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THE COGNITIVE PROCESSES OF READING SKILLS

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ABSTRACT
Three processes (phonological, syntactic, and working memory) show a significant increase in development during the period of rapid reading skill acquisition. Students with reading disabilities experience significant disruptions in these processes, but not to the same extent in semantic or orthographic processes. However, reading is hampered by the underutilization of phonological processing and the near-total reliance on semantics and orthographic or other cognitive processes (sustained attention, sequential processing, visual processes, comprehension, etc.). The core traits of reading disability are deficits in three basic cognitive functions: phonological processing, syntactic awareness, and working memory. It is crucial that assessments for learning disabilities take into account and methodically measure these processes. All rights reserved. (Siegel& Mazabel, 2014).

Key Words: Cognitive processes, reading skills, cognitive awareness, reading disabilities, comprehension, visual processes.

1. INTRODUCTION
The research on reading and reading impairments is quite inconsistent and contentious. Therefore, it is essential to first clarify some basic definitional concerns and presumptions before discussing reading and reading disabilities. Because reading and reading disabilities are two important categories, there are not any clear, uniform operational definitions for them in the field. Reading is defined differently in each of the hundreds of exams that are referred to as "reading tests," therefore even though it may seem minor; each test produces a different measure. Lack of clarity regarding the fundamental operational definitions is the cause of the lack of integration in this industry.

The distinction between reading comprehension and word recognition is one of the most important definitional challenges, according to Siegel and Heaven (1986), who evaluated these concerns. In tests of reading comprehension, texts are often read along with multiple-choice questions about them; in examinations of word reading, single words are read. While word-reading assessments are not timed, reading comprehension tests are. Although reading comprehension may seem to be the most important component of reading and is undoubtedly the end aim of reading, assessing reading comprehension is a methodologically challenging task that is rife with problems.

The problems with measuring reading comprehension have been thoroughly discussed by Siegel and Heaven, Siegel and Ryan (1989b), and Tal and Siegel (1996), but the fundamental issue is that

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measures of reading comprehension are masked by a variety of other factors, including background knowledge, vocabulary, and reading speed. Additionally, the majority of reading comprehension tests currently available do not require the student to draw conclusions from the text itself but rather to find a verbatim answer. Word recognition exams, on the other hand, assess more fundamental abilities, and results are not influenced by factors such as reading speed, prior knowledge, or test-taking techniques.

Additionally, word recognition scores may not produce the same results as reading comprehension scores when used as the independent variable or as the foundation for the definition of reading disability (e.g., Siegel & Ryan,1989a, 1989b; Stanovich, Nathan, & Zolman, 1988). In addition, word recognition is essential to comprehension from a theoretical standpoint (e.g., Gough & Tunmer, 1986; Stanovich, 1988a, 1988b). Text comprehension and the capacity to read single words are significantly connected (e.g., Shankweiler & Liberman, 1972). The issues that new readers or readers with disabilities face are unquestionably at the word level. Word-level issues (Shankweiler & Liberman, 1972) hamper reading-related material.

2.CLASSIFICATION OF THE COGNITIVE PROCESSES OF READING SKILLS

How these processes are classified differs from one author to the next.
As a result, two common classifications will be considered. The first classification divides cognitive processes into three key categories: decoding, fluency, and understanding, which are then further separated into subcategories, these processes focus on operations that address the issue of invention and production. The second classification divides these cognitive processes into six categories, which deal with the practical or mental components of students or recognition (Siegel, 2005).

Working memory, phonological processing, and syntactic awareness are three cognitive processes that have been demonstrated to be important in the development of reading skills in the English language and to be distributed in individuals with reading disabilities. These three processes have such a strong influence that many psychological educational tests for individuals at risk of learning difficulties include some or all of them (Siegel, 2005).

2.1 First classification of the cognitive processes

These are important skills since humans cannot be competent or proficient readers without them, but they are not the essential fundamentals. In truth, our brains must construct a way and connection between areas of our brains that are not otherwise connected to decode words and associate a phoneme (language sound) with a symbol (visual representation, letters).

Because our brains developed for the spoken language but not for reading adapted existing systems (the Visual Word Form Area in the back of the brain and Broca's Area in the front of the brain) to read. Reading, in addition to creating and activating this connection, requires our brains to engage a range of other cognitive processes at the same time to decode words, including

:(https://www.edcircuit.com/cognitive-skills-reading/)

a. Decoding

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It can be defined as the process of converting coded data back to its original phrases or symbols. Information processing, communication, and computer science all use decoding (VandenBos, 2002). The process by which a receiver (e.g., the brain or a gadget like a cell phone) converts signals (sounds, writing, gestures, and electrical impulses) into meaningful messages in information theory (American psychological association, 2009).

b. Fluency

Humans depend on practice when it comes to improving their fluency. Practice is required to develop automaticity in the pairing of symbols and sounds, as well as to expand one's sight word vocabulary. Some other cognitive processes will also be involved. Fluency can be described as the ability to quickly and easily develop ideas, words, mental associations, orpotential solutions to a problem; it is commonly regarded as an important aspect of creativity. Associative fluency is a term used to describe the ability to make connections between things. It refers to the ability to talk or write in a language that is not one's native tongue (VandenBos, 2002).

c. Comprehension

The third and final reading skill is "basic" just as "basic" as the first two. The purpose of learning to read is to gain comprehension, but even after students have mastered decoding and achieved respectable fluency, comprehension frequently eludes them. Teachers and students struggle with this problem year after year. Following are three cognitive abilities that may aid or obstruct our efforts to comprehend what students read. (https://www.edcircuit.com/cognitive-skills-reading/)

2.2 The second classification of the cognitive processes

Siegel (1993) mentions six processes as being important in the development of reading skills in the English language. Semantics, phonology, working memory, morphology, syntax, and orthography are the processes that circle them. The complications of researching the relationship between the learning of reading abilities and different orthographies vary greatly in the demands they impose on the beginning reader, according to Liberman et al, (1980).

The depth of the orthography, or its distance from the phonetic representation, and the particular linguistic unit morpheme, syllable, or phoneme that is explicitly represented, are two essentially distinct features of this variance. A deep orthography, such as English, necessitates more phonological development on the part of the reader than a shallow orthography, such as Vietnamese. Logographies (like the Chinese writing system), syllabifies (like Old Persian cuneiform), and alphabetic systems (like English) all necessitate progressively higher levels of language understanding.

a.Phonological Processing

It entails several abilities, the most important of which, in the context of reading development, is the ability to associate sounds with letters (i.e., the understanding of grapheme-phoneme conversion rules and the exceptions to these rules). This ability is the foundation for decoding print, and while there are other ways to decode print, the phonological pathway is undoubtedly the most fundamental and crucial in the early stages of reading development (e.g., Carroll et al, 2003; Jorm, 1979; Shaywitz, 2003; Stanovich, 1988a, 1988b).

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The most important underlying cognitive process in the development of reading skills in English, according to current ideas, is phonological processing. According to Stanovich (1988), phonological processing involves a variety of functions, the most important of which, in the context of the development of reading skills, is the association of sounds with letters or combinations of letters. This function is known as comprehending grapheme-phoneme conversion rules, and learning these rules is a difficult task due to the irregular character of the correspondences in English.

In the context of "dual-route" reading theories, the evolution of phonological processing and reading can be understood. These ideas take many forms, but their underlying premise is that there are two ways to grasp the meaning of the text (e.g., Coltheart, 1978, 2007; Forster & Chambers, 1973; Meyer, Schvanevelt, & Ruddy, 197). One of these paths is direct lexical access, which entails visually reading a word without any phonological processing in between.

The phonological method, on the other hand, entails using graphemephoneme conversion principles to get lexical access to a print stimulus. To convert a graphemic code to a phonemic code grapheme- phoneme conversion rules are used. Because the execution of the rules does not rely on word-specific pronunciations, this technique is referred described as "no lexical." Instead, it is assumed that grapheme-phoneme conversion rules are explicitly kept and used to determine a word's pronunciation.

Pseudo words, according to this concept, can only be read by a no lexical route because they cannot have a lexical representation by definition.

b.Syntactic Awareness

It is also known as grammatical sensitivity, and it refers to the capacity to comprehend a language's syntax. This skill appears to be essential for fluent and effective text reading, as it necessitates forming predictions about the following words in the sequence. Single words that are difficult to integrate into a semantic network, such as function words, prepositions, and auxiliary verbs, may be affected by syntactic issues. Beginning readers learn about the syntactic features of function words when they are taught to read them in the context of a sentence, according to Ehri and Wilce (1980). As a result, the ability to interpret grammar could be a crucial component of word learning.

Other authors define syntactic awareness as the ability to comprehend the basic grammatical structure of the language in question. On a reading cloze task that measured syntax comprehension, Guthrie (1973) discovered that disabled readers performed at a lower level than chronologically and reading level-matched normal readers, although the disabled readers had an adequate sight-reading vocabulary to perform this task. Poor readers made more errors than regular readers, according to Cromer and Wiener (1966), demonstrating a lack of understanding of syntax in text reading tasks.

Glass and Perna (1986) discovered that children with a reading handicap performed worse on an oral language sentence comprehension exam than typical readers. In a reading cloze process, Willows and Ryan (1981) discovered that less proficient readers were not as accurate as regular readers at substituting a missing word.

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Children with reading issues have syntactic difficulties, according to some data from other languages. In an oral cloze test including Chinese syntactic awareness, children with reading issues in Chinese (Cantonese) performed worse (So & Siegel, 1997). Children from Canada who spoke Portuguese as a first language received reading instruction in English, and attended a Portuguese Heritage Language Program in Portuguese had similar outcomes (Da Fontoura & Siegel, 1995). Children who scored poorly on the Portuguese word and pseudoword reading exams performed much worse on the Portuguese oral cloze than children who read Portuguese well.

c.Working Memory

It is the process of retaining information in short-term storage while processing incoming data and retrieving data from long-term storage.

Because the reader must decode and/or recognize words while retaining what has been read and accessing information such as grapheme-phoneme conversion rules, working memory is important in reading. Working memory is also important for reading individual words, especially when learning to read words for the first time because the grapheme-phoneme conversion rules for each segment of the word must be remembered while the remaining segments are processed. Longer words, in terms of syllable count, exert greater demands on working memory.

Furthermore, the amount of possible alternative grapheme-phoneme pronunciations may have an impact on the ease or difficulty of reading a particular word; hence, the complexity of a particular rule will influence the difficulty of word recognition. Reading will be slower and less precise as more alternative pronunciations are introduced until the particular things are learned. More rules could be found and applied to the word now being read. Because the letters c and g have several pronunciations at the start of English words, words or pseudo words beginning with these letters may be more difficult to understand than words or pseudo words beginning with other letters, especially for beginning readers. The ability to store knowledge in short-term memory while processing incoming data is referred to as “working memory”. Working memory in reading refers to the ability to decode or recognize words or phrases while also remembering what has been read.

Siegel and Ryan (1989a) researched working memory in normal and handicapped readers, as well as dyslexics. Two, three, four, or five sentences are read aloud in the modified form of this exercise, and the child is asked to fill in a missing word at the end of each phrase.

d.Semantic Processing

It is a term that relates to the comprehension of meaning. Word meanings are coded in semantic networks and recovered through these networks, according to theory. When it comes to reading, semantic processing is important for word retrieval. For example, the ease with which a word’s meaning may be retrieved may be influenced, at least in part, by the connections it has with other words in a semantic network (Roman et al, 2009).

e.Morphological awareness

It relates to a person’s sensitivity to word morphemes. It was

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characterized as "conscious awareness of the morphemic structure of words and their ability to reflect on and change that structure," according to the definition (Carlisle, 1995). Morphological knowledge helps in decoding, spelling, and meaning construction in reading (Deacon et al, 2007; Kemp, 2006; Shaywitz, 2003; Siegel, 2008).

However, research on the significance of morphological awareness in reading development and reading difficulties is rising (Bowers et al, 2010; Deacon& Kirby, 2004). Morphemes, the smallest units of meaning within words, enable the maintenance of semantic links between words by making word pronunciation predictable (Chomsky & Halle, 1968; Shaywitz, 2003).

The words printer and printing, for example, are constructed from two morphemes: the root print and the suffixes "-er" and "-ing". The reader is aware that both phrases refer to making a mark with pressure or ink, and it is the suffixes that reveal each word's distinct meaning.Morphological awareness, according to Carlisle (1995), is"conscious awareness of the morphemic structure of words and their ability to reflect on and change that structure." In other terms, it refers to morpheme sensitivity in words.

Reading, spelling, and meaning building are all aided by morphological understanding (Deacon et al., 2007; Kemp, 2006; Shaywitz, 2003; Siegel, 2008). Derivational morphology (e.g., -ness refers to a noun, "ize" refers to a verb, and "-ive" refers to an adjective) contributes to word decoding by assisting word segmentation and decoding efficiency; to spelling by providing consistency of English spelling characteristics (e.g., ness is always spelt with two "-s's"); and to reading comprehension by assisting the understanding of word meanings, easing the load on working memory (Siegel, 2008).

According to research on the relationship between morphological awareness and reading comprehension, the two variables have a positive relationship. Morphological awareness, for example, has been demonstrated to be a strong predictor of reading comprehension (Carlisle, 1995; Deacon & Kirby, 2004; Mahony, 1994). Furthermore, research has indicated that morphological awareness, in addition to phonological awareness, helps with reading comprehension.

Saiegh-Haddad and Geva (2008) explored the association between morphological and phonological awareness and reading in English–Arabic bilingual children. Their findings back up the theory that morphological structure and transparency differences between languages can affect the cross-linguistic contribution of morphological awareness abilities to reading.

Sixth graders with reading impairments scored considerably lower than usual readers on a measure of sensitivity to derivational morphology, according to Siegel (2008). Nonetheless, Casalis and colleagues (2004) found that children with reading disabilities used a morphological (meaningrelated) technique to decipher words to compensate for their weak phonological skills. Deacon proposed this hypothesis as well (in press). Poor morphological awareness abilities may contribute to the reading and spelling difficulties seen in children with reading impairments, implying the need for morphological awareness teaching and testing in this population.

f.Orthographic processing

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It relates to knowledge of the correct and wrong spellings of words, as well as an awareness of the writing traditions of the language in the issue. Legal and prohibited, as well as more and less likely sequences of letters, exist in all alphabetic systems, and a proficient reader makes use of these sequences to some extent. Rules for converting graphemes to phonemes based on their position.

Orthographic processing entails being aware of the structure of alanguage's words. In English, for example, there is no v at the end of a word, nor are there any words that begin with dl or contain the letters zxg. Two tasks created by Olson et al (1985) give a direct contrast between the visual (orthographic) and phonological processing paths. The youngster is presented with a real word and a pseudo word (for example, rain–rane and boal–bowl), and must choose the proper spelling. In the phonological task, the kid must choose which of two visually presented pseudowords (e.g., kake–dake and joap–joak) sounds like a real word. Each of these tasks is designed to allow only one process to operate; for example, in the visual task, both options sound identical, necessitating the use of visual memory for word orthography; phonological processes are not useful in this case because sounding out the words would result in the same response for each word.

The ability to distinguish lawful and illegitimate orthographic combinations of English letters is another facet of orthographic structural awareness. Siegel et al (1995) to measure this ability devised a task.

Students show 17 sets of pronounceable pseudo words, one of which had a bigram that never appears in an English word in that position and the other of which contained a bigram that does appear in English.

3.THE CONCLUSION

Scientists conclude that learning to read proficiently necessitates the automatization of basic decoding and comprehension processes, which eliminates the need to think about them consciously. Learners who must intentionally decode letters and words become distracted by the process and hence are unable to focus on the meaning of what they are reading.

Visual discrimination, attention, working memory, and visual sequential processing are all cognitive processes that enable decoding and

must be automatic for good reading. These abilities are lacking in many struggling readers. Despite their importance, these skills are not taught in universities. In reality, closing the gap between what researches say is needed for struggling readers and what is being delivered in our universities is the fundamental obstacle to enhancing reading instruction. The fact that cognitive skills are not formally taught in schools does not rule out the possibility of teaching them. Techniques to build basic cognitive skills have been discovered and employed in various clinical therapies for more than half a century, but they have not been practical to offer in the classroom.

Cognitive training programs can now be delivered in a classroom context thanks to digital game-based learning.

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