

EXPLORING COGNITIVE TRAILS: A REVIEW ON THE BENEFITS OF SUPPLEMENTATION ON COGNITION AND MENTAL PERFORMANCE

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Abstract: **Introduction:** Optimizing cognitive function through supplementation has gained prominence in a series of studies due to its benefits on brain function. **Objective:** The present study aims to construct a bibliographical review about the supplementation of creatine, vitamin B12, iron, collagen, medium chain triglycerides (MCT), omega-3, *Bacopa Monnieri* and magnesium l-threonate and its effects on cognitive aspects. **Methodology:** 28 articles were selected in a search carried out in the databases PubMed, Undergraduate Academic Repository (RAG) – PUC GOIÁS and Digital Library of Monographs of “Universidade Federal do Pará”, using the descriptors “cognition”, “memory” and “supplements” among the years 2016 to 2023 in English, Portuguese and Spanish. **Results:** The studies analyzed indicate strong effectiveness in supplementing vitamin B12, iron and fatty acids in attention, while collagen peptides, Bacopa and creatine offered better results for memory, the latter mainly in long-term memory. Magnesium l-threonate, in turn, promoted significant improvements in all categories of cognition tests analyzed, with greater emphasis on elderly patients. As for MCT, data indicate a significant increase in young people, with a minimum time of 2-3 weeks. **Conclusion:** The supplements analyzed showed certain levels of benefits in cognitive improvement but factors such as age, dose, time of use, previous health status, adverse effects and intended objectives need to be taken into consideration for a more satisfactory result.

Keywords: Cognitive Performance; Supplements; Memory; Attention.

INTRODUCTION

The relentless search for strategies that improve cognition and optimize mental performance has been a constant journey at the intersection of science and health. This review article takes a deep dive into the vast landscape of nutritional supplements, examining their pivotal role in promoting brain health and boosting cognitive functions. The focus of this analysis is on the comprehensive evaluation of the benefits offered by a variety of supplements, each one standing out for its unique properties. From the indispensable vitamin B12, recognized for its vital role in brain metabolism, to the promising collagen peptides, whose interactions with the central nervous system are increasingly being explored, the range of nutrients covered is wide and diverse. Additionally, we explore the contributions of omega-3 fatty acids, known for their positive impact on neuronal cell membranes, creatine, whose cognitive benefits have transcended its traditional association with physical performance, and newer supplements such as chain triglycerides medium (TCM), which have gained prominence due to their rapid conversion into brain energy sources. Furthermore, we examine the role of magnesium L-Threonate, iron and Bacopa monnieri, highlighting their unique contributions to improving cognition. This review aims to consolidate the latest findings and offer a comprehensive look at the fascinating intersection between nutrition and brain function, providing a solid foundation for those seeking to optimize their cognitive health through nutritional supplementation.

LITERATURE REVIEW

Cognitive function can be understood as a set of operations carried out by the brain to process information, and covers areas such as memory, perception, different forms of attention, reasoning, language, and thinking

itself. The impairment of any of the cognitive functions — or even all of them —, due to injury, illness or aging, can harm daily activities that depend on this set, such as driving and cooking, affecting the individual's interaction with the world. The preservation of a healthy cognitive function is essential for the individual's good overall functioning and occurs in several ways, whether by protecting the blood-brain barrier (BBB), increasing the number of synapses, or promoting an increase in ATP synthesis. To this end, there is a range of nutrients and substances produced by the body itself or absorbed through food that act on one or more of these mechanisms in the brain, contributing to the maintenance or improvement of brain metabolism and, consequently, cognitive function. It is worth analyzing some of these substances and the benefits of their supplementation.

CREATINE

Creatine is a compound of amino acids produced by the body itself in the kidneys, pancreas and liver and which, after its synthesis, is released into the bloodstream and transported to perform its main functions in skeletal muscle fibers and the brain. In the brain, creatine plays a fundamental role in assisting in the synthesis of ATP for cells, increasing the energy supply for efficient neuronal activity. With creatine deficiency, the individual can develop mental disorders, such as learning delays and autism, due to the lack of ATP in the energy pathways, preventing the efficient functioning of neurophysiological processes. In addition to its production in the kidneys and liver, creatine can also be synthesized, although in smaller quantities, in the brain itself, and absorbed through food, being found especially in red meat and fish. When ingested, creatine is absorbed by the gastrointestinal tract and then enters the bloodstream to be distributed. Due to these properties, studies

indicate that creatine supplementation in healthy individuals is capable of increasing physical performance and also contributing to cognitive function, increasing memory and attention, in addition to preventing the development of neurodegenerative diseases. Upon entering cells, creatine is transformed into phosphocreatine (PCr) — formed by a phosphate molecule linked to creatine — through the action of the enzyme creatine kinase (CK). It is this PCr that will contribute to the supply of energy to cells, as it donates a phosphate group for the resynthesis of ATP (MCKENDRY, J. et al., 2020), the main source of energy for cells. When supplemented, these ATP levels regenerated by creatine increase significantly in skeletal muscles, but brain levels do not increase at the same level. The studies analyzed demonstrated that although there is an increase in creatine in the brain, which promotes an improvement in cognitive function, this increase is not as significant and changes according to the individual's age and health status. An example of this is in studies carried out by MCMORRIS et al (2007), who demonstrated that creatine supplementation produces a positive impact on cognitive areas in healthy elderly people, improving cognitive function in this group. At the same time, in the analyzes of MEREGE-FILHO et al (2016), this same supplementation did not generate any significant impact on the cognitive function of healthy young people, demonstrating in this study that exogenous intake is less necessary than brain creatine synthesis in the brain homeostasis of this population. In another study carried out by Pires L.A.M. (2020), supplementation of 20g of creatine per day for seven days was carried out in a population of elderly people between 68 and 85 years old, resulting in a significant improvement in memory, especially in the memorization of long digits of numbers and in long-term memory. Similarly, in a study

carried out on vegetarians, 5g of creatine was supplemented per day for six weeks (WATANAB, A. et al., 2002) in which improvement in working memory was found. However, studies are limited regarding the specific benefits of creatine supplementation in healthy individuals with efficient endogenous creatine synthesis, demonstrating that there is no significant effect in children, young people and adults. In cases of creatine deficiency, supplementation is essential to delay the development of diseases and mental disorders that have loss of cognitive function as one of the main signs.

B12 VITAMIN

Vitamin B12 or cobalamin (Cbl) is a water-soluble vitamin synthesized only by microorganisms, and is supplied in the diet mainly through meat, dairy products, eggs and fish. Deficiency of this nutrient arises from factors such as low intake, absorption defects, transport disorders or problems in cellular processing. Its importance is notable when investigating the synthesis of neurotransmitters and elements that constitute the structure of neurons, contributing to the maintenance of cognitive integrity and prevention of the degenerative process of the cerebral cortex. In addition, cobalamin also has great relevance in the hematological system, as its enzymatic forms - methylcobalamin and adenosylcobalamin - are essential for maintaining the homeostasis of an amino acid involved in blood clotting, homocystine (Hcy). To assess cognitive capacity, an issue of greatest interest, two protocols are used: The MMSE (Mini Mental State Examination) and the MoCA (Montreal Cognitive Assessment). These exams were used over a period of 6 months in patients with some degree of cognitive impairment and aged 45 years or over. For a more efficient analysis, the individuals were divided into

two groups: one of them received 500 mg of vitamin B12 intramuscularly once a day for 7 days, followed by cobamamide (0.25 mg) and methylcobalamin (0.5 mg) per day. orally in the following days; the second group did not receive any daily treatment, being a control group. With regard to middle-aged and elderly individuals, studies found significant improvements in MMSE and MoCA scores. At the end of the six months of experiment, the group that received the treatment showed greater changes when compared to the control group, mainly in relation to orientation, registration, attention and calculation, recall, visuospatial function and language. This highlights the effectiveness of vitamin B12 supplementation in the functional recovery of the frontal cortex, a region of the brain involved in executive actions, attention, memory and intelligence. Furthermore, other analyzes have shown that there is a close relationship between dementia and vitamin B12 deficiency. The accumulation of toxic substances, demyelination and disturbances in the production of neurotransmitters are some of the factors included in this relationship and which lead to cognitive impairment. A study by Spence JD (2016) suggests that early treatment is an important method for preventing this cognitive dysfunction, which can be completely reversible through replacement therapy. Although the experiment period was relatively short for definitive results to be achieved, treatment with vitamin B12 proved to be an important advance in maintaining mental health.

IRON

Iron is an essential mineral important in the production of red cells and the transport of oxygen in the blood, being found especially in red meat, dark green leaves and legumes such as beans. Its deficiency has been associated with a delay in the cognitive development of

children, especially when caused by anemia due to nutritional deficiency, in which there are also reduced levels of folic acid, vitamin B12 and vitamin A. Various studies conducted in the late 90s showed that iron deficiency and iron deficiency due to anemia can cause failures in cognitive function, suggesting that iron supplementation could then be beneficial and improve the individual's cognition. This would be because iron provides good oxygenation of the brain, favoring cerebral blood flow, and contributing to the regulation of the release of neurotransmitters. In a study conducted by Baumgartner (2012), the effects of iron supplementation compared to a placebo in the memory area of cognitive function in children between six and twelve years old were analyzed, with a significant improvement in the memory of those who received iron supplementation. Furthermore, the effect was more significant in female children than in male children, and with levels also higher in children who had some type of nutritional anemia when compared to healthy children. Another similar study carried out with female children of the same age group in India (KANANI, J. et al, 2009), showed that iron supplementation in combination with folic acid twice a week is also capable of improving memory. However, this effect is moderate and there is not enough evidence to prove that this supplementation can also contribute to improving memory in adolescents and adults. With regard to the cognitive area of attention, the study carried out by Kanani (2009) demonstrated that daily or twice-a-week supplementation with the combination of iron and folic acid is beneficial for attention and concentration, causing a significant increase in attention in girls in particular. The study published by Pollitt (1997) showed that iron supplementation brought improvements to the attention of children of both sexes, being greater in those with some type of anemia. The

benefits of iron supplementation for attention occur because iron is one of those responsible for maintaining dopamine metabolism, and this in turn contributes to the regulation of attention. The studies analyzed did not show any considerable improvement in the fields of verbal and non-verbal language, and logical reasoning, not demonstrating any beneficial effect that iron supplementation may have on the individual's general intelligence. Furthermore, it was found that daily iron supplementation can harm cognitive function, reducing reasoning and attention. One of the likely reasons for this would be oxidative stress caused by the accumulation of iron in the brain. Other negative effects of frequent iron supplementation are the possibility of diarrhea, constipation, nausea, abdominal pain and gastroesophageal reflux.

COLLAGEN PEPTIDES

Collagen is the protein found in greatest quantity in the body, being the main constituent of body tissues and an important component of structures exposed to major impacts, such as ligaments and tendons. Its action also covers the nervous system, presenting benefits in cognitive function and brain structure. From the second decade of life onwards, a gradual loss of collagen begins, reaching a rate of approximately 1% per year after the age of 40. As a result, there is the appearance of chronic pain that worsens with aging, being even more prevalent in females. Added to this, depressive behaviors and mood changes are symptoms that can also accompany this loss. Drugs such as NSAIDs and corticosteroids are used to control pain; however, in addition to having several side effects when administered long-term, they do not solve the source of the problem. Therefore, supplementation with collagen peptides (PC) is an interesting way to correct the etiology of this condition, preventing the manifestation of

pain and maintaining a healthy mental state. To evaluate the benefits of supplementation with collagen peptides, a treatment involving their intake was used over a period of 3, 6 and 9 months in physically active, middle-aged people. For better analysis, three groups were established, each receiving different dosages (0 g/d, 10 g/d and 20 g/d). Among the findings of this study, it was identified not only the improvement in pain, but also in activities of daily living (ADLs) after the oral administration of 10 g/d over 6 months. The results were even more effective when supplementation was associated with regular physical activity, which is in line with studies carried out by **Praet et al (2019)** e **Bruyère et al (2012)**. These showed improvements in the KOOS (Knee injury and Osteoarthritis Outcome Score) measure for pain in patients who practiced physical exercise for more than 188 minutes per week, which highlights the influence of physical activity on the action of CP. Other studies have indicated that some collagen peptides are capable of crossing the blood-brain barrier, reaching brain tissues and exerting various cognitive effects. Research carried out by **Nogimura, D. et al (2020)** found that the administration of a collagen derivative is related to an increase in the proliferation of neural stem cells in the hippocampus, an essential process for memory and learning. Hippocampal neurogenesis has also been shown to be an important factor in controlling depressive behaviors and chronic stress, as these are closely related to the decrease in neural cells in the hippocampus. The same study also identified that the greater concentration of dopamine in the prefrontal cortex promotes the antidepressant activity of hydrolyzed collagen, while the decrease in dopaminergic receptors inhibited this collagen activity, inducing depression-like behavior. Furthermore, research published by **Koizumi, S. et al., (2019)** found that

PC supplementation 5g/d for 4 weeks was positive with regard to brain structure, cognitive function and memory in patients aged between 43 and 69 years, which, added to other studies, reflects the various benefits of this supplementation for the human body.

MEDIUM CHAIN TRIGLYCERIDES (MCT)

The human brain represents about 2% of body weight. Despite this, its energy expenditure is responsible for approximately 20% of basal metabolism (**ROLFE D.F. et al, 1997**). Furthermore, this organ stores reduced amounts of glycogen and its primary energy source is the oxidation of glucose, essential for maintaining the ionic gradient and carrying out synapses (**ASHTON J., et al 2020**). When considering that disorders in glucose metabolism are present in most neurodegenerative diseases - such as Alzheimer's, Parkinson's, Huntington's and Amyotrophic Lateral Sclerosis (**ASHTON J., et al 2020**) – the study and approach of alternative pathways that use ketone bodies is growing in importance, as they show promise in maintaining energy supply to the brain, delaying the progression and development of neurodegenerative diseases, or even preventing them, since that the approach to these pathways is stimulated sufficiently in advance (**CUNNANE, S.C., et al, 2020**). Furthermore, it has already been demonstrated that addressing such pathways, in healthy individuals, through medium-chain triglyceride (MCT) supplementation, shows promise in increasing performance in cognitive tasks. Medium-chain triglycerides (MCTs) are mixed fatty acids (FAs) with chains of 6 to 12 carbons. Some of its main natural sources are coconut oil, palm oil and breast milk. It is a fatty acid that is rarely present in the Western diet, in which the FAs consumed are mostly long chain (>12 carbon atoms),

however, in recent years, MCTs have been increasingly incorporated into dietary plans both through intake through natural sources, as well as through supplementation, due to a series of health benefits. Its commercial form contains varying proportions of caprylic acid (C8) and capric acid (C10). The C8 form is more ketogenic than the C10 (ST-PIERRE V. et al, 2019), (VANDENBERGHE C. et al, 2017) and is metabolized preferentially by neural cells, whereas the C10 form is metabolized more slowly, tending to accumulate in the body (KHABBUSH A. et al, 2017). Despite this, C10 is easily digested, which prevents gastrointestinal discomfort. Therefore, an adequate C8:C10 ratio is essential for adherence to the inclusion of MCTs in the diet. Vandenberghe et al showed that a moderate portion of C8 in the C8-C10 mixture is enough to cause the ketone peak caused by pure C8 supplementation. Furthermore, Hughes et al. observed that C10, but not C8, increased citrate synthase activity after 6 days of MCT supplementation, indicating an increase in the number of mitochondria. MCTs, after ingestion, are quickly digested and readily co-opted as an energy source. Their digestion begins in the mouth, where they are acted upon by lingual lipase, after which they are hydrolyzed in the stomach and, in the intestine, under the action of pancreatic lipase, they are degraded into monoglycerides and medium-chain fatty acids (MCFAs). MCFAs, a few minutes after ingestion, can be absorbed directly through the portal vein, part of them linked to albumin, which facilitates transport in the blood. Furthermore, MCTs can be absorbed by enterocytes without being acted upon by bile and pancreatic lipase, this differentiates them from long-chain fatty acids (LCFAs), which must be emulsified for digestion, incorporated into chylomicrons, through which they are transported, through the lymphatic system,

to the tissues. Furthermore, MCFAs, unlike LCFAs, do not depend on carnitine to enter the mitochondrial membrane (ŁOŚ-RYCHARSKA E. et al, 2016), allowing rapid oxidation. In the liver, most MCFAs are oxidized via β -oxidation, originating Acetyl-CoA, subsequently converted into acetoacetate, which can be decomposed into β -hydroxybutyrate (β HB) and acetone. Acetone can participate in glycogenolysis as a substrate, but is generally expelled through urine and lungs. On the other hand, β HB, transported by the blood, accesses the muscles and brain tissue, where it can be used as an alternative energy source to glucose (ASHTON J., et al 2020). In muscles and the brain, β HB is converted to acetoacetate, which after several processes culminates in the formation of Acetyl-CoA, which enters the Krebs cycle, producing NADH and FADH₂ for the electron transport chain. In this process, each acetoacetate molecule generates 23 ATP molecules and each β HB generates 26 ATP. Furthermore, medium-chain FAs that have not undergone hepatic metabolism, with their small chains, can cross the blood-brain barrier and be oxidized in astrocytes. Therefore, MCTs are an alternative energy source for the brain, both directly and indirectly (via β HB). Initially it was thought that the human body had a reduced capacity to use acetone as an energy source, believing that it could only serve as a substrate in gluconeogenesis in the Krebs cycle, however, in the 1980s new pathways were discovered (ASHTON J., et al 2020) and, more recently, Kaleta et al. identified 58 possible pathways for converting acetone to glucose. Thus, with the knowledge that MCTs provide alternative routes of energy supply to the brain, their supplementation is interesting, promoting cognitive improvements in healthy young individuals, elderly people and individuals with neurodegenerative diseases. Ashton, et

al. (2020) promoted a study in which MCT supplementation (30:70 ratio of C8:C10) was carried out in healthy university students (age 19.7 ± 1.5 years) without neurological diseases, observing improvement in cognitive tests, with minimal difference between doses of 12g and 18g of MCT/day for most data collected. Data indicates a minimum of 2-3 weeks of supplementation to see cognitive improvements.

FATTY ACIDS - OMEGA 3

Fatty acids are important components of the brain, influencing its structure, functioning and fluidity (Clandinin MT., 1999). The long-chain polyunsaturated fatty acids omega-3 (n-3) and omega-6 (n-6) are obtained exclusively through food, being found in sources such as fish, oils and seeds. These compounds are related to the myelination and integrity of nerve fibers, directly affecting neural signaling. Docosahexaenoic acids (DHA) and arachidonic acids (AA), in particular, play an essential role in the functioning of the central nervous system, influencing complex cognitive processes and the transmission of signals in the frontal cortex (Almaas AN. et al. 2016). With regard to omega-3, several studies have emphasized the benefits of its supplementation for neurodevelopment at different stages of life, showing that its effects cover communication, language, intelligence and several other cognitive domains. With regard to intrauterine supplementation, studies have shown that increased maternal DHA is related to improved K-ABC language scores in 5- and 6-year-old children. (Mulder KA. et al., 2018), Better performance was also found in attention and behavioral state tests in the first year of life (Colombo J. et al. 2016). Regarding vision development, several studies have linked gestational n-3 supplementation to the formation of the retina and visual acuity, as verified by research carried out by

Ress A. et al (2019), which obtained positive effects mainly during the third trimester of pregnancy. When DHA supplementation was carried out in childhood, it was found that 10-year-old girls obtained superior results in the reading and spelling measures of the Weschler Individual Achievement test (Isaacs EB. et al., 2011); when combining this supplementation with AA, an increase of 7 points was observed on the BSID-II mental development scale (Martinez M. 1992). Supplementation with fatty acids was also shown to be important in brain electrophysiology, with greater activation of neural networks in the supplemented groups and, consequently, faster reaction times in the tests performed (Liao K. et al. 2017). Furthermore, several studies have also investigated fatty acid supplementation during adolescence. Research carried out by Aberg et al (2009) found that weekly fish consumption at 15 years of age provided higher levels of composite, verbal and visuospatial intelligence when compared to individuals who did not consume this intake. Vesco et al (2019) found improvements in the ability to maintain attention, filter information and learn, in addition to suggesting positive effects of omega-3 in the treatment of mood disorders. Several benefits were also found with regard to information processing speed, impulsivity and memory. It is important to highlight that high intake of n-3 supplementation showed a decrease in cognitive abilities, which shows that an efficiency threshold must be established so that its effects are not the opposite of what was expected. Furthermore, although several beneficial results have been found, more research is needed to better investigate the topic.

BACOPA MONNIERI

Bacopa monnieri, also known as Brahmi, emerges as an adaptogenic plant steeped in distinction, revered in traditional Indian medicine, notably in Ayurveda, for its prominent medicinal properties, especially with regard to the nervous system and cognitive faculties. Substantial research was meticulously carried out, unfolding in an evaluation of the effectiveness of the standardized extract of Bacopa monnieri on the cognitive functions of medical students, through a randomized and thoroughly placebo-controlled clinical trial, which lasted six weeks. The study was carried out on sixty students, meticulously divided at random into two contingents, subjected to the imposition of 150 mg of the extract or, alternatively, a placebo, both administered bimonthly. Throughout the observation, participants underwent a range of neuropsychological tests, including the Digit Span Memory Task, Paired Associate Task, Logical Memory Test (Story Recall), Memory Span for Nonsense Syllables, Finger Tapping Test, Simple Reaction Test, Choice Reaction Test, Choice Discrimination Test and Digit Picture Substitution Test, fundamental constituents for the penetrating analysis of your cognitive abilities. Neuropsychological tests revealed substantial improvements, especially in the sphere of immediate memory, logical memory and the ability to manipulate information, notably evidenced in the “digit span backwards” test (Kumar N., et al., 2016.). It must be noted, however, that some tests did not demonstrate statistically significant improvements during the extended analytical period. Furthermore, after six weeks of oral administration at a dose of 150 mg twice a day, the results showed a significant increase in serum calcium levels in the group receiving Bacopa, and this increase was also significant when compared with the placebo group. Therefore, an increase

was recorded that remained within the limits considered normal. In contrast to this increase, other aspects of the biochemical profile, notably the lipid profile, remained undisturbed, refraining from manifesting variations worthy of significance between the two groups studied. In summary, the results provide a promising glimpse into the cognitive benefits arising from the administration of *Bacopa monnieri*.

MAGNESIUM L-THREONATE

Magnesium (Mg) is one of the most abundant essential minerals in the body, playing crucial roles in more than 300 enzymatic reactions. Although present in many foods, magnesium deficiency is common in several populations. A promising solution to improving brain magnesium levels is the use of the compound magnesium L-threonate, known as Magtein®. This compound, discovered by the Massachusetts Institute of Technology (MIT), has shown a remarkable ability to increase magnesium levels in the brain, surpassing other magnesium supplements in bioavailability. Studies have revealed that magnesium supplementation, especially in the form of magnesium L-threonate, can have significant impacts on cognitive function. Magtein®PS, a formulation based on magnesium L-threonate and phosphatidylserine, enriched with vitamins C and D, was subjected to a rigorous double-blind, placebo-controlled clinical trial. The study involved 109 healthy Chinese adults, aged between 18 and 65 years. Cognitive assessment was conducted using “The Clinical Memory Test”, a standard tool in China for assessing memory and cognition. The results revealed significant improvements in five subcategories of the memory test, as well as in the overall memory quotient score. “The group that received Magtein®PS demonstrated significant improvements in all

categories of the cognition tests performed, in accordance with the synergistic hypothesis. Interestingly, older participants experienced the greatest improvement in cognition” (ZHANG C. et al., 2022). Magtein®PS has demonstrated efficacy in improving memory and cognition in healthy Chinese adults, suggesting its potential as a promising intervention in this context. The addition of phosphatidylserine and vitamins C and D to the formulation may have contributed to synergistic effects, increasing magnesium absorption and promoting cognitive benefits. It is worth noting that the safety of the supplement was carefully monitored, including general health parameters and biochemical tests. Zhang C.'s research aligns with previous studies indicating the crucial role of magnesium in cognitive function, and highlights the relevance of Magtein®PS as a potential strategy for optimizing brain health in healthy populations.

CONCLUSION

Given the above, it is possible to infer that nutrition and supplementation are capable of supporting mental performance both positively and negatively, whether directly or indirectly. In effect, it is considered: Creatine, when supplemented, significantly increases regeneration in ATP levels at the level of skeletal muscle, however, when considering brain levels, the increase is not significantly significant, in addition to undergoing changes when related to age and health status of the individual. When analyzing vitamin B12 supplementation, it was possible to demonstrate significant improvements in cognitive assessments in middle-aged and elderly individuals, showing its effectiveness in the functional recovery of the frontal cortex, with cases of dementia related to its lack. Another substance whose functions were evaluated was iron, which

proved to be important for the regulation of neurotransmitters, mediated by increased cerebral oxygenation. Its supplementation is beneficial for improving attention, due to its function of balancing dopamine metabolism. However, daily iron supplementation can cause its accumulation in the brain, triggering oxidative stress. Gastrointestinal changes are other possible adverse effects when using iron. Collagen peptide supplementation was positive in terms of brain structure, cognitive function and memory in patients between 43 and 69 years old. Part of this is due to its ability to cross the blood-brain barrier, enabling hippocampal neurogenesis. With MCT, it was possible to observe improvements in cognitive tests even in previously healthy individuals, as it is an alternative way of supplying energy to the brain. When analyzing the fatty acid (omega 3) evidenced benefits of its supplementation for neural development at different stages of life, related to different cognitive domains, however, its intake is associated with a threshold, correlating its excess to a decrease in cognitive abilities, showing further clarifications are still necessary in order to avoid undesirable effects. Bacopa *Monieri*, revered in traditional Indian medicine, revealed improvements in the immediate and logical spheres of memory, in addition to the ability to manipulate, however, during the period analyzed, some tests did not show statistically significant improvements. Its use was associated with a significant increase in serum calcium. A priori, the results regarding the use of Bacopa *monnieri* are based on partial or incomplete evidence. Ultimately, Magnesium L-threonate proved to be a potential strategy to optimize brain health in healthy populations, especially in the elderly, who showed greater improvements in cognition. Part of this can also be associated with the addition of phosphatidylserine and vitamins C and D to the supplementation, as

they increase the absorption of Magnesium, enhancing its effects. Finally, it is possible to infer that supplementation of the analyzed substances is potentially beneficial, however, it must be prescribed based on the analysis of

professionals trained to manage them, in their appropriate concentrations for the appropriate purposes, thus avoiding inadvertent use. harm associated with this practice.

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