Journal of Education, Teaching and Social Studies
ISSN 2642-2336 (Print) ISSN 2642-2328 (Online)
Vol. 6, No. 4, 2024
www.scholink.org/ojs/index.php/jetss

Original Paper

Subtypes of Dyslexia and the Current Status of Morphemic Awareness Interventions

Limin Song[1] & Rongjian Mao[1,*]

[1] School of Special Education, Beijing Union University

[*] Corresponding author

Received: July 29, 2024 Accepted: August 30, 2024 Online Published: September 15, 2024

doi:10.22158/jetss.v6n4p1 URL: http://dx.doi.org/10.22158/jetss.v6n4p1

Abstract

This paper summarizes and analyses the subtypes of dyslexia, and finds that the major frameworks for dyslexia research, both in alphabetic writing system and Chinese, include three areas of delineation based on reading model theory, basic perceptual deficits, and cognitive-linguistic deficits. Then describes how morphemic awareness is measured, and the current state of research on morphemic awareness interventions for dyslexia was reviewed, and it was found that morphemic awareness instructional interventions are better, and the content of the interventions varies across researchers and subjects. Future interventions for children with dyslexia may consider the use of targeted instructional interventions for morphemic awareness.

Keywords

dyslexia, morphemic awareness, reading ability, intervention

1. Introduction

1.1 Higher Prevalence of Dyslexia

Dyslexia is the most common type of learning disability, with prevalence rates ranging from approximately 5% to 17% in alphabetic writing system and 3.45% to 10% in Chinese (Zhou & Meng, 2001), which is much higher than other types of disabilities. Dyslexics with normal intelligence and equal access to educational opportunities show low accuracy and fluency in vocabulary recognition and low spelling ability, and their reading level is significantly lower than that of children of the same age. Children with dyslexia not only perform poorly in reading, but also often have cognitive, emotional, and social adjustment problems that are detrimental to their self-confidence. Failure to improve their reading ability can lead to emotional problems such as anxiety and depression, which in turn affects their personal growth. Therefore, targeted interventions should be provided. Although the incidence of

Chinese dyslexia is increasing, dyslexic patients are not included in the scope of special education objects stipulated in the education policy of mainland China (Liu, 2016), and the assessment methods and interventions for dyslexia are relatively lacking, which have not attracted sufficient attention.

1.2 Current Research is More at the Theoretical Level

Dyslexia is a neurodevelopmental disorder that manifests itself in deficits in word recognition or language comprehension or both during reading (Aaron & Kotva, 1999). There is no cure, but with timely diagnosis and effective intervention, the reading ability of children with dyslexia can be improved to a certain extent. Through early identification and prevention programs, the number of children who are identified as poor readers through special education or compensatory education programs can be reduced by as much as 70% (Lyon et al., 2001). This shows the importance of early intervention for children with dyslexia.

Many scholars in the West have conducted a series of empirical studies around dyslexia from different perspectives and methods, leaving behind diverse strategies and methods for intervening in dyslexia. Many scholars in China have also done research and intervention on the cognitive deficits of dyslexic children. At the linguistic level, research has been conducted mainly in the areas of phonological awareness, morphemic awareness, and word recognition, the results of which can predict children's reading ability and proficiency (Wang et al., 2016). In terms of cognitive deficits at the non-linguistic level, studies have mainly focused on visual processing deficits, auditory processing deficits, attention deficits and memory deficits (Liu et al., 2022). Domestic scholars' studies on Chinese dyslexia have mostly stayed at the theoretical level, such as the latest progress of Chinese dyslexia research and the mechanism of dyslexia, with fewer empirical studies on interventions for dyslexics.

1.3 Lack of Pedagogical Interventions Tailored to the Characteristics of Morphemic Awareness

Morphemes are the smallest phonological and semantic combinations in language and are the smallest meaningful linguistic units (Zhou, 2012). Morpheme awareness refers to students' ability to recognize and manipulate lexical structures, morphemes retain syntactic and semantic information that helps to understand new or uncommon words, and words containing multiple morphemes can be broken down into smaller units that provide clues to pronunciation and meaning (Law & Ghesquière, 2017). The composition of morpheme awareness shows variability based on the characteristics of different language systems themselves. In epenthesis, morpheme awareness includes flexion morpheme awareness, derivational morpheme awareness and compound morpheme awareness. The content of Chinese morpheme awareness includes lexical morpheme awareness, homophonic morpheme awareness, homomorphic morpheme awareness, and morphological and phonological morpheme awareness. Phonological awareness contributes better to children's word recognition, spelling and reading comprehension, and has been found to predict children's reading ability while controlling phonological awareness, naming speed and orthographic knowledge (Kirby et al., 2012). Unlike the centrality of phonological awareness in reading in the alphabetic writing system, several studies have shown that the core deficit in children with Chinese dyslexia may be a deficit in morphemic awareness

(Li et al., 2011). Therefore, phonological awareness intervention for dyslexic children may enhance their reading ability.

Most of the existing interventions on morphemic awareness in dyslexic patients have been conducted in the context of Western countries' phonetic scripts, while there is a lack of research on morphemic awareness interventions for Chinese children with dyslexia, and the effectiveness of these interventions needs to be further confirmed. Most of the existing studies focus on the middle grades of elementary school, while the characteristics of morphemic awareness of students in the lower, middle and upper grades are different, and there is a lack of research on teaching interventions for children with dyslexia in different age groups.

2. Literature Review

2.1 Core Concepts

2.1.1 Dyslexia

The International Statistical Classification of Diseases and Related Health Problems, 11th Revision (ICD-11) mentions dyslexia as a type of learning disability in which individuals with this disorder have a normal level of intelligence and have the same educational opportunities as their peers, but exhibit low reading levels, vocabulary recognition, and spelling accuracy (ICD-11, 2018). In the United States Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5), dyslexia is recognized as a type of specific learning disorder and consists of three main characteristics, accuracy in reading, speed or fluency in reading, and poor reading comprehension (DSM-5, 2013).

Dyslexia, one of the types of learning disabilities, is a specific language disorder characterized by word decoding difficulties, often reflecting deficits in phonological processing. These word decoding difficulties are often unexpected compared to age and other cognitive and learning abilities, they are not the result of a generalized developmental disorder or sensory impairment. Dyslexia manifests itself in varying degrees of difficulty with different forms of language and, in addition to reading problems, usually includes significant problems with proficiency in writing and spelling (Lyon et al., 2003).

2.1.2 Morpheme Awareness

First proposed by the American linguist Bloomfield in A Theory of Language, a morpheme is a form of language that has no phonetic or semantic similarity to any of the other forms (Shi, 2011). A morpheme, also known as a lexeme, is the smallest combination of sound and meaning, the smallest word-making unit that can be used independently, the smallest grammatical unit that reflects the connection between word form and meaning (Lü, 1979). Morpheme awareness is intertwined with meta-linguistic awareness, which refers to the ability to reflect on and manipulate the rules of word formation in language (Li-jen et al., 2006).

In the alphabetic writing system, morphemes are categorized into free morphemes and sticky morphemes. Free morphemes are those that can form words independently without combining with other morphemes, such as table, while adhesive morphemes, which must be combined with other

morphemes in order to form words, are categorized as flexion morphemes and derivational morphemes (Carroll, 2007). Therefore, morpheme awareness is divided into three types: flexion morpheme awareness, derivational morpheme awareness and compound morpheme awareness. Flexional morpheme awareness refers to the ability to use different grammatical forms such as number, tense, adjectives, adverbs, nouns, etc.; Derivational morpheme awareness refers to the ability to use different roots and affixes, etc. to change the nature of words; and compound morpheme awareness refers to the ability to comprehend the structure of a compound word and to guess the meaning of the word.

Chinese is a non-alphabetic script, and the essence of Chinese orthography is "morpheme-syllable", i.e., a syllable represents a corresponding morpheme (Siok & Fletcher, 2001). Homophonic morpheme awareness, homomorphic morpheme awareness and compound morpheme awareness are three important types of morphological awareness in Chinese (Pan et al., 2016). Firstly, in Chinese, many different characters have the same pronunciation for a limited number of syllables. Secondly, for homonyms, one character can represent different meanings of multiple words. Thirdly, Chinese word formation relies heavily on lexical compounding (McBride, 2016). Due to the special characteristics of Chinese characters, consonant awareness does not show the main features of morpheme awareness well. because in morphosyntactic characters, most of the characters have semi-syllabic or non-syllabic consonants (Chen et al., 2016). Subsequent studies have also suggested that the division of morpheme awareness in Chinese should also include the ability to utilize the knowledge of radicals (Wang, 1999). Therefore, morpheme awareness in Chinese can be divided into the following four dimensions: lexical morpheme awareness, homophonic morpheme awareness, homomorphic morpheme awareness, and morpho-syntactic morpheme awareness.

2.1.3 Reading Ability

Reading ability is a form of literacy that is acquired. Students use acquired language knowledge plus their own experience to reconstruct reading material and understand its meaning (Zhaohua Publishing House, 2004). Reading includes components such as word recognition, sentence reading, and chapter comprehension, and these tests are used to reflect students' reading levels.

Reading is an important ability, and for children with dyslexia, who have some difficulties in reading, morphemic awareness is crucial for a better understanding of reading development and dyslexia mechanisms in Chinese children (Shu et al., 2006). Previous studies have shown that morpheme awareness affects Chinese children's reading comprehension (Cheng et al., 2017). Morphemic awareness promotes children's ability to decode characters, access the meaning of vocabulary, and read sentences or connect text fluently. Thus, morpheme awareness may affect reading comprehension through one or more of these abilities. Research has shown that morphemes play an important role in reading and that the development of children's morphemic awareness predicts their level of reading ability (Lam et al., 2012). In both epigraphic and ideographic writing, morpheme awareness is specific, but Chinese language has different characteristics of morpheme awareness from English, and some studies have shown that the elementary school period is an important stage in the development of

morpheme awareness in Chinese-speaking children (Sui et al., 2009).

2.2 Relevant Studies at Home and Abroad

2.2.1 Subtypes of Dyslexia

2.2.1.1 Subtypes of Dyslexia in Alphabetic Writing System

There are three main research frameworks for subtypes of dyslexia in in alphabetic writing system: based on reading model theory, based on cognitive linguistic deficits, and based on basic perceptual deficits.

(1) Subtypes based on reading model theory

In phonetic text conditions, common subtypes of dyslexia include phonological dyslexia and surface dyslexia according to the reading model theory. Reading model theory suggests that there are two kinds of pathways for reading, lexical pathway and sublexical pathway. And the damage of different pathways is the cause of different types of dyslexia (Baron & Strawson, 1976). And the damage of different pathways is the cause of different subtypes of dyslexia in two pathways, the sublexical pathway and the lexical pathway. Patients with damage to the sublexical pathway are phonological dyslexic and show difficulty in reading pseudowords, while patients with superficial dyslexia are caused by damage to the lexical pathway and they show difficulty in reading exception words. It was found that the most stable and common of the phonological reading subtypes was phonological awareness deficits. In contrast, in controls with children at the same reading level, patients with epigraphic dyslexia were found to be significantly behind in orthographic processing (Peterson et al., 2013).

(2) Subtypes based on basic perceptual deficits

Some researchers believe that the premise of cognitive processing of language is basic perceptual, if there are certain deficits in basic perceptual, it will lead to deficits in cognitive processing of language, and then dyslexia occurs (Sprenger et al., 2006). Dyslexia-is categorized on the basis of basic perceptual deficits, and there are two types of visual processing deficits and auditory processing deficits. The visual processing deficit type leads to reading errors in dyslexic individuals by substituting letters or words they see for similar letters or words (Valdois et al., 1995). The auditory processing deficit type has implications for the ability of dyslexics to process temporal properties or to respond to frequency changes in auditory signals, they are unable to process received auditory stimuli quickly or do not respond acutely to changes in sound.

(3) Subtypes based on cognitive linguistic deficit classification

Based on cognitive deficits at the cognitive linguistic level, the subtypes of dyslexia in the alphabetic writing system include three types: phonological awareness deficits, rapid naming deficits, and orthographic processing deficits. Phonological awareness refers to the ability to understand and manipulate phonological components, and several studies have shown that phonological awareness deficits are the core deficits of dyslexia in alphabetic writing conditions (Ziegler & Goswami, 2005). Rapid naming refers to the ability to rapidly and accurately name visual symbols, such as rapidly

naming symbols numbers and shapes. The presence of rapid naming deficits in dyslexics affects an individual's reading fluency, and thus the level of rapid naming can predict an individual's reading level. Orthographic processing refers to the ability to recognize whether a word or phrase is written correctly. Individuals with dyslexia make errors when making true or false word or phrase judgments or combination judgments, which in tum affects their reading fluency.

2.2.1.2 Subtypes of Chinese Dyslexia

There are two main research frameworks for Chinese dyslexia subtypes: reading model-based, and cognitive linguistic deficit-based.

(1) Subtypes based on reading model theory

Unlike in alphabetic writing system, Chinese language has its own special characteristics. In the study of Chinese dyslexia, the division of dyslexia subtypes based on the reading model theory is somewhat different from that in alphabetic writing system, including phonological dyslexia, surface dyslexia, and deep dyslexia. For the study of dyslexia with phonological deficits, it was found that the proportion of Chinese dyslexia types with phonological deficits was much less high than that in alphabetic writing system (Wang & Yang, 2014). In other words, there are few types of phonological dyslexia in Chinese dyslexia. Studies have shown that about 60% of children with Chinese dyslexia belong to patients with superficial dyslexia (Ho et al., 2007), indicating that superficial dyslexia is also one of the subtypes of Chinese dyslexia. Deep dyslexia refers to patients' difficulties in reading rule and exception words. Yin et al. (2003) proposed a triangular model, pointing out that when reading, individuals need to rely on the connection between orthography and phonology, i.e., the non-semantic pathway, and dyslexic patients with certain impairments in the non-semantic pathway may show an inability to correctly discriminate between words that have the same part or a similar semantics. Studies have shown that about 20% of Chinese children with dyslexia belong to the deep type of dyslexia type and show semantic errors in tests (Wang & Yang, 2014).

(2) Subtypes based on cognitive linguistic deficit

Like dyslexia in alphabetic writing system, Chinese dyslexia is based on the results of cognitive-linguistic deficits delineation, which also includes phonological processing deficits, rapid naming deficits, and orthographic processing deficits. Due to the specificity of the Chinese language, phonological information does not play as large a role in Chinese character reading as it does in alphabetic writing. Among the subtypes of Chinese dyslexia, the proportions of rapid naming deficits and orthographic processing deficits are higher than those of phonological processing deficits. As the research on Chinese dyslexia continues to deepen, it has been found that the proportion of phonological processing deficits in Chinese dyslexia is significantly lower than that alphabetic writing dyslexia (Perfetti et al., 2005). A number of studies have shown that morphemic awareness deficits may be a more significant cause of dyslexia, and Wu Sina (2004) found that morphemic awareness plays an important role in Chinese reading from the specificity of Chinese, and that morphemic awareness is one of the important subtypes of Chinese dyslexia (Sina, 2004). Xiong et al. (2014) analyzed the subtypes

of Chinese dyslexia and found that more than 50% of dyslexic children had a deficit in morphemic awareness, indicating that a deficit in morphemic awareness is a major type of Chinese dyslexia.

2.2.2 Measurement of Morphemic Awareness

Wang et al. (2006) identified four main areas of measurement of morpheme awareness: morpheme recognition, morpheme discrimination, morpheme interpretation and morpheme manipulation. Morpheme recognition is the ability to recognize the constituent morphemes of a complex word. Morpheme discrimination is the ability to recognize morphemes from semantically or phonetically similar words. Morpheme interpretation is used to assess children's ability to use their knowledge of compounding rules and derivational morphology to provide correct interpretations of complex words. Morpheme manipulation refers to children's ability to use their knowledge of compound rules and derived lexemes to produce appropriate word forms in a given context.

The structure and content of morphemic awareness in different language conditions are necessary prerequisites for assessing children's morphemic awareness, and measuring the morphemic awareness of children with dyslexia is a prerequisite for targeted intervention. Due to the different characteristics of alphabetic and non- alphabetic characters, different scholars do not have the same tasks and methods for measuring morpheme awareness, which can be roughly categorized into two types. One is an output task, such as morpheme production and morpheme structure testing, in which word forms are changed to conform to grammar. The other is input tasks, such as morpheme interpretation, by choosing different words to explain the meaning of the morpheme (Dong et al., 2016). When exploring the role of morpheme awareness in the reading of Chinese dyslexic children, Sina Wu et al. (2005) selected two output tasks, the morpheme structure test and the judgment test, when compiling the content of the morpheme awareness test (Sina et al., 2005). When exploring the role of morpheme awareness in children's speech development, Li Hong et al. (2011) used a morpheme generation task of the output task kind, in which children were asked to form two kinds of words using the target morpheme. One with the same meaning as the morpheme in the original word and the other with a different meaning from the morpheme in the original word. A follow-up study by Dong et al. (2013) measured their study for a year and a half found that morpheme awareness still explains children's reading ability (Dong et al., 2013).

Geng Yajin (2014), in conducting the measurement of morpheme awareness and intervention for children with developmental dyslexia in Chinese, selected the input task, and the measurement of morpheme awareness utilized the morpheme structure judgment task in morpheme interpretation. Leilei Li (2017), when studying the relationship between Chinese morpheme awareness and reading comprehension, the test used materials such as self-administered morpheme identification, homophonic morpheme discrimination, and homomorphic morpheme discrimination. When Wu et al. (2004) conducted an intervention study on morpheme awareness, they choose the measures of morpheme identification and morpheme differentiation to conduct a morpheme identification test and a homophonic morpheme discrimination task respectively. Chen (2016) chose the measure of morpheme

recognition and conducted a morpheme recognition quiz. Chang (2011) selected the measure of morpheme differentiation when studying the role of morpheme awareness on Chinese reading, which consisted of a polyphonic morpheme matching task. Li (2002) used morpheme discrimination and morpheme interpretation tasks for the test materials when studying the role of morpheme awareness on Chinese reading (Li et al., 2002). Li et al. (2009) used a morpheme judgment and morpheme production task to compare the cognitive abilities of children with different literacy levels in the preschool and lower elementary school levels. Shu et al (1995) chose a morpheme interpretation measure and used a semantically related judgement task to study the role of morpheme awareness in Chinese reading. Ho et al. (2003) chose a morpheme interpretation measure and used a morpheme matching task to test their research, and used a word-sense relation judgment tasks. Li et al. (2009) chose a measure of morpheme identification and used a semantic category judgment task to measure children's form-parallel awareness in their study of the role of morpheme awareness in preschool children's verbal skills.

All of the above studies illustrate that the measures of morpheme awareness summarized by Wang et al. i.e., morpheme identification, morpheme discrimination, morpheme interpretation, and morpheme manipulation, are recognized and used by many scholars.

3. Interventions for Morphemic Awareness

In order to understand the recent status of research on morpheme awareness intervention for dyslexia, this study reviewed the literature on empirical studies of morpheme awareness intervention for dyslexia at home and abroad, and analyzed them from the perspectives of research design, subjects, test content, specific intervention strategies, intervention content, and the final effect of the intervention, with the basic information summarized as shown in Tables 1.

Table 1. Studies of Foreign and Chinese Morpheme Awareness Interventions for Children with Dyslexia

Research design	Subject	Content of the test	Specific intervention strategies	Content of the intervention	Final result
Bemninger et al., 2013 Factorial design	24 dyslexic students in grades 4-9	Standardized reference tests with age-or grade level subscale scores	Morphemic awareness teaching	Grapheme-phoneme correspondence, flexion, derived suffix classification	No significant difference From pre-experimental measurements
Wolter &	20	Test of Written	Multilingual	Morphological	No significant

Dilworth,2014, Factorial design	dyslexic second graders	Spelling, Fourth Edition (TWS-4)	interventions that also emphasize phonological, orthographic, and phonological awareness	discrimination, derivational word manipulation, etc.	Improvement in word spelling
Georgiou et al., 2021 Pre- and post-tests with randomly assigned control groups	48 dyslexic students in grades1 and·2	Phonological Awareness, Morphological Awareness, Reading (WRAT-4), Diagnostic Spelling Tests	Simplicity Intervention	Phoneme blending, segmentation, morpheme recognition, root word, affix recognition	Intervention has a significant effect on the post-test of morpheme awareness
Barbara et al., 2024 Pre- and post-tests with randomly assigned control groups	16 dyslexic students in grades 4-6	Phonological Awareness, Vocabulary, Reading Fluency, Morphological Awareness, Spelling	Direct Instruction in the teaching of morphemes	Morphological decomposition, synthesis, affixation, morpheme manipulation	Words, reading fluency, and spelling improved in experimental group
Zhao, 2019 Non-randomized Assignment Control Group Pre-and Post-test	30 dyslexic students in Grades 3-4	Morpheme differentiation task; lexical awareness; morpheme interpretation task	Morphemic awareness teaching intervention	Forms, homophones, multiple meanings, etc.	No significant difference in pre- and post-test scores for morphemic awareness

4. Discussion

Sorting out the empirical studies on the interventions for children with phonics dyslexia in the above table, it is found that, in terms of intervention methods, there are mainly morpheme instruction strategies, multilingual vocabulary interventions, morpheme awareness instruction, simplicity interventions, vocabulary instruction, and integrated vocabulary knowledge instruction, etc. Most of the methods used can effectively improve the reading level of children with dyslexia, among which, the intervention method of morpheme awareness instruction is remarkably effective. In terms of the content of intervention, researchers have mostly focused on morpheme awareness, affix differentiation, and vocabulary instruction. Regarding morpheme awareness, the main intervention contents are the structure of morphemes, grapheme-phoneme correspondence, morpheme identification, morpheme discrimination, phoneme segmentation, morpheme manipulation (Barbara et al., 2024), and other specific contents; in the aspect of affix differentiation, the contents mainly include the identification of prefixes and suffixes, the manipulation of derivational affixes, and inflectional affixes (Georgiou et al., 2021), etc.; in the aspect of vocabulary instruction, there are the target vocabulary direct instruction, vocabulary identification, synthetic words (Barbara et al., 2024), and the learning of compound words. It can be seen that there is some specificity in the content of interventions across studies.

Intervention studies for children with Chinese language dyslexia have found that in terms of specific strategies for intervention, the most studies have used instructional intervention strategies, followed by morpheme awareness interventions, and the least by non-morpheme awareness interventions. The method of morpheme awareness teaching intervention was the most effective, indicating that this intervention method is more targeted. In terms of intervention content, domestic researchers' interventions for children with Chinese dyslexia are more centered on several aspects of reading and morphemic awareness. Regarding reading, most of them involve reading speed and reading comprehension; in terms of several aspects of morpheme awareness, the main interventions include homophones, homographs, graphemes, and morphophones (Zhao, 2019).

From a comprehensive view of relevant studies at home and abroad, there are the following characteristics of the research on the intervention of morphemic awareness for children with dyslexia. In the targeted intervention for children with dyslexia, the method of teaching intervention for morphemic awareness has a more significant effect. At the level of intervention content, different researchers have adopted different intervention contents, and the effect varies. Future interventions for children with dyslexia may consider the use of targeted instructional interventions for morphemic awareness.

References

Aaron, P. G., & Kotva, H. (1999). Component model-based remedial treatment of reading disabilities. In I. Lundberg, F. E. TOnnessen & I. Austad (Eds.), *Dyslexia: Advances in Theory and Practice* (pp. 221-244). Netherlands: Kluwer Academic Publishers.

Arlington, W. (2013). *America Psychiatric Association. Diagnostic and statistical manual of mental disorders* (5th ed., p. 111) VA: American Psychiatric Publishing.

Barbara, B. M. MEd, & John, R. K. PhD. (2024). The Effects of a Morphological Awareness Intervention on Reading and Spelling Ability of Children with Dyslexia. *Learning Disability Quarterly*, 1-12.

Baron, J., & Strawson, C. (1976). Use of orthographic and word-specific knowledge in reading words aloud. *Journal of Experimental Psychology: Human Perception and Performance*, *2*(3), 386-393.

Berninger V. W., Lee Y., Abbott R. D., & Breznitz Z. (2013). Teaching Children With Dyslexia to Spell in a Reading-Writers' Workshop. *Annals of Dyslexia*, *2013*(1), 1-24.

Classification of Diseases for Mortality and Morbidity Statistics (ICD-11). (n.d.). Diagnostic criteria for research. Geneva: World Health Organization [J/OL].

Miao, X. C. (2007). Carroll. *The psychology of language* (4th ed., pp. 280-283). Shanghai: East China Normal University Press.

Chen, A., & Wu, Z. W. (2002). *Introduction to Modern Chinese* (pp. 82-83). Beijing: Beijing Language and Culture University Press.

Center for Curriculum and Textbook Development of Basic Education, Ministry of Education. (2004). *Evaluation of Elementary School Students' Reading Ability (Teacher's Guidebook)* (p. 8). Beijing: Zhaohua Publishing House.

Cheng, Y., Zhang, J., Li, H., Wu, X., Liu, H., Dong, Q., & Sun, P. (2017). Growth of compounding awareness predicts reading comprehension in young Chinese students: A longitudinal study from grade 1 to grade 2. *Reading Research Quarterly*, *52*(1), 91-104. https://doi.org/10.1002/rrq.155

Chen, B. (2016). *An intervention study on phonological awareness and phonemic awareness of children with language academic malpractice in the lower primary grades*. Xi'an: Shaanxi Normal University.

Chang, Y. (2011). Research on the role of morphemic awareness on Chinese reading for international students. *Journal of Inner Mongolia Normal University (Education Science Edition)*, *24*(07), 109-111.

Dong, Q., Li, H., Wu, X. C., Christina, R., & Zhu, J. (2013). The predictive role of morpheme awareness on preschool children's verbal skill development: evidence from a follow-up study. *Psychological Development and Education*, *29*(2), 147-151.

Geng, Y. Z. (2014). *Measurement and intervention of morpheme awareness in children with developmental dyslexia in Chinese*. Xiamen: Xiamen University.

Georgiou, G. K., Savage, R., Dunn, K., Bowers, P., & Parrila, R. (2021). Examining the Effects of Structured Word Inquiry on the Reading and Spelling Skills of Persistently Poor Grade 3 Readers. *Journal of Research in Reading*, *2021*(1), 131-153.

Ho, C. S. H., Chan, D. W., Chung, K. K. H., Lee, S. H., & Tsang, S. M. (2007). In search of subtypes of Chinese developmental dyslexia. *Journal of Experimental Child Psychology*, *97*(1), 61-83.

Ho, C., Ng, T., & Ng, W. (2003). A "Radical" Approach to Reading Development in Chinese: The Role of Semantic Radicals and Phonetic Radicals. *Journal of Literacy Research*, *35*(3), 849-878.

Kirby, J. R., Deacon, S. H., Bowers, P. N. et al. (2012). Children's Morphological Awareness and Reading Ability. *Reading and Writing*, *2012*(2), 389-410.

Lü, S. X. (1979). *Problems of analyzing Chinese grammar* (p. 15). Beijing: The Commercial Press.

Li-jen, K., & Richard, C. A. (2006). Morphological Awareness and Learning to Read: A Cross-Language Perspective. *Educational Psychologist*, *41*(3), 161-180.

Law, J. M., & Ghesquière, P. (2017). Early Development and Predictors of Morphological Awareness: Disentangling the Impact of Decoding Skills and Phonological Awareness. *Research in Developmental Disabilities*, 47-59.

Lam, K., Chen, X., Geva, E. et al. (2012). The Role of Morphological Awareness in Reading Achievement Among Young Chinese-Speaking English Language Learners; a Longitudinal Study. *Reading and Writing*, *25*(08), 1847-1872.

Lu, S. H., & Yu, Y. Y. (2016). Measurement of Chinese morpheme awareness. *Asia-Pacific Education*, (01), 296.

Li, L. L. (2017). *Research on the relationship between Chinese morpheme awareness and reading comprehension in children with ADHD*. Xi'an: Shaanxi Normal University.

Li, W., Anderson, R. C., Nagy, W., & Zhang, H. (2002). *Facets of Metalinguistic Awareness That Contribute to Chinese Literacy* (pp. 87-106). Chinese children's reading acquisition, New York: Springer U.S.

Li, H., & Shu, H. (2009). Comparison of the cognitive abilities of children with different literacy levels in preschool and lower elementary school. *Psychological Development and Education*, *25*(03), 1-8.

Li, H., Dong, Q., Zhu, J. et al. (2009). The role of morpheme awareness in the development of preschool children's verbal skills. *Psychological Science*, *2009*(6), 1291-1294.

Liu, Q. L. (2016). On the object problem of special education in China. *China special education*, (06), 3-7+16.

Lyon, G. R., Fletcher, J. M., Shaywitz, S. E. et al. (2001). Rethinking learning disabilities. In Finn C. E., Rotherman, A. J., Hokanson, C. R. (Eds.), *Rethinking special education for a new century* (pp. 259-287). Washington, D.C.: Thomas B. Fordham Foundation and the Progressive Policy Institute.

Liu, D. Z., Ma, D. M., & Su, S. H. (2022). A review of hot spots of learning disabilities research in foreign countries in the past ten years—A visualization analysis based on VOSviewer. *Educational Observation*, *11*(15), 18-21+34.

Li, H., Christina, R., Dong, Q., Zhu, J., & Wu, X. C. (2011). The roles of phonological awareness, morphemic awareness and rapid naming in children's speech development. *Psychological Development and Education*, *27*(2), 158-163.

Lyon, G. R., Shaywitz, S. E., & Shaywitz, B. A. (2003). *Annals of Dyslexia*, *53*, 1-14.

Shi, Y. (2011). Definition of morphemes and vocabulary teaching in Chinese as a foreign language. *Journal of Hubei Second Normal College*, *28*(12), 30-32.

McBride, C. A. (2016). Is Chinese special? Four aspects of Chinese literacy acquisition that might distinguish learning Chinese from learning alphabetic orthographies. *Educational Psychology Review*, *28*(3), 523-549. https://doi.org/10.1007/s10648-015-9318-2.

Pan, J., Song, S., Su, M., McBride, C., Liu, H., Zhang, Y., ... Shu, H. (2016). On the relationship between phonological awareness, morphological awareness and Chinese literacy skills: Evidence from an 8-year longitudinal study. *Developmental Science*, *19*(6), 982-991.

Peterson, R. L., Pennington, B. F., & Olson, R. K. (2013). Subtypes of developmental dyslexia: Testing the predictions of the dual-route and connectionist frameworks. *Cognition*, *126*(1), 20-38.

Perfetti, C. A., Liu, Y., & Tan, L. H. (2005). The lexical constituency model: Some implications of research on Chinese for general theories of reading. *Psychological Review*, *112*(1), 43-59.

Siok, W. T., & Fletcher, P. C. (2001). The role of phonological awareness and visual orthographic skills in Chinese reading acquisition. *Developmental Psychology*, *37*(6), 886-899. https://doi.org/10.1037//0012-1649.37.6.886

Shu, H., McBride-Chang, C., Wu, S., & Liu, H. (2006). Understanding Chinese developmental dyslexia: Morphological awareness as a core cognitive construct. *Journal of Educational Psychology*, *98*(1), 122-133. https://doi.org/10.1037/0022-0663.98.1.122.

Sui, X., Ma, L. B., & Wang, Y. (2009). A study of morpheme comprehension in children with developmental dyslexia in Chinese. *China Special Education*, *2009*(05), 93-96.

Sprenger-Charolles L., Cole, P., & Serniclaes, W. (2006). *Reading Acquisition and Developmental Dyslexi*. Psychology Press.

Sina, W. (2004). *Subtypes of developmental dyslexia in Chinese*. Beijing: Beijing Normal University.

Sina Wu, Shu Hua, Yanru Liu. *The role of morpheme awareness in children's Chinese reading*[J]. Psychological and Behavioral Research, 2005, 3(1): 35-38.

Sina, W., Hua, S., & Yu, W. (2004). A heterogeneous study of developmental dyslexia in elementary school students in grades 4-6. *Psychological Development and Education*, *20*(3), 46-50.

Shu, H., & Anderson, R. C. (1995). Role of Radical Awareness in the Character and Word Acquisition of Chinese Children. *Reading Research Quarterly*, *32*(1), 78-89.

Valdois, S., Grard, C., Vanault, P., & Dugas, M. (1995). *Peripheral developmental dyslexia: a visual attentional account? Cognitive Neuropsychology*, *12*(1), 31-67.

Wang, Y., & Zhu, N. (2016). A review of developmental dyslexia research. *Modern Special Education*, (24), 10-17.

Wang, C. C. (1999). *Learning to read Chinese: The roles of phonological awareness and morpho-logical awareness*. Champaign-urbana: University of Illinois at Urbana-Champaign.

Wang, L. C., & Yang, H. M. (2014). Classifying Chinese children with dyslexia by dual-route and triangle models of Chinese reading. *Research in Developmental Disabilities*, *35*(11), 2702-2713.

Wang, M., Cheng, C., & Chen, S. W. (2006). Contribution of Morphological Awareness to Chinese-English Biliteracy Acquisition. *Journal of Educational Psychology*, *98*, 542-553.

Wolter J. A., & Dilworth, V. (2014). The Effects of a Multilinguistic Morphological Awareness Approach for Improving Language and Literacy. *Journal of Learning Disabilities*, (1), 76-85.

Xiong, J. P., & Yan, G. L. (2014). Analysis of major subtypes of children with developmental dyslexia in Chinese. *Psychological and Behavioral Research*, *12*(4), 496-500.

Yin, W., & Weekes, B. (2003). Dyslexia in Chinese: Clues from cognitive neuropsychology. *Annuals of Dyslexia*, *53*(1), 255-279.

Zhao, S. H. (2019). *Effects of comprehensive intervention on children with developmental dyslexia in Chinese* (pp. 12-42). Jinhua: Zhejiang Normal University.

Zhou, X. l., & Meng, X. Z. (2001). A study of developmental dyslexia in Chinese. *Applied Psychology*, (01), 25-30.

Zhou, Y. N. (2012). *A general theory of Chinese morphemes* (pp. 5-304). Beijing: China Social Science Press.

Ziegler, J. C., & Goswami, U. (2005). Reading acquisition, developmental dyslexia, and skilled reading across languages: a psycholinguistic grain size theory. *Psychological Bulletin*, *131*(1), 3-29.