

A Bibliometric Analysis of Language Disorders in Alzheimer Patients: Present Tendencies and Forthcoming Agenda

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Abstract

Introduction: Alzheimer's disease significantly impacts cognitive functions, particularly language ability. Language disorders impact patients' quality of life, necessitating systematic literature assessment to highlight promising research in this complex field. **Objective:** The purpose of this review is to examine the complex interaction between language disorders and Alzheimer's disease. **Methods:** PRISMA was used in a bibliographic approach review to search for studies on language disorders in Alzheimer's patients. The search revealed patterns and correlations, while VOSviewer helped identify relevant authors and countries. The results of the initial search for keywords showed (7,123) publications, and after adding Inclusion and exclusion criteria and careful assignment of keywords results were narrowed to (1,577) relevant articles. **Results:** The number of publications and citations concerning language disorders in Alzheimer's disease patients increased from 2013 to 2023, with 2021 seeing the greatest increase. Research from various countries, particularly the United States of America, generated considerable interest. Certain journals, universities, and research institutions have undertaken innovative endeavors. The topic's dynamic nature also provided an opportunity for eminent authors to explore it across multiple disciplines. **Conclusion:** The expansion of publications on this topic indicates global interest, and the diversity of disciplines that address it indicates the existence of research with a diverse and broad approach that allows the issue to be addressed from multiple angles. Such research interests would be of great value to the health of the elderly. **Recommendation:** This study recommends continuing to expand the scope of research to explore different destinations and provide new insights and this requires more support and funding for promising research.

Keywords: Alzheimer's Disease, Alzheimer's, Language, Language Disorders, Language Ability, Language Disability, Bibliometric Analysis.

Introduction

Alzheimer's disease (AD) is a severe neurodegenerative disease typified by progressive erosion of cognitive faculties, impairment in performing activities of daily living, and numerous behavioral and neuropsychiatric disorders (Thakur, 2000). The estimates show that 24.3 million people have dementia today, with 4.6 million new cases of dementia every year. The number of people affected will double every 20 years to 81.1 million by 2040 (Ferri et al., 2005)

Given that the management of Alzheimer's disease imposes a substantial financial and social strain on support services, it is both an intellectually demanding and socially significant concern in the realm of senior health care. Recent attention has been drawn to their significance as the proportion of the global elderly population continues to rise.

Language disorders are a sign of neurodegeneration and, considering the disease's nature and the intricacy of human language, are managed via comprehensive and multifarious research. Based on the studies published within the last decade that were incorporated in this review, the levels of discussion related to language and Alzheimer's can be divided into six overarching themes

1. **Diagnosing the disease through language:** Language disorders are an initial sign of the disease. Some studies are examining the possibility of early detection of the disease through changes in the language of the affected person. Individuals with preclinical Alzheimer's disease also show changes in various cognitive domains, including language (Lange et al., 2002). Some studies investigate the association of language disorders with different stages of the disease or as a sign of its progression (Ahmed et al., 2013). Several investigations are examining the distinctions between Alzheimer's and other neurodegenerative diseases, such as Parkinson's disease. Through a different pattern of language impairment (Gui et al., 2016). Certain research studies the possibility of using automated speech analysis with NLP to help clinicians evaluate language disorders in patients. (Yeung et al., 2021).
2. **Identifying areas of linguistic disorders:** In their studies, many researchers sought to define linguistic disorders according to different levels of linguistic processing, including phonetic, phonetic, lexical-semantic, and grammatical, as well as disorders of dialogue and communication. These studies have shown that language abilities begin to weaken in different ways as the disease progresses (Ortiz et al., 2021).
3. **Determining the manifestations of linguistic disorders:** Several scholarly articles examine the manifestations of linguistic disorders and their ramifications on everyday communication. These manifestations include deficiencies in semantic fluency, naming, expression, word retrieval, and expression (Fraser et al., 2016). As the disease advances, these studies have demonstrated that symptoms of language impairments become more pronounced and pervasive, such as impaired comprehension, fluency, and the capacity to form coherent sentences.
4. **Assessing the Effects of Language Disorders on Everyday Life:** Language disorders are investigated regarding their influence on various aspects of daily life, such as effective communication, mental well-being, social interactions, and comprehension of quality of life (Woodward 2013; Jones, 2015).

5. **Suggesting preventive and therapeutic strategies about language:** Certain studies have offered a fresh perspective on the preventive dimension of language-related Alzheimer's disease. Several research studies have investigated the effect of multilingualism on preventing the disease or delaying its onset (Hack et al., 2019). There is evidence from several studies that bilingualism is associated with a delayed onset of Alzheimer's disease (Klein et al., 2016; Cheng, 2014; Mendez, 2020). Other research has discussed the role of speech-language pathologists (SLPs) in providing care to patients. These services include not only direct assessment and treatment of communication and swallowing, but also counseling, education, and cognitive screening (Lanzi et al., 2021).
6. **Understanding the association of language disorders with memory, cognition, and the brain:** Understanding and analyzing language disorders can contribute to discovering the changes that occur in patients with Alzheimer's disease at the cognitive, neurological, and cognitive levels. It is an interdisciplinary endeavor, based on neuroscience, linguistics, and psychology. Several research studies have investigated the variations in brain structure between individuals with Alzheimer's disease who are monolingual and those who are multilingual (Duncan et al., 2018). To investigate the correlation between executive control and cognitive reserve, scholars deliberated on the mechanistic explanation of how bilinguals contribute to cognitive reserve (Grant et al., 2014).

A wide range of methodologies are utilized in Alzheimer's disease language research, including longitudinal studies, small-scale investigations, and large-scale comprehensive studies. By integrating multiple academic disciplines, one can attain a more comprehensive understanding of the impacts of Alzheimer's disease on human language and the repercussions of language disorders associated with the disease on the lives and lifestyles of those affected. The purpose of this bibliometric analysis is to identify research trends and patterns in the scientific literature spanning the previous decade, attempt to identify gaps in existing research and propose potential avenues for future research that may aid in the fight against this disease by providing answers to the following questions

- What is the distribution of language disorders in Alzheimer's patients' publications from 2013–2023 and what are the peak years of publication?
- What are the most influential papers in the study of language disorders in Alzheimer's patients?
- Which countries are leading in research on language disorders in Alzheimer's?
- Which academic institutions have been the most significant contributors to the research on language disorders in Alzheimer's?
- Which Authors have produced the most substantial contributions to the research on language disorders in Alzheimer's?
- Which researchers have made the most impactful contributions to language disorders in Alzheimer's?
- In the past ten years, what terms have been most frequently associated with research on language disorders in Alzheimer's?

Methods

Research Design

This bibliographic study adopts the PRISMA methodology Moher et al (2009) in constructing preferred reporting items for systematic reviews and meta-analyses. The goal of this comprehensive analysis is to review the literature that focuses on language disorders in patients with Alzheimer's disease, to understand how the topic is treated, and the specializations in which it is addressed, to provide an overview of trends and patterns. This includes examining the most important countries that lead research in this field, the academic institutions that have the most influence in it, and the publications and writers who contributed to the publication. Also, defining the scope of keywords allowed us to understand how the topic was addressed.

This study also used the VosViewer program in conjunction with PRISMA, which is a program that helps visualize the links between the various research elements to facilitate their reading and processing by creating visual maps that facilitate understanding the complex networks and relationships between these elements, including countries, educational institutions, researchers, publications, research specializations, and the most frequently used keywords. In the research field, allowing bibliographic data to be comprehensively analyzed.

VosViewer contributed to providing a comprehensive view of the research landscape of language disorders in Alzheimer's, understanding the structure of the relevant research field, and identifying relevant subfields or research groups.

Identification

- Database Selection

Conspicuously selected as the principal source for this review, Scopus is one of the most sizable and all-encompassing databases, housing a vast collection of publications spanning numerous disciplines. It provides access to a variety of research and facilitates seamless navigation through an abundance of data. January 16, 2023.

- Search Strings

To guarantee a comprehensive collection of pertinent studies, the search strategy was meticulously planned. Organized search phrases, including those like TITLE-ABS-KEY, incorporated criteria, for instance (language AND Alzheimer's). The established time frame for the study encompassed publications from the years 2013 to 2023 "PUBYEAR > 2012 AND PUBYEAR < 2024". Because this research topic falls between different specializations, starting from language and ending with medicine, the research disciplines directly targeted in this review were neuroscience, psychology, social sciences, and arts and humanities "LIMIT-TO (SUBJAREA, "NEUR") OR LIMIT-TO (SUBJAREA, "PSYC") OR LIMIT-TO (SUBJAREA, "SOCI") OR LIMIT-TO (SUBJAREA, "ARTS")". Furthermore, the search sources were limited to article only "LIMIT-TO (DOCTYPE, "ar")" and strictly limiting the journal only (LIMIT-TO (SRCTYPE, "j")) with confined the language of publication in English (LIMIT-TO (LANGUAGE, "English")).

- Inclusion and Exclusion Criteria

Figure 1 below shows the outputs and inputs that are used in this review to ensure that the required data is obtained:

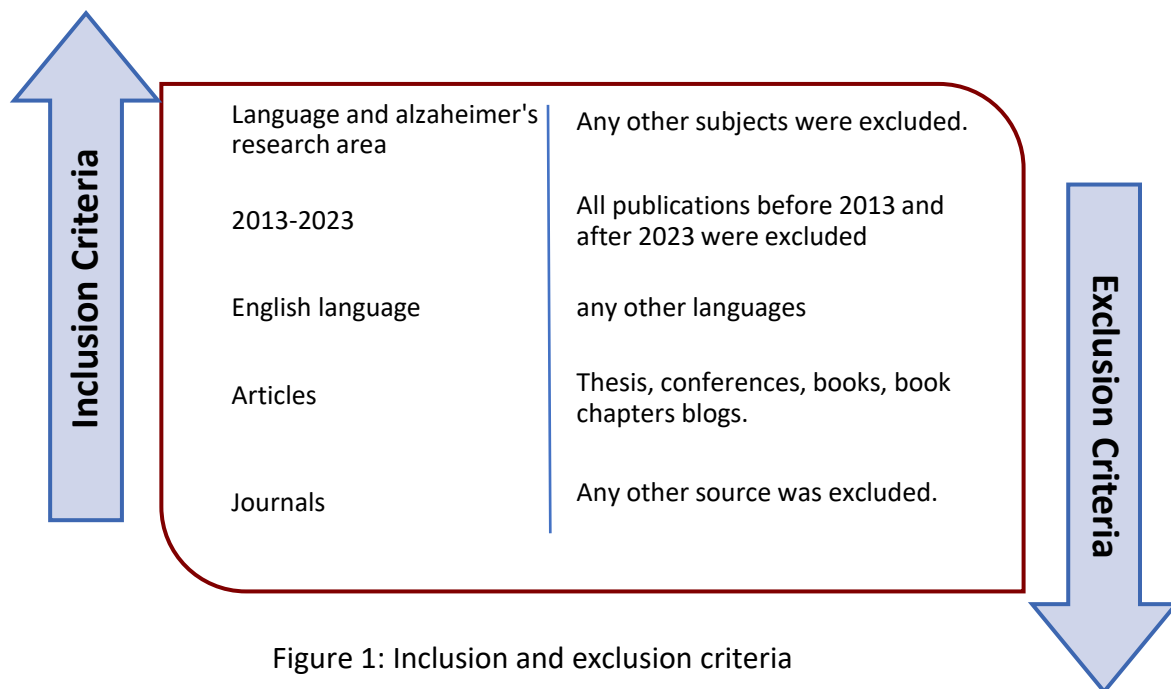


Figure 1: Inclusion and exclusion criteria

Screening and Selection

Given that the research topic falls between linguistics and medicine, it is self-evident that the scope of the research is very broad, and this is why the word selection methodology was carefully designed, and this explains the large number of keywords that were chosen to ensure focus on a specific research area related to the topic of this review. The initial search in the database, utilizing the key terms 'Language and Alzheimer's', yielded a total of 7,123 entries. Applying the inclusion and exclusion parameters detailed in Figure 1, the count of pertinent papers was narrowed down to 1,577. This refinement process resulted in the removal of 5,546 articles that did not meet the established criteria.

Inclusion and Reporting

This bibliometric analysis's findings are displayed following the PRISMA guidelines, depicted in **Figure 2** below (Moher et al., 2009). The subsequent section will commence by addressing

the research questions previously outlined, showcasing the outcomes in an organized and clear manner.

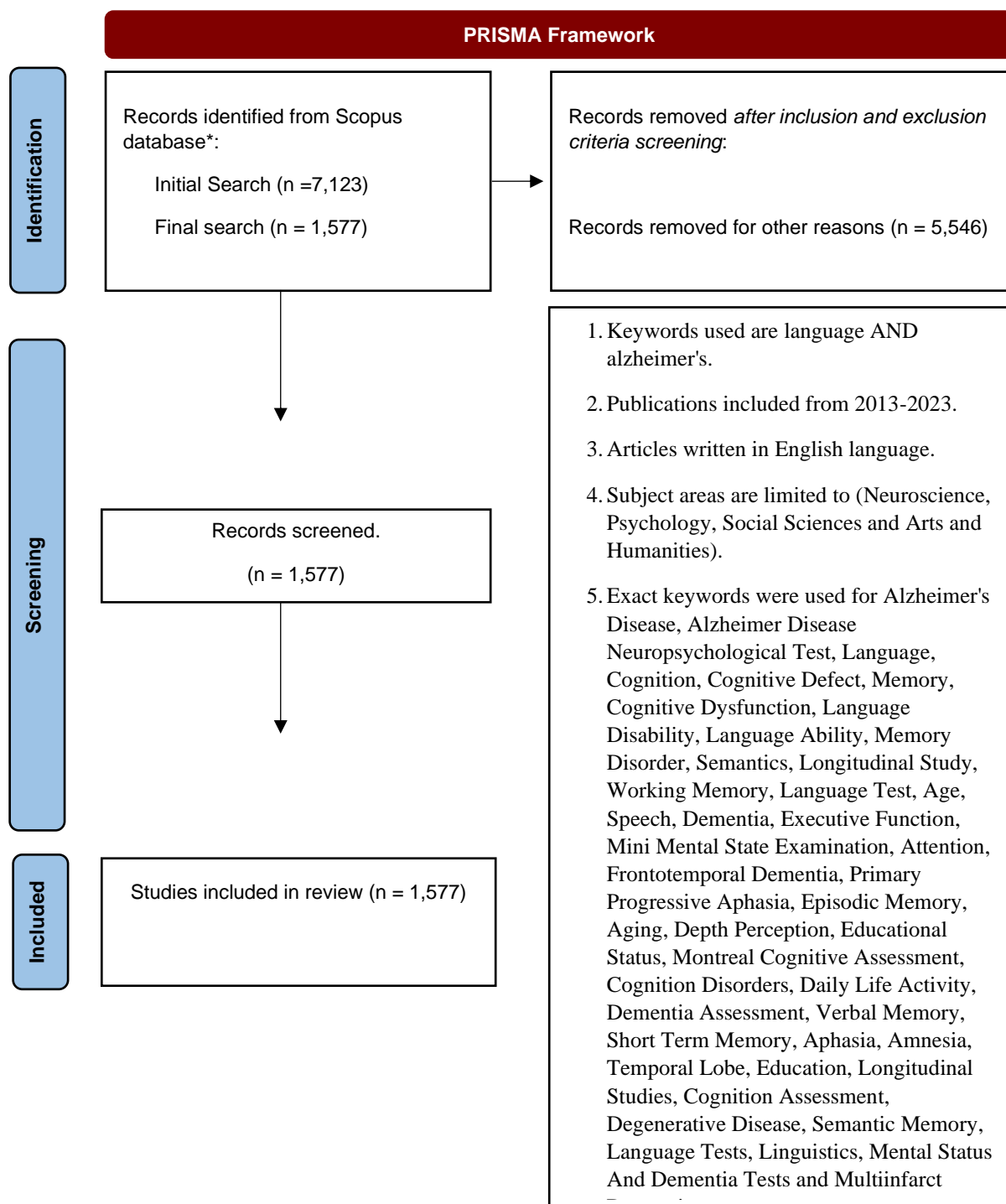


Figure 2: Prisma framework for this review

Results

In the Results section of this bibliometric analysis, we provide an analysis of the key findings extracted from the dataset used by highlighting key patterns, trends, and themes that have

emerged on the current landscape of language disorders in Alzheimer patients. The results are designed to provide a clear view of the research topic, including publication trends, authorship patterns, geographic distribution, and thematic concentrations. First, we begin by examining the volume and trajectory of publications over the given time frame, which provides an accurate view of research activity in this area. This is followed by highlighting the most prolific authors and institutions, highlighting the leading countries in this field of study. In addition to quantitative data, we also provide a qualitative analysis, summarizing the thematic development of the field.

Through advanced bibliometric techniques, Through keyword analysis, we explore thematic clusters that indicate the focal areas of research and their interconnections. The use of visual aids, such as graphs, charts, and network maps, enables a bird's-eye view, makes the data easier to understand, and supports the narrative of the review's findings. The results of this data analysis not only provide a broad understanding of the review topic but also enable an understanding of future trends and potential gaps in the literature.

Publication Trend Analysis

The results of the statistical analysis of the number of articles on language disorders in Alzheimer patients in the Scope database are shown in **Figure 3**. As The findings show, the number of publications-year distribution shows an Irregular increasing trend. In the first 5 years between 2013 and 2017 a total of 641 papers were published compared to 913 research papers published in the following five years, which shows that more and more researchers have paid attention to this field. The diagram additionally reveals a notable surge in research paper production from 2021, which represents the most substantial yearly growth rate with an increase of 66 papers compared to the year 2020, while publishing peaked in 2022 with a total of 229 publications.

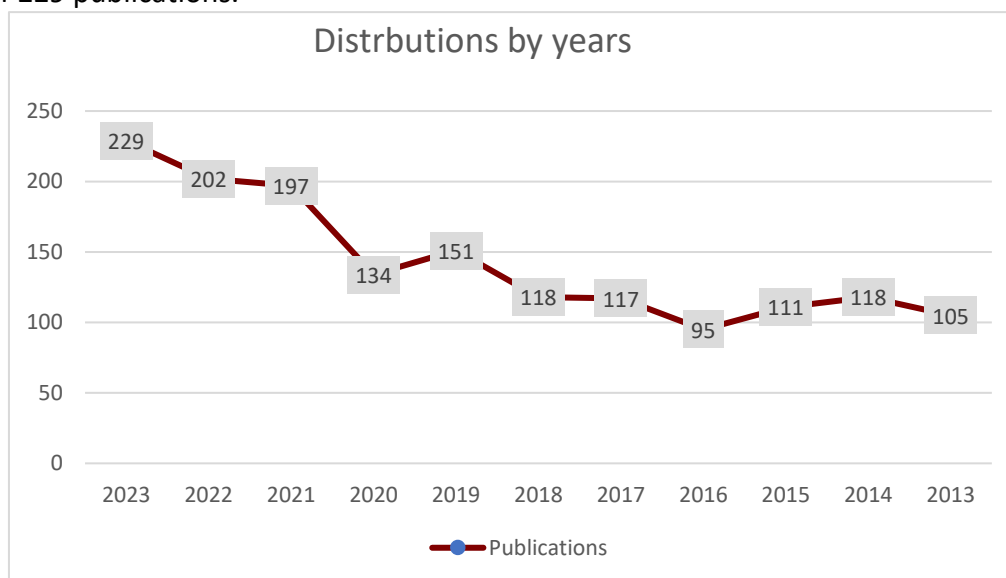


Figure 3: The publication-year distribution.

The apparent increase in the number of publications indicates greater interest in studying linguistic patterns in patients with Alzheimer's disease, driven by the world's growing elderly population and the high incidence of the disease. This increase after 2020 can also be

attributed to the development of trends in understanding and diagnosing disease and the use of advanced technologies such as machine learning and natural language processing.

The Most Relevant Journals

This paper has analyzed the top 10 journals in terms of total publications, total citations, and the cite score during the last 10 years as shown in **Table 1**. Such insights are significant for researchers in the field as it helps them recognize the most impactful scholarly journals. The number of citations a journal receives serves as an effective measure of its influence and importance.

Table 1

Summary of the most relevant journals in Language disorders in Alzheimer's patients

c	Journal	TP 2023	TC 2023	Cite Score 2023	Most cited article	Times Cited	Publisher
1	Journal of Alzheimer's Disease	3,146	19,998	6.2	Pathological and Therapeutic Advances in Parkinson's Disease: Mitochondria in the Interplay	14	IOS Press
2	Alzheimer's and Dementia	946	13,971	14.6	2023 Alzheimer's disease facts and figures	246	Wiley-Blackwell
3	Frontiers in Aging Neuroscience	3,271	17.163	6.2	Transcranial cortico-cortical paired associative stimulation (ccPAS) over ventral premotor-motor pathways enhances action performance and corticomotor excitability in young adults more than in elderly adults	10	Frontiers Media S.A.
4	Dementia and Geriatric Cognitive Disorders	262	1,244	4.6	Comprehensive Bibliometric Analysis of Stem Cell Research in Alzheimer's Disease from 2004 to 2022	10	Karger
5	Alzheimer's Research and Therapy	665	7,966	12.6	Hormone replacement therapy is associated with improved cognition and larger brain volumes in at-risk APOE4 women: results from the European Prevention of Alzheimer's Disease (EPAD) cohort	22	Springer Nature
6	Neurobiology of Aging	1,048	9,093	8.2	A framework for concepts of reserve and resilience in aging	25	Elsevier

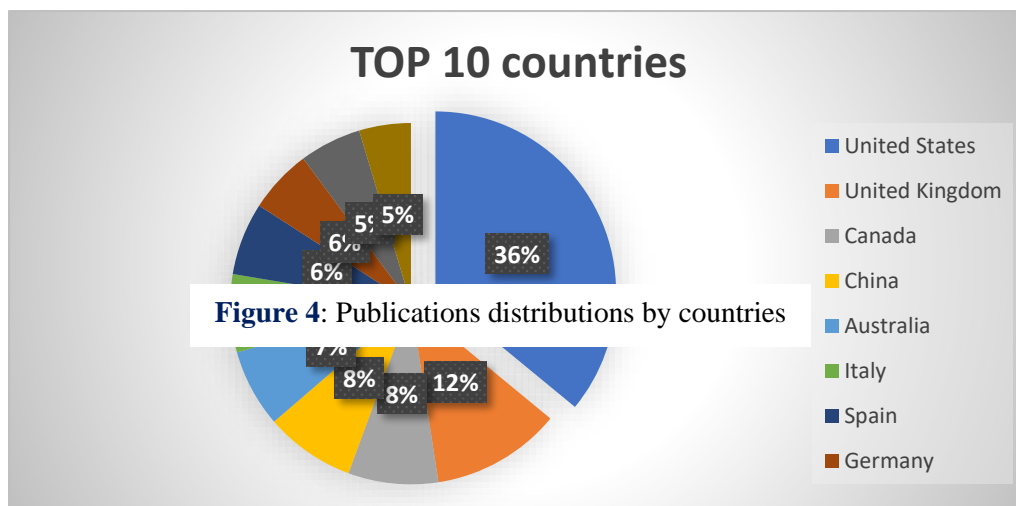
7	International psychogeriatric	367	3,141	9.0	Prevalence of loneliness and social isolation among older adults during the COVID-19 pandemic: A systematic review and meta-analysis	59	Cambridge University Press
8	Alzheimer's Disease and Associated Disorders	243	878	3.0	Carotid Intima-Media Thickness (cIMT) and Cognitive Performance: A Population-Based Cross-Sectional Study from North India	2	Wolters Kluwer Health
9	Current Alzheimer Research	397	2007	4,1	Outcomes and Factors Affecting Transcranial Direct Current Stimulation in Alzheimer's Disease Patients: A Systematic Review	2	Bentham Science Publishers
10	Journal of the International Neuropsychological Society	373	1,793	5.2	Unsupervised high-frequency smartphone-based cognitive assessments are reliable, valid, and feasible in older adults at risk for Alzheimer's disease	9	Cambridge University Press

TP= Total publications, TC= Total citations

As **Table 2** shows, the Journal "Alzheimer's Disease" has the most significant impact to pertinent the subject of language disorders in Alzheimer's patients. It obtained more citations by far than any other journal. This may be related in part to the number of published articles (3,146 articles), which generated more citations (19,998 citations) and a cite score of 6.2. Followed by the Journal of "Alzheimer's and Dementia" which was distinguished by the most cited score of 14.6 and a total of 946 publications with 13,971 citations. Its well-known article "2023 Alzheimer's disease facts and figures" has the most garnered considerable interest with 246 times cited. The Journal "Frontiers in Aging Neuroscience" from Frontiers Media S.A. came in third place with 3,271 publications and 17,163 citations accompanied by a cite score of 6.2. The Journal "Dementia and Geriatric Cognitive Disorders" also achieved 1,244 citations which is impressive compared to the total articles published (262 articles) with a cite score of 4.6. With a cite score of 12.6, the Journal of "Alzheimer's Research and Therapy" comes in the top 5 co-cited journals with a total of 665 publications and 7,966 citations.

The most Significant Countries

To investigate which countries, have the greatest influence on the research field of language disorders in Alzheimer patients, an examination of the provided data shows a diverse global impact, as illustrated in **Figure 4**, which depicts the distribution of publications by country.



According to TP and %TP, it was observed that the interest in language disorders in Alzheimer patients is worldwide, as evidenced by 81 countries that have published at least one article related to the subject. The United States ranks first with a cumulative count of 598 articles. This number of USA papers is much higher than that of other countries, indicating American researchers' high level of interest in this field. Moreover, the USA has embarked on collaborative interactions in this field with numerous other nations, as will appear later in **Figure 6**. Significant European engagement in the field is evident through the United Kingdom's contribution of 193 articles, which presents 12% of the total publications. The United Kingdom is a key player in international collaborations, working with other countries and global organizations to advance Alzheimer's research by Chaired the Alzheimer's Association, the National Institute on Aging, and the Alzheimer's Research (ARUK). In the third place, Canada and China came respectively with 134 articles. The strong network of collaborative research initiatives that Canada has such as the Canadian Consortium on Neurodegeneration in Aging (CCNA) shown its substantial interest in this field. On the other hand, the rising importance that China places on research on language disorders in Alzheimer patients is particularly pertinent in a nation with one of the world's largest aging populations.

The most Significant Educational Institutions

As the number of research papers on language disorders in Alzheimer patients grows, it becomes essential to explore further to identify the most prolific and impactful researchers and identify the universities and educational institutions that are leading the development in this discipline. **Table 2**, **Figure 5**, and **Figure 6** analyze and identify the most influential educational institutions worldwide on the subject.

Table 2

The most significant educational institutions on language disorders in Alzheimer patients.

Educational institution	TP	Country
University of California, San Francisco	54	United States
University College London	52	United Kingdom
University of California, San Diego	50	United States
UCL Queen Square Institute of Neurology	47	United Kingdom
Inserm	41	France
UNSW Sydney	41	Australia
Harvard Medical School	39	United States
Mayo Clinic	37	United States
University of Toronto	37	Canada
Massachusetts General Hospital	37	United States

TP= Total publication

The University of California, San Francisco (United States) is the most productive institution in terms of TP, followed by the University College London (United Kingdom) with 52 publications and the University of California, San Diego (United States) with 50 publications. The fact that the USA is home to five of the top ten producing institutions indicates that American academic institutions are very interested in studying language impairments in Alzheimer's patients. **Figure 5** illustrates the geographical spread of the publications.

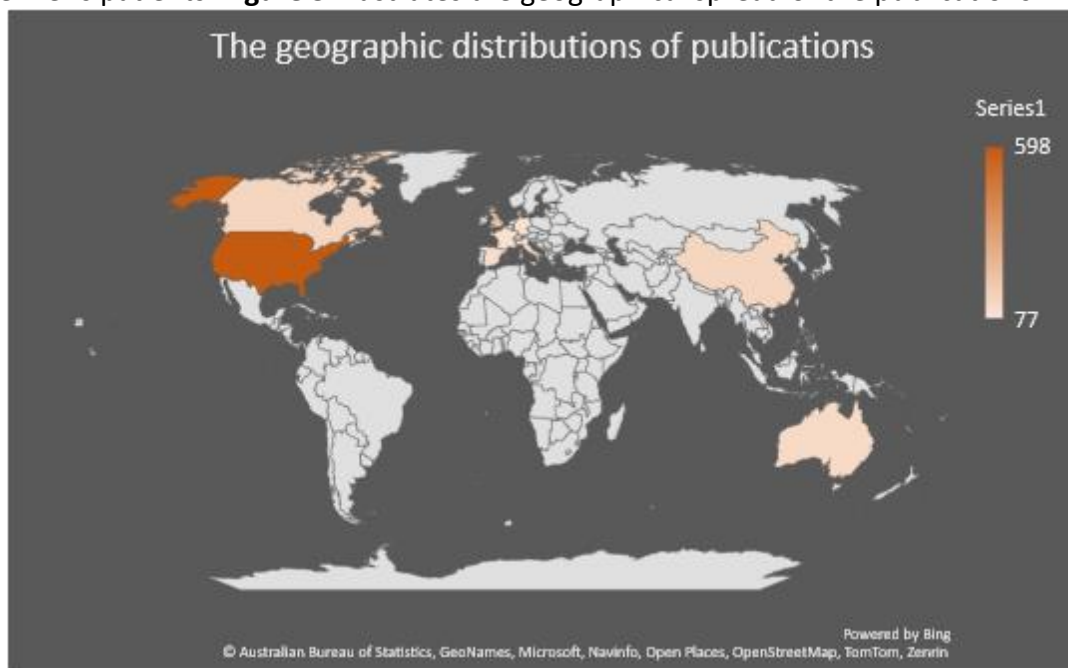


Figure 5: the geographical distributions of

Figure 5 illustrates the global geographic distribution of publications across the top 10 countries. The number of publications from each country is indicated by a higher hue on the map. As we can see, most of the producing nations are mainly found in South America, West Europe, East Asia, and Australia. **Figure 6** displays the geographical distribution analysis performed using the VosViewer software.

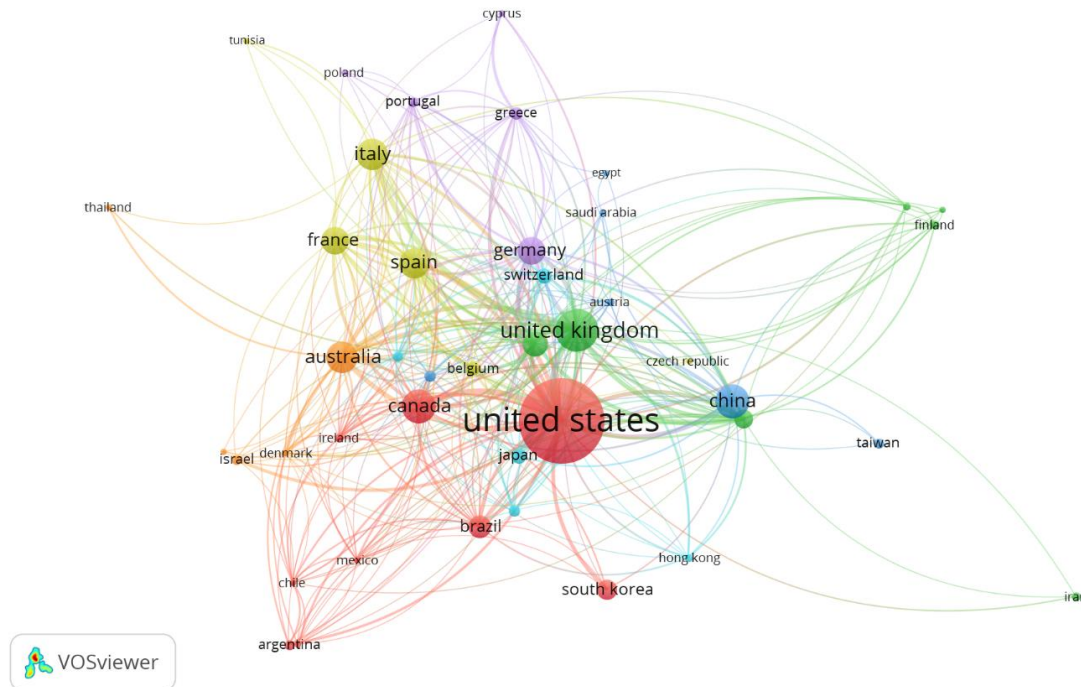


Figure 6: the geographical distribution based on VosViewer

A country-by-country breakdown of research on language disorders in Alzheimer's patients is shown in **Figure 6**. Remarkably, of all the data gathered on the subject, the United States of America has made the largest contribution to academics, accounting for 36% of the total. This is demonstrated by the volume of work that the nation has recorded. This analysis concludes that research on language disorders in Alzheimer patients has been conducted worldwide, with developed economies contributing more to this research than emerging ones.

The Most Prolific Authors

Numerous noteworthy articles have appeared in a variety of periodicals. Sorting publications according to the quantity of citations they have received is one way to find them. The quantity of citations indicates the scientific community's impact, appeal, and attentiveness. **Table 3** lists the top 10 authors based on the number of papers published in the study of language disorders in Alzheimer patients, as determined by Scopus' scientific data.

Table 3

The top 10 authors in language disorders in Alzheimer's patients research area

No.	Author	Year of first publication	TP	h-index	TC	Current affiliation	Country
1	Scheltens, P. K.	1995	1,216	157	128,895	Amsterdam UMC - Vrije Universiteit Amsterdam	Netherlands
2	Hodges, John R.	1995	734	146	79,523	The University of Sydney	Australia
3	Josephs, Keith Anthony	2000	570	101	40,684	Mayo Clinic, Rochester	United States
4	Piguet, Olivier	1997	334	64	16,285	The University of Sydney	Australia
5	Weintraub, Sandra	1995	377	92	47,790	Northwestern University	United States
6	Miller, Bruce L.	1995	1,229	175	131,020	University of California, San Francisco	United States
7	Whitwell, Jennifer L.	2001	336	75	22,764	Mayo Clinic, Rochester	United States
8	Duffy, Joseph R.	1995	216	50	8,265	Mayo Clinic	United States
9	Na, Duk-lyul	1995	521	58	15,058	Samsung Medical Center, Sungkyunkwan university	South Korea
10	Salmon, David P.	1995	362	95	43,379	La Jolla	United States

As the data shows, the author with the best combination of productivity and influence in this field is Scheltens, P. K., with an h-index of 157 and a total of 1,216 articles published. In 2020 alone, he published roughly 77 articles, one of these articles, "The diagnosis of dementia due to Alzheimer's disease: Recommendations from the National Institute on Aging-Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's disease" which included a collaboration with a team of researchers, received 10,411 citations. The second author on this list is Hodges, John R. with an h-index of 146 and a total of 79,523 citations. The data shows that Hodges, John R. started publishing articles in 1995 and he stopped in 2020 with a total of 734 publishes. With an h-index of 101 and a total of 40,684 citations, Josephs, Keith Anthony from Mayo Clinic, Rochester ranked third on the list of top authors, followed by Piguet, Olivier Equipped with an h-index of 64 and 16,285 citations. Olivier wrote most of his research on Primary Progressive Aphasia, Frontotemporal Dementia, and Alzheimer's Disease. Australia's second and fourth-place rankings attest to the noteworthy advancements in Alzheimer's research. Research are supported by the Australian Dementia Network (ADNeT) and the National Health and Medical Research Council (NHMRC). Weintraub, Sandra has amassed an h-index of 92, 377 articles, and 47,790 citations since her debut publication in 1995. Her

connection to Northwestern University Feinberg - School of Medicine confirms the great role played by the United States of America in this important field.

The sixth position goes to Miller, Bruce L., who has an h-index of 175. Miller, however, is among the most pertinent writers in this field when all of the indications listed in Table 3 are taken into account. Miller is the most prolific writer with a total of 1,229 articles, it is worth noting that he has far more citations (131,020) than any other author on the list. Moreover, thirteen of Miller's publications have more than a thousand citations. Moreover, the co-authorship network based on VosViewer software in **Figure 7** shows the Great joint work between (179) others in the field of language disorders in Alzheimer patients, in which fifteen colors correspond to fifteen clusters.

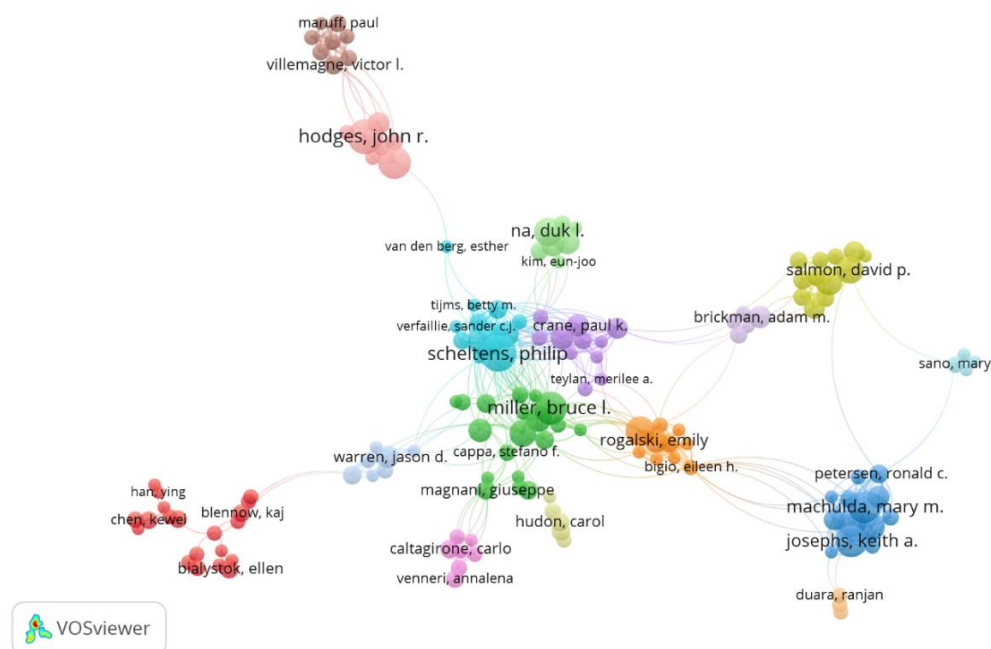


Figure 7: The author co-citation network based on VosViewer

The goal of co-citation analysis is to reveal the relationships and organization of authors who are referenced together more often. The collaboration between the two authors is shown by the line between them. The collaboration clusters are represented by the colors. **Figure 7** demonstrates the significance of Miller, Bruce L., in the research of language disorders in Alzheimer patients with a total of 103 link strengths, followed by Josephs, Keith A. with 102 link strengths, Van der Flier, Wiesje M. with 101 link strengths, Scheltens, P. K. with 99 link strengths, and Whitwell, Jennifer with 98 link strengths. The figure also includes other notable authors with close relationships. Researcher collaboration is essential to understanding the field of language impairments in Alzheimer's patients. This collaborative work frequently crosses disciplinary and geographic barriers. Through collaborative efforts, scientists exchange knowledge, information, and innovative methodologies, thereby fostering advancements in the comprehension of the etiology, progression, and potential therapeutics of Alzheimer's disease and facilitating more comprehensive investigations.

The primary research keywords and trends

Co-occurrence analysis of keywords is a useful and vital tool to provide a perspective of the knowledge structure and research trend in the field of language disorders in Alzheimer's patients. It helps to understand the research themes of publications in this area. The link between terms is depicted in **Figure 8** In network visualization, the relationships between terms are represented as a network or line connecting them. Presenting the relationships with other terms was done by color, square size, text size, and connecting line thickness.

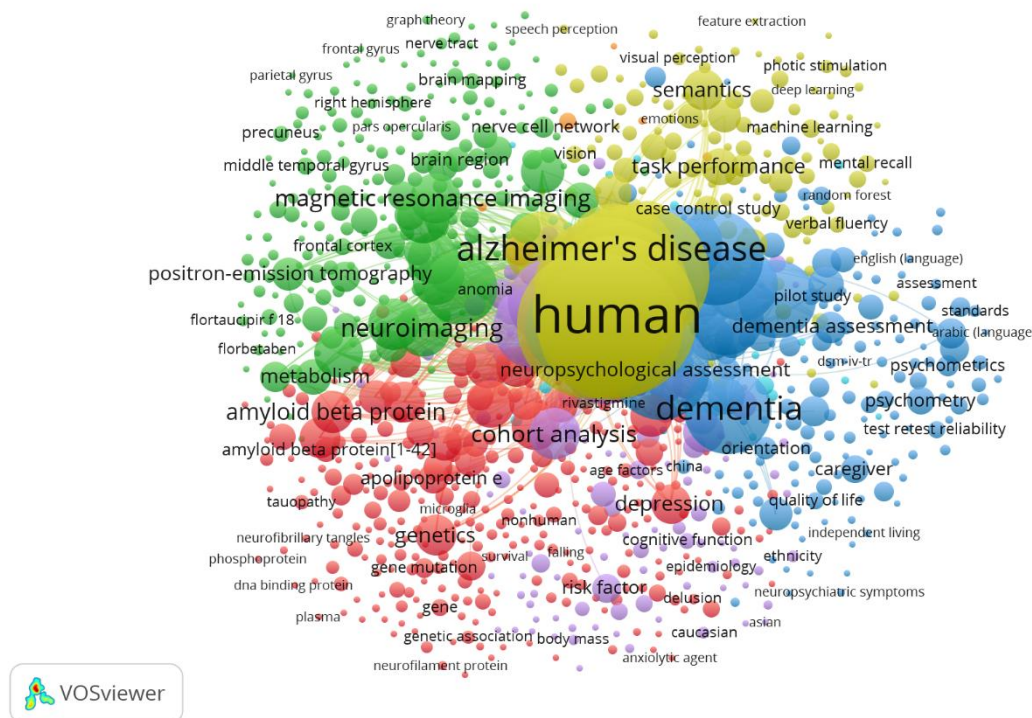


Figure 8: The Keywords co-citation network based on VosViewer

The figure represents a grid centered on replicating keywords in the literature on language disorders in Alzheimer's patients. Results show that "human" is the most used category (1454 times), and this makes sense if we consider that the study falls between linguistics and medicine, and the humanitarian issue is at its core. In addition, the term "Alzheimer's" has been used under different names in this area, for example, "Alzheimer's Disease" appears 1195 times, "Alzheimer's" appears 362 times, and "Alzheimer's Disease" appears 573 times. Moreover, the terms "language" (638 times), "language ability"(168 times), "language disability" (170 times), and "Language disorders"(43 times) also appeared at different levels of frequency which highlights the research's main focus. All of these terms related to language appeared in the same group (yellow color) in which the terms "human" and "Alzheimer's" appeared, which confirms the great importance that language-related studies play in understanding, diagnosing, and treating diseases such as Alzheimer's, and also reflects the current research focus and ongoing developments in this field.

The most important subject area

Figure 9 shows the relative between specialized fields of research on language disorders in Alzheimer's patients. According to Scopes data, the topic area that is the most critical in this

field is Neuroscience. Over the past ten years, there have been a total of 1219 articles published in the Neuroscience field on this topic. finding Alzheimer’s disease biomarkers has been greatly aided by neuroscience research. Moreover, Biomarkers are essential for tracking the development of disease, enabling early diagnosis, and understanding behavioral and cognitive symptoms such as language.

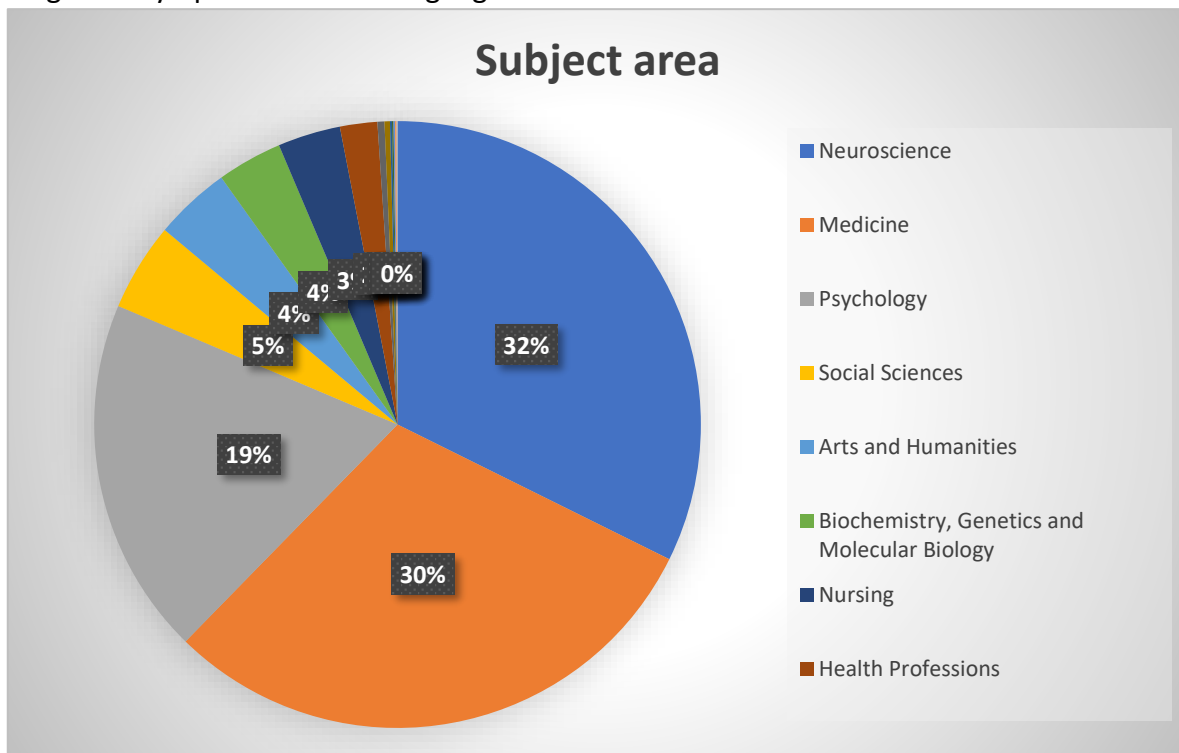


Figure 8: The most important subject area

Medicine ranked second on the list of the most critical subject areas in the field of language disorders in Alzheimer's patients (1131 articles). Medicine comprehensive care focuses on patient-centered and addressing the psychological, physical, and cognitive symptoms of the disease to slow progression. This understanding is important for developing treatments and care plans including language abilities. Understanding the cognitive loss linked to Alzheimer's disease such as language is largely dependent on psychology (719 articles). Psychology contributes to developing therapeutic psychological interventions that can help manage symptoms and maintain communication skills for as long as possible.

According to their 177 articles, the Social Sciences investigate how language impairments brought on by Alzheimer's disease impact a person's sense of self, their place in their family and community, and their comprehension of their needs and problems. Additionally, a comprehensive contextual understanding of how language difficulties in Alzheimer's patients are experienced and managed within a social and cultural framework is provided by the Arts and Humanities as seen in their 153 articles. This viewpoint is essential for creating all-encompassing care and support strategies.

In conclusion, every discipline offers a different perspective on this topic, emphasizing the value of interdisciplinary cooperation in addressing challenging medical issues.

Discussion

This study has examined and uncovered the evolution of the research of language disorders in Alzheimer's patients between 2013 and 2023 by using bibliometric analysis to assess the output of research and publications for people, journals, organizations, and nations. The study also created and examined co-citation networks of cited references, initial authors, and journals to gain a deeper understanding of the dynamics and structure of this field.

Trends in Publication

The results of the bibliometric analysis indicate that between 2013 and 2023, publications on language disorders in Alzheimer's patients showed an irregular rise with a total of (1577 articles). The apparent increase in publications suggests greater interest in studying language patterns in people with the disease, likely due to the disease's high incidence and the world's growing older population. Moreover, advances in technology have also given researchers new means to investigate the brain and language in Alzheimer's patients functions more thoroughly and from a variety of angles.

Geographic Distribution

The study observed that there is global interest in linguistic disorders in Alzheimer's patients. 81 nations made contributions to this topic, the United States, the United Kingdom, Canada, and China being the most notable. One of the primary reasons for this significant interest is the rising prevalence of the disease which is due to the increasing number of aged people globally. While national levels of interest and funding for researching language disorders in Alzheimer's patients vary, there is a global trend toward a greater appreciation of the significance of this area.

Influential Journals and Educational Institutions

Studying and discerning the leading journals and the most influential establishments is an important step to staying informed about the highest quality research to identify current trends, and find gaps in the field of linguistic disorders research in Alzheimer's disease. The effort certain universities and journals are making in this field has been very important. The United States of America by its universities and journals has contributed the most to academia out of all the data collected on the subject (36%).

Prolific Authors

The citation analysis's findings indicate a relationship between the most renowned authors and the publications that receive the most citations. The author makes a substantial contribution by offering broad perspectives and pointing research in new directions. On the other hand, the collaborative work between authors frequently crosses academic domains and geographic barriers. By working together, scientists exchange knowledge, information, and creative approaches, allowing for a more thorough investigation and promoting breakthroughs in the understanding of the origins, course, and possible therapies of Alzheimer's disease.

Research Keywords

One important and helpful technique for gaining an understanding of the knowledge base and current research directions in the area of language impairments in Alzheimer's patients is the co-occurrence analysis of keywords. The analysis revealed numerous relationships

among the keywords, such as "human," "Alzheimer's," and "language." The three terms and their derivatives came in the same color group, showing broad regions of correlation between them.

Subject Areas and Their Implications

The study showed the relative between fields that study language disorders in Alzheimer's patients including Neuroscience, Medicine, and Psychology. These fields focus on patients and try to address psychological, physical, and cognitive symptoms including language disabilities. On the other hand, the Social Sciences, Arts, and Humanities investigate how language impairments affect Alzheimer's patients' lifestyles.

Summary of the results of this review

The subsequent table presents a comprehensive synopsis derived from the aforementioned research article, which undertakes a thorough examination of the progression, repercussions, and prospective advancements of linguistic disorders in Alzheimer's patients. The researchers categorized the data into substantial domains, including findings, consequences, trends, and future strategies. The aforementioned categorizations offer a holistic comprehension of the scholarly focus, geographical distribution, principal authors, and significant educational institutions. This study aims to provide an overview of the current situation and predict future developments in this rapidly evolving field, as illustrated in **Table 4**.

Table 4

Comprehensive analysis of study language disorders in Alzheimer's patients: key findings and future potential

Aspect	Findings	Implications	Trends	Future Agenda
Publications	An irregularly increasing trend in publications. A notable surge in research paper production from 2021. Publishing peaked in 2022 with a total of 229 publications.	There is greater interest in this field, driven by the world's growing elderly population and the high incidence of the disease.	An expansion in publications after 2020 may be attributed to the development of trends in understanding and diagnosing and the use of advanced technologies.	The continued expansion of publishing will allow the exploration of different fields and the discovery of new directions, which is why it is so important to provide funding and support to advance research.
Journals	"Computers and Human "Alzheimer's Disease", "Alzheimer's and Dementia", "Frontiers in Aging Neuroscience", "Dementia and Geriatric Cognitive	Such journals are significant for researchers in the field as it helps them recognize the most impactful research.	The wide diversity in presenting the issue with the diversity of journal specializations.	grasp hot topics and track the development trend by following up on publications and continuing scientific publishing.

	Disorders”, and “Alzheimer's Research and Therapy” have the most significant impact.			
Countries	The nations that make the most substantial contributions are the USA, the UK, Canada, and China.	indicates a broad interest driven by supporting research centers and the development of technical infrastructure, support, and funding.	Cooperation between researchers from different countries to develop research in this field, not only in developed countries.	Expanding the scope of the research to include other countries allows for studying the influence of factors such as multilingualism, population diversity, and the lifestyle of the elderly.
Educational Institutions	University of California, San Francisco, University College London, and University of California, San Diego are the most significant and notable educational institutions of this cause.	Emphasizing the importance of institutions in supporting, developing, and promoting influential qualitative research.	the USA is home to five of the top ten producing institutions indicating that American academic institutions are very interested in this field.	It is important to cooperate with institutions in different countries to achieve better results, especially with the variations in the existence of institutions with limited research resources.
Authors	Numerous noteworthy articles have appeared in a variety of periodicals. Among its most famous and prominent authors are Scheltens, P. K., Hodges, John R., Josephs, Keith Anthony, and Piguet, Olivier.	The analysis of prominent and most cited articles represents an opportunity to learn more closely about leading authors in the field.	There are collaborative efforts. Authors from leading countries exchange knowledge, information, and innovative methodologies.	It is important to provide adequate support and funding to researchers, especially in research that requires long-term testing or that requires the development of technical programs.
Keywords	Results show that "human, "Alzheimer's", "language", "language ability",	The co-occurrence of language-related keywords and	The keywords in the analysis reflect the common relationships and different angles that	There are commonalities and diverse perspectives that can be studied

	<p>"language disability", and "Language disorders" are the most important keywords.</p>	<p>the terms "human" and "Alzheimer's" in the same search engine results indicates the critical significance of language-related research in the comprehension, diagnosis, and treatment of Alzheimer's.</p>	<p>can be approached between the topic of language impairments and Alzheimer's disease.</p>	<p>between the subject matter of language impairments and Alzheimer's disease, as reflected by the analysis keywords.</p>
<p>Subject Areas</p>	<p>Critical topic areas in this field include neuroscience, medicine, psychology, the social sciences, and the arts and humanities.</p>	<p>comprehensive contextual comprehension of how language difficulties are encountered, and managed among Alzheimer's patients is facilitated by the contributions of each discipline.</p>	<p>Exploratory medical humanities research that integrates insights from other corroborating academic disciplines to enhance comprehension of the field.</p>	<p>Promoting interdisciplinary research endeavors to yield more precise outcomes and enhanced understanding, with a particular focus on the contribution of technical and linguistics disciplines in this regard.</p>

Conclusion

This paper presented an inclusive bibliometric analysis of language disorders in Alzheimer's patients from 2013 to 2023. The current study presents the evolution of scientific research in this field by observing the impact of publications, influential countries and institutions, and science mapping analysis.

The results indicated an increase in publication over the past ten years, which confirms the importance of the topic. There is global interest led by some developed countries, with an expansion in presenting the issue from multiple specializations, allowing diverse visions to be presented about it. The analysis also indicated that there is significant cooperation between several researchers from different countries, which is important for the development of this scientific field.

The data collection for this study is limited to a single database. It contains only a portion of the accessible data, despite being one of the biggest and most complete databases with a broad variety of papers spanning a wide range of fields and providing access to a wide range of research. As a result, results should not be generalized without caution.

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