

CHAPTER NINETEEN

CONTRIBUTION OF VITAMINS AND MINERALS IN IMPROVING LEARNING DIFFICULTIES FOR CHILDREN WITH LEARNING DISABILITIES

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Vitamins and minerals are micronutrients required by the body to carry out a range of normal functions. However, these micronutrients are not produced in our bodies and must be derived from the food we eat. Vitamins are organic substances made by plants or animals and are generally classified as either fat soluble or water soluble. Fat-soluble vitamins are vitamins that can dissolve in fat and tend to accumulate in the body and they include; vitamin A, vitamin D, vitamin E, and vitamin K. Water-soluble vitamins are vitamins that can dissolve in water before they can be absorbed by the body, and therefore cannot be stored. Any water-soluble vitamins unused by the body are primarily lost through urine. Examples of water soluble vitamins include; vitamin C and the B-complex vitamins, such as vitamin B1, B2, B3 B5, B6, B7 vitamin B12, and folate. Minerals are inorganic elements present in soil and water, which are absorbed by plants or consumed by animals. Examples of minerals include; calcium, sodium, potassium, magnesium, manganese, selenium, iron, copper and iodine.

Minerals and vitamins play important roles and functions that help humans maintain a healthy body and live healthy lives. For example minerals and vitamins play a major role in enzyme control and they are a co-factor to over 300 enzymes. Given the importance of minerals and vitamins to the body, a deficiency of any of these minerals and vitamins can cause serious health issues. Also in cases of extreme deficiencies and the presence of toxic mineral such as lead, mercury and others can cause disabilities such as reading difficulties, hyperactivity, cognitive dysfunction, autism spectrum disorders, and some time physical challenges. For example a deficiency in folic acid during pregnancy can cause a child to be born with hydrocephalus or skeletal malformation (Piro, Tagarelli, Lagonia, Tagarelli, Quattrone, 2010).

Learning disabilities are a group of disorders that are caused by genetic and neurobiological factors that alter brain functioning in a manner which affects one or more cognitive processes related to learning. These processing problems can interfere with learning basic skills such as reading, writing and mathematical calculations. They can also interfere with higher level skills such as organization, time planning, abstract reasoning, long or short term memory and attention. It is important to realize that learning disabilities can affect an individual's life beyond

academics and can impact relationships with family, friends and in the workplace. According to the Learning Disability Association of America, learning disabilities have been defined practically, medically and legally. Practically, the term “learning disabilities”, sometimes referred to as specific learning disabilities, is an umbrella term that covers a range of neurologically based disorders in learning and various degrees of severity of such disorders. These disorders involve difficulty in basic psychological processes such as, input (auditory and visual perception), integration (sequencing, abstraction, and organization), memory (working, short term, and long term memory), output (expressive language), and motor (fine and gross motor). The medical definition is derived from the Diagnostic and Statistical Manual of Mental Disorders Fifth Edition (DSM-V) which defines specific learning disabilities as a Neurodevelopmental Disorders that includes difficulties in reading, written expression, and mathematics. And the legal definition is derived from the Individuals with Disabilities Education Act (IDEA) which defines specific learning disability as a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which disorder may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations.

Learning disabilities should not be confused with learning problems which are primarily the result of visual impairments, hearing impairments, motor handicaps, intellectual disability, emotional disturbance, environmental, cultural or economic disadvantages. This is because people with learning disabilities are of average or above average intelligence. There often appears to be a gap between the individual’s potential and actual achievement. This is why learning disabilities are referred to as “hidden disabilities. That is the person looks perfectly “normal” and seems to be a very bright and intelligent person, yet may be unable to demonstrate the skill level expected from someone of a similar age. Since difficulties with reading, writing and mathematics are recognizable problems during the school years, the signs and symptoms of learning disabilities are most often diagnosed during that time. However, some individuals do not receive an evaluation until they are in post-secondary education or adults in the workforce. Other individuals with learning disabilities may never receive an evaluation and go through life, never knowing why they have difficulties with academics and why they may be having problems in their jobs or in relationships with family and friends.

Learning disability is a lifelong challenge that cannot be cured. But with appropriate support and intervention, people with learning disabilities can achieve success in school, at work, in relationships, and in the community. The thesis statement of this chapter is hinged on the fact that children with learning disabilities experienced learning difficulties that needs to be addressed to help them learn better and achieve success in school, at work, in relationships, and in the community. In achieving this target, the discussion will begin with identifying the causes of learning disabilities, identify the learning difficulties of children with learning disabilities, using minerals and vitamins to help children with learning

disabilities improve on their learning difficulties and the implications of using minerals and vitamins on learning difficulties of children with learning disabilities. Conclusion and suggestions will end the discussions.

Causes of Learning Disabilities

Learning disabilities are lifelong disabilities that cannot be cured. But identifying the causes of the disorder can help parents and teachers to help these children improve or even overcome the learning difficulties they go through. According to Peterson (2022) some factors or possible causes of the disorder and there include:

Heredity: heredity has to do with a person's genetic makeup and children inherit their genetic makeup from their parents. Learning disabilities are hereditary disorders that can be passed on from one generation to the other. So a child with a parent or sibling who has a learning disorder has a higher likelihood of having an offspring with learning disability compared to children with no family history of such learning disorders. Research has also shown that a child diagnosed with learning disability has either one of the parents or a sibling with the same disorder pointing to heredity as the cause of the disability.

Environmental factors: exposure to toxins in the environment may cause learning disabilities. For example Lead is a known toxic heavy metal in the environment and if a child is exposed to lead in paint, ceramics, toys or lead in the water, they could develop processing problems in the brain that show up as learning disorders.

Prenatal and Neonatal risks: Prenatal risks are a number of dangers that can pose a potential risk to the growing fetus during pregnancy while neonatal risks are those dangers which can affect a newborn. A complication during the prenatal or neonatal stage can increase the risk of learning disability. For example, exposure to substances like alcohol and drugs, illness during pregnancy, premature birth, inadequate growth in the uterus, and low birth weight can increase the risk of learning disability in children. Premature birth is a birth that occurs before the 37th week of pregnancy as pregnancy usually lasts for about 40 weeks while Low birth weight is when a baby is born weighing less than 2500 grams. Low birth weight is known to increase the risk for major disabilities and contribute to minor difficulties in motor skills and in thinking, learning, and memory (cognitive abilities).

Physical trauma: Physical trauma is defined as a body wound produced by sudden physical injury from impact, violence, or accident. Physical traumatic experience during birth or during the early stages of life can also increase the possibility of learning disability.

Nutrition: nutrition plays an important role for normal growth and development and also for a healthy life. Essential nutrients, minerals and vitamins that are necessary for proper growth and development are obtained through nutrition. Therefore it is important that parents ensure that children are given balanced diet that contains adequate minerals and vitamins to help them grow and developed

normally. Nutrition is essential because a deficiency of minerals and vitamins can cause diseases and disabilities including learning disabilities. Some examples of diseases that are caused by deficiencies of minerals and vitamins include: scurvy; caused by a deficiency of vitamin C, beri-beri caused by a deficiency of vitamin B1, pellagra; caused by a deficiency of vitamin B3, and rickets; caused by a deficiency of vitamin D, anemia; caused by a deficiency of iron etc.

Learning Difficulties of Children with Learning Disabilities

Reading Difficulties: reading difficulties are also referred to as dyslexia. Dyslexia is a specific learning disability that is neurobiological in origin. It is characterized by difficulties with accurate or fluent word recognition and by poor spelling, reading, trouble with identifying speech sounds and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Although dyslexia affects the areas of the brain that process language, children or individuals who have dyslexia have normal intelligence and with the correct intervention, they can succeed in school. Individuals who have dyslexia may also have difficulty in conveying and expressing themselves and their thoughts verbally and they may even face difficulty during conversations, wherein, they are required to put their thoughts together.

Reading difficulties or dyslexia can appear in many different forms and each child may need a different approach to how they are supported in improving their reading skills. It is therefore important to know about the different types of reading difficulties and the errors a child makes so that you can identify which specific aspect of reading they are finding difficulty in so that the correct intervention plan can then be put in place. The different types of Dyslexia/ reading difficulties include:

- a) **Dysphonesia:** Children in this category have difficulty in reading (decoding) words and spelling (encoding) words. It is also known as Auditory Dyslexia or Phonological deficit. Learners in this category are able to memorize sight words but cannot sound out new ones or figure out what they are. Often in the earlier grades, their reading difficulty is not always picked up because many of the words can be learnt by sight. Their spelling is however generally very weak. Errors in spelling show a lack of phonetic knowledge while errors in reading include substitutions. These children have obvious trouble learning sound-symbol correspondence, sounding out words, and spelling. The core problem of children in this group is in the phonological processing system of oral language.
- b) **Dyseidesia:** It is also known as Surface Dyslexia, Visual Dyslexia, Processing speed, orthographic processing deficit or fluency problem. Children with this type of reading disorders have difficulty in recognizing sight words and spend a great deal of time decoding word by word as they read. They have

specific weaknesses with speed of word recognition and automatic recall of word spellings hence this affects their reading speed significantly. Children with this type of dyslexia are able to sound out individual letters phonetically but have trouble identifying patterns of letters in groups. Their spelling tends to be phonetic even when incorrect e.g. laf for laugh. Children in this group have deficits in vision and memory of letters and word shapes, making it difficult for them to develop a sight vocabulary. However, they have the ability to acquire adequate phonetic skills.

- c) **Comprehension deficit or poor comprehension:** People with poor reading comprehension have trouble understanding what they read. Children in this group appear to decode words better than they can comprehend the meanings of passages. These poor readers are distinguished from the other groups because they can read words accurately and quickly and they can spell but their problems are caused by disorders of language comprehension.
- d) **Dysnemesia:** it is also referred to as Reversal problems in writing and reading. This literally means “poor memory of motor movements” and this type involves number and letter reversals. These children are identified quite easily as they tend to reverse b/d p/q and words such as no (on) and saw (was)
- e) **Alexia:** it is an acquired inability to read. Unlike most reading disabilities, which are present from when a child starts to learn to read, people with alexia were once able to read but lost the ability after a stroke or injury to the area of the brain involved with reading.

Motor Skill Difficulties or Dyspraxia: Dyspraxia is a learning disorder in which the child's or individual's motor skills movement is affected. Motor skill movements involve the coordination of small muscles involved in the synchronization of hands and fingers and with the eyes as well. A child who has dyspraxia has trouble with movement and coordination, he or she may have trouble holding things, tying their shoelaces and they may even tend to bump into things. The child may also have speech difficulties, he or she may also be sensitive to light, touch, taste, or smell and they may also have trouble with eye movements. There are four main skills that are affected when it comes to dyspraxia and there are as follows:

- Fine motor skills:there enables an individual to make movements using the small muscles in the hands and wrists.
- Gross motor skills: there allow people to do things that involve using the large muscles in the torso (upper half of the body), arms, and legs.
- Motor planning skill: this skill allows us to recognize and perform steps to make a movement happen.
- Coordination Skills: this skill helps children to organize the activities of two or more groups so that they work together efficiently.

Mathematical Difficulties or Dyscalculia: Dyscalculia is a learning disorder that affects a child's or an individual's ability to do mathematical calculations. Children who are young have difficulty in learning to count and recognizing numbers whereas, when a child gets older, the child may have trouble in solving basic mathematical problems and equations. Children with dyscalculia have problems with understanding how numbers work and relate to each other, calculating mathematical problems, memorizing basic calculations and formulas, using math symbols, understanding word problems and organizing and recording information while solving a mathematical problem.

Writing Difficulties or Dysgraphia: Dysgraphia is a specific learning disability that impacts a child's written expression. Dysgraphia affects a child's writing abilities in such a way that the child can have trouble with spelling, poor handwriting (unclear, irregular, or inconsistent handwriting often with different slants, shapes, upper- and lower-case letters, and cursive and print styles), trouble putting down their thoughts on paper and they also tend to write or copy things slowly. Dysgraphia is a problem related to the nervous system that impacts one's fine motor skills that are required to write. Dysgraphia among children also makes it difficult for them to think and write simultaneously. Children with writing difficulties may also exhibit cramped grip which may lead to a sore hand, have difficulty spacing things out on paper or within margins (poor spatial planning), frequent erasing, inconsistency in letter and word spacing, poor spelling, including unfinished words or missing words or letters and unusual wrist, body, or paper position while writing.

Auditory Processing Difficulties or Disorder (APD): Auditory Processing Disorder is also known as Central Auditory Processing Disorder (CAPD), which is the reduced or impaired ability to identify, comprehend and discriminate sounds even though the individual's hearing is not impaired. Children with auditory processing disorders have difficulty with learning to read, difficulty in distinguishing sounds from background noise, trouble with following spoken directions or instructions especially if there are multiple steps to the task, difficulty with telling the difference between similar-sounding words, trouble remembering things they have heard, trouble in following conversations, difficulty in knowing where a sound came from, trouble with listening to music and difficulty in understanding what people say, especially in a loud place or if more than one person is talking.

Visual Processing Difficulties or Disorder (VPD): Visual Processing Disorder is when a child or an individual has trouble interpreting visual information. He or she may have a hard time with reading or discriminating between objects that look similar. Individuals with a visual processing disorder may have trouble with hand-eye coordination.

Nonverbal Learning Difficulties or Disorder (NLD or NVLD): Nonverbal Learning Disorder involves difficulties that are present in visual-spatial skills

which is the ability to tell where objects are in space, visual-motor skills, and other skills necessary in social or academic functioning. The child has difficulty in receiving and interpreting nonverbal cues of communication like body language and expressions. They may also have difficulties with interpreting facial expressions and nonverbal cues/clues in social interactions, have difficulties using language appropriately in social situations, have problems with physical coordination, have problems with fine motor skills, such as writing, have difficulties with attention, planning, and organizing.

Apraxia of Speech Difficulties: Childhood Apraxia of Speech is a disorder in which a child has difficulty making accurate movements when speaking and has difficulty in saying what he or she intends to say. When it comes to apraxia of speech, the speech muscles aren't weak, but they don't function normally as the brain has difficulty in directing and/or coordinating the movements.

Using Minerals and Vitamins to Help Improve Learning Difficulties of Children with Learning Disabilities

Minerals and vitamins are the building blocks of the body and are needed in the right amounts for normal growth and development. Deficiencies of mineral and vitamins and heavy metals or minerals have been listed as a cause of learning disabilities. This is because nutrition is the means by which these minerals and vitamins can be obtained by humans from other animals, plants and water. Humans may not be getting the right amounts of minerals and vitamins from the food they eat as the minerals and vitamins may be lost during the cooking processes and this can lead to deficiencies of essential minerals and vitamins that can cause diseases and consequently disabilities. A variety of handicaps, including orthopaedic and learning disabilities, can be caused by severe deficiencies of minerals and vitamins and a major contributing factor to many children's health problems around the world, including anaemia (low iron), hypothyroid (low iodine), scurvy (vitamin C deficiency), and rickets (calcium and/or vitamin D deficiency) (Reynolds, Vannest and Fletcher-Janzen, 2014). Minerals and vitamin supplements have been used as an intervention for many disabilities including learning disabilities because of the important functions they play in the body. Minerals and vitamins play critical function as enzymatic co-factors for numerous reactions in the body, such as the production of neuro-transmitters and fatty acid metabolism. For example multiple neurotransmitter systems such as gamma-aminobutyric acid (GABA)-ergic system, glutaminergic system, and serotonergic system are dysfunctional in individuals with learning disabilities as a result of a deficiency in minerals and vitamins such as B5, B6, Calcium, Zinc and Magnesium and this has affected the children's ability to read, spell and write. Therefore supplementation with vitamin B5, B6, Calcium, Zinc and Magnesium will improve on the functions of these neurotransmitter systems which will in turn improve on the learning difficulties of these children.

Minerals and vitamins are essential in the translation and transcription of polynucleotide, DNA synthesis and cell division. They are also involved in the

synthesis and the degradation of lipids, proteins, carbohydrate and nucleic acids. Minerals and vitamins are present in all the tissues (skeletal muscle, bone, choroid of the eye etc.) and fluids (blood plasma or prostatic fluids) of the body and it is also essential in wound healing.

Minerals and vitamins are necessary for milk production during lactation, for normal foetal growth and development since they interact with hormones involved in bone growth (somatomedin-c, testosterone, osteocalcin, thyroid hormones and insulin). Minerals and vitamins are indispensable to the development of the central nervous system because they are involved in the production of neurotransmitters. Minerals and vitamins play important roles in brain growth and memory function as they control the enzymes, proteins and neurotransmitters involved in the growth and development of the brain. Minerals and vitamins also play important role in immune function. Minerals and vitamins forms part of hemoglobin, which carries oxygen from our lungs and circulates it throughout our body and they are also necessary for temperature regulation, cognitive development and growth. Minerals and vitamins are essential for the maintenance of membrane potential and this membrane potential is a key for nerve impulse transmission, muscle contraction and heart function. Minerals and vitamins play important role in connective tissue formation, melanin formation, formation and maintenance of myelin sheath, protection of red blood cells and lung cells, regulation of gene expression and antioxidant function. Minerals and vitamins are essential for growth and development of humans. They are also essential for bone growth, development of teeth and healthy gums, necessary for blood clotting and the stabilization of many body functions. Minerals and vitamins have a natural calming and tranquilizing effect and are necessary for maintaining a regular heartbeat and the transmission of nerve impulses. They help in lowering cholesterol, improve muscular growth, prevent depression, dizziness, muscle twitching and may help prevent cardiovascular disease. Minerals and vitamins have a major role to play in many cognitive functions such as learning, memory and attention processes. Minerals and vitamins are necessary for the synthesis of nucleic acids (DNA and RNA), amino acid synthesis, and metabolism of fats, drugs and steroids. Minerals and vitamins play important roles in vision, cellular growth and differentiation of tissue such as epithelial tissue, bone tissue and nervous tissue.

Given the important roles that minerals and vitamins play in the body, a deficiency of any of the minerals and vitamins will lead to many health problems and learning difficulties such as reading, writing, dyscalculia, motor skill difficulties, auditory processing difficulties, visual processing difficulties and apraxia for children with learning disabilities. Therefore to help children with learning disabilities overcome or improve on these learning difficulties, the deficient minerals and vitamins need to be supplemented. In achieving this, children with learning disabilities need to be tested to find out the deficient minerals and vitamins using either atomic absorption, quantum resonance

magnetic analyze or urine and hair analysis. This will ensure that only the deficient minerals and vitamins are given to the children. When the deficient minerals and vitamins are given this will go a long way in improving the difficulties of children with learning disabilities and also improve the general health status of these children.

Implications of Using Minerals and Vitamins on Children with Learning Disabilities

- Mineral and vitamin supplementation will help improve brain function and brain processes which in turn will help children with learning disabilities to be able to improve on learning difficulties such as reading, writing, spelling and mathematical difficulties.
- Minerals and vitamin supplementation will help children with learning disabilities improve on the auditory and visual processing difficulties as the minerals and vitamins that are involved in the production of neurotransmitters that are responsible for these processes may be deficient.
- Improving on the learning difficulties of children with learning disabilities as a result of minerals and vitamins supplementation will help in improving the overall academic performance of these children which will also go a long way to boost their self-esteem and confidence.
- Using minerals and vitamins supplementation in helping children with learning disabilities improve on their learning difficulties will also help the children to overcome stigmatization and labeling.

Conclusion

Minerals and vitamin supplementation is an effective intervention for children with learning disabilities and other disabilities. This is because minerals and vitamins are the building blocks of the body and they play important roles and functions that help to keep the body healthy and prevent diseases. Also deficiencies of minerals and vitamins impaired brain and nervous system functions that can lead to learning disabilities. Therefore supplementation can help improve on these functions and help improve on the learning difficulties of children with learning disabilities.

Suggestions

- Minerals and vitamins are essential for growth and development and therefore should be given to every child most especially those with special need. They are also essential for preventing diseases and maintaining a healthy life style.
- Minerals and vitamins supplementation should be used alongside other educational interventions for children with learning disabilities for optimum results.

- Parents should be educated on the benefits of minerals and vitamins supplementation to children with special and other health conditions for them to take advantage of such options and improve on their children's difficulties.

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