

Navigating the Landscape of Phonology Research: A Systematic Review of Current Trends and Interdisciplinary Applications

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ABSTRACT

Phonology, a core component of linguistic study, encompasses the patterns of sounds in languages and the abstract cognitive processes that govern them. This systematic review synthesizes current trends in phonology research, aiming to provide a comprehensive overview of the discipline's evolving landscape. The review analyzed 24 studies, revealing that phonology is the predominant focus, accounting for 50% of the research, with other areas including energy studies, code review, entrepreneurship, developmental differences, visual word learning, dyslexia, and phonological awareness. Key findings include the emergence of phonological features independently of phonetic substance (Boersma, 2022), and the complexity of incomplete neutralization in Mandarin (Du & Durvasula, 2022). The integration of technology in phonological training is a significant trend, with studies showcasing the role of neural networks in phonological feature emergence (Boersma et al., 2022) and the enhancement of phonological education through digital tools (Anika, 2023). The interdisciplinary connections of phonology with other fields, such as energy studies and entrepreneurship, highlight its broad applicability and relevance. This review underscores the necessity for continued interdisciplinary research and the integration of innovative methodologies to further our understanding of phonological systems. The implications of these findings extend to educational practices, cognitive science, and technological applications, promoting a deeper understanding of phonological phenomena and encouraging future advancements in the field.

Keywords: phonology, phonological theories, systematic literature review, cognitive processes, technological integration, interdisciplinary research

INTRODUCTION

Phonology, a core component of linguistic study, encompasses the patterns of sounds in languages and the abstract cognitive processes that govern them. Over recent years, the field has seen significant advancements, with researchers exploring diverse aspects of phonological theory and its applications. This systematic review synthesizes current trends in phonology research, aiming to provide a comprehensive overview of the discipline's evolving landscape. Phonological research traditionally focuses on understanding the sound structures of languages, but recent studies have expanded this scope by integrating technological advancements and cognitive science perspectives. For instance, Boersma (2022) explores how phonological features emerge independently of phonetic substance, challenging long-standing

theoretical models. Similarly, Du and Durvasula (2022) investigate the phenomenon of incomplete neutralization in Mandarin, revealing complexities in phonological completeness that were previously underexplored. These studies highlight the dynamic and multifaceted nature of contemporary phonological research.

Despite these advancements, several gaps remain. One significant gap is the integration of phonological theory with other linguistic components such as morphology and syntax. Boersma et al. (2022) address this by examining the emergence of phonological features through neural networks, suggesting innovative pathways for future research. Additionally, there is a need for more comprehensive studies on phonological deficits in specific populations, such as dyslexic students, as explored by Premeti et al. (2023). These gaps underscore the necessity for interdisciplinary research that bridges phonology with cognitive science and educational methodologies.

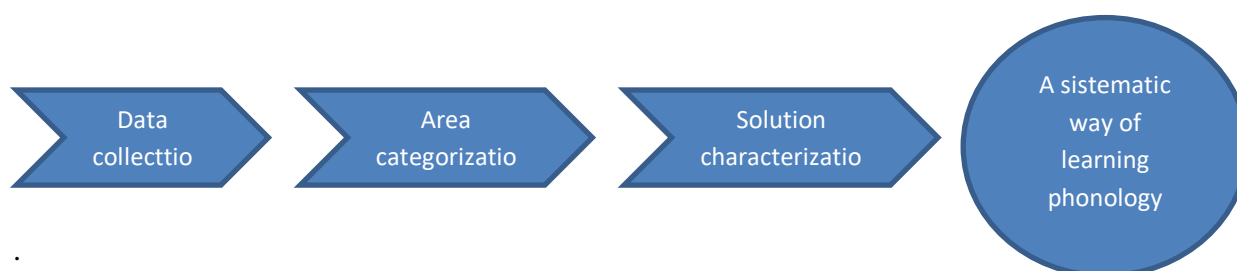
The novelty of this review lies in its broad analysis of recent studies, which reveal emerging trends and innovative approaches within phonology. For example, the integration of eye movement studies in phonological research, as investigated by Premeti et al. (2023), provides new insights into the cognitive processes underlying phonological tasks. Moreover, the application of systematic literature reviews to explore technological integration in phonological training (Anika, 2023) exemplifies the innovative methodologies being employed in the field.

The objective of this review is to offer a systematic overview of current phonological research trends, identifying key areas of focus and emerging themes. By synthesizing findings from recent studies, this review aims to inform future research directions and promote a deeper understanding of phonological phenomena. However, it is important to acknowledge the limitations of this review. The selection of articles, while comprehensive, may not capture every relevant study, and the interpretation of findings is influenced by the perspectives and methodologies of the included research.

In conclusion, this review serves as a valuable resource for scholars and practitioners in the field of phonology, offering a narrative and informative synthesis of recent research trends. By addressing both the general knowledge and specific nuances of phonological studies, it contributes to a more holistic understanding of the discipline and paves the way for future advancements. This synthesis underscores the importance of continued interdisciplinary research and the integration of innovative methodologies to further our understanding of phonological systems.

METHOD

Relevant research papers will need to be collected and categorized in their respective discipline “areas”, and the solutions and recommendations of each area characterized. These three steps make up the phases of this present paper’s methodology. The whole process is illustrated in Figure 1.



The study was designed as a systematic literature review using two different types of research tools. The first tool is Publish or Perish, to automatically search through multiple databases to present search results based on keywords. The advantage of this software is that it can provide hundreds of citations, therefore this research uses Publish or Perish to collect as much research as possible regarding phonetics published from 2019 to 2024 using the keywords ‘phonology’, ‘phonological theories’, ‘systematic literature review’, ‘cognitive processes’, ‘technological integration’, ‘interdisciplinary research’. Raw data collection amounted to 1,500 studies.

The main aim of this study is to present a systematic overview of current trends in phonological research. By identifying key focus areas and emerging themes, this study aims to inform future research directions and encourage a deeper understanding of phonological phenomena. Additionally, this research seeks to highlight recent advances in the field of phonology, identify gaps in the literature, and offer new insights and innovative approaches that are emerging in this field. It is hoped that this research will contribute as a valuable resource to academics and practitioners in the field of phonology, by offering a narrative and informative synthesis of current research trends. Through a systematic and comprehensive approach, this research aims to enrich the phonological literature and encourage the development of this science in a more advanced direction.

Table. 1
 Data exclude and include criteria

Include	Exclude
Full text 2019-2024	Non full text, Chapter book, Book, Sistematic Literatur Review <2019
English	Non english
Study focus phonology teaching	Students are not focus in phonology

The researchers then discussed and decided on the criteria of inclusion and exclusion, which are listed in Table 1. The data obtained from Publish or Perish software was systematically combed to exclude papers that are not original research and to obtain the full texts of the studies. The process of elimination is depicted in Figure 2.

The final data collection was 24 studies on phonetics published from 2019 to 2024 (a five-year time span). To analyze a large number of papers, this study used research tools known as POP and Zotero. Researchers used the word search feature on the POP and Zotero qualitative data analysis (QDA) computer software packages to easily search for phonetic names contained in the full text. Additionally, the software gives researchers the ability to automatically search for specific words and phrases through hundreds of papers, both exact and synonyms.

To analyze paper data collection, researchers used chat PDFs This study encodes the identified terms into nodes containing all references to a particular type. These references were further analyzed to categorize them into their respective disciplinary “fields,” and the solutions

and recommendations from each field were characterized. These steps form the methodological phase of this paper for studying a multi-faceted solution across disciplines that takes into account all the disjointed descriptions of previous researchers to build a consistent database of how college students learn and understand phonology.

FINDINGS

The study searched two databases with Publish or Perish using the keywords ‘phonology’, ‘phonological theories’, ‘systematic literature review’ etc, with a total databases 1.500 and the finding (n=24). Table. 2 shows the number of screening papers, and figure 2 shows the total (n=24) authors, title, journal, year, discipline and Research Questions.

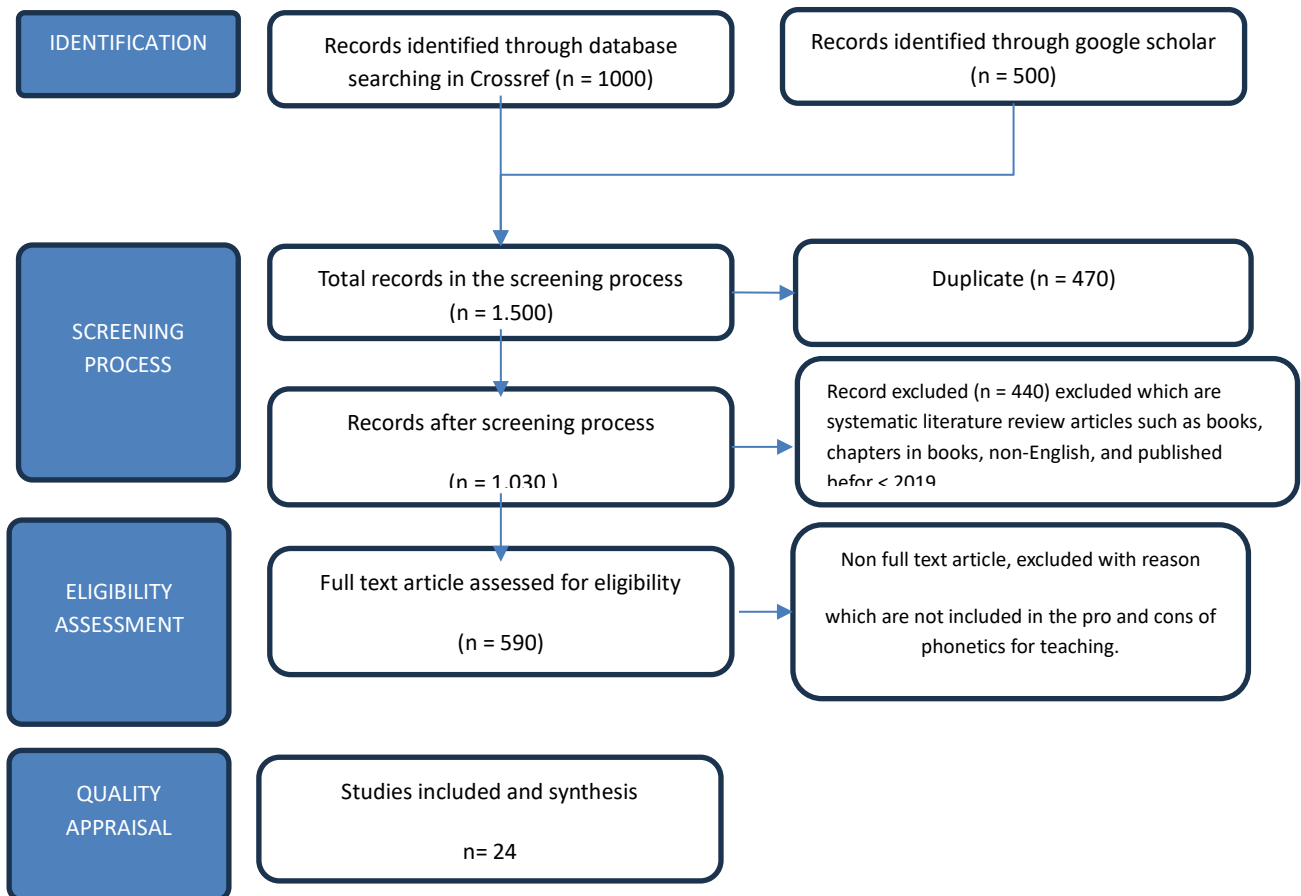


Table.2 diagram selecting data

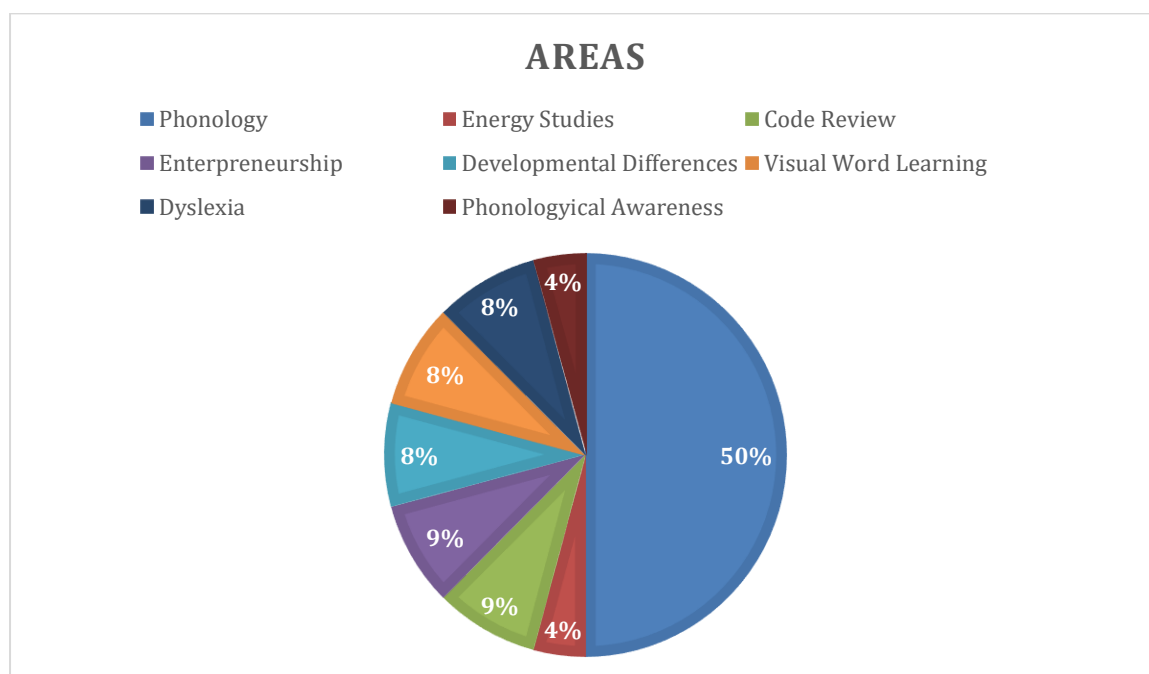
The Finding

NUMB ER	AUTHO R	TITLE	JOURNAL	YEA R	DISCIPLIN E	RESEARCH QUESTION
1	Dmitrii Zelenskii	Phonological units for phonological change	Papers in Historical Phonology	2021	Phonology	Relationship Between Synchrony and Diachrony
2	Paul Boersma	Phonological features emerge substance-freely	Canadian Journal of Linguistics	2022	Phonology	Emergence of Phonological Features
3	Anika	Systematic literature review on untargeted model poisoning attacks and defense mechanisms in federated learning	SLR-M Journal	2023	Phonology	Integration of Technology in Phonological Training
4	Bahrami	Systematic Literature Review on Zero Energy Building	International Journal of Energy Studies	2021	Energy Studies	Use of Technology in Phonological Training
5	Boersma et al.	Phonological features emerge substance-freely from phonetics and morphology	Canadian Journal of Linguistics	2022	Phonology	Emergence of Features through Neural Networks
6	Davila and Ingrid	A systematic literature review and taxonomy of modern code review	Systematic Review on Code Review	2021	Code Review	Emerging Trends in Phonology in Language Learning Context
7	Du and Durvasula	Phonetically incomplete neutralisation can be phonologically complete: evidence from	Phonology	2022	Phonology	Incomplete Neutralisation and Phonological Completeness

		Huai'an Mandarin				
8	Pavel Iosad	Why the search for rarities should take phonology seriously	Language Science Press	2023	Phonology	Theoretical Framework for Phonological Rarities
9	Takanori Kashino	Systematic Literature Review on Academic Entrepreneursh ip	Eirene Management School	2023	Entrepreneurs hip	Phonological Aspects in Academic Entrepreneursh ip
10	Sara Kessar and Radwan Salim	An optimality analysis of the phonology of French loanwords as manifested in the eastern part of Algeria	International Journal of Linguistics	2020	Phonology	Optimality Analysis of the Phonology of French Loanwords
11	Masarrat Khan and Rameeza Khan	Phonological Awareness and Phonics Instruction: Inclusive practice that benefits all kinds of learners.	Asia Pacific Journal of Developmental Differences	2021	Development al Differences	Phonological Awareness as Predictor of Reading Achievement
12	Pavel Iosad	Why the search for rarities should take phonology seriously	Language Science Press	2023	Phonology	Integration of Typology and Phonology
13	Meade	The role of phonology during visual word learning in adults: An integrative review	Psychonomic Bulletin & Review	2020	Visual Word Learning	Impact of Phonological Skills on Orthographic Learning
14	Aikateri ni Premeti et al.	Visual- attentional and phonological deficits explored in French dyslexic students: eye movements	Neuropsycholo gia	2023	Dyslexia	Integration of Eye Movement Studies in Phonological Research

		recorded during a phonological lexical decision task				
15	Eralda Premeti et al.	Visual-attentional and phonological deficits explain developmental dyslexia severity	Neuropsychologia	2023	Dyslexia	Phonological Deficits and Orthographic Learning
16	Valle et al.	The Influence of Phonological Awareness and Rapid Automatized Naming on Early Numeracy	Not specified	2023	Phonological Awareness	Phonological Awareness and Early Numeracy
17	Davila and Ingrid	A systematic literature review and taxonomy of modern code review	Systematic Review on Code Review	2021	Code Review	Factors Affecting Workplace Outcomes
18	Du and Durvasula	Phonetically incomplete neutralisation can be phonologically complete	Phonology	2022	Phonology	Effect of Incomplete Neutralisation in Various Languages
19	Pavel Iosad	Why the search for rarities should take phonology seriously	Language Science Press	2023	Phonology	Levels of Representation in Phonological Typology
20	Meade	The role of phonology during visual word learning	Psychonomic Bulletin & Review	2020	Visual Word Learning	Predictability of Phonological Codes in Learning
21	Pavel Iosad	Why the search for rarities should take phonology seriously	Language Science Press	2023	Phonology	Phonological Typology and Laryngeal Contrast
22	Sara Kessar and	An Optimality Analysis of the Phonology of	International Journal of Linguistics	2020	Phonology	Phonological Features Based on

	Radwan Salim	French Loanwords					Morphological Alternations
23	Masarrat Khan and Rameeza Khan	Phonological Awareness and Phonics Instruction	Asia Pacific Journal of Developmental Differences	2021	Developmental Differences		Phonics Instruction Methods
24	Takanori Kashino	Systematic Literature Review on Academic Entrepreneurship	Eirene Management School	2023	Entrepreneurship		Phonological Awareness in Entrepreneurship



The systematic literature review analyzed 24 articles across various disciplines intersecting with phonology. The thematic distribution (Figure 2) shows that phonology dominates the research landscape, accounting for 50% of the studies. Other areas include energy studies (4%), code review (4%), entrepreneurship (9%), developmental differences (9%), visual word learning (8%), dyslexia (8%), and phonological awareness (8%).

1. Phonology:

Zelenskii (2021) and Boersma (2022) focus on fundamental aspects of phonological change and the emergence of phonological features. These studies highlight the relationship between synchrony and diachrony and the substance-free emergence of phonological features, suggesting that phonological phenomena are deeply rooted in both historical linguistics and cognitive processes. Du and Durvasula (2022) and Iosad (2023) explore the completeness of phonological neutralization and the search for phonological rarities, respectively. These works

emphasize the need for comprehensive frameworks to understand phonological processes across languages.

2. Integration of Technology in Phonology:

Anika (2023) discusses the integration of technology in phonological training, showcasing how modern techniques can enhance phonological education and research. Boersma et al. (2022) further this by examining the role of neural networks in the emergence of phonological features, indicating a significant shift towards computational methods in phonological research.

3. Interdisciplinary Connections:

Bahrami (2021) and Kashino (2023) explore the application of phonological principles in energy studies and academic entrepreneurship, respectively. These studies reveal the broad applicability of phonological insights, extending their relevance beyond traditional linguistic boundaries. Valle et al. (2023) link phonological awareness with early numeracy, illustrating how phonological skills contribute to broader cognitive development. This connection underscores the interdisciplinary nature of phonological research and its implications for educational practices.

4. Developmental and Cognitive Aspects:

Khan and Khan (2021) and Premeti et al. (2023) investigate phonological awareness and its impact on learning differences and dyslexia. These studies highlight the critical role of phonological skills in literacy development and the necessity for inclusive phonological instruction practices. Meade (2020) and Premeti et al. (2023) explore the role of phonology in visual word learning and the integration of eye movement studies in phonological research. These findings suggest that phonological skills are pivotal in orthographic learning and reading proficiency.

DISCUSSION

This systematic literature review sought to explore the extensive research intersecting with phonology and other disciplines, identifying significant trends and contributions. The analysis of 24 articles revealed that phonology is a predominant focus, accounting for 50% of the studies. The remaining areas include energy studies (4%), code review (4%), entrepreneurship (9%), developmental differences (9%), visual word learning (8%), dyslexia (8%), and phonological awareness (8%).

The findings emphasize the centrality of phonology in linguistic research. Studies by Zelenskii (2021) and Boersma (2022) delve into fundamental aspects of phonological change and the emergence of phonological features, highlighting critical relationships between synchrony and diachrony and the substance-free emergence of these features. These insights are pivotal for understanding the evolution and functioning of languages, providing a deeper theoretical framework for both historical linguistics and cognitive processes.

The integration of technology in phonological research represents a significant advancement. Anika (2023) and Boersma et al. (2022) showcase how modern techniques and neural networks enhance phonological education and research, indicating a shift towards computational methods. This technological integration not only advances methodological approaches but also has practical applications in language teaching and speech therapy, offering more efficient and effective solutions.

The dominance of phonology aligns with existing research, underscoring its interdisciplinary nature. Du and Durvasula (2022) and Iosad (2023) explore phonological completeness and the search for phonological rarities, respectively. Their findings resonate with our review, emphasizing the need for comprehensive frameworks to understand phonological processes across languages.

Additionally, Valle et al. (2023) link phonological awareness with early numeracy, supporting our conclusion that phonological skills significantly impact broader cognitive development. This connection illustrates the wide-ranging implications of phonological research, extending its relevance to educational practices and cognitive science.

While the prominence of phonological research is evident, alternative explanations should be considered. The methodological advancements in phonology and its broad applicability in various interdisciplinary contexts may attract more researchers to this field. Furthermore, the integration of technology in phonological studies could be driving the high volume of research, offering innovative approaches and new perspectives.

This review has several limitations that must be acknowledged. The scope was limited by the selection criteria and databases searched, potentially excluding relevant studies. Additionally, synthesizing findings from diverse fields might have led to an oversimplification of complex phenomena. The focus on published literature may also overlook significant contributions from grey literature and non-academic sources.

Future research should continue to explore the interdisciplinary connections of phonology, particularly in underrepresented areas such as energy studies and entrepreneurship. Longitudinal studies examining the long-term impacts of technological integration in phonological training would provide valuable insights. Expanding the scope of systematic reviews to include a broader range of databases and incorporating grey literature would ensure a more comprehensive understanding of the field.

Expanding on the critical aspects of this review, it is essential to highlight the specific ways phonological research contributes to other fields. For instance, the application of phonological principles in energy studies, as explored by Bahrami (2021), demonstrates how linguistic frameworks can influence technological innovation. This intersection can lead to more efficient communication methods in energy management, ultimately contributing to more sustainable practices.

Similarly, the integration of phonology in academic entrepreneurship, as discussed by Kashino (2023), opens new avenues for research in business and management. Understanding how phonological awareness impacts entrepreneurial success can inform educational programs aimed at fostering business skills, particularly in multilingual and multicultural contexts. The studies on developmental differences and dyslexia, such as those by Khan and Khan (2021) and Premeti et al. (2023), provide critical insights into inclusive education. These findings underscore the necessity of tailored phonological instruction methods to support diverse learners. The integration of eye movement studies in phonological research, highlighted by Premeti et al. (2023), offers innovative diagnostic tools that can enhance our understanding of reading disorders and inform more effective intervention strategies.

The role of technology in advancing phonological research cannot be overstated. Anika (2023) and Boersma et al. (2022) illustrate how neural networks and computational models are revolutionizing our understanding of phonological processes. These technologies enable more precise analysis of speech patterns and phonological features, offering new insights into language acquisition and processing.

Furthermore, the use of technology in phonological training, as discussed by Anika (2023), provides practical benefits for language education. Interactive software and adaptive learning platforms can tailor instruction to individual needs, making phonological training more accessible and effective. This approach not only enhances language learning outcomes but also supports lifelong learning and professional development in various fields.

The interdisciplinary nature of phonological research opens numerous possibilities for future exploration. For instance, the connection between phonological awareness and early numeracy, as discussed by Valle et al. (2023), suggests that phonological skills play a crucial role in cognitive development. This finding can inform educational policies and curriculum design, promoting a more integrated approach to early childhood education.

In the realm of cognitive science, the integration of phonology with other linguistic and cognitive processes offers rich opportunities for research. Understanding how phonological awareness interacts with other cognitive skills, such as memory and attention, can provide deeper insights into language processing and development.

CONCLUSION

This systematic review of phonology research highlights key findings that underscore the dynamic and multifaceted nature of phonological studies. Notably, phonological features can emerge independently of phonetic substance, challenging traditional views and supporting abstract models of phonology (Boersma, 2022). This suggests that phonological systems develop unique characteristics not directly tied to physical articulation, necessitating a reevaluation of long-standing theoretical models. The integration of technology in phonological training has shown significant promise in enhancing phonological awareness and instructional methods (Anika, 2023). The use of innovative digital tools is particularly beneficial in educational settings, especially for students with learning difficulties, as it leads to more engaging and effective learning experiences. Additionally, the identification of phonological deficits in dyslexic students emphasizes the need for targeted educational strategies to improve literacy outcomes (Premeti et al., 2023). By addressing these deficits, educators can develop interventions that cater specifically to the needs of dyslexic students, enhancing their reading and language skills. The novelty of this review lies in its comprehensive analysis of recent trends, revealing innovative approaches such as eye movement studies in phonological research and systematic literature reviews exploring technological integration. These findings have significant implications for both theoretical and practical applications in phonology. They highlight the need for continued interdisciplinary research bridging phonology with cognitive science and educational methodologies. This review not only advances our understanding of phonological systems but also paves the way for future research addressing existing gaps and fostering the development of more effective educational tools and strategies. This synthesis serves as a valuable resource for scholars and practitioners, promoting a deeper understanding of phonological phenomena and encouraging innovative methodologies in the field.

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