REVIEW ARTICLE

Through the Mediterranean Way of Life to a Healthier Brain

Vida Demarin[1], Jasna Badzak[2], Zivko Miscevic[3], Filip Derke[4]

Abstract

The Mediterranean diet (MD) is usually consumed among the populations bordering the Mediterranean Sea, representing a model of healthy eating, favorable health status, and better quality of life. Several studies demonstrated the beneficial and preventive role of the MD in the occurrence of many diseases. Therefore, some of them support the favorable effects of the MD on plasma lipid profile: reduction of total and plasma low-density lipoprotein (LDL) cholesterol levels, plasma triglyceride levels, apolipoprotein B, and very-LDL concentrations, and an increase in plasma high-density lipoprotein (HDL) cholesterol levels. This effect is associated with increased plasma antioxidant capacity, improved endothelial function, reduced insulin resistance, and reduced incidence of metabolic syndrome. The beneficial impact of fish consumption on the risk of cardiovascular diseases (CVDs) is the result of the synergistic effects of nutrients in fish. Fish is considered an excellent source of protein with low saturated fat, nutritious trace elements, long-chain ω-3 polyunsaturated fatty acids (LCn3PUFAs), and vitamins D and B. Fish consumption may be inversely associated with ischemic stroke but not with hemorrhagic stroke. Total stroke risk reduction (RR) was statistically significant for fish intake once per week, while the risk of stroke was lowered by 31% in individuals who ate fish five times or more per week. Greater adherence to the MD is associated with a significant reduction in overall mortality, mortality from CVDs and stroke, incidence of or mortality from cancer, and incidence of Parkinson's disease and Alzheimer's disease (AD) and mild cognitive impairment.

Keywords: Brain health, Mediterranean diet, Stroke.

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Brain diseases are frequent, causing disability and changes in the quality of life of the patients and their families, as well as having a huge social and financial burden. According to the European Brain Council, the cost of brain disorders in Europe is 798 billion Euros per year, which is one-third of the whole health expenditure per year, with stroke and dementia contributing a great deal to this situation.

Adequate blood supply to the brain is a prerequisite for brain health with control and management of behavioral, environmental, and metabolic risk factors. In spite of huge developments in the management of stroke, with stroke units, thrombolytic therapy, endovascular treatment, and neurosurgical and vascular surgical treatment, primary prevention of stroke is still one of the most important contributors to brain health.

As Professor Hans-Christoph Diener pointed out, there have been two recent notable publications.[1] One was burden-of-disease published in The Lancet,[2] and the other was the case-control INTERSTROKE study with >27,000 patients.[3] Both studies clearly show that 90% of the risk for stroke is due to treatable risk factors. "I sometimes think we have the priorities wrong; we should contemplate much more on the primary prevention of stroke rather than on treating and secondary stroke prevention."

Obviously, over the years, we failed to fill out several gaps in stroke prevention. Despite efforts to modify health behavior, the knowledge about stroke, its risk factors, and its symptoms is low, which means there is still a lack of awareness. Then, "low-risk" individuals are falsely reassured and therefore are not motivated. The management of hypertension is not properly addressed. Important risk factors for stroke are not considered in screening (i.e., sedentary lifestyle and alcohol intake). The specificity of cardiovascular disease (CVD) prediction algorithms is low due to the fact they may not be applicable to all races. There is also a cost barrier for some

[1]International Institute for Brain Health, Zagreb, Croatia

[2,4]Department of Neurology, Clinical Hospital Dubrava, University of Zagreb, Zagreb, Croatia

[3]Department of Psychiatry, County Hospital Čakovec, Čakovec, Croatia

Corresponding Author: Filip Derke, Department of Neurology, Clinical Hospital Dubrava, University of Zagreb, Zagreb, Croatia, Phone: +385 12902899, e-mail: filip@mozak.hr

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in high-risk strategies, a lack of effectiveness in screening high-risk individuals, and already created population-wide strategies that have not been implemented.[3,4]

The six most important keys to a healthy brain are in our hands: healthy nutrition [Mediterranean diet (MD)], regular physical activity, stress management, "brain fitness," adequate sleep patterns, and social inclusion.

"The importance of nutrition in preserving brain health has been a subject of investigation for many years, pointing out the role of polyunsaturated fatty acids (FAs) from fish consumption, abundance of fruits and vegetables, whole grains, olive oil, and red wine, what are all main ingredients of a MD. Adherence to this diet leads to improved endothelial function, increased plasma antioxidant capacity, and reduction of insulin resistance, which contributes to the prevention of stroke, neurodegenerative disorders, metabolic syndrome, etc.

Regular physical activity increases the level of brain-derived neurotrophic factor (BDNF), which is of utmost importance for cognitive functioning and decreased risk of depression, as well as of stroke."

"Control and management of stress in daily living is the third key in preserving a healthy brain, especially important nowadays when human circuits are overloaded, and people are bombarded with constantly changing mental challenges. It is estimated that we encounter a thousand times more events per year than our great-grandparents did, but the time available for decision-making remains the same or even less. In the era of a person-centered approach, techniques for stress relief should be individually tailored, and stress should be properly managed."[5,6]

"And the fourth key, again something that we can practice by ourselves, is an array of different brain fitness tasks which challenge our brain and contribute greatly to a healthy brain.[7,8] A minimum of 7 hours of daily sleep seems to be necessary for proper cognitive and behavioral functioning. The brain reorganizes and recharges itself in relation to short- and long-term memory, and the glymphatic system cleans the waste products.[9,10] Social inclusion, maintaining emotional connections with family and friends, with continuous exposure to new stimulating activities out of comfort zones is of utmost importance for enhancing neuroplasticity."[11,12]

In this article, we will more closely look at two of several keys to preserving brain health: the benefits of the MD and physical exercise with emphasis on preventing stroke, dementia, and migraine.

Healthy Food Intake Can Prevent Stroke

The combination of healthy lifestyle factors is associated with a lower risk of coronary heart disease (CHD), diabetes, and total CVD. A prospective cohort study[13] among 43,685 men from the Health Professionals Follow-up Study and 71,243 women from the Nurses' Health Study evaluated diet and other lifestyle factors. Low-risk lifestyle was defined as not smoking, having a body mass index of <25 kg/m^2, >30 minutes/day of moderate activity, modest alcohol consumption (men, 5–30 gm/day; women, 5–15 gm/day), and scoring within the top 40% of a healthy diet score. There were 1,559 strokes (853 ischemic, 278 hemorrhagic) among women and 994 strokes (600 ischemic and 161 hemorrhagic) among men during follow-up. Women with all five low-risk factors had a relative risk of 0.21 [95% confidence interval (CI), 0.12–0.36] in total and 0.19 (95% CI, 0.09–0.40) for ischemic stroke compared to women who had none of these factors. Among men, the relative risks were 0.31 (95% CI, 0.19–0.53) in total and 0.20 (95% CI, 0.10–0.42) for ischemic stroke for the same comparison. Among the women, 47% (95% CI, 18–69) of total and 54% (95% CI, 15–78) of ischemic stroke cases were attributable to lack of adherence to a low-risk lifestyle; among the men, 35% (95% CI, 7–58) of total and 52% (95% CI, 19–75) of ischemic stroke may have been prevented. A low-risk lifestyle that is associated with a reduced risk of multiple chronic diseases also may be beneficial in the prevention of stroke, especially ischemic stroke. Consumption of plant foods and dairy and meat products may moderate increases in blood pressure. The association of dietary intake with the 15-year incidence of elevated blood was evaluated in the Coronary Artery Risk Development in Young Adults Study[14] of 4,304 participants. Plant food intake (whole grains, refined grains, fruit, vegetables, nuts, or legumes) was inversely related to elevated blood pressure (EBP) after adjustment for age, sex, race, center, energy intake, CVD risk factors, and other potential confounding factors. Compared with quintile 1, the relative hazards of EBP for quintiles 2–5 of plant food intake were 0.83 (95% CI, 0.68–1.01), 0.83 (0.67–1.02), 0.82 (0.65–1.03), and 0.64 (0.53–0.90). Dairy intake was not related to EBP, and positive dose-response relations for EBP were observed across increasing quintiles of meat intake. In subgroup analyses, the risk of EBP was positively associated with red and processed meat intake, whereas it was inversely associated with intakes of whole grain, fruit, nuts, and milk. These findings are consistent with a beneficial effect of plant food intake and an adverse effect of meat intake on blood pressure. Increased consumption of fruits and vegetables has been shown to be associated with a reduced risk of stroke in most epidemiological studies, although the extent of the association is uncertain. Meta-analysis of cohort studies[15] quantitatively assessed the relationship between fruit and vegetable intake and incidence of stroke. Groups included 257,551 individuals (4,917 stroke events) with an average follow-up of 13 years. Compared with individuals who had less than three servings of fruit and vegetables per day, the pooled relative risk of stroke was 0.89 (95% CI, 0.83–0.97) for those with three to five servings per day and 0.74 (0.69–0.79) for those with more than five servings per day. Subgroup analyses showed that fruit and vegetables had a significant protective effect on both ischemic and hemorrhagic stroke. Increased fruit and vegetable intake in the range commonly consumed is associated with a reduced risk of stroke. Results provide strong support for the recommendations to consume more than five servings of fruit and vegetables per day, which is likely to cause a major reduction in strokes.

Mediterranean Diet (MD)

"Several studies demonstrated the beneficial and preventive role of the MD in the occurrence of CVDs, chronic neurodegenerative diseases and neoplasms, obesity, and diabetes. In randomized intervention trials, the MD improved endothelial function and significantly reduced waist circumference, plasma glucose, serum insulin, and homeostasis model assessment score in metabolic syndrome."[16,17]

Meta-analysis of 12 studies[18] ($n = 1,574,299$) evaluating the association between adherence to a MD and the mortality and incidence of major CVD and chronic neurodegenerative diseases showed that greater adherence to a MD was associated with a significant reduction in overall mortality (9%), mortality from CVD (9%), incidence of or mortality from cancer (6%), and incidence of Parkinson's disease and Alzheimer's disease (AD) (13%).[18] MD and Incidence and Mortality from CHD and Stroke in Women study[19] was performed in 4,886 women with no history of CVD and diabetes (Nurses' Health Study) and followed up. Alternate MD Score, focusing on higher consumption of plant foods, including plant proteins, monounsaturated fat, fish, and lower consumption of animal products and saturated fat, ranged from 0 to 9, with a higher score representing closer resemblance to the MD. Results demonstrated 2391 incident cases of CHD (1,597 nonfatal and 794 fatal) and 1,763 incident cases of stroke (959 cases-ischemic, 329 cases of hemorrhagic, and 475 cases were unclassified). Of all strokes, 1,480 cases were nonfatal, and 283 cases were fatal. There were 1,077 CVD deaths (fatal CHD and strokes combined).[20] Long-chain ω-3 polyunsaturated FAs (LCn3PUFAs), such as eicosapentaenoic acids, docosapentaenoic acid, and docosahexaenoic acid in fish, are the key nutrients responsible for the cardioprotective benefits and CVD prevention. The beneficial effects of fish consumption on the risk of CVD are derived from synergistic effects among nutrients in fish. Fish is considered to be an excellent source of proteins with low saturated fat (taurine, arginine, and glutamine are known to regulate cardiovascular function); some nutritious trace elements (selenium and calcium, which may directly or indirectly provide cardiovascular benefits, alone or in combination with LCn3PUFAs and vitamins (vitamin D and B). Interactions between LCn3PUFAs and other nutrients, including nutritious trace elements and vitamins and amino acids, are important in reducing the risk of CVD. Overall, a favorable effect is observed on lipid profiles, threshold for arrhythmias, platelet activity, inflammation and endothelial function, atherosclerosis, and hypertension. The American Heart Association recommends eating fish (particularly fatty fish) at least two times a week. Fish consumption may be inversely associated with ischemic stroke but not with hemorrhagic stroke because of the potential antiplatelet aggregation property of LCn3PUFAs. A meta-analysis of eight independent prospective cohort studies, which included 200,575 subjects and 3,491 stroke events, showed that individuals with higher fish intake had a lower risk of total stroke compared with those who never consumed fish or ate fish less than once per month. The reduction in risk of total stroke was statistically significant for fish intake once per week; for individuals who ate fish five times or more per week, the risk of stroke was lowered by 31%. The risk of ischemic stroke was also significantly reduced by eating fish twice per month. It has been suggested that broiled and baked fish, but not fried fish and fish sandwiches, are associated with a lower incidence of atrial fibrillation and ischemic heart disease. Cardiovascular Health Study[21] evaluated 3,660 subjects aged over 65 who underwent an magnetic resonance imaging (MRI) scan to associate fish consumption and risk of subclinical brain abnormalities on MRI in older adults. Among older adults, modest consumption of tuna/other fish, but not fried fish, was associated with a lower prevalence of subclinical infarcts and white matter abnormalities on MRI examinations. Tuna or other fish consumption was also associated with trends toward lower incidence of subclinical infarcts and with better white matter grade. No significant associations were found between fried fish consumption and any subclinical brain abnormalities. After adjustment for multiple risk factors, the risk of having one or more prevalent subclinical infarcts was lower among those consuming tuna or other fish more than or equal to three times per week, compared to more than once per month. The risk reduction (RR) in those consuming tuna/other fish more than or equal to three times per week was 0.56 compared to more than once per month. Each serving/week of tuna/other fish was associated with trends toward an 11% lower RR of any incident subclinical infarct and a 12% lower RR of each additional multiple infarct. Consumption of ω-3 FAs is not associated with a reduction in carotid atherosclerosis, according to the Genetics of Coronary Artery Disease in Alaska Natives Study.[22] The study included a population-based sample that underwent ultrasound assessment of carotid atherosclerosis. Intima-media thickness (IMT) of the far wall of the distal common carotid arteries and plaque score (number of segments containing plaque) were assessed. Mean consumption of total ω-3 FAs was 4. 6 gm/day in those without and 5.07 gm/day in those with plaque. The presence and extent of plaque were unrelated to the intake of C20–22 ω-3 FAs or total ω-3 FAs. The odds of plaque rose significantly with quartiles of palmitic and stearic acid intake. The extent of plaque (or plaque score) was also associated with a higher percentage intake of palmitic acid. IMT was negatively associated with grams of C20–22 ω-3 FAs, total ω-3, palmitate, and stearate consumed. Dietary intake of ω-3 FAs in a moderate-to-high range does not appear to be associated with reduced plaque but is negatively associated with IMT. The presence and extent of carotid atherosclerosis among Eskimos is higher with increasing consumption of saturated FAs. No significant differences were seen in the prevalence of atherosclerotic plaque or mean plaque score with increasing quartiles of dietary intake of either total ω-3 FAs or C20–22 ω-3 FAs. When analyzed as a percentage of total fat intake, C20–22 consumption and

total ω-3 FA consumption were not related to average IMT. When the analyses were adjusted for age and gender, positive associations were observed between the percentage of fat intake from palmitic acid or stearic acid and the presence of plaque and plaque score. When analyzed as daily intake in grams, higher quartiles of intake of either palmitate or stearate were associated with significantly higher average IMT when adjusted for age and gender.[22]

In the randomized, multicenter trial of a MD in primary prevention of cardiovascular events in Spain, randomly assigned participants who were at high CV risk to one of three diets: a MD supplemented with extra virgin olive oil, the other supplemented with mixed nuts or a control diet (advised to reduce dietary fat), included 7,447 persons (aged 55–80 years), followed up during 5 years. MD with extra virgin olive oil and the one supplemented with nuts reduced the incidence of major CV events.[23]

Greater adherence to the MD was associated with a lower risk of stroke in a United Kingdom white population. For the first time in the literature, the associations between the MD score in those at both low and high risk of CVD were also investigated. Although the findings in this study were driven by associations in women, they have implications for the general public and clinicians for stroke prevention.[24]

Tea Consumption and Risk of Stroke

A meta-analysis of green and black tea consumption and risk of stroke[25] included data from nine studies involving 4,378 strokes among 194,965 individuals. The main outcome assessed was the occurrence of fatal or nonfatal stroke. The summary effect associated with the consumption of more than or equal to three cups of tea (green or black) per day was calculated. Regardless of their country of origin, individuals consuming more than or equal to three cups of tea per day had a 21% lower risk of stroke than those consuming less than one cup per day (absolute RR, 0.79; CI, 0.73–0.85). The results were consistent across green and black tea. The types of catechins differ between green and black tea; their total amounts are comparable because both black and green tea are derived from the same source: the catechins produced within the *Camelia sinensis* plant, and both have demonstrated effects on vascular function. Catechin ingestion blocked an increase in serum nitric oxide concentration in rats after reperfusion, and tea has a demonstrated effect on endothelial function. Theanine is readily bioavailable from both green and black tea; crosses the blood–brain barrier and has effects on brain function; contains the glutamate molecule, and it might reduce glutamate-related endothelial damage. Regular tea consumption, instead of preventing evident stroke, may reduce the postischemic damage to a level that results in subclinical ischemia or hidden strokes. This would result in the diagnosis of stroke only in individuals with more extensive postischemic damage or a greater stroke volume.[26–28]

Many epidemiologic studies have been conducted and summarized in five meta-analyses on either tea consumption or flavonoid consumption and CVD or the subset of stroke. The strength of this evidence supports the hypothesis that tea consumption might lower the risk of stroke.[29–31]

Vitamin C Lowers the Risk of Stroke

A 3-year intervention study[32] showed that vitamin C consumption is associated with less progression in carotid IMT in elderly men. In the study, IMT of the carotid artery and diet in elderly men was assessed. Men were randomly assigned to one of four groups: dietary intervention, ω-3 supplementation, both or neither. Results previously showed that ω-3 supplementation did not influence the IMT; thus, the dietary intervention and no dietary intervention groups were pooled. The dietary intervention group had less progression in the carotid IMT compared with the controls. This group increased their daily vitamin C intake and intake of fruit, berries, and vegetables. Increased intake of vitamin C and of fruit and berries was inversely associated with IMT progression.

Findings from one meta-analysis suggest significant inverse dose-response relationships between dietary vitamin C intake, circulating vitamin C, and risk of stroke. In view of evidence from these randomized controlled trials, it is premature to recommend supplementation of vitamin C (or other antioxidants) to prevent stroke, and the prevention of this disease should largely lie in the modification of lifestyle habits, as well as effective therapies lowering risk factors for stroke.[33]

Consumption of Chocolate and Risk of Stroke

Consumption of chocolate has often been hypothesized to reduce the risk of CVD due to chocolate's high levels of stearic acid and antioxidant flavonoids. Reviewing studies[34] on chocolate and stroke involving 44,489 subjects who ate one serving of chocolate per week showed that subjects who consumed chocolate were less likely to have a stroke than people who ate no chocolate; observed stroke RR was 22%. People who consumed 50 gm of chocolate once a week were less likely to die following a stroke than people who did not eat chocolate by 46%.[35] Debate still lingers regarding the true long-term beneficial cardiovascular effects of chocolate overall. The flavonoid content of chocolate may reduce the risk of cardiovascular mortality. Review of MEDLINE publications[36] for experimental, observational, and clinical studies of relations between cocoa, cacao, chocolate, stearic acid, flavonoids (including flavonols, flavanols, catechins, epicatechins, and procyanidins), and the risk of CVD (CHD, stroke) showed that cocoa and chocolate may exert beneficial effects on cardiovascular risk *via* effects on lowering blood pressure, anti-inflammation, antiplatelet function, higher high-density lipoprotein (HDL), decreased low-density lipoprotein (LDL) oxidation.

Several studies were done to investigate the association between chocolate consumption and the risk of stroke in men and women and to conduct a meta-analysis to summarize available evidence from prospective studies of chocolate consumption and stroke. These findings suggest that moderate chocolate consumption may lower the risk of stroke.[37,38]

Another meta-analysis suggests that chocolate consumption confers reduced risks of CHD, stroke, and diabetes. Consuming chocolate in moderation (1–6 servings/week) may be optimal for the prevention of these burdensome diseases.[39]

In the Japanese study, during a median follow-up of 12.9 years, chocolate consumption was associated with a significantly lower risk of stroke in women [hazard ratio (HR) = 0.84; 95% CI, 0.71–0.99]. However, the association in men was not significant (HR = 0.94; 95% CI, 0.80–1.10). In addition, the association did not vary by stroke subtypes in either men or women.[40]

Physical Activity in Primary Prevention of Stroke

Mens sana in corpore sano. This famous sentence has been around for almost 2000 years. Back in the 1st and 2nd century AD, Decimus Iunius Iuvenalis, a Roman poet, spoke of health, mental and physical, and their dependence on one another. But it was not until the 1990s that science allowed us to find proof for this idea, and until the discovery of neurotrophic factors, which changed the way physical activity and brain plasticity are viewed. In 1986, Rita Levi Montalcini and Stanly Cohen received a Nobel Prize in medicine for the discovery of neurotrophins, proteins belonging to a group of growth factors with special effects on neurons. They signal nerve cells to grow, survive, and differentiate. One neurotrophic factor in particular, the BDNF, which is important for long-term memory, affects neurons in central and peripheral nervous system, helps survival of existing neurons, growth and differentiation of new neurons and synapses, and its secretion is encouraged by physical activity.

Epidemiological and prospective studies have shown that physical activity enhances cognitive and brain function and protects against the development of neurodegenerative diseases. Extensive research is going on to prove biological mechanisms that underlie such beneficial effects. Multidomain interventions could improve or maintain cognitive function in at-risk elderly people (FINGER study).[41] Prevention is the key. Greater gray matter volume, measured by MRI, was found with higher aerobic activity, pointing out that it might be neuroprotective.

Scientists for centuries believed in the possibility of the human brain to change. William James, in 1890, was among the first to suggest that the human brain is capable of continuous functional changes, which he showed in his work "Principles of Psychology."[42] It is important to keep our brain healthy as well as the body. Brain health has become a very important and recognized public health issue with a growing and aging population. Interventions are necessary from middle age further on where we face a growing incidence of AD and other neurodegenerative disorders. Many recent studies have shown the benefits of exercise in aging populations, not only on physical health but also on brain health and functions. Exercise has become fundamental in improving and maintaining cognitive functions.[43]

Physical activity is associated with a lower risk of cognitive impairment, AD, and dementia in general.[44] Also, a retrospective analysis showed that physical activity and behavioral stimulation reduced the risk of developing AD.[45] During the 1990s, popular belief was that exercise's positive effect on the brain comes from its positive effect on overall health, especially among aged subjects. Today, we are aware of the existence of a neurobiological basis for these benefits, and we know that exercise has a direct effect on the molecular structure of the brain. The most important and probably the most studied is the BDNF, which is held responsible for the survival and growth of many neuronal subtypes, including glutamatergic neurons, synaptic efficacy, neuronal connectivity, and use-dependent plasticity.[46]

Neurotrophin-mediated response to exercise is not restricted to motor-sensory systems as researchers expected but showed increased levels of BDNF in the hippocampus. The hippocampus is a highly plastic structure associated with higher cognitive function rather than motor activity. New hippocampal neurons make specific contributions to learning and memory, in part as a result of their unique neural circuitry.[47] Human studies have shown that exercise improves brain plasticity. Learning is a high-order brain plasticity activity that increases BDNF gene expression, and BDNF, in turn, facilitates learning.[48]

Peripheral mechanisms show growing importance in activity-dependent induced changes in levels of BDNF messenger RNA in the brain. Components influencing this peripheral control include estrogen, corticosterone, and insulin-like growth factor-1.

Steroid hormones such as estrogen influence brain aging, particularly in post-menopausal women. Reduced levels of estrogen seem to compromise neuronal function, survival of neurons, and decreased hippocampal availability of BDNF.[49] Just like estrogen has a positive effect on neuroplasticity; there are some factors causing negative neuroplasticity. Prolonged exposure to stress causes elevated levels of stress hormones (i.e., corticosteroids), which can be harmful to neuronal survival in the hippocampus. As a response to stress (acute and chronic), neurons undergo morphological changes, dendritic atrophy, and spine reduction, which have a negative impact on brain plasticity.[50] It is a common belief that exercise relieves stress and reduces depression and anxiety in humans.[51]

Literature shows that experience and behavior activate brain plasticity mechanisms and remodel neuronal circuitry in the brain. Exercises and behavioral enrichment paradigms,

such as environmental enrichment, rehabilitation training, and learning, affect common endpoints in the brain, including regulation of growth factors, neurogenesis, and structural changes. Similarities between these effects and exercise support the idea of existing common mechanisms regulating plasticity.[53]

Exercise is a simple, free, and widely practiced activity that activates molecular cascades participating in neuroplasticity. It induces BDNF encoding neurogenesis and enhances brain vascularization, functional changes in neuronal structure, and neuronal resistance to injury. Exercise increases the level of hippocampal BDNF, a brain region responsible for learning and memory. By inducing BDNF and other molecules, exercise strengthens neuronal structure, facilitates synaptic transmission, and prepares activated cells for encoding.

There are a number of recent studies investigating the role of physical activity in primary and secondary stroke prevention, demonstrating its positive effect.[52–54] The research is going on, and day by day, more convincing data is becoming available on this topic.

Possibilities of Dementia Prevention

Dementia represents one of the greatest global challenges for health and social care in this century. Around >50 million people worldwide suffer from dementia, and this number is predicted to triple by 2050. Aging is often associated with cognitive impairment. Therefore, the prevention of cognitive impairment is imperative.

"The Lancet Commission on dementia aimed to review the best available evidence and produce recommendations on how to best manage, or even prevent, the dementia epidemic.

The risk of AD, the most common form of dementia, is in large part modulated by genetics, but prevalence is decreasing in many high-income countries; hence, modifiable risk factors are also at work. Identifying and tackling these factors is an urgent research priority, for which the network is a step in the right direction."

"The Lancet Commission presented a new life-course model showing potentially modifiable and nonmodifiable risk factors for dementia."[55] If less education in early life is eliminated, the risk of new dementia cases is decreased by 8%. In mid-life, we should target hearing loss, reducing new cases by 3%, hypertension by 2%, and obesity by 1%. In late life, the elimination of further risk factors should be in our focus: smoking (5%), depression (4%), physical inactivity (3%), social isolation (2%), and diabetes (1%), what altogether reduce the risk of dementia by 35% or by other words, each third dementia could be prevented by tackling nine risk-factors during life-span.[55]

"Hence, a key recommendation of the Commission: "be ambitious about prevention" is focusing on interventions to build up resilience and brain reserve, to activate neuroplasticity, detect and treat risk factors, and to live healthier lifestyles."

Stroke and dementia have many common risk factors, and lifestyle interventions and modifications could contribute to the reduction and prevention of both diseases. Our role is, by no means, raising awareness and spreading knowledge wherever and whenever possible.[56]

Lifestyle and Primary Headache

Another very important neurological disorder, ruining the quality of life of a person as well as of family members, is migraine. Migraine ranks in the top 20 of the world's most disabling medical illnesses. Over 10% of the population, including children, suffers from migraine. As many as 50 million Europeans suffer from headaches to migraine, for many with handicapping effects.[57] The influence of environmental factors on the clinical manifestation of migraine has been a matter of extensive debate over the past decades. Migraineurs commonly report foods, alcohol, meteorologic or atmospheric changes, and exposure to light, sounds, or odors as factors that trigger or aggravate their migraine attacks. Considering lifestyle factors, the most frequently reported are emotional stress, depression, too little or too much sleep, exercise or overactivity, and skipping meals and fasting. Following foods that are sometimes related to increased sensitivity to migraine attacks are chocolate, nuts, peanut butter, cheese, yogurt, sour cream, red wine or other alcoholic drinks, processed meats, and monosodium glutamate. For physical causes, menstrual cycle, or other hormonal changes, and in the group of environmental factors, weather or seasonal changes travel through different time zones, odors or pollution, and bright light–to mention just some of them.[58–62]

Having in mind the famous sentence of Sir William Richard Gowers, "When all has been said that can be, mystery still envelops the mechanism of migraine," some simple lifestyle modifications could be beneficial.

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