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DETERMINANTS OF QUALITY OF LIFE IN OLD AGE: A SYSTEMATIC REVIEW OF CONTRIBUTING FACTORS

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ABSTRACT

Objective: The objective of this literature review is to report the current knowledge about the main factors that contribute to healthy aging in the elderly population, considering nutrition, physical exercise and social involvement. Methodology: We searched the PubMed database using combinations of descriptors with the Boolean term "AND": "Healthy aging", "Elderly health", "Quality of life in the elderly", "Physical activity in the elderly" and "Geriatric care". A total of 125 articles were found, of which 36 were initially selected. After applying inclusion and exclusion criteria, 9 articles were included in the review. The inclusion criteria were: articles in English, Portuguese, and Spanish, published between 2019 and 2024, and available in full. Duplicate articles, in the form of an abstract, or not directly related to the topic were excluded. Results: The review identified that adequate nutrition is essential for the prevention of weakness and cognitive decline in the elderly, highlighting the importance of protein intake, vitamins and essential fatty acids. Supplementation with creatine, vitamin D, and omega-3 is effective in promoting muscle and cognitive health. Regular physical exercise, especially aerobic and resistance training, is critical for maintaining cognitive function, cardiovascular health, and muscle strength. In addition, social involvement and

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family and community support are crucial for the mental and emotional health of seniors. Conclusion: It is concluded that the promotion of healthy aging requires an integrated approach that combines adequate nutrition, regular physical exercise, and social involvement. The implementation of these strategies can significantly improve the quality of life of the elderly, promoting active and healthy aging.

Keywords: Healthy Aging. Nutrition. Physical Exercise. Social Involvement. Quality of Life.

INTRODUCTION

Healthy aging is an increasingly relevant concept in a world where the aging population is growing rapidly. It is estimated that by 2050, a quarter of the population of Europe and North America will be 65 years of age or older, and the number of people aged 80 and over is expected to triple (BAUTMANS et al., 2022). Aging is an inevitable biological process, marked by a series of cellular and molecular changes that affect the health and longevity of individuals. In Western societies, life expectancy is constantly increasing, but this phenomenon is often accompanied by a higher risk of chronic diseases, including cancer, cardiovascular disease, and neurodegenerative disorders (ASHIKALI et al., 2023).

The main cellular characteristics of aging include genomic instability, telomere shortening, epigenetic changes, loss of proteostasis, cellular senescence, stem cell exhaustion, and altered intercellular communication (ARLEO et al., 2024). Preventive strategies, such as calorie restriction, dietary interventions, exercise, pharmacological therapies, and genetic alterations, have been proposed to mitigate the effects of aging. However, in humans, the current focus is on non-genetic therapies, with an emphasis on correct diet, regular physical exercise, safe living conditions, and pharmacological therapies (DOLAN et al., 2019). The World Health Organization (WHO) defines healthy aging as the process of developing and maintaining functional capacity that enables well-being in old age (BAUTMANS et al., 2022). This includes not only the absence of disease, but also a state of complete physical, mental, and social well-being.

The concept of functional capacity is central to healthy aging, encompassing attributes that help individuals lead meaningful lives, such as building and maintaining relationships, continuous learning, decision-making ability, and mobility (ASHIKALI et al., 2023). Focusing on healthy aging involves implementing effective interventions to prevent the decline of these capacities or maintain them before they are compromised. Intrinsic capacity, which includes an individual's mental and physical reserves, is essential for independence and quality of life in old age (ASHIKALI et al., 2023).

To achieve successful aging, it is essential to consider all aspects of seniors' health. Many problems faced by them result from unhealthy lifestyles adopted over the years (SIKKES et al., 2021). Focusing on successful aging through the adoption of healthy behaviors can prevent and reduce age-related problems, thereby decreasing the costs associated with the burden of disease (ESTEBSARI et al., 2020).

The concept of successful aging has gained prominence in recent decades. It encompasses several approaches, such as active aging, positive aging, and productive aging (ESTEBSARI et al., 2020). These concepts have in common the pursuit of a

purposeful life, based on meaningful goals and ideal incentives, as well as the promotion of self-esteem and close social contact. Defining and measuring successful aging is challenging due to the variety of cultural characteristics and contexts. However, studies show that genetic factors, early life experiences, and individual behaviors are crucial determinants (WONG et al., 2023). Education and the promotion of healthy lifestyles from childhood are key to preparing society for healthy aging (SIKKES et al., 2021).

The objective of this systematic review is to synthesize and critically evaluate the available evidence on healthy aging, based on multiple studies. With this, we seek to identify patterns, inconsistencies and gaps in existing research, providing a clearer and more comprehensive view on the subject. In addition, this systematic review aims to inform clinical practices and public policies, guiding interventions and recommendations based on solid evidence. Finally, we aim to define priority areas for future research, ensuring that scientific efforts are directed towards issues that still need further investigation.

METHODS

This systematic review seeks to understand the various dimensions of healthy aging, highlighting the benefits of adequate nutrition, regular physical exercise, and social involvement in promoting health and quality of life in the elderly. The goal is to identify effective interventions and direct future research on the subject.

For the development of this research, a guiding question was elaborated through the PVO strategy (population, variable and objective): "What are the main factors that contribute to healthy aging in the elderly population, considering nutrition, physical exercise and social involvement?"

The searches were carried out through searches in the PubMed database. Three descriptors were used in combination with the Boolean term "AND": "Healthy aging", "Elderly health", and "Quality of life in the elderly", in addition to another combination with "Physical activity in the elderly" and "Geriatric care". The search strategy used was: "Healthy aging AND Elderly health AND Quality of life in the elderly", and "Healthy aging AND Physical activity in the elderly AND Geriatric care".

From this search, 125 articles were found, which were subsequently submitted to the selection criteria. The inclusion criteria were: articles in English, Portuguese and Spanish; published in the period from 2019 to 2024 and that addressed the themes proposed for this research, in addition to review, observational and experimental studies, made available in full. The exclusion criteria were: duplicate articles, available only in abstract form, that did not directly address the proposal studied, and that did not meet the other inclusion criteria.

After associating the descriptors used, a total of 125 articles were found. After applying the inclusion and exclusion criteria, 36 articles were initially selected, of which 6 were excluded because they were not available in full, resulting in 9 articles selected to compose the collection of this systematic review.

DISCUSSION

GUT MICROBIOTA AND AGING

The gut microbiota plays a crucial role in host health. With aging, the diversity and richness of the microbiota tend to decrease, resulting in dysbiosis that can harm health. Studies indicate that diet and physical activity have a significant impact on the composition of the microbiota. Diets rich in dietary and plant-based fiber, such as the Mediterranean diet, are associated with greater microbial diversity and anti-inflammatory effects (DONATI ZEPPA et al., 2022). Supplementing with probiotics and prebiotics can help restore and maintain a healthy microbiota, contributing to longevity and overall health (DONATI ZEPPA et al., 2022).

PHYSICAL EXERCISE IN HEALTHY AGING

Physical exercise has shown beneficial effects on the composition of the gut microbiota and overall health. While moderate exercise increases the abundance of beneficial bacteria, such as Bifidobacterium spp. and Akkermansia muciniphila, excessive training can have adverse effects, including increased inflammation and gastrointestinal upset. Studies indicate that combined exercise, such as aerobic and resistance, are more effective in promoting a healthy microbiota compared to resistance exercise alone (DONATI ZEPPA et al., 2022).

Regular physical exercise is essential for maintaining health and cognitive function during aging. Studies indicate that physical activity is associated with a substantial reduction in the risk of cognitive decline and progression to dementia, including Alzheimer's disease. Vigorous and moderate physical activity is linked to a decrease in the risk of transitioning from an unimpaired cognitive state to a mildly impaired state, with a risk reduction of up to 35% (YONEDA et al., 2021, SIKKES et al., 2021).

In addition to the cognitive benefits, physical exercise contributes to neural plasticity, possibly by increasing the volume of the hippocampus, a region crucial for memory and other cognitive functions. This mechanism may explain why physically active individuals are less likely to develop mild cognitive impairment (MCI) and more severe dementias. Physical activity seems to help maintain cognitive function even in individuals who already have

some degree of impairment. This aligns with the cognitive reserve hypothesis, where engaging in stimulating activities, including physical activity, can offset the effects of brain pathology (YONEDA et al., 2021).

Aerobic exercise has a significant impact on global cognition, while resistance training, while promising, still lacks a robust evidence base. Integrating these activities into the daily routine can improve not only physical health but also cognitive function, potentially slowing the progression of neurodegenerative diseases (SIKKES et al., 2021, YONEDA et al., 2021). In addition, combined resistance training and aerobic exercise is more effective in promoting gut health and reducing the risks of chronic diseases (DONATI ZEPPA et al., 2022).

DIET AND SUPPLEMENTATION

Balanced diets, rich in fruits, vegetables, fiber, and polyphenols, have been shown to promote a healthy gut microbiota and reduce the risks of chronic diseases associated with aging (DONATI ZEPPA et al., 2022). Components such as resveratrol and curcumin have antioxidant and anti-inflammatory properties, contributing to gut and overall health (DONATI ZEPPA et al., 2022). Adequate protein intake (1.0-1.5 g/kg body weight/day) is crucial for maintaining muscle mass and preventing sarcopenia (TAMURA et al., 2020). Supplementing with vitamin D and omega-3 fatty acids can improve microbial composition, promote cognitive health, and reduce inflammation (TAMURA et al., 2020, SIKKES et al., 2021).

Proper nutrition is critical for the prevention of weakness and cognitive decline in older adults. Optimal energy intake is recommended, along with a high protein intake (1.0-1.5 g/kg body weight/day) to maintain muscle mass. In addition, a high intake of vitamin-rich vegetables (A, C, E, and B-complex) and fish rich in PUFA, ω-3FA, and vitamin D is crucial (TAMURA et al., 2020).

Vitamin D plays an essential role in calcium absorption, increasing bone mineral density and reducing the risk of fractures. It also has a positive impact on muscle mass and strength. Studies show that vitamin D deficiency is correlated with cognitive decline, and the vitamin D receptor is expressed in several regions of the brain, including the hippocampus. Vitamin D supplementation, especially when combined with protein or exercise, may improve muscle mass and lower limb function in older adults with sarcopenia (TAMURA et al., 2020).

Proteins are vital for maintaining muscle mass and physical function. An adequate protein intake helps reduce mortality in older adults with diabetes, especially those aged 75

and older. Protein supplementation may be recommended for patients at high risk of frailty and sarcopenia. In studies, high protein intake has been shown to improve muscle mass and physical performance (TAMURA et al., 2020).

Omega-3 fatty acids (PUFA and ω-3FA) are known to reduce plasma triglyceride levels and inflammatory and oxidative markers. Intake of PUFA and ω-3FA may be important for the prevention of cardiovascular disease and sarcopenia. Studies show that a reduced intake of ω-3FA is associated with a higher prevalence of sarcopenia (TAMURA et al., 2020).

As patients age, dietary strategies should adapt to focus on preventing frailty and sarcopenia, rather than just managing metabolic syndrome and obesity. Patients aged 75 years and older, or those with signs of malnutrition and frailty, should be given diets that support adequate energy and nutrient intake. For the prevention of frailty, an optimal energy intake and a high protein intake are recommended. A diet rich in vegetables and fish is desirable for maintaining physical and cognitive health (TAMURA et al., 2020).

Dietary diversity is another approach that should be considered for the prevention of frailty. Studies show that a high variety in diet, along with exercise, is associated with a lower incidence of frailty. Diet-related quality of life, which includes satisfaction with food and perception of the merits of dietary therapy, is also important. Maintaining a diverse and pleasurable diet improves treatment adherence and contributes to the overall well-being of older adults (TAMURA et al., 2020).

As far as supplementation is concerned, much is said about creatine, which has gained popularity as a dietary supplement due to its key role in the rapid regeneration of ATP, the main source of energy for muscle contraction. During periods of high energy demand, such as during high-intensity exercise, creatine helps maintain muscle strength production and physical performance capacity. In addition, creatine influences the spatial transfer of energy between high-production, high-demand sites within muscle cells, facilitating the continuation of cellular work and, consequently, improving muscle endurance and performance (DOLAN et al., 2019).

The mechanisms of action of creatine are diverse. It can act directly on the bioenergetics of the muscles, increasing the availability of phosphorylcreatine (PCr) and helping in the rapid regeneration of ATP. It also has anabolic and anti-catabolic effects, reducing muscle protein breakdown and helping to maintain muscle mass. Additionally, creatine has antioxidant properties that help balance reactive oxygen and nitrogen species, protecting muscles from oxidative stress, which is implicated in the development of sarcopenia (DOLAN et al., 2019).

While there is robust evidence that creatine supplementation can increase muscle function and mass in older adults, especially when combined with exercise training, results vary. Creatine alone may have limited effects on lean mass in the long term, but it can help prevent lean mass loss associated with aging. However, when combined with resistance exercise, creatine proves to be much more effective, significantly improving muscle strength and the ability to perform in daily activities (DOLAN et al., 2019).

There is still much to be explored about the effectiveness of creatine in different populations, especially in the most frail elderly. Future research should focus on exploring the co-supplementation of creatine with other nutrients, such as protein or antioxidants, and evaluating the influence of drugs that affect muscle metabolism. Well-controlled studies are needed to fully understand the impact of these combinations and ensure the safety and efficacy of creatine in more vulnerable populations (DOLAN et al., 2019).

In the hospital context, the identification and management of sarcopenia and frailty are essential to prevent adverse clinical outcomes in hospitalized older adults. These conditions are associated with prolonged hospitalizations, higher health care costs, frequent readmissions, institutionalization, low quality of life, and increased mortality. Therefore, early screening, assessment, and intervention are recommended to optimize the care of elderly patients (IULIANO et al., 2022).

Sarcopenia is defined as a progressive and generalized disease of skeletal muscles, characterized by loss of muscle mass, strength, and function. Its pathophysiology involves a series of metabolic and hormonal changes, chronic inflammation, and reduced physical activity. With advancing age, there is a decline in muscle protein synthesis capacity, largely due to anabolic endurance, which is the reduction of the response of muscle fibers to protein intake and exercise (IULIANO et al., 2022).

In addition, insulin resistance and chronic inflammation increase levels of inflammatory cytokines, such as TNF-α and IL-6, which promote protein degradation and inhibit muscle protein synthesis (IULIANO et al., 2022). Adequate nutrition, with an emphasis on high-quality protein intake (1.0-1.5 g/kg body weight/day) and supplementation with vitamin D and omega-3 fatty acids, is crucial for maintaining muscle mass and preventing sarcopenia (TAMURA et al., 2020). Multicomponent exercise programs, which include resistance training, balance, and functional activities, are key to increasing muscle strength and mobility (IULIANO et al., 2022).

Creatine supplementation is also a promising dietary intervention, as it can increase muscle function and mass in older adults, especially when combined with exercise training (DOLAN et al., 2019).

Dementia, especially Alzheimer's Disease (AD), represents one of the most urgent challenges in healthcare, exacerbated by the aging of the world's population. The increased prevalence of dementia brings with it huge financial costs and significant impacts on the quality of life of affected individuals and their caregivers (SIKKES et al., 2021). In this context, non-pharmacological interventions (NPTs) emerge as a promising approach, not only for symptom management, but also for primary and secondary prevention of dementia (SIKKES et al., 2021).

A coordinated analysis of 14 longitudinal studies revealed that individuals engaged in physical activity (PA) in adulthood are more likely to preserve cognitive function and prolong life. PA contributes to the decrease of symptoms that exacerbate poor cognitive performance and helps individuals regain some lost function. This suggests that PA has a significant positive impact even after the onset of cognitive impairment (YONEDA et al., 2021).

In addition, the literature suggests that individuals who are still able to engage in PA have relatively better cognitive performance, which may be an indication that PA promotes cognitive resilience. However, the possibility that a third unmeasured variable influences both PA and cognitive functioning cannot be ruled out, as well as the hypothesis of reverse causality (YONEDA et al., 2021).

Cognitive training (CT) is a formal intervention that aims to improve or maintain specific or global cognitive processes through standardized tasks. Evidence suggests that CT may lead to modest improvements in global cognition in individuals with mild cognitive decline (MCI) and dementia. However, the effectiveness of such interventions depends on the rigorous implementation of methodological standards and the personalization of treatments to meet the individual needs of patients (SIKKES et al., 2021).

Physical exercise is another essential strategy to promote healthy aging. Studies indicate that aerobic training can have a significant positive impact on global cognition, while resistance training, while promising, still lacks a robust evidence base. Integrating these activities into the daily routine can improve not only physical health but also cognitive function, potentially slowing the progression of neurodegenerative diseases (SIKKES et al., 2021).

Proper nutrition also plays a crucial role in brain health. Supplementation of micronutrients, such as vitamins and omega-3 fatty acids, has been shown to benefit cognitive function, particularly in individuals with high homocysteine levels. Large-scale, long-term clinical trials are needed to confirm these effects and develop effective nutritional guidelines for the prevention of cognitive decline (TAMURA et al., 2020).

Meditation emerges as a promising intervention for healthy aging, improving cognition, well-being, and overall health in old age. Regular meditation practices can influence inflammation, stress, and emotional regulation, as well as improve brain connectivity and structure. Longitudinal trials and rigorous studies are essential to fully understand the mechanisms underlying the benefits of meditation. Music treatments, both active and receptive, have been shown to be effective in reducing depressive and behavioral symptoms, although evidence on cognitive improvements is still limited (SIKKES et al., 2021).

The practical implementation of these interventions depends on a holistic and integrated approach, which considers the individual characteristics of patients and methodological challenges. The personalization and integration of treatments into the daily lives of the elderly are essential to maximize their therapeutic benefits and promote healthy aging. Future research should focus on improving the quality of clinical trials, better understanding the factors that influence the effectiveness of treatments, and developing effective strategies for implementing these interventions on a large scale (SIKKES et al., 2021).

FUNCTIONAL CAPACITY AND VITALITY

The World Health Organization (WHO) advocates a healthy aging model focused on preserving functional capacity and preventing the loss of capacity over the years. Functional capacity is made up of all the health-related attributes that allow people to be and do what they have reason to value. This concept goes beyond the absence of disease and focuses on the maintenance of physical and mental abilities, as well as the interaction with environmental factors (BAUTMANS et al., 2022).

Vitality, which refers to the individual's energy and resilience in the face of challenges, is crucial for maintaining independence and functionality in old age (BAUTMANS et al., 2022). Regular exercise programs, preferably three to five times a week, are recommended to maintain gut health and fitness (DONATI ZEPPA et al., 2022).

Functional ability refers to attributes that help individuals lead meaningful lives, such as building and maintaining relationships, continuous learning, decision-making ability, and mobility. For older people to maintain their independence, it is vital to identify effective interventions that prevent the decline of these capacities or maintain their integrity before they are compromised. The domains of intrinsic capacity identified by the WHO include sensory abilities (vision and hearing), locomotor capacities (ability to move the body), cognitive ability (mental functions such as memory and language), vitality (energy and

balance, with nutrition being a key factor), and psychological capacity (emotional and affective functions, with an emphasis on depression) (ASHIKALI et al., 2023).

These domains are interrelated, and maintaining one can benefit the others. For example, untreated hearing loss can impact communication and cognitive abilities, leading to social isolation and depression. Therefore, effective interventions are diverse and cover several areas. Physical activity was consistently shown to have an impact on several domains, including locomotor, cognitive, psychological abilities, performance in daily activities (ADL) and instrumental activities (IADL), social relationships, and physiological system health. Multimodal exercise, which combines different types of exercise, is especially effective. In addition, sociocultural interventions, such as intergenerational programs, music, and art, demonstrate benefits in cognitive, psychological, and locomotor capacities, as well as reducing loneliness and developing social relationships. Psychological interventions focus on maintaining mental and emotional health by preventing and managing depression and anxiety, while nutritional interventions are crucial for maintaining vitality and energy. Preventive care, such as screenings and vaccinations, is essential for the health of the physiological system and sensory capabilities (ASHIKALI et al., 2023).

The role of caregivers, both paid and unpaid, is fundamental in supporting the elderly. Training for fall prevention and response, promotion of physical activity and social support are priority interventions. Studies indicate that caregivers often do not seek relief care solutions until they reach a critical point of fatigue, highlighting the need for better dissemination of information about these solutions (ASHIKALI et al., 2023).

The traditional model of medical care is based on treating diseases as they manifest themselves clinically. In contrast, the WHO approach proposes to identify and intervene in cases of reduced intrinsic capacity from the earliest stages. Standardized and objective tools to assess vitality capacity are essential for monitoring the health of older adults and implementing preventive interventions. Grip strength measurements are suggested as strong predictors of disability, falls, and mortality (BAUTMANS et al., 2022).

Social engagement plays a crucial role in healthy aging, promoting not only mental and emotional health, but also physical health. Family and community support is essential for older adults, contributing to emotional well-being and reducing the risks of social isolation, which can lead to depression and cognitive decline (TAMURA et al., 2020). Structured physical exercise programs, combined with social support, help maintain physical and cognitive function, offering an environment of interaction and mutual support (SIKKES et al., 2021). Additionally, engagement in social and cultural activities, such as

intergenerational programs, music, and art, have demonstrated significant benefits in reducing loneliness, improving cognitive abilities, and promoting healthy social relationships (ASHIKALI et al., 2023; TAMURA et al., 2020). Maintaining a robust social support network is therefore an essential component for promoting healthy and active aging.

CONCLUSION

In short, healthy aging is a multifaceted goal that requires a comprehensive approach, considering various aspects of the lives of the elderly. The interventions discussed highlight the importance of proper nutrition, regular physical exercise, social engagement, and therapeutic interventions to promote active and healthy aging. Nutrition plays a critical role in maintaining muscle mass and cognitive health, with an emphasis on adequate intake of protein, vitamins, and essential fatty acids. Supplementation with creatine, vitamin D, and omega-3 has also been shown to be effective in promoting muscle and cognitive health.

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