



# The written language performance of children with Attention Deficit Hyperactivity Disorder in Taiwan



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## ABSTRACT

Poor writing is common in children with Attention Deficit Hyperactivity Disorder (ADHD). However, the writing performance of children with ADHD has been rarely formally explored in Taiwan, so the purpose of this study was to investigate writing features of children with ADHD in Taiwan. There were 25 children with ADHD and 25 normal children involved in a standardization writing assessment – Written Language Test for Children, to assess their performance at the dictation, sentence combination, adding/deducting radical, cloze and sentence making subtests. The results showed that except for the score of the sentence combining subtest, the score of children with ADHD was lower than the normal student in the rest of the subtests. Almost 60% of ADHD children's scores were below the 25th percentile numbers, but only 20% for normal children. Thus, writing problems were common for children with ADHD in Taiwan, too. First, children with ADHD performed worse than normal children on the dictation and cloze subtests, showing the weaker abilities of retrieving correct characters from their mental lexicon. Second, children with ADHD performed worse on the adding/deducting radical subtest than normal children did. Finally, at the language level, the score of children with ADHD on the sentence combination subtest was not lower than normal children, implicating their normal grammatical competence. It is worth mentioning that Taiwanese children with ADHD ignore the details of characters when they are writing, a finding that is common across languages.

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## 1. Introduction

Writing difficulties often appear in children with ADHD (Yoshimasu et al., 2011). Research on English writing, Doyle, Wallen, and Whitmont (1995) collected the subjective opinions of parents of 38 children with ADHD in Australia and found that the writing performance of 58% of the children with ADHD was poor than that of normal children. Barkley (1998) also claimed that handwriting was a difficulty in basic academic skills for children with ADHD. Lerer, Lerer, and Artner (1977) and Lerer, Artner, and Lerer (1979) reported the writing characteristics of children with ADHD, including the writing being poorly organized in the spatial distribution, improper spatial distribution in a word or between words, hard to be recognized,

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distinct shapes of letters, disorderly arrangement, frequent alteration, frequent letter (or word) omission, and mirror words. In addition to the bad quality of the above writing appearance, poor writing fluency and slow handwriting were also found. Whalen, Henker, and Finck (1981) also found the bad writing appearance of children with ADHD, where the teachers of children with ADHD indicated that the handwriting of children with ADHD was immature, messy, and hard to recognize, and they had low motivation and passive attitudes towards writing activities.

Writing could be divided into spelling, lexicon, and composition, where spelling and lexicon abilities of children with ADHD are emphasized in this study. In west Asia, regarding the ability of spelling, Adi-Japha et al. (2007) found that Hebrew children with ADHD were likely to make more spelling errors than normal children; children with ADHD obviously made more lexical errors and phonologically plausible errors. The former was caused by omitting a silent letter which resulted in a non-word (e.g., whether – wether), while the latter referred to substituting for homophones (e.g., vacation – vakation). However, semantic errors (like writing knight as night) of Hebrew children with ADHD were not different from those of normal children. In other words, Hebrew children with ADHD could write characters which were correspondent with the sentence meaning. When analyzing the orthographic representation of nonsense words, Hebrew children with ADHD did not differ significantly from normal children indicating that children with ADHD did not show problems in phoneme–grapheme conversion. In alphabetic scripts, phoneme–grapheme conversion is used to convert speech sounds into corresponding written symbols, termed orthographic representation.

In addition, Adi-Japha et al. (2007) found that Hebrew children with ADHD made more graphemic buffer errors, which could not be classified into the above types of errors (lexical, semantic, and phonologically plausible errors), but into the error types of character repetition, omission, substitution, and transposition. The findings showed higher overall errors of Hebrew children with ADHD than normal children, especially the transposition, in which HAKLAI was replaced by HAKALI. Hebrew children with ADHD also tended to simplify the suffix to be the common appearance, and they also incorrectly retrieved symbols with similar shapes in Hebrew. Since a graphemic buffer, the integration before outputting messages in a language system, is used for transforming correct spelling for outputting the system, it is regarded as a temporary working memory for abstract alphabets (Roeltgen, 2003). In other words, the orthographic representation generated in the spelling process is first kept in a graphemic buffer (as it requires some time for writing) and then written out in order. Adi-Japha et al. (2007) considered the attention deficit of children with ADHD as the factor in poor function of graphemic buffer that the orthographic representation could not be effectively kept, resulting in more graphemic buffer errors.

In Europe, Re, Pedron, and Cornoldi (2007) analyzed the spelling errors in handwriting of Italian children with ADHD, including (1) phonological errors, the pronunciation of incorrect characters different from real characters, (2) nonphonological errors, the pronunciation of incorrect characters same as real characters, and (3) geminate or accent errors, which were unique in Italian, the alphabetic order of the incorrect characters being correct, but some tiny errors in phonological markers, such as writing giraffe as girafa and città as citta. The results revealed a lot of repetition or accent errors of children with ADHD, but not other types of errors.

Thus, past research showed that children with ADHD were more likely to write graphemic similar characters than normal children did (Adi-Japha et al., 2007; Lerer et al., 1977, 1979; Re et al., 2007). In contrast, the results of children with ADHD appearing more phonologically plausible errors were not consistent; both for (Adi-Japha et al., 2007) and against (Re et al., 2007) evidences were proposed. Moreover, past research showed that children with ADHD did not appear to make more lexicon errors (Adi-Japha et al., 2007), and research on spelling errors inferred that the attention deficit might be the important cause of writing difficulties of children with ADHD (Adi-Japha et al., 2007).

## 2. Motivation and purpose

Apparently, the above research results on the types of incorrect characters of children with ADHD are still inconsistent. It is possible that the different languages with different characteristics make children with ADHD from different countries perform different error types of characters. The degree to which a written language deviates from simple one-to-one grapheme–phoneme correspondence is different across languages. It is generally recognized that writing systems fall into two broad categories: alphabetic and logographic. Alphabetic systems are those in which each symbol (grapheme) ideally corresponds to one sound unit (phoneme) such as Spanish and Italian. Although English does not relate letters or letter patterns directly to phonemes at all times, it mostly does exactly that. In the Hebrew writing systems, each symbol also always or usually stands for a consonant. One of the representative languages that employs a logographic system is Chinese. In the Chinese writing system, each character represents a word, morpheme, or semantic unit, and each character represents one syllable of spoken Chinese. Therefore there are plenty of homonyms (e.g. the 合, 河, 盒, 和, 禾, 核, 何, 荷, which present distinct meanings. Thus, learning to discriminate these homonyms or phonologically plausible characters is quite important/difficult for children to learn Chinese characters. It is worth studying whether the characteristics of Chinese characters cause children with ADHD to perform specific errors in writing. However, there has been little research related to writing difficulties of children with ADHD using Chinese characters. By realizing the difficulties of children with ADHD in writing Chinese characters and comparing with the research on other languages, we expect to better understand the written language abilities of children with ADHD.

Another important possible reason is that the above research presented different classifications on the error types of characters such that the results of different research could not be compared. Nevertheless, homonyms/phonological plausible, graphemic similar, and incorrect semantic characters are the error types covered in most languages, based on

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