolution (Fig. 8), scholars who want to know more about this field can trace back to the source and development route. Using "Author's keywords" as a condition, a thematic evolution map (Fig. 8) is generated, showing

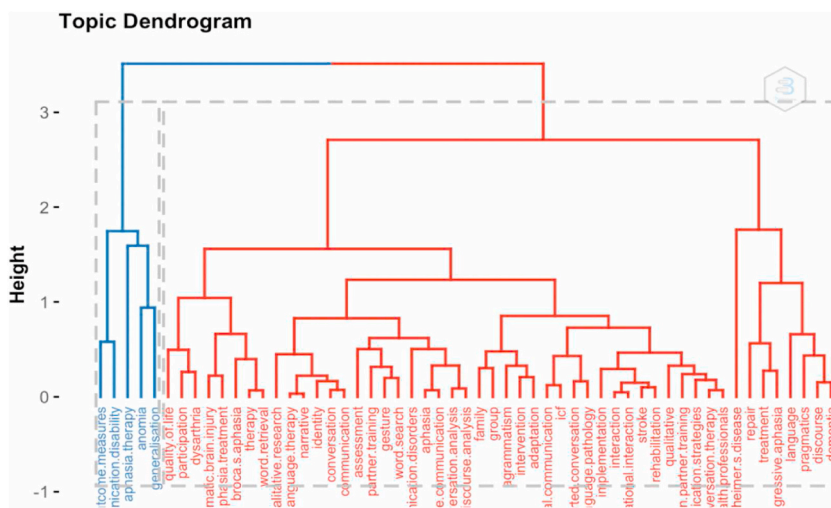


Fig. 7. Topic dendrogram.

that the conversational study of aphasia is roughly divided into two stages, the first stage starting from 1998 to 2013 and the second stage from 2014 to 2022. There were eight topics in the first stage, and the number of topics used varied. “Aphasia” came first, followed by “partner training” and “stroke.” The second stage of research is the integration and further development of the first stage, which has more predicative value. Themes in the second stage show that qualitative methods, especially conversation analysis, have been adopted as a major way to explore the discourse of PWAs and the verbal and non-verbal strategies used in interaction. Simultaneously, optimizing intervention approaches to improve the quality of PWAs’ lives is also a distinguishing feature.

The thematic map (Fig. 9) is a form of conceptual structure with “author’s keywords” as the variable, which can present the status quo of topic groups in the area of “aphasia” and “conversation,” the relationships within and between the topic groups. The thematic map contains four quadrants drawn by two standards of relevance and degree of development.

Themes in the first quadrant are characterized by a high degree of relevance and development with a strong momentum and mature system, which is called the mainstream theme (motor theme). Motor themes are developed themes in the field and are essential for organizing the study topic. Anomia is a form of aphasia. Many scholars explore the linguistic feature of anomia, especially features in real conversation. Some use conversation analysis to describe how a man with anomia constructed turns or named entities [61,62]. Some focus on measuring informativeness in unstructured conversations in people with anomia [63]. In addition, combining aphasia therapy with conversation has also been the mainstream. Studies have either analyzed conversations participated by PWAs in the therapeutic context [27,64,65], or adopted conversation as a means to facilitate aphasia therapy [21,66–68].

Themes in the second quadrant have a higher degree of development and a lower degree of relevance, indicating that the development momentum is better but not closely related to mainstream research in the current field. Such themes belong to the niche theme. According to Fig. 8, themes including “counselling”, “emotion”, and “psycho-social well-being” are all related to psychological state. It indicates that some scholars begin to pay attention to PWAs’ psychological health. They explore the counselling approach for people with severe aphasia [69], and speech-language pathologists claim that the main facilitators to address psychological well-being included personal interest, personal and professional experience and availability of counselling health professionals for people with aphasia [70]. Besides, speech-language therapists call for more counselling knowledge and skill training to meet the needs of people with aphasia [71].

The third quadrant is low in both density and centrality, which means that its development is immature and has not yet formed a powerful core theme. And the themes in this quadrant will be either emerging or declining. The themes around dementia are less developed and low in centrality, which possibly become an emerging theme because more recent work examining primary progressive aphasia and behavioral variant frontotemporal dementia was explored [72].

The fourth quadrant has a high degree of relevance, but a low degree of development and is considered a basic theme, usually laying the foundation for understanding a certain field. For instance, in Fig. 9, “communication disability”, “communication strategies”, “supported conversation”, “functional communication”, and “conversational interactions” are all basic themes. By conducting research, some general consensus has been reached. Topic and flow of conversations are controlled by the communication partner, creating asymmetry in conversations [73]. PWAs’ social participation is greatly reduced but they still long to regain their former language ability and role in social activities. To help them return to society and lead a normal life, it is essential to train communication partners in communication skills [74–77].

4. Conclusion and discussion

This study visually analyzed the 409 publications focusing on studies of PWAs’ conversations in WoS, with the help of bibliometric in the RStudio environment, and found that: (1) In recent years, there has been an increasing trend in international studies on PWAs’ conversations and the disciplines concentrate on clinical medicine, nursing, rehabilitation medicine and linguistics; (2) Related studies

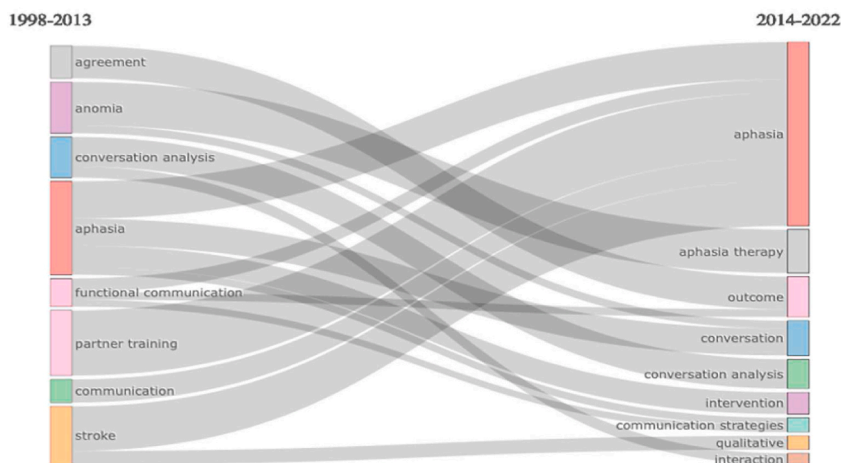


Fig. 8. Thematic evolution.

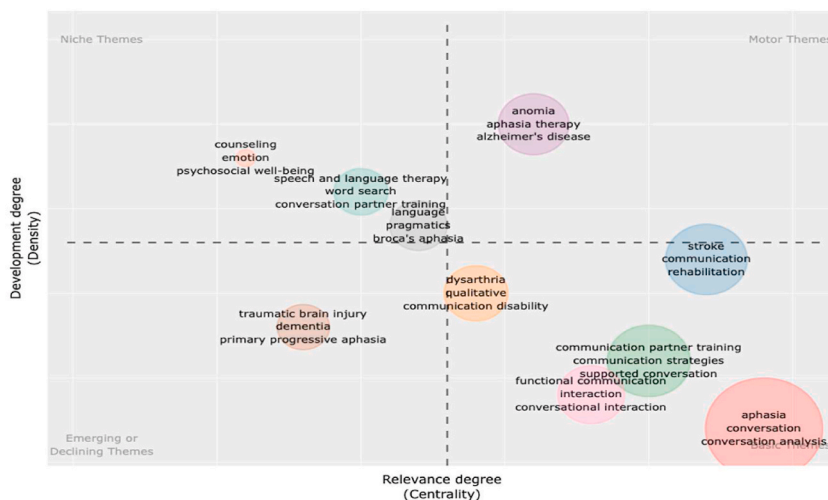


Fig. 9. Thematic map.

have formed a relatively mature research system and paradigm, including descriptive research centered on language disorders and applied studies on rehabilitation treatment, and the two types of studies complement each other; (3) There is an extensive and in-depth cooperation between Australia, the United States, the United Kingdom, Sweden and other countries, forming a cooperative institution; (4) Research hotspots are the performance of PWAs' language impairment, assessment, intervention, rehabilitation, and therapy of aphasia; (5) Future research in this field will use conversation analysis as a tool, take PWAs' non-verbal abilities into consideration, conduct communication skills training for caregivers, and attach importance to emotional support for PWAs and their relatives [78].

Since clinical data used in aphasia studies have been flawed in terms of organization and application, there exists a belief in the need for a more comprehensive and sophisticated paradigm to interpret this data. In this regard, scholars led by Damico and Simmons-Mackie et al., who advocated qualitative research methods, suggested establishing a sub-discipline in clinical research on aphasia, namely interactive aphasia [79]. Because they see the importance of interaction for human beings, even individuals with aphasia still need to participate in interactions, and because the origin of society and social action all exist in face-to-face interactions. Therefore, it is valuable to study the language ability, effective intervention, and emotional experience of PWAs by focusing on their real interactions.

Firstly of all, future studies could focus on improving therapy and exploring the implementation of "dialogue-based therapy" for PWAs. As participants in social interaction, PWAs may be speakers who need to be heard or listeners who need to understand others. Thus, it is crucial to provide conversation-based therapy for PWAs that emphasizes real-life experiences and encourages social participation. This therapy aims to increase opportunities for successful communication while reducing sources of errors and repair time [80]. For instance, group therapy as a form of conversation-based therapy, is an effective option for PWAs to share their own experiences and views with others [24] in a relaxed and supportive environment, which can ultimately promote interactions and participation among PWAs.

Secondly, future studies should value the role of conversation partners for PWAs and explore effective strategies for conversation partner training (CPT). Aphasia language therapy and research should recognize that language ability is not the sole measure of communication ability for PWAs. Other participants' language and behavior in the communication process can also provide assistance for PWAs to express their thoughts and achieve their goals [81]. Therefore, many scholars emphasize that in aphasia discourse research and language rehabilitation training, not only should the PWAs be focused on, but the involvement of the interaction partner should also be considered. Based on this view, we call for language therapists and individuals closely related to the PWAs (such as family members and caregivers) to receive Conversation Partner Training, enabling them to understand the mechanisms of collaborative communication, master the skills of interacting and communicating with PWAs, and timely provide "support" to enhance the PWAs' motivation to participate in interactive activities and fully utilize available resources [82].

Thirdly, future studies should give greater consideration to the emotional needs of PWAs. Healthcare providers should address PWAs' emotional needs during the process of diagnosis and treatment by providing them with understanding and support. Due to communication barriers, medical staff need more patience and empathy to actively listen to PWAs' words and understand their feelings and needs. In addition, healthcare providers can use nonverbal communication methods (such as facial expressions, postures, and gestures) to communicate with patients in order to better convey information and establish a connection. Emotional support can not only help PWAs improve their satisfaction with the treatment and understanding of treatment goals [83,84], but reduce their anxiety and fear, thereby improving treatment effectiveness.

In addition, the rapid development of artificial intelligence has brought about more possibilities for improving PWAs' language disabilities. We call for more scholars to utilize artificial intelligence and virtual reality technologies to provide real interactive scenarios and conduct personalized language therapy for PWAs.

According to the Seventh Census Data released by the National Bureau of Statistics in 2021, the current Chinese population is 1.412

billion, and the population over 60 years old is 264 million, accounting for 18.70% of the total population, indicating an obvious aging trend. Elderly individuals are at high risk of stroke. What's more, owing to the large population and large aging population in China, stroke has become the leading cause of death and disability in adults. Currently, the number of stroke patients in China reaches 12.42 million, and studies show that about 1/3 of stroke patients have different degrees of aphasia. There are limited specialized rehabilitation institutions in the face of a large aphasia population. The intervention and therapy of aphasia are highly structured, and there is much room to improve the PWAs' communication ability. Therefore, Chinese scholars can broaden their research perspectives and applications by drawing lessons from international research paradigms and methods to make breakthroughs and progress as soon as possible.

This study employed bibliometrix as the primary tool, combined with VOSviewer, to conduct a visual analysis of conversation studies on people with aphasia. The aim was to understand the development process and research hotspots in this field and to predict future research trends. The study showed that conversation studies on aphasia are a highly promising research direction that requires further exploration to better serve society and the public. However, there is still room for improvement in the depth and breadth of the analysis and the aesthetics of the graphics in this study.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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