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An analysis of the current status of morpheme awareness inchildren with developmental dyslexia

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Abstract: *Syllable awareness plays an important role in Chinese reading activities. This paper reviews the research on the deficits of syllable awareness in children with developmental reading disorders in China over the past 20 years, analyzes the ways of measuring and evaluating syllable awareness, and different research methods in studies of children with developmental reading disorders. Finally, it discusses the limitations of research on the deficits of syllable awareness in children with developmental reading disorders and the future development direction of the research, in order to further verify and enrich related intervention studies.*

Keywords: *Developmental Dyslexia, Morphological Awareness, Literature Review*

1. Introduction

Berlin was the first scholar to come up with the term "dyslexia," which comes from a combination of Latin and Greek. In the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V), dyslexia is defined as a specific pattern of learning difficulties, characterized by an inability to read words and texts accurately and fluently, as well as difficulties in spelling and understanding text content. At present, the assessment criteria for dyslexia in the International Classification of Diseases (ICD-10) promulgated by the World Health Organization (WHO) in 1993 have been widely recognized and used, which is divided into acquired dyslexia and developmental dyslexia.[1]

The proportion of school-age children with Chinese developmental dyslexia is between 4% and 8%.[2] At present, Western studies on dyslexia have generally recognized that phonological awareness deficiency is the core problem of phonetic character dyslexia, and is the most basic and main manifestation of developmental dyslexia in children. [3]However, since the 1990s, with the continuous deepening of domestic research on dyslexia, combined with the unique characteristics of Chinese, studies have found that after controlling for age, oral vocabulary, Chinese character recognition and other two cognitive skills, morpheme awareness can still independently predict reading comprehension performance. [4]It can be seen that morpheme awareness plays an important role in Chinese reading.

2. Concepts

2.1 Developmental dyslexia

Developmental dyslexia (DD) is an extremely complex neurodevelopmental disorder, the core feature of which is that although the individual's intelligence is normal and the visual and auditory functions are intact, they still show persistent difficulties in reading, spelling and writing. The incidence of dyslexia in different languages and cultures is about 5% to 15%, and there is a phenomenon of intergenerational transmission. At present, children are usually identified as dyslexic in the process of mastering reading skills in the second grade or higher.[5]

2.2 Morphological awareness

As the smallest independent unit in a language, morphemes not only carry phonetic features but also contain meaning content, and are the basic elements constituting grammar. [6]Morpheme awareness, as an ability at the metacognitive level, reflects children's ability to clearly recognize and flexibly use the morpheme structure within vocabulary. [7]In view of the diversity of language system and the difference of cultural background, the formation of morpheme consciousness has its own characteristics. For the phonetic writing system, morpheme awareness includes flexion awareness, derived morpheme awareness

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and compound morpheme awareness. [8]In the ideographic writing system, morphemic awareness is divided into four main aspects: morphemic awareness, homophone awareness, homomorphic awareness and paralogic awareness.[9] In addition, morpheme awareness has a significant positive impact on children's language development. It can effectively promote word recognition and spelling skills as well as the improvement of reading comprehension ability, which is independent of the development of other language skills such as orthographic processing, phonological awareness, rapid naming ability and vocabulary.[10]

3. Morphological awareness measurement and evaluation methods

3.1 Assessment of morpheme awareness

The assessment of morpheme awareness usually includes morpheme analogy, morpheme structure judgment and morpheme comprehension test. Morpheme analogy task, also known as morpheme construction, [11]by verbally describing the definition of a concept known to children, this task leads subjects to break down the compound words constituting the concept into independent morpheme units, and then encourages them to use these morphemes to rearrange and combine to create words representing new concepts. [12]This process not only investigates children's sensitivity to morpheme decomposition. They also tested their ability to use morphemes creatively to construct new words. The morpheme structure judgment task focuses on analyzing children's understanding of the role of Chinese characters in different phrase structures. Researchers carefully select a series of commonly used Chinese characters to ensure that these characters can flexibly participate in a variety of phrase structures, such as subject-predicate, verb-object, bias, parallel, and dynamic complement, while maintaining a balanced distribution in word frequency as far as possible to ensure the fairness and representativeness of the test. Then, these Chinese characters are used to compose the test materials. Children were asked to identify and judge the role of each Chinese character in a particular phrase structure to assess their ability to judge morpheme structure. The morpheme understanding task is designed to assess subjects' ability to grasp the specific meaning of a single Chinese character in different combinations by asking them to select from a number of options that best match the correct meaning expressed by that Chinese character in a given vocabulary.

3.2 Assessment of homomorphic morpheme awareness

In the assessment of homomorphic morpheme awareness, the common test methods include morpheme generation test and polyphonic morpheme recognition task. The morpheme generation test, [13] also known as the morpheme Formation Ability test, [14]operates by showing a word with two morphemes, specifying one of them, and then asking the test subject to pick a word in which the meaning of the morpheme is the same or different from that of the original word. As for the polyphonic morpheme recognition task, it focuses on selecting those polyphonics whose pronunciation is different only because of the change in tone. During the test, such a polyphonic word will be displayed in a specific context, and the tester will be asked to select the word that is consistent with the pronunciation of the polyphonic word in the current context from the given options. This task not only examines the recognition ability of the polyphonic word, but also indirectly reflects the depth of the tester's understanding of the different meanings carried by the same Chinese character under different pronunciation.

3.3 Assessment of homophone awareness

The assessment of homophone awareness includes morpheme judgment and morpheme matching tests. The morpheme judgment task, in which each spoken word is presented with a pair of two-word words, asks subjects to determine whether a homophone (such as "tan" in "talk" and "bounce") has the same meaning. In the task of morpheme matching, the pronunciation is usually the same, and the sound side and the shape side are completely different. The test requires the subjects to choose the appropriate word from the two homophones to match the original sentence according to the context. In order to avoid the subject's association based on the familiarity of font and word formation, the words were marked in pinyin form.

3.4 Physical awareness assessment

The assessment of para-consciousness involves a variety of test tasks, two of which are semantic

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correlation judgment [15]and word selection. [16]In the semantic relevance judgment test, the tester will show the subject A target word, and give three option words A, B and C at the same time, and ask the subject to select the word that is closest to or related to the target word based on the morphological meaning of each word. By analyzing the selection results of the subjects, the development level of their paralogic awareness can be evaluated, that is, whether they can effectively use the clues provided by paralogic to infer the meaning of words. The word selection and word formation test further tested the subject's comprehensive ability to use the form and word meaning. In this task, a target word in a two-character word is presented in pinyin form, and the subject is required to select a word that matches the pinyin and conforms to the meaning of the word from four given Chinese character options based on the meaning of the whole word. For example, in the word "tiao war", subjects were required to identify the word "pick" as the correct answer, while excluding three other distractions that were identical in sound to the target word but different in shape, such as "flitter", "overlook", and "jump", thus demonstrating the key role of shape in distinguishing the meaning of a word and choosing the correct word. Together, these two test tasks constitute an effective means of assessing physical awareness.[17]

4. Research method

4.1 Intervention technique

After systematic review and induction, the application of intervention strategies in the current research field mainly focuses on the core means of teaching intervention. This method can be divided into two categories: direct teaching intervention and indirect teaching intervention. Direct teaching intervention strategy refers to the design and implementation of specific and targeted teaching activities directly aimed at each key dimension of morpheme awareness. For example, Geng Yajin adopted such a method. She compiled her own Morpheme Awareness Intervention Materials for Primary school Students, which was used as a teaching tool to carry out targeted intervention to enhance morpheme awareness for children with reading difficulties. [8]Indirect teaching intervention, however, focuses on skillfully integrating morpheme awareness into the teaching content in the process of improving reading related cognitive skills of dyslexic children. For example, Zhao Ying made use of the adapted PASS Reading Promotion Program (PREP), a cognitive intervention training program that indirectly promoted the improvement and enhancement of morpheme awareness of children with developmental dyslexia in the Chinese context. [18]Zhang Chenchen used the computer-accelerated reading paradigm to intervene the morpheme awareness ability of Chinese dyslexic children.[19]

4.2 Intervention content

Through comprehensive analysis of previous studies, it is clear that the intervention content mainly focuses on the multiple dimensions of morpheme awareness and the ability closely related to reading. In the intervention practice of morpheme awareness dimension, researchers have creatively designed a variety of intervention materials to directly target one or more implementation strategies of paralogic awareness, morpheme awareness, homophone awareness and homomorphic awareness. [20]Taking the form consciousness intervention as an example, the guiding function of form side in form word, the discrimination of side of form word, the construction of form word, the change of form side position and its relation with the meaning of Chinese characters are discussed in depth. In terms of intervention strategies to improve reading ability, researchers flexibly use single or multiple strategies to enhance reading comprehension, language processing skills and cognitive processing ability of dyslexic children. These processes often implicitly or explicitly include training and assessment of morpheme awareness, so as to explore its promoting effect on the development of morpheme awareness. For example, Guligna Aitahong's research has effectively intervened in Uyghur dyslexia children through form-sound association training and repeated reading training. [21]In addition, at the level of organization and implementation of intervention content, researchers showed different methods and paths, mainly divided into two models: "hanzi oriented" and "dimensional-oriented". "Hanzi oriented" emphasizes on taking the high-frequency Chinese characters in primary school Chinese textbooks as the core, focusing on the pronunciation, font, meaning, vocabulary, sentence, paragraph and even chapter of these Chinese characters, and integrating the cultivation of morphemes, morphemes, homophones and homomorphic morphemes awareness into it. "Dimensional-oriented" focuses on the independent teaching of each specific morpheme consciousness dimension, and selects words that meet the characteristics of this dimension for detailed explanation, aiming at deepening students' understanding and grasp of the concept of this dimension. To sum up, the existing intervention strategies for morpheme awareness include

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specific intervention directly targeting morpheme awareness and treating it as reading ability building.

4.3 Intervention duration

After analysis, existing studies show that the duration of interventions usually lasts 30 to 45 minutes, twice a week, and the total intervention time is mostly between 10 and 30 hours. When determining the duration of a single intervention, factors such as pupils' attention span and the standard teaching time of primary schools should be considered. The setting of weekly frequency and overall intervention time may be related to morpheme characteristics, cognitive maturity and ability level of children.

4.4 Intervention effect

Previous studies have generally focused on morpheme awareness and the effectiveness of intervention in various dimensions. At the overall level, some studies clearly indicate that interventions have a significant positive effect on improving morpheme awareness. For example, studies by Gurigna Aitahun have shown that both figure-sound association training and repeated reading training show significant improvement over baseline levels in children with general and more severe dyslexia. Specifically, these training strategies not only promote the decoding and understanding ability of children with general dyslexia, but also play a particularly significant role in the semantic decoding of children with severe dyslexia. [22]However, other studies have pointed out that the intervention effect is not significant, which is attributed to the fact that children who may have defects in morpheme awareness need more sophisticated measurement tools, more personalized intervention programs, and long-term, high-frequency and continuous morpheme awareness training in order to see substantial progress. When we go deep into the different dimensions of morpheme awareness, the effect of intervention shows some differences. In spite of this, the existing morpheme awareness intervention strategies still tend to show positive intervention results. The different performance of this effect may be affected by many factors, including but not limited to the specific characteristics of the intervention object, the rationality of the design of the intervention program, the length of the intervention cycle, and the specific form of the intervention implementation. At the same time, the critical period of the development of different morpheme consciousness dimensions may also have an important impact on the intervention effect, making the intervention effect significantly different among different dimensions.[22]

5. Discussion

5.1 Inadequate research

After reviewing the literature on dyslexia and morpheme awareness intervention in children over the past two decades, the following deficiencies have been found. First of all, the number of intervention studies on the morpheme awareness of dyslexic children is relatively insufficient, and its effectiveness still needs to be further verified. Secondly, the sample size involved in these studies is generally small and mainly focuses on middle grade students in primary schools, and there is relatively little research on the level of morpheme awareness of the groups with dyslexia in the lower and upper grades and above. Third, the current assessment of morpheme awareness shows a large inconsistency in the choice of dimensions and the specific tasks of each dimension, and tends to use a single measurement method. Fourth, existing studies have not adequately covered all relevant aspects in the design of interventions, and further improvements are needed in the way these interventions are implemented. Finally, the single and total intervention time of different studies varied greatly, and there was a lack of long-term follow-up studies on intervention effects.

5.2 Future direction of development

In order to deepen the understanding of morphological awareness deficits in Chinese developmental dyslexia, future research can focus on the following key aspects for in-depth exploration.

5.2.1 Unified morpheme awareness assessment methods

Reviewing the existing domestic research results, we can find that there are obvious differences and disputes in the academic circles about the developmental level and characteristics of morphemic awareness, which specifically covers multiple dimensions such as morphological awareness, morphemic awareness, homophone awareness and homomorphic awareness in children of different ages. This

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controversy may be due to the lack of a set of standardized assessment tools for Chinese dyslexia for a long time, especially the lack of unified operating standards and methods for the measurement of morpheme awareness. Some studies have addressed this problem by using self-written tests, but this has led to a decrease in the comparability of the results. Therefore, in future studies, it is urgent to unify the operational definition of morpheme awareness and improve the measurement tools and methods, so as to more accurately identify the specific defects in morpheme awareness of Chinese dyslexic children of different ages, which can not only provide a clearer framework for understanding the development of morpheme awareness, but also lay a solid foundation for subsequent intervention training.

5.2.2 Study on the intervention of Chinese dyslexic morpheme awareness

Morpheme skills play a key role in predicting children's reading development and are especially important for children learning Chinese. [23]Knowledge of morphemes can help to reduce the frequency of spelling mistakes, improve the accuracy of word meaning understanding, the ability to distinguish synonyms, reduce misreading and wrong inferring the meaning of words from the font, and avoid the creation or misunderstanding of words. In addition, morpheme learning can help children expand their vocabulary and master the rules of vocabulary combination. Therefore, researchers should recognize the unique value of morpheme awareness in improving the reading ability of dyslexic children, and actively carry out relevant intervention studies to explore the effects of different intervention strategies, so as to enrich the research results and provide practical references for improving the level of dyslexic children's morpheme awareness and reading ability.

5.2.3 At the same time, we choose "dimension" and "morpheme" as the starting point of teaching intervention, and design and implement a four-dimension comprehensive intervention scheme

Morpheme awareness plays a key role in promoting children's literacy and reading skills development, and each dimension is indispensable and cannot be substituted for each other. In the current intervention practice, sometimes only focus on a single dimension of morpheme awareness, which may neglect the balanced development of the whole morpheme awareness. Therefore, future research needs to adopt a comprehensive strategy in intervention design that covers all four dimensions of morpheme awareness and ensures the comprehensiveness of the intervention. At the same time, due to the independence and interaction between different dimensions of morpheme awareness, subsequent studies should pay attention to the combination and optimization of "dimension" and "morpheme" in the implementation of intervention in each dimension, so as to improve the effect of intervention. Specifically in the teaching process, this includes not only the systematic explanation and analysis of morpheme awareness and the concepts, characteristics and functions of each dimension, but also the selection of specific and representative morphemes to connect different dimensions of teaching content to help children understand morpheme awareness from abstract to concrete, so as to ultimately improve the effectiveness of intervention.

5.2.4 Scientific planning of intervention time and strengthening continuous tracking of intervention effect

As a key part in the formation of metalinguistic consciousness, the intrinsic properties and characteristics of morpheme consciousness are directly related to the close relationship between the time span required by intervention measures and the final effect. If a single intervention time is too short, the intervention content may not be fully displayed; However, if the time is too long, it may affect children's attention, interest, and efficiency and quality of knowledge acquisition. Similarly, if the total duration of intervention is too short, it may lead to the difference of effects in different dimensions. If the duration is too long, it may cause children's intervention fatigue, and even cause negative emotional and behavioral problems, thus affecting the intervention outcome. Therefore, future studies need to carefully control the timing of interventions. At the same time, long-term tracking of the effects of interventions should also be strengthened in order to better analyze and understand the lasting impact of interventions.

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