

A Review of Language Interventions for Children with Learning Disabilities in China over the Past Forty Years: Keyword Analysis and Research Trajectory Outlook Based on CiteSpace

Renxin Qiu[#], Bei Chen^{#,*}

Xi'an Eurasia University, Xi'an, Shaanxi, China

[#]These Authors Contributed Equally to This Research.

**Corresponding Author.*

Abstract: This study systematically reviews and analyzes research on language intervention for children with learning disabilities over the past four decades using the visual analysis tool CiteSpace on the CNKI platform. By constructing a knowledge graph, the study explores the evolving trends in temporal and spatial distribution of these studies, as well as the main characteristics of the research content. The results indicate a consistent growth in the quantity of related studies over the years, with a primary research focus centered around teacher training institutions, highlighting a high level of research attention on academic development. Further analysis of the key word knowledge graph reveals that cognitive intervention forms the core content of research in this field. In the initial stages of research, many studies drew upon Western research outcomes and experiences. However, due to significant linguistic differences between Chinese and English, researchers gradually recognized inadequacies in considering text specificity. Subsequent research shifted its focus to morphological studies in Chinese, demonstrating the significant predictive role of Chinese morphemes in students' language development. Additionally, the study uncovers limitations in many current intervention and teaching methods, suggesting the need to explore comprehensive intervention strategies that integrate cognition with academic learning to achieve more thorough and effective intervention outcomes.

Keywords: Phonological Awareness; Morphological Awareness; Learning

Disabilities; Dyslexia; Visual Analysis

1. Introduction

The evolution of special education stands as a pivotal discussion within the realm of education. The advancement of society and technology has paved the way for enhanced educational opportunities and support for children with special needs. Previously, these individuals were often marginalized or excluded from mainstream educational systems. Nonetheless, with the deepening understanding of multiculturalism and inclusivity, special education has progressively garnered increased attention and backing. Today, educational institutions and schools offer tailored educational services for special needs children, encompassing personalized instruction, restorative training, and psychological reinforcement. One crucial domain within special education is the realm of learning disabilities, which has been witnessing a slow but steady surge in research in China. Language learning disabilities typically include challenges related to phonological awareness, morphological awareness, or a combination of both, with a predominant emphasis on phonological awareness. Phonological awareness denotes an individual's conscious capacity to engage with and manipulate spoken language sounds, incorporating syllable awareness, onset-rime awareness, and phoneme awareness. This encompassing skill set spans activities like phonemic segmentation, synthesis, and sound discrimination [1]. Children with learning disabilities in language face profound attention within the special education domain. Their struggles with language expression and comprehension impede their integration into conventional educational settings, thereby

impacting their physical and mental well-being, as well as future growth. Unraveling the underpinnings and mechanisms of language learning disabilities stands as a critical stride in formulating scientific-backed intervention strategies. This study employs CiteSpace software to scrutinize the frequency of keywords in pertinent literature, visually dissecting research focal points and trends. Such an analytical approach aids in swiftly grasping the contemporary landscape and developmental trajectories, bearing significant implications for research on language learning disabilities in the domain of special education.

2. Research Tools and Process

2.1 Research Tools

CiteSpace software stands as a powerful tool for scientific literature analysis, employing visualization techniques to unveil the structure, patterns, and distribution of scientific knowledge, thereby crafting a “scientific knowledge graph”. In this study, the CiteSpace 6.3.R1 version was utilized to map and analyze Chinese literature on language learning disabilities in children with learning disabilities. Through the visualization techniques of Cluster View-static and Show Merged Network, the final analytical map was presented in an illuminating manner.

2.2 Research Process

2.2.1 Data selection

Clustering scientific papers offers researchers a comprehensive insight into the dynamics and key elements within an academic domain, encompassing scholars, research institutions, and focal points. This facilitates a macroscopic understanding of research trends and trajectories. In order to ensure the precision and efficacy of data collection, this study rigorously followed the principle of relevance. By employing search parameters like “learning disabilities, phonological awareness”, “learning disabilities, morphological awareness”, “learning disabilities, dyslexia”, and “learning disabilities, intervention”, academic papers intimately tied to language learning disabilities in children with learning disabilities were meticulously chosen. Adhering to the completeness principle, the study ensured that critical data such as authorship details, abstracts, keywords, and

publication dates were explicitly delineated. Additionally, the exhaustive approach was adopted to draw from diverse sources, including the China National Knowledge Infrastructure (CNKI), the Chinese Doctoral Dissertations Full-text Database, and the Chinese Master’s Theses Full-text Database. The research timeline spanned from January 1, 1994, to March 30, 2024, capturing a broad spectrum of literature spanning over three decades concerning language learning impediments in children grappling with learning disabilities.

2.2.2 Data preprocessing

The study utilized keyword searches, followed by manual screening to eliminate irrelevant data such as reports, conference notices, interviews, and calls for papers, resulting in 178 valid documents. These documents were saved in RefWorks format and underwent data encoding (Data-import/export). To effectively identify key milestones and temporal patterns in the research evolution of language learning disabilities in children with learning disabilities, the data from 1994 to 2024 was segmented into one-year intervals (Years Per Slice = 1). For a thorough analysis of the research content, the node types “Keyword”, “Author”, and “Institution” were selected sequentially. In the node selection method “g-index”, a k-value of 20 was used. In the simplification process, options such as “Pathfinder” and “Each Time Period” were selected, while other parameters were left at their default settings.

3. Research Findings and Analysis

3.1 Exploration of Spatiotemporal Knowledge Graphs and Insights

3.1.1 Fluctuating and rising of publication trends

Analyzing the trajectory of scholarly articles on interventions in language learning for children with learning disabilities reveals a fluctuating yet upward trend since 1997. Post-2003, the acceleration in publication growth became evident, peaking in 2013 after a period of notable fluctuations between 2007 and 2021. This trend underscores the rising interest in language interventions for children with learning disabilities. Notably, given the delayed initiation of research in this domain within China and the inherent complexity of

interdisciplinary studies, the variability in publication numbers over time reflects the intricate landscape of this field.

3.1.2 Dominance of educational institutions and authors from normal universities

An exploration of the knowledge graph of research institutions, developed using CiteSpace software, along with Table 1, reveals that the primary contributors to research on language intervention for children with learning disabilities comprise higher education institutions, particularly normal universities, followed by comprehensive universities, as well as uncharted entities such as educational research departments, hospitals, and primary schools. Further scrutiny, focusing on institutions appearing four or more times, highlights significant research contributors such as East China Normal University, Shaanxi Normal University, Central China Normal University, Hunan Normal University, and Northwest Normal University. These establishments collectively form the vanguard in studying language interventions for children facing learning challenges. This indicates that the inception of this field in China is rooted in the pedagogical and child-centric research vantage, emphasizing an assessment of teaching efficacy and a critical examination of the linguistic learning barriers encountered by students, subsequently propelling research and intervention endeavors.

Table 1. List of Institutes with Count ≥ 4

S/N	Count	Year	Institute
1	10	2004	East China Normal University
2	7	2007	Shaanxi Normal University
3	5	2003	Central China Normal University
4	4	2008	Hunan Normal University
5	4	2013	Northwest Normal University

The information reflected in the author occurrence count graph aligns with the insights gleaned from the aforementioned institutional graph. As per the author occurrence count (≥ 3) list (Table 2), Cai Dan from Shanghai Normal University focuses on intervention strategies concerning the phonological loop in working memory. Moreover, Hu Lailin from East China Normal University, Zhao Wei from Shaanxi Normal University, and Fang Junming from East China Normal University are dedicated to

exploring phonemic awareness intervention methods in dyslexia. Liu Chang from Nanjing Normal University specializes in researching intervention techniques for dyslexia and phonological loops in working memory. Additionally, Tao Sha from Beijing Normal University primarily investigates intervention measures for word decoding in English reading disorders. These scholars, each with their unique research emphasis, collectively catalyze the advancement and progression of this field.

Table 2. List of Authors with Count ≥ 3

S/N	Count	Year	Authors
1	4	2011	Cai Dan
2	4	2006	Hu Lailin
3	4	2004	Zhao Wei
4	4	2004	Liu Chang
5	3	2004	Fang Junming
6	3	2007	Tao Sha

In a comprehensive assessment, universities play a crucial role in the research domain of language learning disabilities among students. Employing diverse methodologies such as pre-testing, analysis, intervention, and post-testing, they delve deeply into this area to assist students facing learning disabilities in overcoming obstacles and achieving academic advancement. Various teacher training institutions actively offer a range of intervention methods, thereby providing frontline elementary schools with flexible and varied solutions.

3.2 Content Knowledge Graph and Analysis

Keywords encapsulate the essence of a paper's theme. Utilizing CiteSpace to process keywords from literature on language interventions for children with learning disabilities allows for the identification of research hotspots, evolution trajectories, and research frontiers in this domain.

3.2.1 Research hotspots: focusing on cognitive mechanisms and intervention studies in language learning

Research hotspots refer to issues, directions, or topics currently receiving widespread attention within a specific domain. In CiteSpace, by setting keyword nodes and pruning sliced networks, a co-occurrence map of keywords from studies on language learning disabilities among children was generated. This map includes 267 keyword nodes and 743

connections, indicating that research in this area is relatively dispersed and not yet systematic, with varied research directions. The larger the node in the graph, the higher the frequency of the keyword occurrence. The co-occurrence map reveals that the most prominent nodes correspond to thematic words or directly related terms in the literature, such as “working memory”, “phonological awareness”, “morphological awareness”, and “learning disabilities”.

To better understand the research hotspots, a frequency analysis of keyword co-occurrences was conducted. As shown in Table 3, among the top 20 high-frequency keywords, “working memory” ranks first with 21 occurrences, followed by “phonological awareness” (11 occurrences), “learning disabilities” (9 occurrences), “dyslexia” (8 occurrences), “morphological awareness” (6 occurrences), “English phonology” (5 occurrences), and “phonological loop” (3 occurrences). This data indicates that research in this field in China is still nascent, with significant emphasis on working memory and phonological awareness. From a centrality perspective, keywords with a centrality greater than 0.1 are considered to have a high central role. As shown in Table 3, keywords meeting this criterion include “strategies” (0.39), “intervention” (0.23), “learning disabilities” (0.22), “working memory” (0.16), “elementary students” (0.14), “middle school students” (0.12), and “English phonology” (0.12). The higher the betweenness centrality of these keywords, the more significant their intermediary role in the knowledge graph. Notably, “strategies” and “intervention” exhibit the most prominent intermediary roles, indicating that domestic research focuses more on exploring and practicing intervention strategies.

To delve deeper into the analysis of research hotspots in the field, the author conducted a cluster analysis of high-frequency keywords. The results indicate a modularity value (Q value) of 0.7469 and an average silhouette value (S value) of 0.9305. With a criterion that an S value exceeding 0.3 signifies significant clustering outcomes, research on interventions for students with language learning disabilities in China demonstrates remarkably robust results post-cluster analysis. Based on the keyword clustering for interventions targeting students with language learning disabilities,

this study discerned nine distinct clusters. These categorizations not only showcase the depth and breadth of research but also underscore the significance of interventions for students struggling with language learning disabilities. This classification aids in a more systematic comprehension of the current research landscape and developmental trends in this domain, offering valuable insights for future investigations.

Table 3. Count, Centrality, and Years of Keyword Co-occurrence (Ranked by Count)

S/N	Count	Centrality	Year	Keywords
1	21	0.16	2004	Working Memory
2	11	0.05	2004	Phonological Awareness
3	9	0.39	2005	Strategies
4	9	0.22	2006	Learning disabilities
5	8	0.09	1997	Reading Impairment
6	8	0.11	2003	Challenges
7	7	0.23	2006	Intervention
8	6	0.07	2005	Teaching Strategies
9	6	0.12	2010	Middle School Students
10	6	0.07	2005	Reading Difficulties
11	6	0.05	2011	Morphological Awareness
12	5	0.12	2004	English Phonology
13	4	0.14	2011	Elementary Students
14	4	0.00	2009	English Language Learning
15	4	0.02	2003	Phonetics
16	4	0.02	2015	Students with learning disabilities
17	4	0.11	1999	Children
18	3	0.02	2006	Comparative Analysis
19	3	0.00	2005	Phonological Loop
20	3	0.08	2005	Causation

The clustering analysis results, particularly focusing on Table 4, highlight the most effectively clustered keywords as follows: “#6 English Language Learning”, “#4 Literacy Strategies”, and “#1 Tone Teaching (including Working Memory Training)”. These findings underscore that research on language learning interventions in China predominantly centers on academic aspects, delving deeply into language learning disabilities through a “cognitive and academic lens”. In particular, the inclusion of “Tone Teaching” in cluster #1 suggests a potential correlation between math

performance and working memory training with tone teaching. For instance, students' mathematical achievements may tie back to factors such as learning aptitude, attention, which could impact their performance in tone teaching. This implies that children facing language learning disabilities may also encounter challenges or obstacles in mathematical learning.

Table 4. Clustering Results of Interventions for Students with Language Learning Disabilities

No.	Keywords	Silhouette Value
0	Vowels, Consonants, Chinese Developmental Reading Impairment, Orthographic Processing, Rhymes	0.928
1	Tone Teaching, Working Memory Training, Math Performance, Analysis	0.977
2	Working Memory, Reading Difficulties, Arithmetic Learning disabilities	0.880
3	English Phonology, Classroom Instruction, Native Language, Teaching	0.925
4	Literacy Strategies, Second Language Phoneme Acquisition, Literacy Difficulties, Chinese Language Learning disabilities	0.984
5	Reasons, Polarization, Poor Pinyin Skills, Chinese Reading Impairment	0.889
6	English Language Learning, Rural Middle Schools, Private High Schools	0.991
7	Reading Impairment, Reading Abilities, Morphological Awareness, Children's Cognition	0.918
8	Phonetics, Challenges, Rhythm	0.873

3.2.2 Research evolution trajectory - gradually focusing on the development and intervention of metalinguistic awareness

Over time, the keyword layout of interventions for students with language learning disabilities has continually evolved. Therefore, building on the co-occurrence analysis of keywords, further clustering analysis (Cluster) was conducted, integrating the temporal dimension with thematic clusters to delineate the

Keyword Timeline Map and the Keyword Timezone Map. The former focuses on depicting the relationships between clusters and the historical span of specific clusters within Chinese literature, while the latter clearly showcases the updates and mutual influences of the literature. CiteSpace, based on network structure and clustering clarity, provides two indices: the clustering modularity index (Q value, 0.7469) and the clustering silhouette index (S value, 0.9305). A Q value greater than 0.3 signifies a distinct community structure, and an S value exceeding 0.7 indicates that the clustering is convincing. By combining the Keyword Timeline Map and specific analyses of research on language learning disabilities among Chinese students, the research in this field can be divided into the following three stages.

During the first stage, from 1987 to 1999, Chinese scholars initially focused on the difficulties faced by Hakka dialect-speaking students in learning English and the methods of correction in 1987 [2]. Subsequently, researchers investigated the attributions of vocabulary learning disabilities among students with learning challenges and explored some teaching strategies [3-5]. During this period, scholars delved deeper into foreign language learning, particularly addressing English phonetics, phoneme acquisition, and phonetic awareness among English language learners with learning disabilities, designing teaching strategies based on these aspects [6-9]. At this time, research on interventions for students with language learning disabilities in China began to be refined. While some scholars delved into the causes of English and Chinese reading impairments, early studies predominantly borrowed paradigms and theories from foreign research. Especially, they often used English reading impairments as a template to understand and study Chinese reading impairments. This approach somewhat overlooked the fundamental differences and specificity between Chinese and English, which are not only evident in linguistic structures and expressions but also reflected in cognitive processing and neural mechanisms. During the second stage, from 2000 to 2013, research on interventions for students with language learning disabilities primarily focused on dyslexia, marking a deepening and expansion of the research scope. Compared to

the previous stage, this period's research went beyond general discussions of dyslexia, delving further into the causes of reading difficulties specific to the Chinese language. This shift reflected a profound understanding and emphasis on the particular learning disabilities faced by students in the Chinese context, providing robust academic support for finding effective intervention measures. Some scholars specifically investigated the cognitive processing characteristics of dyslexia, thoroughly exploring the challenges faced by children with reading impairments in cognitive processes, including phonetic decoding, visual processing, and the integration and coordination of short-term memory processing within and between systems [10-12]. Other researchers examined the relationship between changes in cerebral blood flow in children and reading skills tests [13]. In the realm of dyslexia research, acquired dyslexia and developmental dyslexia are two critical types. Acquired dyslexia primarily arises from congenital or acquired brain injuries and associated auditory or visual impairments, whereas developmental dyslexia refers to a phenomenon where children with normal intelligence exhibit significantly lower reading levels compared to their corresponding intellectual level or physiological age, despite the absence of evident neurological or organic damage. Among students with learning disabilities, developmental dyslexia is more prevalent, manifesting as acquired reading difficulties. Consequently, research has increasingly focused on developmental dyslexia, providing crucial theoretical support and practical guidance for improving the reading abilities of students with learning challenges.

During the third stage, from 2014 to 2023, research increasingly focused on a core contributing factor to dyslexia, aiming to analyze from a metacognitive perspective in order to unveil the complex mechanisms and influencing factors behind them. During this stage, phonological awareness concerning dyslexia emerged as a focal point of in-depth investigation for numerous scholars. They dedicated efforts to dissect the pivotal role of phonological awareness in the formation of dyslexia, aiming for a more comprehensive understanding of their causes stemming from this pivotal element. Through meticulous

exploration of phonological awareness, scholars aimed to reveal its close connection to dyslexia, providing a scientific basis for the development of more precise and effective intervention strategies [14-19]. Additionally, research by some scholars confirmed significant deficiencies in phonological processing speed, short-term memory, central executive function, and overall working memory capacity among students with mathematical learning disabilities [20]. It is noteworthy to emphasize that morphological awareness is also an important contributing factor to Chinese reading disorders. The unique linguistic structures in Chinese, such as polysemy, represent an essential area of study. Compared to phonological awareness, morphological awareness significantly impacts the subsequent development of reading. However, there has been relatively limited research in China in this area. One of the earliest proponents of research and intervention into morphological awareness in China was scholar Chen Bei. This scholar explored the positions and roles of phonological awareness and morphological awareness in Chinese language learning disabilities, examining the feasibility and effectiveness of combining metalinguistic awareness with language knowledge [21]. Subsequently, a minority of scholars investigated interventions targeting morphological awareness among children with dyslexia [22,23].

3.2.3 Research frontiers - focusing on language learning disabilities and interventions
Research frontiers refer to a set of burst dynamic concepts and potential research issues. Burst words denote terms that appear frequently or are used more often within a specific period. By analyzing these burst words, one can identify the frontiers and trends in a research field [24]. Based on the Burstness algorithm for keywords in CiteSpace, the top 20 burst keywords in domestic preschool inclusive education research are ranked according to their burst intensity. The duration of keyword emergence is used to infer future research trends.

This study rigorously analyzes and forecasts research directions by examining the temporal mapping of high-frequency keyword clusters. Specifically, from a chronological perspective, dyslexia emerged as a focal research area,

showing a continuous increase in interest from 1997 to 2006. As research in this area deepened, related themes such as reading and writing difficulties began to surface and attract significant attention. These studies not only concentrated on reading disorders themselves but also explored multiple factors influencing reading ability, including phonological loops, phonological awareness, and phonological recognition. Collectively, these research findings provide robust academic support for a comprehensive and in-depth understanding of dyslexia.

Subsequently, this study notes that research on students with learning disabilities began to emerge in 2012 and became a focal point between 2015 and 2024. This trend reflects the growing concern in the educational field regarding issues faced by these students. Preliminary attempts at intervention for students with learning disabilities were made as early as 2006, and by 2020, research on interventions and teaching strategies for this topic had become prominent. This underscores the importance and urgency of addressing the problems of students with learning disabilities in education. Through the temporal mapping, this study clearly illustrates the increasing attention to students with learning disabilities, highlighting the educational field's recognition of this issue. Concurrently, as research on students with learning disabilities deepens, studies on interventions and teaching strategies are also on the rise. Therefore, this study predicts that interventions and teaching strategies for students with learning disabilities will become major research hotspots in the future.

This study is situated within this research hotspot, aiming to delve into interventions and teaching strategies for students with learning disabilities. By conducting an in-depth analysis of the causes, characteristics, and intervention methods for these students, the study seeks to provide robust theoretical support and practical guidance for educational practice. Therefore, this research holds significant importance and representativeness. Using a temporal map based on high-frequency keyword clustering, the study analyzes and predicts research directions. By revealing the evolving trends in research topics such as dyslexia and students with learning disabilities, it further clarifies future research

directions and focal points. Simultaneously, the study also demonstrates its own research value and representativeness in the field of interventions and teaching strategies for students with learning disabilities.

4. Discussion

4.1 Insufficient Consideration of the Specificity of Chinese Characters in Language Interventions for Children with Disabilities in Learning Chinese

In the in-depth exploration of intervention strategies for the poor language learning of children with learning disabilities in China, Chinese scholars initially referred to and even directly adopted existing Western methods and experiences. However, as research progressed, Chinese scholars gradually realized that completely adopting Western models might not fully suit the actual conditions in China. Among various intervention strategies, bilingual learning and its interventions have continuously garnered widespread attention from Chinese scholars. For children with learning disabilities, the challenge of overcoming poor language learning while effectively engaging in bilingual education is a topic worthy of deeper investigation. In the existing research field, the keyword clustering map of interventions for poor language learning in struggling students clearly highlights current research hotspots and trends. English phonetics and English learning, as core research points in this domain, are of undeniable importance. This underscores the critical role of bilingual learning in today's society. However, it is worth noting that the unique character system of Chinese, structurally distinct from English and other foreign languages, should also be fully considered in research.

The English language has quite complex structure, encompassing roots, prefixes, vocabulary, grammar, syntax, phonetics, and semantics. In contrast, Chinese originates from pictographs, created based on the shapes of objects, with symbolic meaning often surpassing expressive meaning. These characters reflect ancient people's meticulous observation of shapes and their unique understanding of the world. As a logographic language, Chinese's expression methods and grammatical structures differ from phonetic

systems. Unlike alphabetic script, Chinese morpheme awareness possesses distinct characteristics. Under various standards, the division of Chinese morphemes is more diverse. Based on the number of syllables, they can be divided into monosyllabic and polysyllabic morphemes; based on their word-formation ability, they can be categorized into free, semi-free, and bound morphemes; based on the structural pattern of compound words, they can be divided into substantive, functional, and weakened morphemes [25]. Morpheme awareness not only demonstrates children's keen insight into the internal structure of words but also their ability to flexibly utilize this structure. As the smallest unit combining sound and meaning, morphemes constitute the basic units of vocabulary, with their core role being the construction and expansion of vocabulary [26]. Research on morpheme awareness is crucial for a deeper understanding of children's reading cognitive mechanisms and the essence of the Chinese language. Chinese metalinguistic awareness includes phonological and morpheme awareness, the latter being especially critical. Morphemes form the foundation of vocabulary and grammar; in-depth research on morpheme awareness aids in precisely grasping Chinese characteristics, thereby advancing Chinese linguistic studies. The complex syllable structure of Chinese, including initials, finals, and tones, endows it with unique rhythmic beauty. Syntactically, Chinese emphasizes word order and the use of functional words like "le", "zhe", and "guo", adding tense and aspect information to sentences. Morpheme awareness is central in advanced language learning, affecting students' performance in Chinese language studies and daily communication skills. Therefore, enhancing morpheme awareness is vital for improving language comprehension and expression abilities.

Chinese scholar Chen Bei's research on morpheme awareness is highly representative. Her studies indicate that morpheme awareness has a more significant predictive effect on early Chinese academic achievement compared to phonological awareness. While research has shown that phonological awareness plays a clear predictive role in early reading for Chinese children, its influence

diminishes as children grow older and the reading levels required by school age increase. As a result, Chinese children increasingly rely on morpheme cues during reading, which enhances the impact of morpheme awareness on Chinese academic achievement [21]. As research on the Chinese language continues to advance, morpheme awareness has emerged prominently. Analysis of keyword co-occurrence maps reveals that nodes related to morpheme awareness are notably prominent and extensive, underscoring its importance and focus in the current research field. This further confirms its status as a focal point of study. Additionally, the emergence of syntactic awareness highlights one dimension of morpheme awareness. Coupled with timeline graphs, the continuous appearance and growth of morpheme awareness undeniably demonstrate that research in this area is steadily advancing and deepening. These indications show that morpheme awareness is increasingly significant in linguistics and education, providing valuable insights into the intrinsic mechanisms of language learning.

Morpheme discrimination in Chinese has an independent predictive effect on Chinese reading, while morpheme generation and discrimination in English can independently predict English reading. Morpheme awareness not only has significant predictive power within its own language system but also shows cross-linguistic predictive effects [27]. As the process of learning Chinese deepens progressively, the importance of morpheme awareness becomes increasingly evident. The cultivation and application of morpheme awareness play a crucial role in enhancing learners' Chinese language proficiency. Given the uniqueness of Chinese, orthographic strategies are particularly vital for students facing language learning disabilities. By systematically mastering and applying orthographic principles, students can more effectively understand and memorize Chinese characters, thereby improving their reading, writing, and overall language abilities. However, this study acknowledges the necessity of integrating diverse intervention methods to comprehensively improve students' language skills. In future academic exploration, this study should further delve into the application of orthographic strategies in teaching practice, aiming to provide more

precise and effective support for students with language learning disabilities. Additionally, Chinese scholar Chen Bei proposed a comprehensive intervention model that combines cognitive and academic processing, such as integrating cognitive training with language subject teaching, to develop a more tailored and systematic intervention strategy that meets the actual needs of students.

4.2 The Integration of Cognitive and Academic Interventions for Children with Language Learning Disabilities in Chinese

In the field of language intervention research in China, many studies focus on cognitive intervention strategies. The keyword co-occurrence map clearly shows that working memory occupies a significant position, with smaller hotspots representing related factors such as attention deficits and pronunciation difficulties. Before implementing cognitive interventions, an intelligence test is commonly conducted to comprehensively assess children's cognitive abilities, ensuring that the intervention measures are more targeted and effective. The phonological loop, also known as verbal working memory, is responsible for the storage and control of sound-based information. This system comprises two subsystems: the phonological store and the articulatory rehearsal process. The phonological store, a passive storage system, retains auditory speech codes, which rapidly decay. The articulatory rehearsal process, an active process, is responsible for the control and processing of pronunciation, refreshing the speech codes stored passively [28]. Studies such as the one conducted by Beneventi et al. (2010) using fMRI technology combined with the n-back paradigm indicate lower activation levels in the frontal and parietal cortices and the cerebellum of individuals with dyslexia [29]. This finding corroborates the existence of functional deficiencies in the phonological loop of individuals with dyslexia [30]. Most research on verbal working memory has yielded consistent results, confirming that children or adults with reading disabilities exhibit certain deficits in language-related working memory. For typical children, extending the duration of information processing and activating the rehearsal system within their verbal working memory can significantly enhance their ability to retain

sequential information. This enhanced memory retention subsequently promotes smoother and more accurate processing of subsequent information. The working memory model provides robust theoretical support for intervention training. By designing specific tasks targeting working memory, researchers can implement more precise and effective interventions and training measures for children with learning disabilities, helping them overcome reading disabilities and improve their learning. Intervention programs based on the PASS (Planning, Attention, Simultaneous, and Successive processing) theory are beneficial for the cognitive processing of individuals with language learning disabilities. Chinese scholar Xue Jing explored the practical application and long-term effects of reading intervention programs based on the PASS cognitive processing theory for children with Chinese reading disabilities. Her research concluded that the PREP (PASS Reading Enhancement Program) intervention, based on cognitive processing facilitation, can improve certain reading abilities in children with Chinese reading disabilities [31]. Furthermore, Zhao Ying's adapted PREP cognitive intervention program has shown significant positive impacts in studies targeting children with developmental dyslexia in Chinese. The research focuses on multiple aspects, including phonological awareness, morpheme awareness, orthography, and reading comprehension. Systematic validation has confirmed that this adapted program effectively enhances the reading abilities of children with developmental dyslexia in Chinese and significantly alleviates their reading difficulties [32]. These studies not only provide strong theoretical support and practical guidance for interventions in children with Chinese reading disabilities but also offer valuable insights for interventions in other language learning disabilities.

In addition to the aforementioned cognitive intervention strategies, this study has observed the rising prominence of comprehensive intervention strategies that integrate cognitive and academic elements. The significant appearance of keywords such as "writing difficulties", "English learning", and "teaching strategies" in the keyword co-occurrence map for children with language learning disabilities

suggests that these areas will become key trends in future research. This trend underscores the importance of interdisciplinary integration in educational interventions, providing new directions and strategies for enhancing the overall abilities of children with learning disabilities. The keyword co-occurrence map also highlights the prominence of terms like “tone teaching”, “literacy”, “learning strategies”, and “word recognition”. This indicates that researchers are increasingly combining academic and cognitive intervention methods to tackle learning disabilities. Such a multi-dimensional approach reflects a comprehensive consideration of improving both learning outcomes and cognitive development, and it hints at potential innovative teaching approaches that may emerge in the future. By thoroughly investigating these keywords, this study aims to identify more scientific and effective educational intervention methods. These methods would support learners in making significant progress both academically and cognitively.

Whether academic intervention, cognitive intervention, or comprehensive intervention strategies that closely combine both, these approaches fall under explicit intervention strategies. Their effects are often measurable and assessable through direct indicators such as test scores. While focusing on explicit academic performance, some researchers have begun to pay attention to and attempt interventions in children’s implicit learning, which has quietly emerged in the keyword co-occurrence map, revealing another possible mode of learning. By deeply exploring the role of implicit learning in language learning, this study aims to discover more effective methods and strategies to help students better master language knowledge and improve academic performance. Isolated academic or purely cognitive interventions often appear superficial when addressing learning disabilities. In contrast, comprehensive intervention strategies that combine cognitive and academic elements can more comprehensively and effectively address the needs of children with learning disabilities. Given that these children maintain a high frequency of interaction with teachers in daily learning activities, especially in classroom and routine teaching sessions, seamlessly integrating intervention measures

into these normalized teaching environments may achieve more remarkable results. This approach aims to avoid the isolation or sense of difference that children with learning disabilities might feel due to special attention, while also subtly helping them overcome learning challenges associated with language difficulties. Based on these considerations, this study posits that employing comprehensive intervention strategies that emphasize both cognitive and academic elements is a more suitable and effective choice.

5. Conclusion and Outlook

This study utilizes the Cite Space information visualization software to conduct an in-depth analysis of research in the field of language learning interventions for children with learning disabilities in China, revealing the current research status and development trends. The findings indicate that poor language learning is primarily caused by deficiencies in phonological awareness, which significantly hinder the integration of children with learning disabilities into mainstream education. Phonological awareness, working memory, and reading disabilities have emerged as key research areas, highlighting the current challenges and future directions in this field. The study found that research on language impairments in children with learning disabilities mainly focuses on phonological awareness and working memory. Notably, research on morpheme awareness is also on the rise. Keywords such as “intervention” and “teaching strategies” occupy significant positions in the knowledge graph, indicating that Chinese research places greater emphasis on the exploration and practice of intervention strategies. Further investigation reveals that children with reading problems exhibit insensitivity to phonemes in language or words, suggesting that educators need to focus not only on cultivating phonological awareness but also on enhancing morpheme awareness to help them better master language learning and reading skills. The uniqueness of the Chinese language significantly influences intervention methods. The complexity of its syllabic structure, distinctive syntactic usage, and the importance of morpheme awareness all need to be adequately considered in intervention strategies. It is particularly noteworthy that morpheme awareness has a more significant

predictive effect on early academic achievement in Chinese than phonological awareness.

This study provides a scientific basis for formulating effective intervention measures, promoting the language development and social integration of children with learning disabilities. It also offers valuable insights and references for researchers in related fields, playing a significant role in advancing the study of reading disabilities and the issues faced by students with learning disabilities. As the field of special education flourishes, the problem of poor language learning among children with learning disabilities is receiving increasing attention from the academic community. Future research will focus more on practical applications, with the hope that more institutions and scholars will engage in language intervention research for children with learning disabilities. Additionally, it is hoped that researchers will actively collaborate with frontline teachers to translate academic findings into specific educational practices, providing more precise language teaching guidance for these special children. Facing challenges and uncertainties, this study aspires to continually contribute to the field of special education through ongoing research and exploration.

Acknowledgments

This study was financially supported by the 2022 Xi'an Eurasia University School-level Scientific Research Fund Project "Intervention Research on Children with Poor Academic Performance in Chinese in Lower Grades of Primary School from the Perspective of Inclusive Education" (2022XJSK24).

References

- [1] Pan Ying. Characteristics of the Development of English Phonological Awareness in Chinese Students and Its Relationship with Reading. Northeast Normal University, 2011.
- [2] Lan Tang. A Brief Discussion on the Difficulties and Correction Methods of Learning English Phonemes for Hakka Students. Education Forum, 1987, (04): 40-45.
- [3] Ren Yuqin. Difficulties and Countermeasures in English Vocabulary Learning. Journal of Jiaying College, 1999,

(04): 34-35.

- [4] Yang Xiaojin. A Study on Vocabulary Recognition Strategy Teaching for Junior High School Students with Learning Disabilities in English. Capital Normal University, 2007.
- [5] Meng Lijun. An Attribution Study on the Methods and Acquisition Ability of English Vocabulary Learning among Private High School Students. Shanghai Normal University, 2009.
- [6] Liu Pengcheng. Difficulties in Learning English Phonetics and Teaching Improvements. Gansu Education, 2003, (S1): 71.
- [7] Li Nan, Hu Shuxia. Difficulties in Phonemic Learning of Chinese Middle School English Learners. Journal of Anyang Normal University, 2008, (04): 87-88.
- [8] Wang Lin. Analysis on Urgency and Studying Teaching of Phonetics Teaching in College English Teaching. Journal of Henan Mechanical and Electrical Engineering College, 2000, (04): 110-112.
- [9] Wu Shiwei. The Relationships between Phonological Awareness, Syntactic Awareness in the Bilingual Reading Performance of the Primary School Children. Shaanxi Normal University, 2007.
- [10] Zhao Wei, Fang Junming. Theoretical Divergences in Study of the Process of Cognition Processing on the Part of Children with Reading Difficulty. Journal of Shaanxi Normal University (Philosophy and Social Sciences Edition), 2004, (04): 123-127.
- [11] Zhao Wei, Fang Junming. The Focus and Development of research on Reading Disabilities as Cognitive Processing deficit. Chinese Journal of Special Education, 2004, (04): 45-50.
- [12] Zhao Wei. Experimental Study on Phonological Awareness and Visual-Spatial Cognition in Chinese Students with Reading Difficulties. East China Normal University, 2004.
- [13] Wu Yonggang, Ma Qilin, Yang Zhiwei, et al. Relationship between the change of brain blood flow and reading skill test in children with Chinese reading disorder (in English). Chinese Journal of Tissue Engineering Research, 2005, (12):

- 236-238.
- [14]Zhao Wei, Fang Junming. An Experimental study on Phonological Processing of Reading Disabilities in Chinese Readers. Chinese Journal of Special Education, 2006, (09): 73-77+15.
- [15]Shu Qiuyue. Comparative Study on Learning Disability Characteristics of Children with Phonological Disorders During School Age. China Medical University, 2018.
- [16]Lv Lianghuan. The Analysis of Difficulties Chinese Students Meet with in their Phonetic Learning and the Strategies to Overcome Them. Global Education, 2012, 41(11): 68-73.
- [17]Hu Lailin. A Research on Applying Intervention of Voice Recognition to the Students with Writing Disabilities. Chinese Journal of Special Education, 2007, (02): 32-35+45.
- [18]Li Dan. Intervention in Chinese Pinyin Learning disabilities Based on Phonetics Research for Primary School Students. Shaanxi Normal University, 2019.
- [19]Deng Tingwu. The Role of Phonological Awareness in the Spelling of Words by Primary School Students with Learning disabilities in English. New Curriculum, 2021, (43): 198.
- [20]Fan Ruilu, Li Yashuang, Wang Huihui, et al. Study on the Characteristics of Visual-Spatial Working Memory in Students with Mathematical Learning disabilities Chinese Psychological Society. Abstracts of the 22nd National Academic Conference on Psychology. Mental Health Education Guidance Center for College Students of Henan Urban Construction College; School of Education Science, Henan University, 2019: 2.
- [21]Chen Bei. Intervention Study on Phonological Awareness and Morpheme Awareness in Children with Poor Academic Performance in Chinese in Lower Grades of Primary School. Shaanxi Normal University, 2016.
- [22]Xu Yue. Effects of Morpheme Intervention on Word Recognition and Reading Comprehension in Children with Reading Difficulties. Shaanxi Normal University, 2019.
- [23]Cai Xiang. Teaching Intervention Study on Reading Difficulties of First Graders Guided by Morpheme Awareness Cultivation. Chongqing Three Gorges University, 2023.
- [24]Wang Juan, Chen Shichao, Wang Linli, et al. Analysis of Research Hotspots and Trends in Educational Big Data Based on CiteSpace. Modern Educational Technology, 2016, 26(2): 5-13.
- [25]Lu Jianming. A Course on the Study of Modern Chinese Grammar. Peking University Press, 2005.
- [26]Fan Xueming. Mimetic Theory's Explanation of Chinese Loanwords. Language Theory Research, 2010(5): 16-17.
- [27]Zhang Fanglei. Study on the Relationship Between Morpheme Awareness and Reading Comprehension in Primary School Students. Shaanxi Normal University, 2011.
- [28]Luo Yan. Study on Working Memory in Children with Developmental Dyslexia and Evaluation of Intervention Effects. Huazhong University of Science and Technology, 2012.
- [29]Beneventi H, Tønnessen FE, Ersland L, et al. Working memory deficit in dyslexia: behavioral and fMRI evidence. The International Journal of Neuroscience. 2010, 120 (1):51-59.
- [30]Grossi G, Coch D, Coffey-Corina S, et al. Phonological processing in visualrhyming: A developmental erp study. J Cogn Neurosci, 2001.13:610-625.
- [31]Xue Jing. Intervention Study on Developmental Dyslexia in Chinese. East China Normal University, 2014.
- [32]Zhao Ying. Cognitive Intervention Study on Children with Developmental Dyslexia in Chinese. Henan Normal University, 2019.