THE MIND Bulletin on Mind-Body Medicine Research

Editorial

Nutrition and Health in the Light of Mind-Body Medicine

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doi: 10.61936/themind/202504301

I must admit. When I was asked to write the next editorial for THE MIND I was delighted. The topic is clearly in my area of interest and expertise. But which topic should I follow in 900 words? Certainly, I do know people who easily talk about nutrition and sell themselves as "Mr. or Mrs. know it all". However, in these cases I love to refer to a highly esteemed colleague, Dr. Mai Thi Nguyen Kim, who states in one of her videos: "Nichts an Ernährung ist einfach" i. e. nothing regarding nutrition, is easy. Hence, there is no way to briefly describe what is going on between nutrition and health. Well, I decided to invite you to join my personal journey in nutrition and health. From my time as a bachelor student at the University Gießen, I very well remember one of my lectures: "Prevent weight gain. It is much easier than losing it". Unfortunately, most people choose the difficult path. Obesity is one of the leading causes of chronic diseases. In 2022, the WHO published a report on the state of the obesity pandemic in Europe, in which 60% of European citizens are overweight or obese. Focusing on children one out of three are overweight or obese (Kluge, 2022). Worldwide the prevalence of obesity has even tripled since 1975 mainly due to progressively more sedentary lifestyles and the consumption of less healthy diets (Boutari & Mantzoros, 2022). But what do we consider a healthy diet? When shall we start? And what do we want to prevent? As an early nutritional epidemiologist, I started to focus on the last stage of our lives, the elderly. And what did I learn? Basically, if we do follow the nutritional guidelines such as from the World Health Organization (WHO, 2020), even late in life, we are able to prevent chronic diseases (Jankovic et al., 2015) and increase our life span (Jankovic et al. 2014), while decreasing cognitive decline (Berendsen et al., 2017) or hip fractures (Benetou et al., 2018). It gets even more promising, when we follow health-targeted diets for instance as suggested by the World Cancer Research Fund (WCRF) in order to decrease the risk for the onset of cancer (Jankovic, 2018) with the greatest benefits for colorectal cancer (Jankovic et al., 2017). After six years of research on the elderly, I felt the urgent need to elaborate on the power of nutrition much earlier in life, right from the start. So, I started my work in the DONALD study, located in the heart of Dortmund, where data on infants, children, and adolescents have been collected since 1985. Here I did not simply focus on beneficial diets, nutrients or foods i.e. "what we eat" but also consider "when we eat" in terms of "chrono-nutrition" (Alexy et al., 2021). Chronotype defines the individual rhythm i.e. the internal clock. We largely talk

Issue 7, April 2025
ISSN: 2940-3243

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THE MIND
Bulletin on Mind-Body Medicine Research is a quarterly publication by the Mind-Body Medicine Research Council (MBMRC), founded in 2022.

Mind-Body Medicine Research Council

about larks who wake up early / sleep early and owls representing the opposite. Both candidates are likely to have a different underlying metabolic rhythm. Our research could show that the alignment between chronotype and timing of food consumption favors the body compositional development in adolescents (Jankovic et al., 2024). Under "normal circumstances" especially later chronotypes suffer from "social jetlag" (SJL) which describes a misbalance between social obligations (like early school starts) and the internal clock. Since SJL is associated with overweight (Jankovic et al., 2022) later chronotypes have an additional risk package due to higher SJL when it comes to health. During the corona-crisis however, SJL decreased quite dramatically which should be considered as a learning from the lock-down time (Perrar et al., 2023).

From the evidence mentioned above, it may be that we are predisposed to certain conditions. More importantly, we do have the power or need empowerment to change things in a way that fits our personality and benefits our health. For me, this is the point when Mind-body medicine comes into play of which nutrition is one key element e. g. in the sense of the BERN framework (Esch & Stefano, 2022). In this current issue of "THE MIND" we are all invited to dive deeper into the power of nutrition. May it be under the condition of mindful eating, feeling the connection to nature through diet, increasing the benefits of nutrition by the inclusion of physical activity, or improving health conditions like Attention-Deficit/Hyperactivity Disorder or Multiple Sclerosis. Certainly, nutrition works best if we harmonize our lifestyle with the way we eat, and I hope you are just as curious as I am to start reading. Simply enjoy!

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Research

Nutrition and Multiple Sclerosis: The Gut is Key

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doi: 10.61936/themind/202504302

Abstract

Background: Nutrition and the gut microbiome can be either risk factors or health-promoting factors for patients with Multiple Sclerosis (MS).

Methods: A literature review was conducted.

Results: Diet plays a crucial role in shaping the microbiota composition and metabolism. Moreover, studies have shown that individuals with MS exhibit microbial dysbiosis in comparison to a healthy control group. Microbial dysbiosis in the gut can affect the central nervous system and promote inflammation.

Conclusion: Nutrition plays an important role and should be considered in Mind-Body-Medicine interventions for patients with MS.

Keywords: Multiple Sclerosis, gut, dysbiosis, nutrition, microbiome

Background: Multiple sclerosis (MS) is a chronic, inflammatory, and neurodegenerative disease of the central nervous system. It is characterized by inflammation, oxidative stress, and mitochondrial dysfunction (Stoiloudis et al., 2022). This leads to symptoms like fatigue, bladder, bowel, and sexual dysfunction, pain, paresthesia, spasticity, disability, depression, anxiety, dizziness, memory dysfunction, balance and coordination problems (Crayton & Rossman, 2006; Ghasemi et al., 2017; Jellinger, 2024; Sadeghi-Bahmani et al., 2022; Thornton & Raz, 1997). The pathogenesis is influenced by genetic, environmental, and gender-related factors (Sharifa et al., 2023), and around 2/3 of MS patients are female (McGinley et al., 2021). Moreover, there is an interaction between genetic, environmental, and lifestyle factors (Olsson et al., 2017). Environmental factors include vitamin D levels and Epstein-Barr virus infection; main lifestyle factors are stress, smoking,

obesity, and dietary factors (Dobson & Giovannoni, 2019; Esch et al., 2002; Olsson et al., 2017; Qian et al., 2023).

Diet and the Microbiome

The gut microbiome is influenced by lifestyle, diet, pollution, genetics, infections, and stress. These factors can contribute to a reduction in beneficial bacteria and can lead to dysbiosis (Campagnoli et al., 2024). Moreover, dysbiosis in the gut can lead to oxidative stress (Sharifa et al., 2023), to which the central nervous system is sensitive (Buga et al., 2023). Diet is an important factor regarding inflammatory status and oxidative stress. Hence, diet can either lead to health promotion (Stoiloudis et al., 2022) or may become a booster of inflammation (Boziki et al., 2020).

Microbial dysbiosis in the gut can affect the central nervous system and promote inflammation (Rutsch et al., 2020). Therefore, the gut-brain axis plays a crucial role in the pathogenesis of MS (Parodi & Kerlero de Rosbo, 2021). For example, there is a connection between microbiota composition and inflammatory activity in the brain (Rutsch et al., 2020). The microbiome synthesizes vitamins and produces neurotransmitters like GABA, histamine, dopamine, and serotonin (Brown et al., 2020).

Vitamin D is well-known as a risk factor for the development of multiple sclerosis, but it also plays a significant role in the course of the disease (Ruth Dobson et al., 2018). A deficiency in vitamin D can negatively alter the microbiome composition and can influence the integrity of the gut epithelial barrier (Murdaca et al., 2021). However, vitamin D can reduce oxidative stress (Stoiloudis et al., 2022), and there is evidence that it positively influences the microbiome composition and functionality (Akimbekov et al., 2020; Waterhouse et al., 2019).

Furthermore, dysbiosis can alter the relationship and communication between the central nervous system and the gut microbiome (Ullah et al., 2023). It remains uncertain whether gut dysbiosis is a cause or consequence of MS (Brown et al., 2020). Studies have shown that individuals with MS exhibit microbial dysbiosis in comparison to a healthy control group (Kozhieva et al., 2019; Ordoñez-Rodriguez et al., 2023). This dysbiosis may represent a reduction in beneficial gut bacteria, like bacteria that produce anti-inflammatory metabolites (Ladakis & Bhargava, 2023), which could influence disease progression in MS patients (Nitzan et al., 2023).

Therefore, the gut plays an important role in the pathogenesis of MS (Parodi & Kerlero de Rosbo, 2021; Rutsch et al., 2020). Moreover, a diet rich in sugar, animal fat, trans-fatty acids (found in processed products like margarines), and salt cannot only contribute to gut dysbiosis and inflammation but also to gut barrier and blood-brain barrier permeability (Boziki et al., 2020). Furthermore, food high in fat and calories activates the reward system in the brain, potentially having negative health effects in the long term (Esch et al, 2006). Therefore, it is of great importance to focus on dietary factors. Especially Western style dietary patterns, which are mainly characterized by low fiber intake, high salt content, animal fat, red meat, fried foods, and sugar-sweetened beverages show positive associations with inflammation (Riccio & Rossano, 2015). Low physical activity can additionally have a negative impact on the microbiome (Moles & Otaegui, 2020).

Diet as health promotion

A balanced and tailored diet can support the well-being of patients with MS (Zielińska & Michońska, 2023).

Nutrition has shown promising results in influencing MS symptoms and progression (Stoiloudis et al., 2022). A well-balanced diet can positively influence MS symptoms, slow disease progression, and support overall health (Sand et al., 2018; Tryfonos et al., 2024). Dietary patterns labeled as “healthy” could improve quality of life (MSQOL-54), mental health (e.g. lower depressive symptoms) (Dakanalis et al., 2024), and fatigue in MS patients (Moravejolahkami et al., 2024).

Furthermore, diet influences the gut microbiome through the gut-brain axis which has implications for cognition and emotional functioning. Both conditions are main problems for MS patients (Schneider et al., 2024). Pre- and probiotic foods may play an important role in the diet of MS patients since they are under discussion regarding their supportive role for the microbiome and the homeostasis of the central nervous system (Moles & Otaegui, 2020; Riccio & Rossano, 2015; Stoiloudis et al., 2022).

In addition, diet plays a crucial role in shaping microbiota composition and metabolism. A rich and diverse microbiome is an important contributor to health and the maintenance of microbiome homeostasis (Diaz-Marugan et al. 2023). In summary, the gut microbiome can support metabolic and intestinal health (Ross et al., 2024) and in consequence may even influence eating behavior and prospective food choices positively or negatively (Rutsch et al., 2020).

With MS, an anti-inflammatory diet is advisable. An anti-inflammatory diet is characterized by a combination of food components that have anti-inflammatory and antioxidative characteristics such as fruit and vegetables, polyphenoles, flavanoides, probioticas, prebioticas, micronutrient, plant-based protein, fiber, unsaturated fatty acids, omega 3 fatty acids, and a small amount of meat (Riccio & Rossano, 2015; Tryfonos et al., 2024). Short-chain fatty acids like propionic acid seem to be of major importance in the condition of MS because MS patients show reduced propionic acid amounts in comparison to healthy persons. Gut bacteria can process propionic acid from indigestible dietary fiber (Duscha et al., 2020), hence they act as nourishing for the gut. One convenient possibility to increase propionic acid if not via diet is supplements (Lorefice & Zoledziewska, 2024). Propionic acid may promote neurite recovery (Gisevius et al., 2024).

A study found that MS patients who did not consume food groups associated with inflammation like dairy or meat had significantly higher physical and mental health composite scores (Altowaijri et al., 2017). Moreover, in a study with 55 participants a higher immunoglobulin G response to animal-sourced milk was found for the 35 patients with MS compared to the 20 healthy people in the control group (Chunder et al., 2023).

The Mediterranean diet (Med-diet) is one example of an anti-inflammatory diet. The Med-diet is high in fruit, vegetables, and fiber, unsaturated fatty acids and low in ultra-processed foods, sugar, trans-fatty acids, fried food, and refined carbohydrates (Clemente-Suárez et al., 2023; García-Montero et al., 2021). Lean and oily fish are also recommended in the Med-diet (Felicetti et al., 2022). High fish consumption is associated with a more favorable MS disability progression (Johansson et al., 2025).

Earlier studies reported that the Med-diet positively affects the gut microbiome; it can reduce oxidative stress, neurodegenerative impairment, and inflammation state (Dakanalis et al., 2024; Di Majo et al., 2022). Nutraceuticals, e.g., in vegetables like phenolic acids, stilbenes, flavonoids, and lignans, terpenoids such as carotenoids and tocopherols, and unsaturated fatty acids can have a positive effect on cognitive performance, which, as mentioned above, is an important determinant in MS (Di Majo et al., 2022). The Mediterranean diet has not only proven a positive effect on health, quality of life, disability, and the gut microbiome but also in slowing down disease progression for chronic diseases like MS (Dakanalis et al., 2024; Ross et al., 2024).

Discussion

When it comes to the microbiome, influenced by a person's diet, we clearly touch a very new field in nutritional research, which is called personalized nutrition (Linseisen et al., 2025). In consequence, the same diet can have different effects for different people because the microbiome is individual (Johnson et al., 2019) which also means that not one size fits all. However, anti-inflammatory diets may clearly come with benefits for MS patients.

Conclusion

On the one hand, diet is one important risk (Brown et al., 2020) and on the other hand a health-promoting factor for Multiple Sclerosis and should be taken into account when it comes to the therapeutic setting (Dakanalis et al., 2024; Ross et al., 2024; Tryfonos et al., 2024) particularly in the field of Mind-Body-Medicine. Personalized dietary approaches are essential, as microbiome composition and responses to diet vary among individuals and should be studied more thoroughly also in the context of MS.

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Nutrition and Connection with Nature - Results of a Qualitative Study in Primary Care

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doi: 10.61936/themind/202504303

Abstract

This qualitative study explores individuals' perceptions of the link between nutrition and nature, as well as their experiences of nature connectedness, based on interviews with 18 participants from an integrative health clinic in Germany. All participants recognized at least one link between nutrition and nature, including concerns over chemical use, plastic packaging, and factory farming, while fresh, regional foods were seen as healthier and more natural. Participants also reported a strong emotional connection to nature, often tied to specific places. The findings highlight the importance of integrating ecological and ethical considerations into health promotion to support personal and planetary health.

Keywords: nutrition, nature, health promotion, connectedness

Background

The relationship between nutrition and nature plays a crucial role in both personal health and environmental sustainability. Previous research suggests exposure to natural environments has been linked to various health benefits, including stress reduction (Yao, Zhang & Gong, 2021) and improved mental well-being (Peterson et al., 2021). Nature-based therapies show effects on physical activity, cardiometabolic, and mental health (Nguyen et al., 2023).

Dietary choices not only impact individual well-being but also influence ecological systems, particularly through food production and agricultural practices. Therefore, the Planetary Health Diet, proposed by the EAT-Lancet Commission, aligns human nutrition with environmental sustainability by emphasizing plant-based foods, reducing animal product consumption, and minimizing processed foods (Willett et al., 2019). This approach mitigates climate impact, conserves biodiversity, and supports long-term food security. Similarly, dietary guidelines from the World Health Organization and the German Nutrition Society advocate for balanced, nutrient-rich diets that prioritize whole foods and sustainable food systems (Breidenassel et al. 2022; WHO, 2021). By promoting regional and seasonal products, these recommendations reduce ecological footprints while enhancing both human health and planetary well-being.

The following findings are part of a larger study on nutrition and health promotion, which investigates various aspects of dietary habits, environmental awareness and behavior change. Within this broader framework, the present analysis focuses specifically on individuals' perceptions of the connection between nutrition and nature, as well as their subjective experiences of nature connectedness.

Methods

We collected qualitative data through semi-structured one-on-one interviews with 18 participants from an Outpatient Clinic for Integrative Health Care and Naturopathy in Germany. Recruitment and interviews took place during four months in 2024. To achieve a heterogeneous sample, participants were grouped according to their engagement with a health promotion course offered by the inpatient clinic.

To explore participants' perspectives on nutrition and nature, we asked two open-ended main questions, with an additional follow-up question for further specification if needed. The main questions were as follows: *To what extent do nutrition and nature or the environment relate to each other in your view? To what extent do you feel connected to nature?* The follow-up question was: *How do you experience this connection to nature?*

The interviews were audio-recorded and transcribed verbatim. The data were analyzed using qualitative content analysis with the software MAXQDA.

Results

Connection between nutrition and nature

All 18 interviewees recognized at least one link between nutrition and the environment.

In particular, the food production process was critically examined, and strong concerns were raised about the use of chemicals. These were seen as problematic both before harvest, due to fertilizers and pesticides, and during further processing, due to preservatives. One participant emphasized that "nitrates, all these environmental toxins […] are produced by the food industry" (VK03) and thus enter the human body through nutrition. Similarly, the extensive processing of food was perceived as detrimental to health: "Everything that exists in a highly processed form is worse for the body," (IK03) particularly when "countless chemicals are added to preserve it or make it taste more appealing." (IK03).

Beyond health issues, concerns extended to the impact of agriculture on the environment. One participant expressed worry that modern agricultural practices are "destroying our planet" (IK04) and that decades of intensive farming have led to soil degradation — an issue that is "not even in people's awareness." (IK04).

One participant described his ambivalence towards genetic modification: "I feel a bit torn about genetically modified products," (VK05) acknowledging, on the one hand, the need for efficient agricultural practices, while on the other, remaining critical of potential ecological and health-related consequences.

Many participants expressed concerns about plastic packaging and its negative impact on both the environment and health. One participant acknowledged that "plastic packaging is generally known to be harmful to the environment," (IK05) while another linked it to broader ecological issues, emphasizing "plastic waste in water and marine animals sometimes dying from it." (BK04)

Animals were frequently mentioned as a key link between nutrition and nature. The use of pesticides was criticized for its cascading effects on ecosystems, as "insecticides cause insects to die, leaving birds without food, leading to species extinction." (VK02).

Animal welfare was another central concern. Many participants criticized conventional factory farming and, in some cases, adjusted their diets accordingly: "I absolutely cannot support factory farming. I just can't eat pork anymore knowing how much the animals suffer." (BK01).

In contrast to highly processed foods, fresh, regional, and seasonal products were perceived as more natural and desirable. One participant stated that "food is best when it comes straight from the tree or the field," (IK03) reinforcing a preference for minimally processed, locally sourced ingredients.

Participants highlighted resource conservation as a crucial aspect of sustainable nutrition, emphasizing that industrial food production tends to deplete natural resources. One participant stressed the importance of "preserving natural resources and being more mindful of where food comes from, while also influencing others to do the same." (VK04)

The strong link between food production and climate change was also widely recognized. Industrial agriculture and factory farming were particularly criticized for their high carbon emissions, with one participant stating, "agriculture has the greatest impact on our environment and climate," (IK04) compared to cars and airplanes, while another specifically pointed to "the high CO2 emissions caused by meat production" (IK05).

Biodiversity was another concern. One participant noted the lack of variety in commercially available crops, emphasizing that "apples and pears are the only products labeled with varieties, while for everything else, it's as if different varieties don't exist." (IK02).

Feeling of connectedness

All 18 interviewees reported feeling connected to nature, often describing this connection through emotions, specific locations, and animals.

The most frequently mentioned emotions were calmness, relaxation, joy, and contentment, and also responsibility. Some participants described deeper feelings such as love, gratitude, and a childlike sense of wonder, while others mentioned more negative emotions like powerlessness and pity.

One participant shared that "after a stressful day, walking in nature helps me unwind – it lowers my stress levels completely." (IK05). Others highlighted the mental benefits of nature, stating that "a walk in the forest clears the mind and creates a sense of happiness and satisfaction." (VK05)

Feelings of responsibility were also noted, particularly regarding environmental conservation: "We have to do what we can, even on a small scale, to protect nature, even though it feels difficult as an individual." (VK04). Some expressed frustration and powerlessness about environmental destruction, with one participant stating, "the Earth is our home, and we are destroying it. Organic farming is just a drop in the ocean, and I feel powerless in the face of this situation." (IK04)

Participants felt most connected to nature in forests, gardens, coastal areas, and during outdoor activities such as hiking. Forests were often described as places of peace: "It's quiet, you hear only the birds and the rustling of trees. Maybe we even breathe differently there, without realizing it." (BK02). Others found connection through plants, appreciating "the incredible beauty of flowers and trees" (IK04) and feeling joy in simply observing them. The ocean was also significant, with one participant stating, "I feel very free at the sea—it's important for me to be there at least once a year." (BK01)

For some, animals served as a gateway to nature, particularly pets, birds, and bees. A few participants mentioned weather phenomena, such as sunlight or rain, as triggers for feelings of connection. Others experienced a deeper awareness of nature through introspection, describing it as sensing "the fire of life" (IK03) or through physical experiences such as "biting into an apple straight from the tree." (IK03).

One participant highlighted the role of yoga in re-establishing their bond with nature, explaining, "I had become disconnected, but through yoga, I gradually reconnected. Today, I even lead forest bathing sessions because I know how beneficial it is to simply be in nature." (BK06).

Discussion

All participants recognized a connection between nutrition and nature, particularly through food production, environmental impact, and sustainability. Concerns were raised about chemicals in agriculture, plastic packaging, and factory farming, while fresh, regional, and minimally processed foods were seen as more desirable. Participants also linked food production to climate change and biodiversity loss.

Additionally, all participants reported a sense of connectedness to nature, often describing feelings of calmness, joy, and responsibility. Forests, gardens, and coastal areas were key places for this connection, and some participants experienced it through animals, weather, or mindful activities like yoga. Environmental concerns also evoked emotions ranging from gratitude for living on this planet to frustration over ecological destruction.

The results of this study highlight that participants perceive nutrition and nature as deeply interconnected, influencing both their personal choices and broader environmental concerns. This perceived connection led to changes in behavior, such as reducing the consumption of factory-farmed animal products, purchasing organic and regional foods, and avoiding palm oil to protect natural resources. The ethical dimension of nutrition played a crucial role, with many participants linking industrial livestock farming to animal welfare and the quality of food products.

While concerns about environmental degradation, biodiversity loss, and pollution were predominant, these insights often translated into a sense of personal responsibility and self-efficacy. Many participants expressed a proactive approach, seeking ways to minimize their ecological footprint through conscious consumption. The role of pollinators, particularly bees, emerged as a recurring theme, with participants recognizing the decline in biodiversity as a serious threat to food production.

These findings suggest that nutritional interventions in health promotion should extend beyond physiological aspects to incorporate environmental sustainability and ethical considerations. Health promotion programs should address the impact of food production, pollution, and sustainable consumption practices, empowering individuals to make informed dietary choices that benefit both their health and the planet.

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Review

The Magic of Mindful Eating: Bridging Tradition and Science

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doi: 10.61936/themind/202504304

Abstract

Mindful eating (ME) has gained significant scientific attention in recent years as a holistic and multidimensional approach to nutrition. ME, which focuses on enjoying food with all senses without judgment, might have the potential to address problematic eating behaviors and tackle weight related health challenges. This paper explores the clinical evidence supporting ME and its potential role in contemporary healthy nutrition concepts, with a particular focus on traditional systems of medicine such as Ayurveda and Chinese Medicine (TCM). By bridging modern scientific research with traditional nutritional wisdom, ME might emerge as a powerful tool in fostering healthier relationships with food, improving overall well-being and beyond.

Keywords: Mindful eating, TCM, Ayurveda, nutrition

Mindful eating (ME) emphasizes awareness with all senses and a conscious appreciation of food and one´s eating experiences. ME focuses on paying attention to internal signals, such as hunger, thirst, and satiety, to prevent overeating, while using external cues like smaller portion sizes, reduced distractions, and eating slowly to enhance active awareness (Monroe, 2015).

Such approaches have been studied in clinical settings and have been linked to promising findings on common eating disorders (Barbosa et al., 2020; Mason et al., 2018) and metabolic health issues (Pepe et al., 2023; Tapper, 2022). Especially with regard to emotional eating, binge-eating (Godfrey et al., 2015; Kristeller et al., 2014), diabetes management (Miller et al., 2014), and weight loss (Pepe et al., 2023) the intersection of ME and conventional nutritional science and counseling seems to be a very promising field for future research and clinical practice.

There is evidence from a systematic review, that ME interventions could be a practical and low cost approach to weight control and might be as effective as conventional diet programs (Fuentes Artiles et al., 2019). Another review suggests that further high-quality research is needed to clarify the role and dynamics of ME in dietary intake and health outcomes, as no significant effects were identified (Grider et al., 2021; Warren et al., 2017).

ME could also possibly be integrated into breast cancer survivor care (Huang et al., 2023). A 9-week virtual teaching kitchen significantly improved ME scores, independent of BMI, by combining nutritional medicine with mindfulness-based behavioral strategies.

Furthermore, (whole food) plant-based diets might align well with ME principles, e.g. to tackle obesity. A study suggested that ME is associated with healthier predominantly plant-based food choices in young Japanese women (Kawasaki et al., 2021). A pilot study with a 6-weeks-mindful-eating-intervention improved weight, eating behaviors, and psychological well-being in obese individuals (Dalen et al., 2010). A cross-sectional study suggests that promoting ME could be beneficial for improving eating habits and supporting weight-loss in young adults. Also, ME was found to be significantly associated with both lower BMI and lower risk for type 2 diabetes (Kes & Can Çicek, 2021). Additionally, an experimental study found enhanced body satisfaction and improved quality of life after an 8-week-ME-intervention with ME guidance, nutritional education, cooking workshops, and food sensory analyses (Minari et al., 2024).

In the complex landscape of dietary recommendations and eating influences, mindful eating (ME) offers a way to reconnect with inner signals of hunger and satiety. It helps break automatic eating patterns while strengthening self-efficacy and self-regulation (Felske et al., 2022). However, the behavioral dynamics still need further research (Fig. 2).

Mindful eating in traditional medicine

Traditional medical knowledge systems like Ayurveda and TCM, have always emphasized ME principles in nutritional and lifestyle medicine. They strongly advocate for personalized nutrition, conscious eating, and the alignment of dietary habits with circadian rhythms (Rai et al., 2022; Zhao et al., 2021), as well as

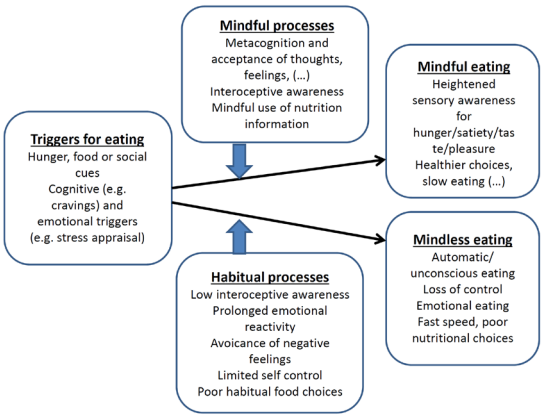

Fig. 1. Mindful eating dynamics. Mindful versus mindless eating and weight regulation, highlight differences in awareness of bodily signals, emotional responses, and choices between habitual reactions and mindful decisions (Kristeller & Epel, 2014).

societal and planetary health. Current conventional clinical research is now starting to validate many of these traditional concepts, offering a unique opportunity to integrate traditional nutritional wisdom with contemporary nutritional science (Agrawal et al., 2024; Gupta, 2024; Kessler et al., 2018; Kessler et al., 2017).

Ayurveda, an at least 2,000-year-old system of medicine originating in India, emphasizes the great importance of ME through the concept of "Ahara" (nutrition). Central Ayurvedic texts recommend eating with full awareness, savoring each bite, and aligning meals with natural rhythms (e.g. season, daytime). Ayurveda also categorizes foods based on their qualities/properties and their effects on both the individual's healthy constitution and health disorder (*Prakriti/Vikriti*) (Guha, 2006; Gupta & Stapelfeldt, 2023). A German online-representative survey from 2024 suggests a growing interest in Ayurvedic principles in Western societies, indicating its potential in promoting holistic well-being by making use of traditional nutritional concepts (Schiele et al., 2024).

Similarly, TCM views food as a form of medicine and stresses the major relevance of balance and harmony in dietary habits. The principle of "Qi" (vital energy) is central to TCM, and ME practices in TCM aim to optimize energy flow by choosing foods that complement one's internal state. Studies have shown that TCM-based dietary interventions can contribute to improved digestion and overall health (Yang et al., 2023; Zhao et al., 2021).

Low-threshold implementation and easily accessible

Incorporating ME into daily life could involve simple and low-cost yet impactful changes (Fig. 2). Medical professionals are increasingly integrating ME into routine patient care. Educational programs, such as the Mindfulness-Based Eating Awareness Training (MB-EAT) developed by Kristeller (Kristeller & Wolever, 2014), provide training for future healthcare providers to incorporate ME approaches into integrative dietary counseling.

ME could be easily integrated into daily life, as it requires no special nutritional knowledge and can be practiced anytime. It is highly practical, helping individuals develop a healthier relationship with food through simple habits. For example, slowing down eating by chewing thoroughly and pausing between bites prevents overeating. Also, savoring food with all senses enhances satisfaction, making mindful eating a potentially sustainable and enjoyable practice (Fig. 1).

What makes ME outstanding is its cost-effectiveness. Unlike expensive pharmaceutical interventions, such as Semaglutide (GLP-1 receptor agonists), ME offers a natural and low-cost alternative for improving eating behaviors and preventing obesity-related diseases. While medications like Semaglutide suppress appetite artificially—often leading to a disconnection from bodily signals and creating significant financial costs—ME fosters awareness, long-term behavioral change, and overall well-being without relevant negative side effects. It encourages individuals to actively engage with their health instead of passively relying on weight-loss injections.

While ME can be practiced independently, guidance from a professional, participation in a group program, or structured training might provide valuable support and improve long-term success. Eat with awareness, and every meal becomes an act of self-care!

Conclusion

Mindful eating represents a powerful synthesis of awareness, appreciation, joy, and balance in routine dietary habits. Bridging traditional nutritional wisdom and conventional nutritional science, ME offers a sustainable and low cost approach to improving well-being and overall health. High-quality clinical evidence on the effectiveness of ME is still limited, highlighting the urgent need for prospective ME research, particularly on long-term effects, dietary intake, and quality, as well as biochemical markers (Fuentes Artiles et al., 2019; Rezende et al., 2024).

Slow down & truly taste your food: Take smaller bites, chew thoroughly, and pause with a deep, conscious breath. Sip warm water or herbal tea, as recommended in Ayurveda, to support digestion and inner balance.

Listen to your body's wisdom: Are you truly hungry, or is it just habit, boredom, or emotion? Tune in with a hunger scale and honor your body's real needs.

Savor with all senses: Appreciate the colors, textures, aromas, and flavors of your meal. Ayurveda recommends to integrate all flavors from sweet to bitter. Eat with gratitude and joy—every bite is a gift!

Create a nourishing atmosphere: Light a candle, use beautiful tableware, and enjoy your meal in a peaceful setting. Eating in a relaxed state supports digestion and energy flow.

Portion with intention: Serve yourself thoughtfully, use smaller dishes for natural portion control, and trust that eating mindfully will leave you satisfied.

Be present: Turn off screens, sit at a table, and give your meal the attention it deserves. When you fully engage with your food, even simple dishes feel more satisfying.

Enjoy the seasons of eating: Whether it's a warm soup in winter or cooling fruits in summer—align your meals with nature's rhythm for balance and well-being.

Fig. 2. Mindful eating practice. Practical implementation of mindful eating principles (Monroe, 2015).

As research continues to validate its potential benefits, ME stands as a valuable, easily applicable, and user-friendly tool for addressing contemporary global nutritional challenges and promoting holistic health approaches.

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Commentary

The Impact of Inflammation and Nutrition on Attention-Deficit/Hyperactivity Disorder (ADHD): Potential Contributions to its Development and Symptoms

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doi: 10.61936/themind/202504305

Abstract

Attention-deficit/hyperactivity disorder (ADHD) is a complex neurodevelopmental disorder characterized by inattention, hyperactivity, and impulsivity. Emerging evidence links ADHD to biological factors such as neuroinflammation, oxidative stress, and mitochondrial dysfunction. Environmental exposures, nutritional imbalances, and genetic composition have a profound influence on these factors. Recent research highlights

the contributions of inflammatory markers, hormonal dysregulation, and maternal immune activation to the etiology of ADHD. Given that deficiencies in omega-3 fatty acids and antioxidants can exacerbate symptoms, interventions such as anti-inflammatory diets and dietary supplementation have shown promise. Recent literature highlights the importance of these insights.

1. Introduction

Attention-deficit/hyperactivity disorder (ADHD) is a widespread neurodevelopmental disorder that is estimated to afflict approximately 5.29% of the world's population (Polanczyk et al., 2007). ADHD is associated with a wide array of symptoms and comorbidities. The most common of these symptoms are inattention, restlessness, behavioral issues such as impulsivity, and often overlooked affective issues such as emotional dysregulation (American Psychiatric Association, 2013). Along with the classical symptoms that are included in the diagnostic criteria for ADHD, this disorder also encompasses a wide variety of comorbidities and negative health outcomes, including obesity, proneness to accidents, addictions, and sleep issues. These comorbidities develop primarily in patients diagnosed with ADHD who have not undergone drug (e.g., stimulant) treatment and psychotherapy (Nigg, 2013). Given the combination of attention-related and affective issues together with the aforementioned comorbidities, ADHD can be a very detrimental condition and lead to a wide variety of negative health outcomes. The importance of appropriate treatment and management of the disorder should not be underestimated if we hope to prevent a wide array of negative health and quality of life outcomes. A variety of biological aspects have also been associated with ADHD. Oxidative stress and high levels of systemic inflammation have been identified as key components of ADHD; antioxidant compounds including plant polyphenols may mitigate these symptoms and have been proposed as adjunct therapies to conventional treatments (Varlaet et al., 2018). In recent years, we have gained a more comprehensive understanding of biological inflammation secondary to toxin exposure and viral infections and its impact on mental health (Esch & Stefano, 2002; Esch et al., 2002). Importantly, neuroinflammation secondary to viral infections and subsequent lingering effects of several virus-associated diseases may also contribute to the exacerbation of psychiatric symptoms. Prenatal exposure to infections and toxins has also been identified as an important risk factor for disorders such as ADHD (Büttiker et al., 2022; Freitas et al., 2020, Stefano et al., 2024; Freitas et al., 2020; Büttiker et al., 2024; Stefano, 2024).

Many individuals diagnosed with ADHD also present with dietary problems, including imbalances in omega-3:6:9 fatty acid ratios and critical mineral deficiencies; these issues have also been identified as potential risk factors for expectant mothers and their as-yet-unborn children (Sinn, 2008). Collectively, these disorders lead to a cycle of ongoing inflammation and continued exacerbation of psychiatric symptoms, suggesting that a more holistic take on mental health is warranted.

2. Recent Studies: ADHD and Inflammation

Etiologically speaking, psychiatric disorders develop in response to a series of complex interactions among factors that are regulated by genetics, epigenetics, and the environment. Further insight into a wide variety of mental health conditions can be obtained by focusing on the interactions between the immune system and the gut microbiome and taking into account the prominent roles played by neuroinflammation and other inflammatory responses (Alam et al., 2017, Stefano et al., 2018). The potential impact of circulating cytokines and inflammatory responses on those diagnosed with ADHD has been recognized for more than a decade. For example, the results of a recent study identified neuroinflammation as a key pathogenetic factor in an animal model of ADHD that was accompanied by elevated rates of autoimmune disease and higher levels of cytokines in the peripheral circulation (Dunn et al., 2019). Many factors are known to contribute to these neuroinflammatory responses, including viral infections (e.g., coronavirus disease 2019 [COVID-19]) (Büttiker, et al. 2022) and heavy metal toxins (e.g., mercury, lead) that have been detected at higher levels in individuals diagnosed with ADHD compared to those who were not (Tabatazde et al., 2018). Other reviews of recent literature reported that the COVID-19 pandemic and post-COVID syndrome had a clear negative impact on those diagnosed with attention disorders (Lopez-Leon et al., 2021). Interestingly, Oades et al. (2010) reported a clear difference in the pro-inflammatory markers found among those with ADHD who were medicated compared to those who were drug-naïve, with diminished levels of

proinflammatory cytokines and other inflammatory markers observed among those in the medicated group. Most viral infections (e.g., COVID-19) are also associated with higher levels of circulating pro-inflammatory cytokines (Anka et al., 2021).

Maternal immune responses and their subsequent effects in utero along with specific toxin exposure (e.g., Bisphenol-A and other plasticizers) have also been associated with subsequent neuroinflammatory responses, ADHD, and a variety of other disorders (Han et al, 2021; Weissenberger et al., 2017). In their 2020 experiment on Taiwanese children diagnosed with ADHD, Chang et al. (2020) identified several differences between the ADHD group and neurotypical children, most notably higher levels of inflammatory biomarkers such as cytokines and neurotrophins and lower levels of salivary cortisol measured at various time points throughout the day. Some researchers have suggested that levels of pro-inflammatory interleukins, cortisol, and other immune cells might be developed for use as potential biomarkers for ADHD (Park, 2022). Other reviews of the literature reported that although the evidence for their use as definitive biomarkers remains inconclusive, they do state unequivocally that inflammation and paradoxically lower cortisol levels remain key components of the ADHD phenotype (Leffa et al., 2018). Results from other studies revealed an association between inflammatory skin conditions (e.g., atopic eczema) and current as well as future ADHD status in children (Kim et al., et al., 2020). Furthermore, a review of studies focused on the contributions of the endocannabinoid system (ECS) elucidated the impact of endocannabinoid receptor imbalances in a variety of mental health conditions, including ADHD, associated with positive allostasis of the cannabinoid receptor 1 (CB1). The authors also suggested possible endocannabinoid-associated biomarkers for a variety of conditions (Navarrette et al., 2020). As research in this field develops further, the association of ECS with disorders such as ADHD may develop into a path toward critical future treatments (Katzman et al., 2016).

Some researchers have suggested a role for nutritional supplementation in ADHD, including zinc, magnesium, and most importantly, omega-3 fatty acids found in fish oils or algae extracts. While some evidence suggests that omega-3 supplements and other minerals can improve ADHD symptoms in children (Bloch & Mulqueen, 2014), others reported that the data on docosahexaenoic acid and fatty acid supplementation remains unconvincing, especially in studies of adults with this disorder (Bonvicini et al., 2016).

Interestingly, supplementation with polyunsaturated fatty acids and fats with high levels of omega-3 and omega-9 compared to omega-6 fatty acids may be highly effective at reducing systemic inflammatory responses. Western diets often create fatty acid imbalances as they include foods with very high omega-6 to omega-3 ratios. Omega-6 fatty acids are the precursors to arachidonic acid, which is itself a precursor to the eicosanoids that contribute to elevated cellular inflammatory responses. Maintaining an appropriate dietary omega-3:6 balance has been recognized as beneficial for other psychiatric conditions, notably depression, which is also known to include an inflammatory component (Freeman & Rapaport, 2011). The cannabinoid receptor CB1 has also been linked to ADHD along with more classically-recognized dopamine receptor D4 gene mutations, with the two possibly being connected (Navarete et al., 2020). Metabolic syndrome and obesity are now also recognized as signs of ECS imbalances; maternal obesity and associated inflammatory responses have also been identified as major risk factors for the future development of ADHD (Sanchez et al., 2018; van der Burg et al., 2016). Meanwhile, dietary supplementation with healthy fats also tends to improve the efficacy of stimulant medications prescribed for children (Millichap & Yee, 2012).

3. Diet and Antioxidants

A variety of nutritional deficiencies in expectant mothers have been identified as risk factors for the development of ADHD in their children. These nutrient deficiencies include zinc, magnesium, and iodine along with inadequate intake of healthy fats (Konkiowska et al., 2012). In 2017, Rios-Hernandez and colleagues (2017) conducted a study on 120 children and adolescents diagnosed with ADHD and found that symptom intensity correlated with lower adherence to a Mediterranean-type diet (high in fruits, vegetables, and healthy fats with minimal red meat) and a much higher self-reported intake of “junk food (i.e., food that is ultra-processed and contains high levels of unhealthy fats, and high sugar content) and higher rates of soda consumption. Results from another similar study revealed that adolescents with ADHD exhibited lower

adherence to a Mediterranean-style diet and higher consumption of "junk food" (Khazdouz et al., 2024). Similarly, in our 2018 study that included a representative sample of the Czech adult population, we found that higher intensity ADHD symptoms were positively correlated with poorer diets, including those that consisted primarily of "fast food" along with higher consumption of sweets and ultra-processed foods; interestingly, the intensity of ADHD symptomatology in this study was also inversely correlated with physical exercise and nicotine intake (Weissenberger et al., 2018). Given that elevated levels of inflammatory markers are typically found at baseline in children diagnosed with ADHD, the rationale for including antioxidant-rich foods and possibly antioxidant supplementation appears to be sound (Verlaet et al, 2018). Certain compounds, including the amino acid and mucolytic N-acetyl cysteine (NAC), have been administered safely in this population and appear to help with several psychiatric conditions, including drug addiction and ADHD. Of note, NAC serves as a glutathione precursor and can thus be considered an antioxidant (Deepmala et al., 2015; Aldini et al., 2018). Recently, Wang and Qi (2022) reported that the carotenoid anti-oxidant, astaxanthin, which crosses the blood-brain barrier, might be used to limit neuroinflammation. Likewise, in a meta-review on cannabinoids and their potential use to promote mental health, the non-psychoactive and neuroprotective agent, cannabidiol was found to be moderately effective in treating ADHD symptoms (Khan et al., 2020).

Antioxidant supplementation in addition to a balanced diet should also be taken into consideration because, in general, children with ADHD seem to suffer from deficiencies in key minerals and vitamins, including magnesium, zinc, selenium, and the B-vitamins (Dura Trave, et al. 2014). An overview of the interplay between pathogenic sequelae, along with nutrition as either a pro-inflammatory contributor to symptomatology or a protective factor is illustrated in Figure 1.

4. Cellular Energy Metabolism, Mitochondria, and ADHD

Mitochondrial dysfunction and its impact on cellular energy metabolism has emerged as a critical factor in ADHD.

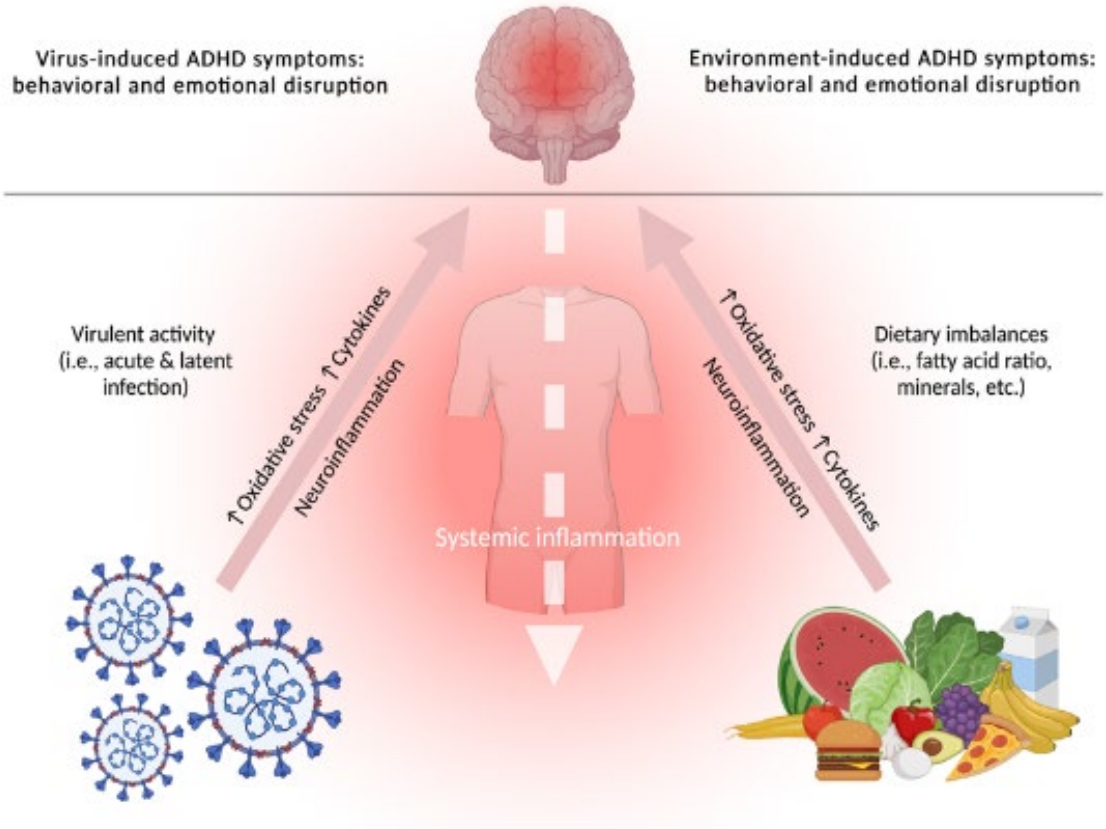

Fig. 1.: The dynamic interplay between pathogens, inflammation, and nutrition in the human organism.

Mitochondria, which are the primary source of adenosine triphosphate, play a pivotal role in maintaining cellular health and energy production, Interestingly, results from recent studies suggest that mitochondrial dysfunction in brain cells plays a key role in the pathogenesis of ADHD (Stefano, 2021). Dysfunctional mitochondria disrupt neuronal activity and neurotransmitter release and contribute to cognitive and behavioral symptoms associated with ADHD (Bonvento & Bolaños, 2021).

Emerging research highlights the link between mitochondrial genetics and ADHD, with variations in both nuclear and mitochondrial DNA contributing to the disorder (Giannoulis et al., 2022). Chronic activation of the cell danger response – a protective cellular mechanism triggered by infections, toxins, and/or stressors – can lead to systemic inflammation and sustained mitochondrial dysfunction (Naviaux, 2014). Such disruptions have long-term implications for neuronal plasticity and attention regulation.

Dietary habits can have a significant impact on mitochondrial function. Imbalances in essential nutrients, most notably omega-3 fatty acids and antioxidants, impair mitochondrial dynamics and exacerbate oxidative stress (Bordoni et al., 2022). Furthermore, excessive production of reactive oxygen species coupled with inadequate antioxidant defenses contributes to DNA damage and neuronal dysfunction. Supplementation with mitochondrial-supportive nutrients, for example, coenzyme Q10, mitoquinone, magnesium, and omega-3 fatty acids has been shown to have some potential to improve mitochondrial function and mitigate ADHD symptoms (Maugeri & Barchitta, 2020).

In astrocytes, mitochondrial dysfunction can limit the supply of energy required by the neurons with a negative impact on the prefrontal cortex and hippocampus. These disruptions hinder cognitive processes, including attention, working memory, and impulse control. Addressing mitochondrial health through dietary and pharmacological interventions could provide a novel approach to the management of ADHD.

5. Conclusions

ADHD continues to be a topic of interest due to its devastating and often overlooked effects on health and well-being. Topics for future research include the identification and validation of biomarkers for assessing ADHD, including inflammatory markers and daily variations in cortisol levels. One other important area of interest is the contribution of the ECS to the pathogenesis of mental health disorders. It is also important to recognize that the dietary imbalances observed among those with ADHD, notably, diets that are comparatively low in omega-3 and omega-9 fatty acids, can in and of themselves lead cause imbalances in the ECS. A healthy ECS requires fatty acids; however, Western diets involving the consumption of processed foods with very high levels of omega-6 fatty acids can lead to a pro-inflammatory state due to increased levels of arachidonic acid (Innes & Calder, 2018). The public in general has become increasingly aware of the importance of healthy foods such as those included in the Mediterranean-style diet in regulating inflammation as well as providing the healthy fats needed for overall health and optimal brain function. With respect to ADHD, supplementing psycho-pharmacological treatment and psychotherapy with critical dietary adjustments and access to nutritional supplements could lead to a profound difference for these individuals. More research is needed to explore the combined effects of traditional treatments with dietary supplementation. Furthermore, validated biomarkers might lead to a more holistic diagnostic process and could have a role in guiding the dietary habits of children and adults with ADHD.

Author Contributions: Conceptualization, S.W.; investigation, S.W.; writing—review and editing, S.W; All authors have read and agreed to this version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: No data was used in this commentary article.

Acknowledgments: Pascal Büttiker, a Ph.D. Candidate, provided the figure, in the Department of Psychiatry, First Faculty of Medicine, Charles University in Prague, Czech Republic.

Conflicts of Interest: The authors declare no conflicts of interest.

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Opinion

Mind-Body Medicine Completes Sports Medicine: Development of a Prophylaxis Model Through Sports Medicine

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doi: 10.61936/themind/202504306

Abstract

In a nutshell:

1. Sports medicine has significant health-preserving potential.
2. Mind-body medicine is developing as a complementary approach to sports medicine to promote holistic health ("whole person health") and is being integrated into sports medicine in prehabilitation on an equal footing with exercise, sport, and nutrition.
3. The prophylaxis model results from prehabilitation.

Keywords: sports medicine, mind-body medicine, prophylaxis, prehabilitation, nutrition

Sports medicine is changing from a diagnostic discipline focused on competitive sports to a holistic, conservative, multidisciplinary, and multimodal therapy concept to promote health (Harvard Medical School, 2025; Nehrer, 2025). The number of scientific publications, congresses, and demands from athletes and patients is enormous (Musumeci, 2022). The importance of sport and exercise for mental health is widely recognized (Ströhle, 2024; Khan & Burton 2023; Laube, 2022).

Maintaining health through sports medicine

The focus is more on health maintenance (Casasco, 2025) and active involvement of patients (therapy & training) or non-patients (hygiene-intervention / training) and athletes (Harvard Medical School, 2025; Nehrer, 2025) than explicitly on the treatment of injuries and performance diagnostics.

The interdisciplinary additional training program in sports medicine (Joisten, 2025) is not an independent subject. It is traditionally characterized by orthopaedic trauma surgery and focuses predominantly on conservative, physical, and regenerative methods, some of which are complementary (Gerbing et al., 2013). In practice, however, there is a lack of sufficient conservative training opportunities, especially in comparison to the high standard of orthopaedic-surgical training (Psczolla et al., 2017).

This makes sports medicine, especially its increasingly integrated complementary (Gerbing et al., 2013) measures such as mind-body medicine, nutrition, and sports nutrition (Gerbing et al., 2013; Esch, 2020;

Marshall, 2023), susceptible to informal approaches (Myall et al., 2023; Dossett et al., 2020) without coordinated guidance for the athlete as well as patients and non-patients (Gerbing et al., 2013).

Sports medicine and integrated mind-body medicine

A promising integrative approach in sports medicine is the increasing use of mind-body medicine (Dossett et al., 2020) with regard to its direct interaction with psychosocial stress factors (Tschaffon-Müller et al., 2023; Deutsches Ärzteblatt, 2023), accelerated regeneration and wound healing (Schubert, 2023) with the involvement of the patient and athlete. Topics such as psycho-social support (Deutsches Ärzteblatt, 2023), self-management (Stöve & Halder, 2025), self-care (Benson, 2011), and self-healing (Esch, 2020; McSwan et al., 2021; Mobasheri, 2022; Schubert, 2025) are of particular importance.

Mind-body medicine is based on the human potential to regulate one's own body physiology or to heal oneself. It focuses on activating and strengthening individual resources to improve one's own health (Schubert, 2025). The underlying psychoneuroimmunological modulation capacity as a reaction to injuries and infections, for accelerated wound healing and, as is known, for an adapted stress response is fundamental (Schubert, 2023; Schubert, 2025).

Mind-body medicine, whose origins and development history can be traced back to people such as Walter Cannon, Hans Seyle, Herbert Benson, Jon Kabatt-Zinn, and Dean Ornish in the USA (Michalsen, 2015), today generally encompasses mental and behavioral approaches as well as techniques from the areas of exercise, relaxation, stress regulation and nutrition (Esch et al., 2003). Of particular note is the strong evidence for exercise and nutritional interventions (Esch, 2020), including the central importance of exercise and relaxation in promoting physical and mental health (Esch & Stefano, 2010). The combination of these elements shows particular potential when a personalized connection and relationship is established (Schubert, 2025). It complements sports medicine with a holistic and comprehensive approach.

This approach considerably expands the spectrum of conservative sports medicine therapy. A comprehensive conservative treatment concept for osteoarthritis of the knee shows positive results in terms of reducing depressive symptoms, anxiety, pain, and improving physical functioning (Lim & Al-Dadah, 2022).

The problem of patients' pre-existing anxiety and avoidance behavior, which occur even before the actual treatment planning, should be particularly emphasized (Kavka et al., 2024).

Mind-body medicine supports sports medicine in prehabilitation

Sports medicine developed in this way with a holistic and comprehensive approach is used to provide targeted support for prehabilitation and patient education (McIsaac et al., 2025). As complementary medical measures of a first-line treatment integrated into various specialties, mind-body medicine attempts, among other things, to counteract the body's own stress response (Schubert, 2025) and reduce unnecessary activation: "The founding principle is trying to counteract the stress system while reducing the unnecessary activation of the stress system" (Baim, personal communication, 31 October 2024).

Prehabilitation includes mind-body medicine, sport, exercise & nutrition

In the field of sports medicine, the concept of prehabilitation (Bloch, 2023) represents a forward-looking and promising development, with the aforementioned anchoring of mind-body medicine. The potential of this connection goes beyond sports medicine, assuming an adequate definition and training (Bloch, 2023; Deutsches Ärzteblatt, 2023). It serves to optimally prepare patients and athletes for the therapy process (Kavka et al., 2024) – an educational process in which a social relationship is also to be established.

Prehabilitation includes preventive measures such as physical training, psychological counseling, and nutritional adjustments (Valle et al., 2023) to prepare and strengthen the body and mind for an upcoming surgery or therapeutic intervention (McIsaac et al., 2025; Valle et al., 2023). These measures can also be particularly important in preparation for major life changes, such as pregnancy or childbirth (Geweniger & Bohland, 2024).

A combination of exercise, nutrition, and psychosocial prehabilitation improves quality of life and physical

recovery the most (McIsaac et al., 2025). Exercise and nutrition in particular have great prophylactic potential for the future (Kow, 2019): "Combined exercise, nutritional and psychosocial prehabilitation was most likely to improve health-related quality of life and physical recovery. Individually, exercise and nutrition were most likely to improve all critical outcomes" (McIsaac et al., 2025, "Intro").

The focus on psycho-social factors and psychological support with the aim of reducing anxiety and depression, increasing motivation for the prehabilitation program, and reducing pain and stress are of enormous importance (Deutsches Ärzteblatt, 2023; Valle et al., 2023).

Prehabilitation as a pioneer of prophylaxis by sports medicine

Prehabilitation is becoming increasingly relevant in sports medicine (McIsaac et al., 2025) as well as in oncology (Frank et al., 2022) and as a further developed transfer to future prophylaxis by sports medicine (sportärztezeitung, 2021). It focuses on the patient and athlete through an individualized, educational approach - a concept that requires a high level of compliance but at the same time makes it difficult to generate generally valid evidence (Schubert, 2025). In specific clinical pictures, such as tumor diseases, targeted protective and supportive measures – such as physical activity and indication-specific nutrition – can make a decisive contribution. However, there is often a lack of standardized implementation strategies and a sustainable care structure, which hinders the wider use of this promising approach (Tumour Therapy Online, 2020).

Based on previous experience and scientific findings in the field of prehabilitation, this can also be used as a prophylactic approach - even before injuries or illnesses occur (sportärztezeitung, 2021). Preventative measures should be integrated, and the active involvement of athletes, patients, and non-patients should be specifically encouraged and trained. Unambiguous communication is essential: "The athlete has to know what to do before he can replicate it" (McGill, personal communication, June 2021). The focus is on an initial motivational counseling session (Bischof et al., 2021), including a screening based on solid foundations and helpful tools, the personal hygiene factors, an interplay in the context of the bio-psycho-social model (sportärztezeitung, 2021). This procedure is carried out by medical professionals (Casasco, 2025). Dental prophylaxis and dental hygiene serve as a model (Geurtsen et al., 2016).

Formal sovereignty of interpretation through training and education

The recommendation and advice of the doctor and therapist on exercise therapy, for example in prehabilitation, serves as a decisive incentive for many patients to start regular training (Matziolis, 2019). This applies equally to all additional techniques to be taught from the previously mentioned subject areas (Esch, 2020; Schubert, 2025; McIsaac et al., 2025; Valle et al., 2023) – stress regulation, exercise, relaxation (Matziolis, 2019) and nutrition – as well as for athletes and non-patients in prophylaxis.

Health awareness, lifestyle medicine, self-care, and prophylaxis by sports medicine

The development and promotion of health-conscious behavior are therefore at the forefront (Matarazzo, 1984) of prehabilitation and in the model of prophylaxis by sports medicine (sportärztezeitung, 2021) to promote general health, as well as to reduce illnesses and secondary diseases and improve therapy and surgical outcomes (Hirst, 2024). The aim is to optimize psychoneuroimmunological functions (Institute Tech Technological University, 2023), whose interaction or interplay can be understood as a form of internal communication with a continuous multidirectional interaction of information (Ader et al., 1995; Schedlowski et al., 2006). In the long term, this can also reduce the burden on the healthcare system (Casasco, 2025), including a possible reduction in costs (Esch, 2020).

Prophylaxis by sports medicine is an educational, communicative, and practical model that considers patient education and training (Matziolis, 2019) as part of the Whole Person Health approach (Casasco, 2025; National Centre for Complementary and Integrative Health; National Institutes of Health 2022) and lifestyle medicine.

Sports medicine is further developed and specifically trained through the additional integration of complementary interventions and targeted training –

preventive and prophylactic. New professions are emerging. Comprehensive preventive healthcare – prophylaxis instead of avoidance – must become attractive for all medical specialties and beyond. Specific scientifically established frameworks for action such as BERN (Esch & Stefano 2022), the SMART program (Traeger et al., 2022; Fricchione 2023), Whole Person Health (National Centre for Complementary and Integrative Health), and lifestyle medicine (American College of Lifestyle Medicine) can serve as a guide here.

Numerous guidelines and specialist articles relevant to sports medicine (Laube 2022; Valle et al., 2023; Stöve & Halder, 2025; Matziolis, 2019; Sturm et al., 2024) emphasize the importance of integrating the aforementioned multimodal and multidisciplinary interventions – exercise, relaxation, stress regulation & nutrition (Esch, 2020) with special consideration of the psychosocial context (Mc Auliffe, 2021). It is unequivocally recommended to consider these aspects and to provide appropriate guidance through motivational counseling (Emery & Wimmer, 2023). Current concepts for the integration of a possible self-management, self-care, and self-healing approach in the context of sports medicine have already been published (Casasco, 2025; Esch, 2020; Dossett et al., 2020; McSwan et al., 2021; Mobasheri, 2022; Schubert, 2025).

This must be offered in a professionally coordinated manner and be formally and thoroughly trained and educated (Myall et al., 2023) to reach and integrate all specialties, patients, athletes, and non-patients (sportärztezeitung, 2021) as a connection within society.

These interdisciplinary connections between all personalized measures and participating people give rise to relationships as social systems. This should be integrated and trained in adaptive dynamic groups such as in Group Medical Visits (Thompson-Lastad, 2018; Thompson-Lastad et al., 2025; Thompson-Lastad & Gardi 2020; Boyd et al., 2023). One conceivable approach is the sports club culture established in Germany (Jütting et al. 2006) after an initial medical screening. The German Pension Insurance's (Deutsche Rentenversicherung) prevention program RV Fit supports employees with initial health impairments to secure their ability to work in the long term (Deutsche Rentenversicherung, 2020).

It is not necessary to develop new methods, as existing ones can exhibit emergent properties through specific inductively organised combinations on a scientific basis. In this way, self-management can become self-care and prophylaxis by sports medicine can develop (sportärztezeitung, 2021).

We have the necessary resources and capacities to achieve the overarching goal of educating the next generation in preserving health and increasing individual salutogenetic potential (Esch, 2020). It is now necessary to utilize these resources efficiently.

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Exercise Corner

A Guided Imagery: “The Lemon Exercise“

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Guided imagery is a mindfulness technique that engages the imagination to create vivid sensory experiences and strengthen the mind-body connection. Research suggests that thoughts have the power to influence health, as mental imagery can produce lasting physiological effects on the brain and body.

The Lemon Visualization demonstrates how guided imagery can evoke real physical sensations, enhancing awareness, relaxation, and overall well-being (Zemla, 2023; Hart, 2008). This article provides a step-by-step guide to practicing the Lemon Visualization, offering a simple yet effective way to incorporate mindfulness into daily life.

Instruction

Preparation: Find a quiet place where you can be undisturbed. Allow yourself to fully immerse in the exercise. Sit comfortably. Place your feet flat on the ground and rest your hands on your thighs. If it helps, you can move your hands in alignment with the instructions during the exercise.

Getting started: When you are ready, close your eyes or focus on a fixed point in front of you.

There is nothing to archive or to hold on to right now. Simply notice your next breaths.

Where can you feel the breath entering your body, spreading through it and leaving again with each exhale?

Do not alter your breathing – just observe it as it naturally occurs.

Now imagine yourself standing in the kitchen.

What does the kitchen look like? How does it smell? How does the countertop feel like? Do you notice a specific taste in your mouth? Can you hear any particular sounds?

On the countertop in front of you lies a lemon. Imagine its vibrant yellow color. Pick it up. How does the lemon feel in your hand? Notice its weight, the soft but uneven texture of its peel. Imagine what the lemon might smell like. Place the lemon back on the countertop.

Slice the lemon in half. Observe the juice seeping out and take in its refreshing aroma. How does it make you feel? Pick up one half of the lemon and bring it close to your nose, letting the scent intensify. What sensations arise? Picture yourself biting into the lemon. Can you detect the sharp tang? How does your body react? Does your mouth begin to water? What other sensations emerge?

Take your time to truly immerse yourself in these sensations. Reflect on how the feelings spread through your body.

When you feel ready, take one last deep breath and slowly return to the present moment. Gently open your eyes and come back to the here and now.

Efficacy:

"Thoughts are powerful. Experts in guided imagery and research findings suggest that people have the power to change their thoughts to promote health. […] Guided imagery may be more than just positive thinking. The images people conjure up in their minds have lasting physiologic effects on their brains and bodies" (Hart, 2008, p. 298).

Studies show that guided imagery reduces stress, anxiety and physical tension while improving cognitive function and emotional regulation. It shifts focus from stressors to calming mental images making it a particular mindfulness tool (Giacobbi Jr et al., 2018; Hart, 2008).

In professional settings, guided imagery helps alleviate workplace stress and enhances well-being (Carroll, 2022). Its accessibility and effectiveness within minutes make it a valuable and easily implemented intervention.

A guided imagery can also be tailored to individual needs using symbols, metaphors or personal goals. Adding music or calming sounds deepens the

experience making it a versatile tool for holistic health (Carroll, 2022).

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Announcement

MBMRC Guest Lecture with Simon Weissenberger[1] on May 21st online and at Witten/Herdecke University, 15:00h – 16:15h (CET)

[1]Department of Psychology, University of New York in Prague. Prague, Czechia. 120 00

We are excited to launch a new lecture series, which will feature distinguished researchers and practitioners presenting current findings and perspectives in MBM.

Join us for the first edition of this **hybrid** event series:

Happily, we welcome Simon Weissenberger from the University of New York in Prague as the first speaker for the opening of a series of MBMRC Guest Lectures at May 21st 2025, hosted by the Institute of Integrative Health Care and Health Promotion (IGVF).

Title: ADHD: Lifestyle, Dietary Supplementation and Conventional Treatments

Time: 15:00h – 16:15h (CET)

Join online: Zoom-Link

Join on-site: Room 1.151 senat hall (Senatsraum), Witten/Herdecke University, Alfred-Herrhausen-Straße 50, D-58448 Witten

The participation will be free of charge.

The lecture will be followed by an open Q&A. ***For further information, please*** *click here.*

Additional dates of the guest lectures are

27th August 2025

19th November 2025

This new series aims to create a platform for exchange beyond institutional boundaries – and you are warmly welcomed to be part of it from the start! We invite all interested participants – students, researchers, and members of the public – to join us for this opening event. We look forward to welcoming you!

The Mind-Body Medicine Research Council (MBMRC)

At the present time, the council consists of the following members:
Tobias Esch, M.D. (Co-Chair) – Witten/Herdecke University
George B. Stefano, Ph.D. (Co-Chair) – Charles University, Prague/ Witten/Herdecke University
Maren M. Michaelsen, Dr. rer. oec. Dr. rer. medic. (Project Lead) – Witten/Herdecke University
Christoph Stueckle, M.D. – Niles-Stensen-Kliniken Osnabrueck
Pascal Büttiker, M.Sc. – Charles University, Prague

How to become a member of MBMRC
As the MBMRC has been founded in 2022, and due to its dedication to rigorous contributions on the basic research foundations of Mind-Body Medicine, the number of members is yet small. In the future, the council aims to invite outstanding researchers in the field to become MBMRC members. Membership implies no fee.

Recent Publications of MBMRC Members

Büttiker, P., Boukherissa, A., Weissenberger, S., Ptacek, R., Anders, M., Raboch, J., & Stefano, G. B. (2024). Cognitive impact of neurotropic pathogens: Investigating molecular mimicry through computational methods. *Cellular and Molecular Neurobiology, 44*(1), 72. https://doi.org/10.1007/s10571-024-01509-x.

Esch, T. (2024). Transparenz als Voraussetzung von Patienten-Compliance und Partizipation am Beispiel von OpenNotes. In C. Straub (Hrsg.), *Transparenz im Gesundheitswesen* (S. 147–156). Berlin: Medizinisch Wissenschaftliche Verlagsgesellschaft.

Esch, T., & Esch, S. M. (2024). *Stressbewältigung – Mind-Body-Medizin, Achtsamkeit, Resilienz: Das Manual zum BERN-Programm* (4. Aufl.). Berlin: Medizinisch Wissenschaftliche Verlagsgesellschaft.

Esch, T., & Michaelsen, M. M. (2024). Digitale Achtsamkeit und Künstliche Intelligenz: Chancen und Herausforderungen in der modernen Mind-Body-Medizin. *Zeitschrift für Komplementärmedizin, 16*(6), 14–18. https://doi.org/10.1055/a-2463-8142.

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