Review Article

Communication Disorders and Artificial Intelligence: A Short Bibliometric Review

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ABSTRACT

Aim: Due to the quadrupling in publications since 2022, a bibliometric study is a need of an hour. This study offers a thorough analysis of communication disorders across an appropriate time period from 1963-2022.

Methodology: Based on the PubMed database, a total of 8713 papers about communication disorders were examined during the time period. At the end, 6233 publications and 7012 key terms were retained specially related to communication disorders. The inclusion criteria involved the peer reviewed journal articles written in English and individuals with severe or nonverbal communication disabilities were excluded due to insufficient representative datasets.

Result: This study systematically reviews research articles on numerous parameters such as (i) cumulative frequency of keywords (ii) analysis of common key terms, (iii) top 10 research scientists, (iv) research article production of top 10 researchers, (v) co-occurrence of key terms. The number of publications increased by 67.7% (60 in 1980, 4725 in 2022). The findings revealed that Bishop DV has made significant contribution in this field. Psychology has contributed to the maximum number of documents than Medicine.

Conclusion - The paper examines the literature using meta-perspectives to analyses the quantitative traits of communication disorders. The proposed analytical study will be a vital resource for substantive discussion for the upcoming researchers. Future studies should focus on innovative treatments like brain-computer interface technologies, and AI-powered personalised therapies to progress in more accurate diagnosis and treatment of communication disorders.

Keywords: neurological disorders, communication disorders, artificial intelligence, interventions, mental health

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INTRODUCTION

The concept of Neuro Developmental Disorders (NDD) is complex and encompasses a very broad spectrum of neurological and psychiatric conditions, including intellectual disabilities, communication disorders, developmental delay, etc. Communication is essential for the exchange of information, listening, learning, delivering one's

thoughts, and establishing social and interpersonal relations. In NDD, communication is one of the major disorders that includes deficiencies in the ability to comprehend and receive verbal, nonverbal, and graphic symbols. The symptoms for the diagnosis of a communication disorder could be identified through deficits in language, speech, sound, childhood fluency (stuttering), social communication, and unspecified deficits (Mahabalagiri N. Hegde, 2021). Deficits in language acquisition and usage, speech, and social communication, along with impairments in motor skills and speech fluency, are the most prevalent features of communication disorders. These can appear as speech blocks, prolonged vowels or consonants, broken or fragmented words, repeated sounds or syllables, or words produced with excessive tension or physical effort. The short review discusses the growing academic and clinical interest in using AI-driven tools for assessment, intervention, and support of communication disorders. Despite the rising scholarly output, the research landscape remains fragmented, with many unexplored areas and emerging themes. This bibliometric review maps the literature, identifies influential contributors, and analyzes keyword trends and thematic clusters. The study will help the study understand current developments and suggest future research directions in the field of communication disorders and AI. The remaining paper is organised as follows: initially, the study offers a comprehensive examination of the prevalence and types of communication disorders, thereby establishing the issue's scope and impact. Subsequently, focus is on the increasing need for technological interventions in the field, and a concentrated analysis of artificial intelligence interventions that have demonstrated potential to enhance communication outcomes is conducted. The paper concludes with a concise bibliometric review that emphasises the most significant publication trends, influential contributors, and emerging research themes at the intersection of AI and communication disorders.

Communication disorders are thought to affect between 5 and 10 percent of the world's population, according to estimates from well-known international groups. In the United States, 5% of people have trouble communicating because they have speech problems, 3.3% have language problems, 1.4% have voice problems, and 0.9% have swallowing problems. In India, on the other hand, 21.5% of people aged 6 to 11 had hearing problems, 6.3% had dyslexia, 5.3% had neurogenic stuttering after a stroke, and 11.08% had speech and language disorders (*Centre for Disease Control and Prevention*, 2022). Communication disorders were caused by a variety of factors, such as aberrant brain development, prenatal factors, palate, exposure to chemicals before birth, and brain injury, in addition to developmental or acquired conditions. Communication disorders are commonly observed in children, and the symptoms are contingent upon the type of disorder and its underlying cause, which may include the misuse of words, repetitive sounds, inability to comprehend messages, or challenges in communicating in a manner that is comprehensible, as well as an individual's articulation, fluency, voice, and resonance quality. Speech, language, and communication abilities must be evaluated in the context of the individual's cultural and linguistic background. Therefore, the assessment protocols encompass morphological, pragmatic, orofacial, and diadochokinetic assessments, among others. According to the Centers for Disease Control and Prevention (*Centre for Disease Control and Prevention*, 2022) and the National Center for Health Statistics (Martin et al., 2014) survey, the prevalence of children aged 3 to 10 years who have experienced more than one type of communication disorder is shown in Figure 1.

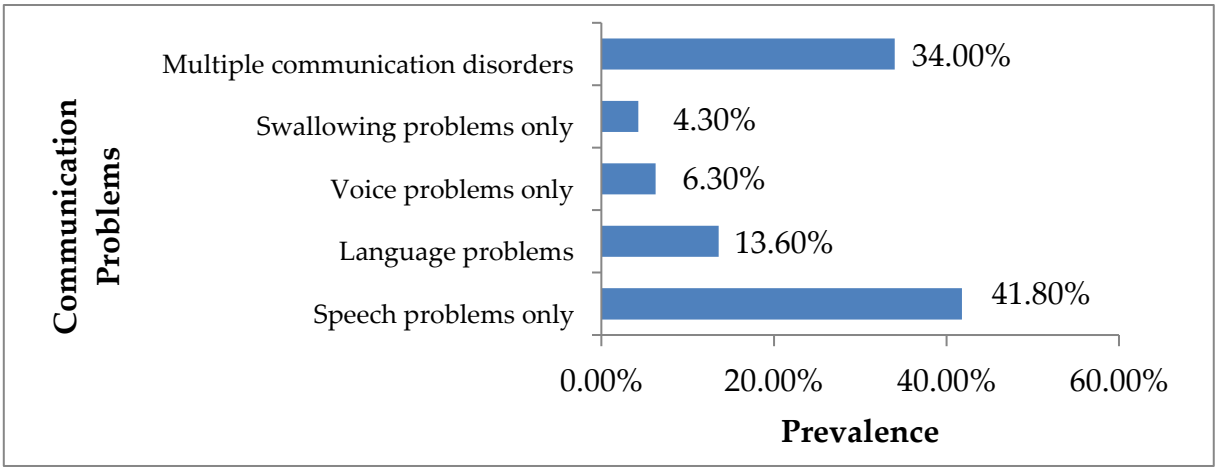

Figure 1. Various types of communication problems and their related prevalence have been reported around the world

The continuous study of literature has also revealed that there are not many gadgets and applications for support. Hence, there is a need to develop interventions to support individuals for the improvement of communication for their livelihood. Therefore, the goal of this short bibliometric review is to understand the concept of communication disorders, their symptoms, and risk factors. In addition to this, the idea is to provide early diagnosis and provide variety of measures or early interventions to support with the help of technologies for individuals suffering from communication disorders. To solve the research problem, the research papers of recent years were searched through various databases. Out of 50, the recent 11 publications were selected and reviewed based on the relevant facts, keywords, and research on technological interventions. The inclusion criteria encompassed peer-reviewed journal articles published in English, while individuals with severe or nonverbal communication disabilities were excluded due to inadequate representative datasets.

In this contemporary era, Artificial Intelligence (AI) is being used for clinical diagnosis of various conditions like communication disorders, Autism Spectrum Disorder (ASD), Parkinson's or Alzheimer's disease, fragile-x syndrome, etc. Present computer-aided diagnosis and interventions in different health fields are primarily utilizing diverse AI approaches for such as machine learning, deep learning, and artificial neural networks. In a broad sense, AI refers to computational systems that can perform tasks with human-like intelligence. Over the past ten years, there have been several systematic studies of AI interventions for individuals with communication deficits (D'Alfonso, 2020). Muskan et al. developed an artificial intelligence-based device to support individuals with communication disorders. The developed application enhanced social communication and social cognition among individuals with communication disorders (Chawla et al., 2024). Attwell et al. reviewed that AI plays a significant role in improving the communication of impaired individuals. With the support of therapists, AI interventions can provide several benefits to individuals with communication disorders (Attwell et al., 2022). In addition, AI has also shown itself to be a very useful method, offering a quick and easy approach to evaluate situations, behaviors, communications, etc. Many researchers implemented AI to provide early and objective diagnosis interventions. AI-based interventions like health screening systems, virtual human avatars, and therapeutic and diagnostic chatbots proved to be beneficial (A. & R., 2023; Bhardwaj et al., 2024; Jia et al., 2022; Zhang et al., 2024). AI interventions showed a huge number of improvements and support individuals to excel in every phase of life (Laacke et al., 2021).

The aim of the study is to provide a comprehensive bibliometric study on neurodevelopmental disorders to examine the publication trends, collaborators, citation impact, and growing research themes over a stipulated time period.

METHODS

This review has been conducted using PubMed data sources. The data was collected and processed using structured information from articles. A general search query was used for title, abstract, and key terms: "(Title-abs-key ("communication" AND "disorder")" in order to find a large number of publications on communication disorders. As of September 8, 2022, the outcome was a list of 8713 articles that were compiled during the period of 1963 to 2022. As the next step, the titles and abstracts were strictly filtered in line with the previously developed inclusion criteria so that only investigations that directly used or tested the methods of artificial intelligence in the assessment, diagnosis, or treatment of communication disorders were selected. The inclusion criteria involved the peer-reviewed journal articles written in English, and individuals with severe or nonverbal communication disabilities were excluded due to insufficient representative datasets. Any non-scholarly communication, textbook chapters, and articles that could not be determined to be intertwined between these fields were then eliminated. Finally, 6233 publications and 7012 key terms about communication disorders were retained. Later, bibliographic entries based on the resulting dataset were loaded into analytic tools, including VOSviewer and Bibliometrix, to deconstruct publication patterns, authorship relationships, collaboration structures, Keyword co-occurrence tables, as well as citation networks.

FINDINGS

The growth rate of annual scientific production is 7.04 %. Figure 2 shows the total number of articles containing the keyword by year. The cumulative occurrence of related keywords such as autism, children, communication disorders, and so on is increasing significantly year after year.

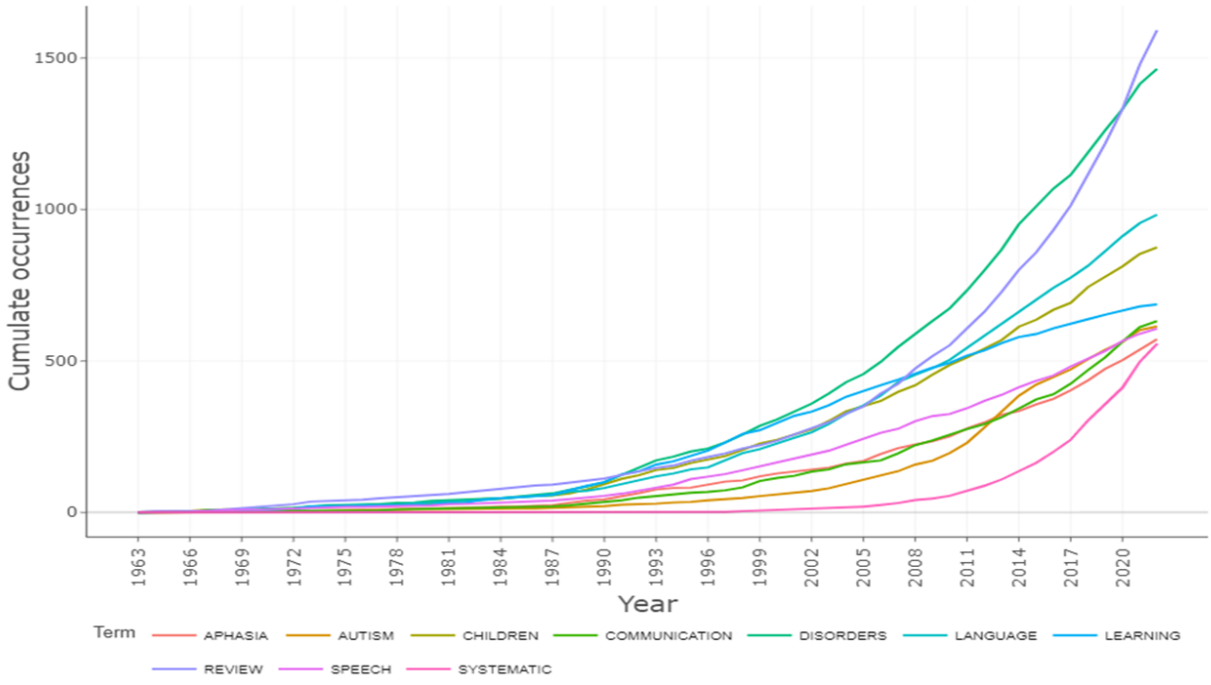

Figure 2. Depicts a rise in the cumulative frequency of keywords in articles

The most highly cited publications were written by Bishop DV and Wang Y (22), followed by Cryan JF (20), Fletcher JM (19), Dinan TG (18), and so forth, are shown in Table 1. Figure 3 shows the article production per year by the top 9 researchers. Through this, researchers can gain insights into the contributions and research impact of these top academics in their field.

Table 1. The top 9 research scientists in the field of communication disorders and ASD

Most relevant authors	No. of documents
BISHOP DV	22
WANG Y	22
CRYAN JF	20
LOGEMANN JA	20
FLETCHER JM	19
DINAN TG	18
FISHER SE	18
HILLIS AE	18
ONSLOW M	18

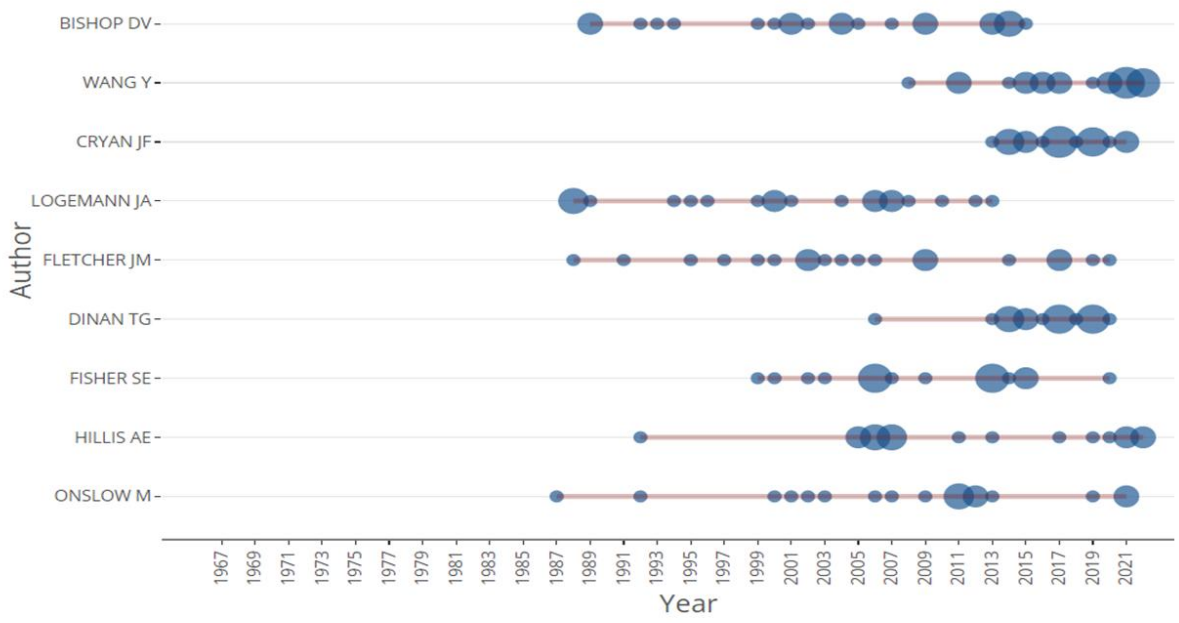

Figure 3. Top 9 authors' research article production per year

Table 2 displays the frequency of a specific keyword. The most often occurring keywords were "communication," "disorders," "infants," "language," and "human." The word "child" is used the most (2,975 times), suggesting that children are a major topic of research. "Female" (1,803) and "male" (1,711) come next, indicating a strong focus on gender-related research. A focus on early childhood and youth populations is further indicated by the inclusion of the terms "child preschool" (1,273) and "adolescent" (1,101).

Table 2. Most relevant keywords with frequency

Most relevant terms	No. of frequency
Child	2975
Female	1803

Most relevant terms	No. of frequency
Male	1711
Child preschool	1273
Adolescent	1101
Adult	1059
Language	506
Aged	485
Diagnosis differential	461
Middle aged	454
Risk factors	416
Neuropsychological tests	400
Infant newborn	306
Age factors	290
Language development	283
Prognosis	272
Phonetics	268
Comorbidity	258
Cooperative behavior	234
Speech therapy	210
Interpersonal relations	207
Speech/physiology	155
Learning disabilities/etiology	178
Cognition/physiology	148
Speech therapy/methods	147

DISCUSSION

In the discussion section, the bibliometric analysis indicates a consistent and escalating rise in research that concentrates on communication disorders, particularly from the late 1990s onwards. The highest cumulative occurrences of terms such as language, speech, learning, and many more are indicative of the primary areas of scholarly focus. The prevalence of terms such as child, preschool, female, and adolescent indicates a significant emphasis on the developmental aspects of communication disorders. The author analysis suggests that Bishop DV, Wang Y, and Cryan JF have made consistent and significant contributions in recent decades. The clustering of publications in the 2000s and beyond suggests that technological advances and clinical demand are driving interdisciplinary collaboration and interest. The patterns are consistent with the global initiative to incorporate AI into diagnosis and intervention. Additionally, the examination of the most relevant terms shows that literature is mainly developmental and age-related in character, with child, preschool child, adolescent, and infant/newborn becoming the most mentioned terms, thus demonstrating a clear focus on the issue of early identification and intervention. The strong number of gender-related words, female and male, indicates that the study of sex-based differences in prevalence and outcomes has been maintained as a scholarly focus. Words used in the core of linguistics and speech-related related (language, language development, phonetics, and speech/physiology) are important to highlight the biggest role of communication mechanisms represented in this sphere. The high usage of clinical terms such as differential diagnosis, risk factors, prognosis, and comorbidity is indicative of a strong clinical orientation that seeks to promote the level of diagnostic accuracy. The results emphasize the necessity of ongoing cross-disciplinary research to capitalize on AI's potential to enhance communication disorder outcomes and

address gaps. People with communication disorders are citizens of our society, but they frequently receive unjust treatment and are neglected. Such unique people struggle to fit in and deal with a lot of stress in their daily lives. As a result, there is a need to develop tailored AI-based interventions to improve their communication and help individuals improve their livelihood. The short bibliometric study highlights the increasing work at the crossroads of artificial intelligence and communication disorders to help individuals. The multidisciplinary nature of the field has the potential to transform the diagnosis, assessment, and development of interventions for individuals with communication disorders. Furthermore, the integration of cutting-edge technologies can develop accurate and scalable solutions for the impaired individuals.

CONCLUSION

The review illuminates the growing intersection of communication disorders and the artificial intelligence field, tracing an undeniable upward trend in academic production, an increase in the quality of research methods, and an intellectual fusion across various fields. The analysis indicates the trends in the domain of assessing, diagnosing, and concurring communication disorders, focusing on the use of AI-based methods, including machine learning and natural language processing, as well as advanced signal-processing algorithms. Although the studied literature of knowledge testifies to significant improvement, there are also salient gaps, like the lack of large-scale empirical studies, the diversity of studies on the topic across the globe, and the need to thoroughly verify AI-based assessment and interventional instruments in the context of a real clinical environment. The findings prove that AI carries significant potential in enhancing the accuracy, accessibility, and efficiency of assessments and support systems of therapy in the field of communication disorders. As concluding remarks, AI interventions appear to be beneficial for enhancing the quality of life for those with such neurological disorders. The study also emphasises the value of interdisciplinary approaches, combining AI, psychology, and neuroscience to improve diagnostic and treatment techniques.

RECOMMENDATIONS

Future research should concentrate on cutting-edge interventions like brain-computer interfaces, virtual reality-assisted speech therapy, and AI-driven personalised treatment. Furthermore, cross-cultural research can increase the intervention's global applicability, and longitudinal studies are crucial for monitoring the development of communication disorders over time.

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Declaration of Conflicting Interests

The authors declare that there is no conflict of interest.

Data Availability Statement

The data analyzed during the study will be made available upon reasonable request.

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