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# MANAGEMENT OF DYSLEXIA FOR EFFECTIVE SCIENCE AND TECHNOLOGY EDUCATION

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**ABSTRACT**

Dyslexia is a common learning disability that can hinder an individual's ability to read, write, spell and sometime speak, and despite conventional classroom experience fails to attain the language skill of reading, writing and spelling commensurate with their intellectual abilities. It is caused by impairment in the brain's ability to translate images received from the eyes or ears into understandable language. The concepts of dyslexia were presented without specific consensus and the epidemiology and most common characteristic of dyslexia were outlined. The causes were attributed to the inability of the brain to segregate and integrate information management by the use of language experience and therapeutic method. It is recommended that a combined involvement of educational psychology, medical neurology and linguistic specialists be engaged to facilitate early discovery and management.

**Keywords**: Management; Dyslexia; Science and Technology; Education

## INTRODUCTION

One of the primary functions of education is to ensure that the individual acquires literacy and necessary skills to become responsible and contribute positively to the development of the society. Some people seem to find education exciting while others develop fear, anxiety and may not cope adequately with the educational training (Nwanneka, 2012). Such persons may have difficulties with learning the letters of the alphabets, associating sounds with letter that represent them, identifying and generating words or counting syllabus in words (phonological awareness), segmenting words into individual sounds or bending sounds to make words etc (phonemic awareness).

The development of literacy skills depend largely on the ability to read and write which serves as the major academic foundation for all school based training (Learner and Kline, 2006). They also pointed out that, the inability to read makes the writing skills become impossible to acquire, and without the skills of reading and writing, the study of science and technology become impossible thus, making the individual, community, society or nation at large to remain at the dregs of development as illiteracy is tantamount to underdevelopment. Unfortunately, large numbers of people undergoing educational training particularly in science and technology education suffer from some learning disabilities such as reading and writing. Careful observation, screening or diagnosis of these individuals with reading and writing difficulties indicate possible cases of dyslexia. That is a reading, writing and spelling disorder that can involve difficulties in visual or auditory perception. As noted by Truta (2010), dyslexia is a natural inability that is an inborn trait.

### Concept of Dyslexia

The problem of reading and writing disability as observed and identified by Oswald Berkhen, a

neurologist was first referred to as "word blindness" in 1881 while the term dyslexia was corned and used in 1887 by Rudolf Berlin, an Ophthalmologist (Malmkjaer and Anderson, 1991). They explain that dyslexia originates from Greek word "dys-lexia" meaning difficulty with words and linguistic processes. They also noted that dyslexia was used to refer to a case of a young boy who had a severe impairment in learning to read and write, despite showing typical intelligence and physical abilities in all other aspects. Some definitions of dyslexia include that given by Squires and Mckeon (2003) as a term used to describe people who have specific difficulties in learning to read, write and spell. It may be neurological in origin and usually have associated difficulties with memory and sequential thinking. Lerner and Kline (2006) equally define dyslexia as an unusual type of severe reading disorder that has puzzled the educational and medical communities for past years. People with this baffling disorder find it extremely difficult to recognize letters and words and to interpret information that is presented in print form. Similarly, Kirk *et al* (2006), defines dyslexia as one of the several distinct learning disabilities, and described it as a specific language based disorder of neurobiological origin characterized by difficulties in single word decoding, usually reflecting insufficient phonological processing. They also stressed that dyslexia is manifested by variable difficulty with different forms of language, often including in addition to the problem of reading, a conspicuous problem with acquiring proficiency in writing and spelling. If dyslexia is a learning disability that prevents the ability of an individual to read, write, spell, speak and develop skill, it will have significant implication for the understanding of the language of science and technology.

There is variability in the definition of dyslexia. Some sources such as the U.S. National Institutes of Health, defines it specifically as a learning disorder, while other sources however, see it as an inability to read in the context of normal intelligence. Princess (2008), categorized dyslexia into two; developmental dyslexia (learning disorder) and acquired dyslexia (loss of the ability to read caused by brain damage). It has also been defined by the World Federation of Neurologists (WFN) as a disorder in people who despite conventional classroom experience fail to attain the language skill of reading, writing and spelling commensurate with their intellectual abilities.

Relating dyslexia with the learning disabilities, and the National Institute of Neurological Disorder (NINDS) defined dyslexia as a disorder that impairs a person's ability to read and which can visibly manifest as a difficulty with phonological awareness, phonological decoding, orthographic coding and auditory short term memory (NINDS, 2010). According to Martin *et al* (2017), dyslexia has been defined in different ways but no conceptual consensus has been reached. They pointed out that dyslexia has been considered to be a disorder involving impaired reading, writing and spelling. They also refer dyslexia to a lifelong condition that makes it difficult for people to read.

Dyslexia is associated with the brain. It is the brain being unable to segregate and then integrate information. According to McCandliss and Noble (2003), dyslexia is believed to be caused by both genetic and environmental factors and reported that some cases run in the family. They pointed out that it often occurs in people with attention deficit hyperactivity disorder (ADHD) and is associated with similar difficulties with numbers. It may begin in adulthood as the result of a traumatic brain inquiry, stroke or dementia. According to Lerner and Kline (2006) a research finding shows the evidence that dyslexia is caused by abnormality in brain structure, a difference in brain function and genetic factors. They however noted that researchers are yet to pinpoint exactly what causes dyslexia but that genes and brain differences play a major role.

Similarly, Mednick (2007) ascertained that dyslexia is a learning difficulty caused by malfunctions in the frontal and occipital lobes, affecting the central executive area (attention, planning, sequencing and checking); phonological loop (speech production and perception) and vasio-spatial sector (right hemisphere space and color). He added that the cause of dyslexia could be attributed to family history, slow and prolonged birth and genetic biochemistry.

The underlying mechanisms of dyslexia are problems within the brains language processing (Princess, 2008). Princess opined that dyslexia is different from reading difficulties caused by hearing or vision problems or by insufficient teaching. She also reported the different types of dyslexia as;

i. Trauma dyslexia. This type of dyslexia occurs after some form of brain trauma or injury to the area of the brain that controls reading and writing.
ii. Primary dyslexia: This type of dyslexia is a dysfunction of, rather than damage to, the left

side of the brain (cerebral cortex) and does not change with age. Individual with this type are rarely able to read above primary four. Primary dyslexia is passed in family lines through their genes. It is found more often in boys than in girls.

iii. Secondary dyslexia: This type of dyslexia is said to be caused by hormonal development during the early stages of fetal development. Developmental dyslexia diminishes as the child matures. It is also more common in boys than girls. From the foregoing, dyslexia may affect several different functions.

iv. Visual dyslexia is characterized by number and letter reversal and the ability to write symbols in the correct sequence.

v. Auditory dyslexia involves difficulty with sounds of letters. The sounds areperceived as jumbled or not heard correctly.

**Epidemiology and characteristics of dyslexia**

Dyslexia is the most common learning disability and occurs in all areas of the world. It affects 3-7% of the population. However, up to 20% may develop some degree of symptoms (McCandliss and Noble, 2003). They also noted that dyslexia has been reported to occur mostly in men and has been observed to affects both men and women.

According to Brish (2005) there is a general believe that dyslexia can affect between 5 to 10% of a given population although there is no study yet to indicate an accurate percentage. In Nigeria, it seems that statistics are not readily available and the presence of very little knowledge of the condition of dyslexia is known in Nigeria and as a result, people grappling with the challenge are usually beaten, called names, bullied and jeered at – leading them to development of an inferiority complex thus hindering the tapping of their potentials in science and technology. However, recent findings in Nigeria show a conservative figure of 17 million people living with dyslexia. He added that dyslexia was responsible for the high rate of school dropouts and increasing number of junile crimes.

According to Nwanneka (2012) dyslexia varies from person to person, common characteristics among people with dyslexia are difficulty with spelling, phonological processing (manipulation of sounds) and rapid visual-verbal responding despite having normal intelligence. Other notable characteristics include difficulty in coping from board or a book. He stressed that there may be disorganization in written work. A dyslexic may not be able to remember content, even if it involves a favorite story work.

**Management of dyslexia for effective learning of science and technology**

When a child cannot read or write very well in class there is need for the teacher to know why. An experienced teacher by way of careful observation can easily detect dyslexia. There is no significant or generally acceptable cure for dyslexia. In addition the dyslexia pupils can be assisted to learn to read and write with the appropriate instructional strategies and educational support. An important aspect of dyslexia is for the school to develop a plan with the parent of dyslexics to meet their challenges. However, if the dyslexics current school is unprepared to address this condition, the child need to be transferred to another school with better plan and facilities to handle dyslexia.

In addition, a good treatment plan should focus essentially on strengthening the child's weakness while utilizing the strength. A multisensory method or Slinger method, the Orton-Grillingham method or Read Project which requires the dyslexic to hear, see, say and do something, could be used (Ise and Korne, 2010).

However, most practitioners quite often incorporate the Kinesthetic method also called the language-experience therapeutic method to manage dyslexia. In schools this method can be used in regular classroom of today. This involves classroom teacher soliciting words to be learned by the dyslexic. These words are often repeated overtime until it is mastered. When a storehouse of words is acquired the dyslexic is required to compose a story. The story is written by the teacher and any new word that appears in the story is equally taught. The dyslexic can go on to read and read it again. In improving a dyslexic reading, the teacher should not read like non-dyslexic does. The teacher should find a way of getting information from text that works efficiently for someone who possesses such information differently from the majority.

According to McCandiss and Noble (2003), for alphabet writing system, the fundamental aim is to increase the child's awareness and phonemes and relate these to reading and spelling. Studies have shown that training focused towards visual language or orthographic issues show better gains than mere oral phonological training in managing dyslexia.

McCandliss and Noble (2003), Blish (2005) and Nwanneka (2012) outlined suggestions for the management and intervention programmes to overcoming the challenges of dyslexia. With regards to intervention programmes, the teacher should make judicious use of reinforcement strategies. Reinforcement should be given for efforts as well as achievements. The teacher's instructional strategies should elicit self-esteem, love, and responsibility on the part of the child. The teacher should make optimal use of meaningful learning materials in teaching. This makes for intrinsic motivation in which school becomes more meaningful to the dyslexic than mere rigid regulations. Since the academic demand on a child with dyslexia may be great, there should be frequent breaks in class and homework time. There should also be regular meetings of parents and teachers in order to have a framework for a common forum to discuss and possibly identify problems of pupils as well as help in the mutual process of child's training for optimal productivity.

i. Appropriate screening and identification test instrument should be made available to schools to help in early identification and referrals to special schools in severe cases.
ii. A consortium approach involving specialist in educational psychology, medical neurology special education linguists (e.g speech therapist) etc may make the optimal combination.
iii. Workshops on dyslexic children needs to be held among school teachers in Nigeria to help them understood these unique pupils the more and thus modifying their learning needs appropriately.

Management of dyslexia depends on a multiple of variations, there is no one specific strategy or set of strategies which will work for all who have dyslexia some teaching is geared to specific reading skill areas, such as phonetic decoding whereas other approaches are more comprehensive in scope, combining techniques to address basic skills along with strategies to improve comprehension and literacy appreciation. Many programmes are multisensory in design, meaning that instruction includes visual, auditory, and kinesthetic or tactile elements, as if is generally believed that such form of instruction are more effective for dyslexic learners (Henry, 2007).

According to Henry (2007) and Nwanneka (2012), with academic remediation and appropriate instructions, dyslexia individuals can become skilled readers. According to them, appropriate remedial instruction includes the use of;

- Direct explicit and comprehensive instruction in the structure of language.
- Structure information from the simple to the complex.
- Reinforcement of newly learned skills throughout the day.
- Integrated spelling and handwriting in structured sequence with reading instruction, so that they are mutually reinforcing.
- Extended practice for each skill until the learner over-learns the skill.
- Ongoing review of previously learned skills.
- Careful spacing to avoid information overload.
- Intensive instruction to help develop fluency and reading rate.
- Paired reading to help develop fluency and enhance comprehensions.

The researchers further maintained, several other special educational approaches have been developed for individuals with dyslexia. Prominent among these are adaptive technology, writing system and orthography; and alphabet orthography.

## CONCLUSION

This review on dyslexia has far reaching implications for science and technology education. Teachers' ineffectiveness, academic inadequacies, parental and home pathological environments and perhaps inadequate satisfaction of basic psychological needs at home and in the school are implicated as likely contributory factors in dyslexia. Attention should be paid to early detection of dyslexia especially by teachers who are the custodians of knowledge and by parents too, to aid acquisition and development of science and technology education. As an added remedy, dyslexic should be engaged in slow, labored, accurate reading of single words in isolation. The learner should be taught grip pencil tightly and in good posture when writing. Dyslexic should be encouraged to participate in pair group reading which helps to developing fluency and enhance comprehensions.

However, the phenomenon of dyslexia should not create panic in the heart of teachers, parents and the general public. From findings, the condition does not render one unless and irresponsible but rather if proper attention is given, the dyslexics could develop amazing talents. The dyslexics could be encouraged to

discover other areas of abilities they can explore such as engineering, architecture and drama which requires the knowledge of science and technology.

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**CONFLICT OF INTEREST**

None declared.

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### *Authors' contributions*

IAA conceived and designed the study, he alongside OMO wrote the initial manuscript. Both managed the literature searches, revised and approved the final manuscript.