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Thyroid Dysfunction, Memory and Learning

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Abstract
The thyroid gland is responsible for the rate of all metabolic and chemical processes in our body such as cell, tissue, and organ. Thyroid gland disorders affect the process of learning subsequently causing entire metabolic activities and performance in the teaching-learning process due to such symptoms as memory retrieval issues and lack of attention. Thyroid problems either hyperthyroidism or hypothyroidism can happen at any age; even the infants can be born with thyroid dysfunction. One out of three Indians is suffering from thyroid-related disorders such as obesity and imbalanced hormonal secretion especially women are the main target for this disorder. Commonly thyroid dysfunction shows the signs like weight gain or weight loss, high or less sensitivity towards cold or hot, changes in bowel movements, and irregularities in the menstrual cycle. The major target organ for thyroid hormone is brain, and can have significant effect on cognition in the teaching-learning process due to adult-onset hypothyroidism. Underactive thyroid gland is called as hypothyroidism that can result in forgetfulness and other thinking problems and emotional disorders such as stress, anxiety, or depression. Also, this can cause forgetfulness, confusion, difficulty in concentration, and other problems that disrupt daily activities. The person who has trouble in memory fail to access the information or retrieve the information which are already stored in their memory which results in deficiencies in their skill acquisition such as recalling the name, directions, retrieving vocabularies which are highly essential for societal communication. The failure to remember names or faces in the classroom or information relevant to content or concept can lead to depression which further leads to avoid the group work altogether which can cause a deficiency in learning. Appropriate treatment such as medication to block the ability of the physique to generate new thyroid hormone or regenerate missing thyroid hormone normally promotes thyroid deficit symptoms are emotional and physical. Most of the thyroid disorders are good, and even if the psychological symptoms take a long time to settle initially, people usually make a full recovery and lead normal lives once their thyroid condition is treated. This paper discusses the association among thyroid dysfunction, memory, and learning in human.

Keywords: Thyroid gland, metabolic, chemical processes, hyperthyroidism, hypothyroidism, cognition, teaching-learning process, memory, medication, thyroid dysfunction, learning

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I. INTRODUCTION

Cellular energy homeostasis and regulation take place by the proper functioning of the thyroid hormone. Most common endocrine disorders with a substantial overlap of thyroid dysfunctions and metabolic syndrome (Iwen et al., 2013). WHO considered metabolic syndrome as the world epidemic of major common health issues, Metabolic syndrome is known to affect cognition and raise memory risk like dementia (Yates et al., 2012). Thyroid dysfunction, obviously subclinical hypothyroidism, has been detected more frequently in metabolic syndrome patients rather than in the general population (Khatiwada et al., 2016). The occurrence of thyroid dysfunction was more common in adolescents than children and in females than males (Gopaliah et al, 2016). Hypothyroidism is associated with multiple dysfunctions such as mental deficit, motor dysfunction, memory dysfunction, etc., (Anjana et al., n.d.). Learning is closely related to memory; learning is the acquisition of skill or knowledge, while memory is the expression of what we have acquired (Learning & Memory, n.d.).

THYROID HORMONE AND BRAIN FUNCTION

The brain largely occupied by the thyroid hormone also generates numerous effects on the central nervous system through different ways and means; the thyroid hormone exhibits its action in it. The modifications in the brain are either functional or structural which are closely associated with hypothyroid states. Both hyperthyroidism and hypothyroidism are associated with changes in mood and intellectual performance and severe hypothyroidism can mimic melancholic depression and dementia. The neurocognitive

dysfunction accompanying thyroid dysfunction is normally reversed rapidly following return to euthyroid hormone status, although severe hypothyroidism if left untreated may rarely result in irreversible dementia. Thyroid hormone activates the metabolic activity of the adult brain. Thyroid dysfunction can be recognized by the neuropsychiatric manifestations. The non-optimal thyroid function creates mood disturbance, cognitive impairment, and other psychiatric symptoms. Functional brain imaging techniques to evaluate cerebral blood flow and metabolism have offered some promising insights into the thyroid–brain relationship (Biswas & Dey, 2016)

THYROID DYSFUNCTION AND MEMORY

Thyroid hormone dysfunction causes the cognitive deficit. Thyroid hormone is more essential for maintaining both high-level physical function and cognitive function (Zhu et al., 2006). Agitation of the thyroid structure, specifically if leading to a hypothyroid state, may deeply change mental functions causing cognition and emotions. Acute hypothyroidism can lead to either serious depression or dementia which may be untreated, various cognitive dysfunction such as intelligence deficit, psychomotor deficit, and memory deficit may be seen ranging from mild to profound. It was recommended that hypothyroid based memory deficits which are not the reason for attention deficit, but specifically the reason for the retrieval deficits. Due to hypothyroidism, elders become highly susceptible to changes in cognition. Also, the evidence shows subclinical hypothyroidism which is related to cognitive dysfunction. A continuous finding among different studies identified a particular deficit in working memory (Biswas & Dey, 2016). The different study evidenced the working memory deficit in patients with subclinical hypothyroidism, Risk factor for dementia may be caused by the untreated thyroid hormone. Hypothyroidism and hyperthyroidism are identified as endocrinological diseases. Given that working memory is pivotal for major cognitive functions which are essential for the common human intelligence, after an L-thyroxine-replacement treatment, the memory performance has improved (Zhu et al., 2006).

MEMORY AND LEARNING

Learning and Memory share important parallels, for the formation of memory traces which essentially need the learning those functions exist in and rely upon the brain (The Relationship Between Learning and Memory | Betterhelp, n.d.). The learning takes place depending upon the capacity of working memory, in view of the fact that the information stored in one's memory generates the basis for linking the existing knowledge with neo-knowledge by association, therefore the memory is essential for learning. It is a harmonious relationship that continues to emerge during the life span (The Role of Memory in Learning, 2018). The components of cognitive functions such as memory and learning that involve a variety of subcomponents can be structured in different ways (Brem et al., 2013). Psychologists pronounce that learning is an act of obtaining information as per the perception of neuroscientists, moreover emphasize that it is a progression to employ distinct areas of the brain, based on weird patterns of neural activity, especially the physiological modification in brain cells that cover the learning experience. Similarly, the term memory is also extensively used besides particular networks in the brain for instance a collective structure or a set of neuronal connections to carry out the functions of memory (Morris et al., 2006). Multiple dimensions of learning such as vocabulary acquisition, language understanding, language performance, and reading comprehension take place in working memory, which is the major focus of cognitive psychology (Guo, 2016)

FINAL THOUGHTS

The features of learning and memory are essential during the process of interacting with the individual and the environment which involve the interplay of huge, dispensed brain networks. Technical advancement in recent years exploring the correlation of neurobiological and neuropsychological paradigms drastically increased our insight into human learning and memory (Brem et al., 2013). Thyroid activity operates a role in cognition; however, medical symptoms of thyroid dysfunction is still unknown, between the operational state of the thyroid and neuropsychiatric alterations proceeding with age among people (Walecka, 2015).

World Health Organisation suggested that 90-150 µg/ day of iodine intake for children and adolescents regarding their age. Many clinical studies suggested that hypothyroidism caused by improper intake of iodine with cognitive impairment. Iodine deficiency is one of the most important single causes of avoidable brain damage in the world (Wallborn et al., 2021, p. 1). Collaboration between clinical physiologists and endocrinologists is needed to develop robust, scientific criterion for when patients should be medically treated for hypothyroidism at the earliest also there is a need to disseminate the relationship among the thyroid dysfunction, memory and learning to the educationists at all levels especially at primary level in order to diagnose the abnormality in thyroid gland at earlier stage to reduce the memory deficit and learning disability (Austin & Petak, 2019)

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