

FEEDING THE MIND: A SYSTEMATIC REVIEW OF HOW NUTRITIONAL CHOICES AFFECT THE MENTAL WELL-BEING OF THE ELDERLY

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ABSTRACT

Introduction: Mental well-being is a significant concern for the aging population. With the increasing prevalence of the elderly, identifying effective strategies to improve their mental well-being is crucial.

Objectives: This systematic review aims to assess the impact of nutritional choices on the mental well-being of older adults, synthesizing evidence on how diet influences mental health outcomes in this demographic.

Materials and Methods: Following PRISMA guidelines, peer-reviewed studies from 2020 to 2023 were sourced from PubMed. The review focused on randomized controlled trials (RCTs) involving elderly participants (65 years and older) and examined the effects of specific nutritional choices on mental well-being outcomes.

Results: From an initial pool of 394 studies, 5 were included in the qualitative synthesis. Key findings highlight the positive impact of diets rich in omega-3, omega-6, polyphenols, vitamin E, carotenoids, and probiotics on cognitive function, stress reduction, and overall mental well-being.

Conclusion: This review underscores the significant role of nutrition in enhancing mental health among older adults. Effective dietary interventions can play a critical role in mitigating mental health disorders in the elderly, highlighting the need for comprehensive dietary guidelines tailored to this vulnerable population.

Keywords: Nutrition, Mental well-being, Depression, Anxiety, Cognitive function

ABSTRAK

Pendahuluan: Kesejahteraan mental merupakan perhatian besar bagi populasi lanjut usia. Dengan meningkatnya prevalensi lansia, mengidentifikasi strategi efektif untuk meningkatkan kesejahteraan mental mereka menjadi sangat penting.

Tujuan: Tinjauan sistematis ini bertujuan untuk menilai dampak pilihan nutrisi terhadap kesejahteraan mental orang dewasa lanjut usia, dengan mensintesis bukti tentang bagaimana diet mempengaruhi hasil kesehatan mental pada demografis ini.

Material dan Metode: Mengikuti pedoman PRISMA, studi yang telah ditelaah dari tahun 2020 hingga 2023 bersumber dari PubMed. Tinjauan ini fokus pada uji coba acak terkontrol (RCTs) yang melibatkan peserta lansia (berusia 65 tahun dan lebih) dan menguji efek dari pilihan nutrisi tertentu terhadap hasil kesejahteraan mental.

Hasil: Dari total awal 394 studi, 5 diantaranya dimasukkan dalam sintesis kualitatif. Temuan utama menekankan dampak positif dari diet yang kaya akan omega-3, omega-6, polifenol, vitamin E, karotenoid, dan probiotik terhadap fungsi kognitif, pengurangan stres, dan kesejahteraan mental secara keseluruhan.

Kesimpulan: Tinjauan ini menekankan peranan penting nutrisi dalam meningkatkan kesehatan mental di kalangan orang dewasa lanjut usia. Intervensi diet yang efektif dapat memainkan peranan kritis dalam mengurangi gangguan kesehatan mental pada lansia, menyoroti kebutuhan akan pedoman diet yang komprehensif yang disesuaikan untuk populasi yang rentan ini.

Kata Kunci: Nutrisi, Kesejahteraan Mental, Depresi, Kecemasan, Fungsi Kognitif.

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INTRODUCTION

Mental well-being is a significant public health concern regarding older people as the world's population ages. The prevalence of mental health problems and psychosocial disabilities in elderly adults is relatively common and might substantially affect their life quality and mental well-being.¹

It has recently been found that nutrition plays a crucial role in mental well-being, especially within an older adult population. The present systematic review will try to draw together all available evidence on the influence of food choice on mental well-being among older adults, focusing on possible dietary interventions with good potential for enhancing mental health outcomes in this vulnerable group. It is a very complex relationship between nutrition and mental health. Some of the nutrients like omega-3 fatty acids apart from certain antioxidants, have been observed to affect brain functioning and structure of the brain.^{2,3} For instance, fish and flaxseed are rich in essential omega-3 fatty acids, which are incorporated into neuron membranes and protect against depression through their anti-inflammatory action⁴. It is believed that omega-3 vital roles in maintaining cognitive health and stability of mood.^{5,6} Evidence extracted from numerous studies is directed towards the positive impact of

a healthy dietary lifestyle on the mental health of the elderly. In contrast, a diet rich in fruits, vegetables, whole grains, and healthy fats has been related to lower rates of depression and cognitive decline.⁷ Conversely, those diets high in processed foods, sugars, and unhealthy fats will point toward poorer mental health outcomes, including a heightened risk for depression and anxiety.⁸

As the prevalence of mental health disorders and psychosocial disabilities increases in this demographic, there is an urgent need to identify effective strategies to enhance their mental well-being. Emerging research underscores the significant role of nutrition in influencing mental health outcomes, particularly in the elderly. Given the complex relationship between diet and mental health, it is imperative to conduct a comprehensive systematic review to synthesize existing evidence and identify effective dietary interventions. The urgency of this review is underscored by the growing mental health crisis among older adults and the need for timely, evidence-based solutions to support this vulnerable population.

OBJECTIVE

To assess the effects of nutritional choices on mental well-being in older adults. This systematic review will summarize the evidence regarding the

influence of different nutritional choices on mental well-being among older adults. This will help derive a wholesome view of the role of diet in promoting mental well-being for older people from the look at randomized controlled trials. These relationships underpin how dietary guidelines and interventions can be developed to reduce the burden of mental health and psychosocial disabilities within our aging populations.

METHODS

This systematic review follows the PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). We looked at peer-reviewed papers only in PubMed from 2020 to 2023, all in English. Our focus was on randomized controlled trials (RCTs) involving elderly participants (65 years and older), research on specific nutritional choices or dietary patterns, comparisons of different diets or nutritional interventions, and studies reporting on mental well-being outcomes like depression, anxiety, stress, quality of live, and cognitive function.

The novelty in our systematic review will consist of a comprehensive analysis of the relationship between nutrition and mental well-being specifically in the elderly population, a topic that has seen fragmented research but lacks an integrated synthesis. While

numerous studies have individually examined the impact of specific nutrients there remains a significant gap in understanding how these findings converge to inform dietary guidelines for older adults.

The articles we reviewed must be conducted by qualified professionals with relevant training in nutrition, psychiatry, or geriatrics. The studies should be delivered through various modes such as face-to-face consultations, group sessions, or individual counseling. We are also open to studies that are conducted in diverse settings, including clinical environments, community centers, and research facilities.

We use a search strategy with MeSH (Medical Subject Headings) terms and with the keywords nutrition AND mental wellbeing AND Elderly, diet AND mental wellbeing AND Elderly, nutrition AND mental health AND Elderly, diet AND mental health AND Elderly, nutrition AND Anxiety AND Elderly, diet AND Anxiety AND Elderly, nutrition AND depression AND Elderly, diet AND depression AND Elderly, nutrition AND cognitive function AND Elderly, diet AND cognitive function AND Elderly.

We collect studies from Pubmed using a specific search strategy and then screen them based on the title and abstract. We remove any duplicate studies and

those that do not fit our criteria. Next, we download all the studies that pass the first screening and conduct a second screening from the Pubmed library. We thoroughly read each full text to ensure they meet our criteria, and exclude any articles that do not meet our eligibility requirement reviewers independently assessed the quality of the studies by thoroughly reading the articles for eligibility and quality. We looked for clear descriptions of the study design, participant characteristics, control conditions, outcome measures, and key results, focusing on statistically significant differences. We selected these quality criteria using GRADE approach.

Inclusion Criteria:

- Focused on research involving elderly individuals aged 65 years and above.
- Specifically targeted studies on the impact of nutrition, and diet on mental health outcomes such as depression and anxiety, quality of life, cognitive function, or overall mental well-being.
- Included only randomized controlled trials (RCTs) published in English and available as free full text on PubMed.

- Considered articles published between 2020 and 2023 to ensure the most recent and relevant research was included.

Exclusion Criteria:

- Excluded studies that did not focus on elderly individuals aged 65 years and above.
- Excluded studies involving mixed age groups where data for elderly individuals could not be isolated.
- Research that did not focus on nutrition, diet, dietary intake, or that examined other lifestyle factors like physical activity without a clear focus on nutrition, was excluded.
- Studies that did not report on mental health outcomes such as depression, anxiety, cognitive function, or overall mental well-being were excluded.
- Studies focused solely on physical health outcomes without addressing mental well-being were also excluded.

RESULTS

The table below displays the number of search results obtained from a literature search on the correlation between nutrition and mental wellness in the elder.

Keyword	All Results
nutrition AND mental wellbeing AND Elderly	8
diet AND mental wellbeing AND Elderly	5
nutrition AND mental health AND Elderly	73
diet AND mental health AND Elderly	35
nutrition AND Anxiety AND Elderly	16
diet AND Anxiety AND Elderly	16
nutrition AND depression AND Elderly	48
diet AND depression AND Elderly	30
nutrition AND cognitive function AND Elderly	110
diet AND cognitive function AND Elderly	53
TOTAL	394

Table 1. Keyword Search Result

The identification and screening process of the studies began with 394 records identified through a PubMed database search. After removing studies with irrelevant content from the abstract and duplicates, 292 records were excluded, leaving 102 records to be screened. Following the screening process, 91 records were further excluded. This resulted in 11 full-text articles that were assessed for eligibility. Of these, 6 articles were excluded because they did not focus on the relationship between nutrition and mental well-being. Consequently, 5 studies were included in the qualitative synthesis.

The systematic review underwent a thorough screening process to identify studies that assessed how nutritional choices affect the mental well-being of older adults. The rigorous methodology guaranteed that only the most relevant and high-quality studies were included in the final review. This meticulous approach improves the reliability and validity of the findings, laying a solid foundation for designing dietary interventions to enhance mental health outcomes in the elderly population.

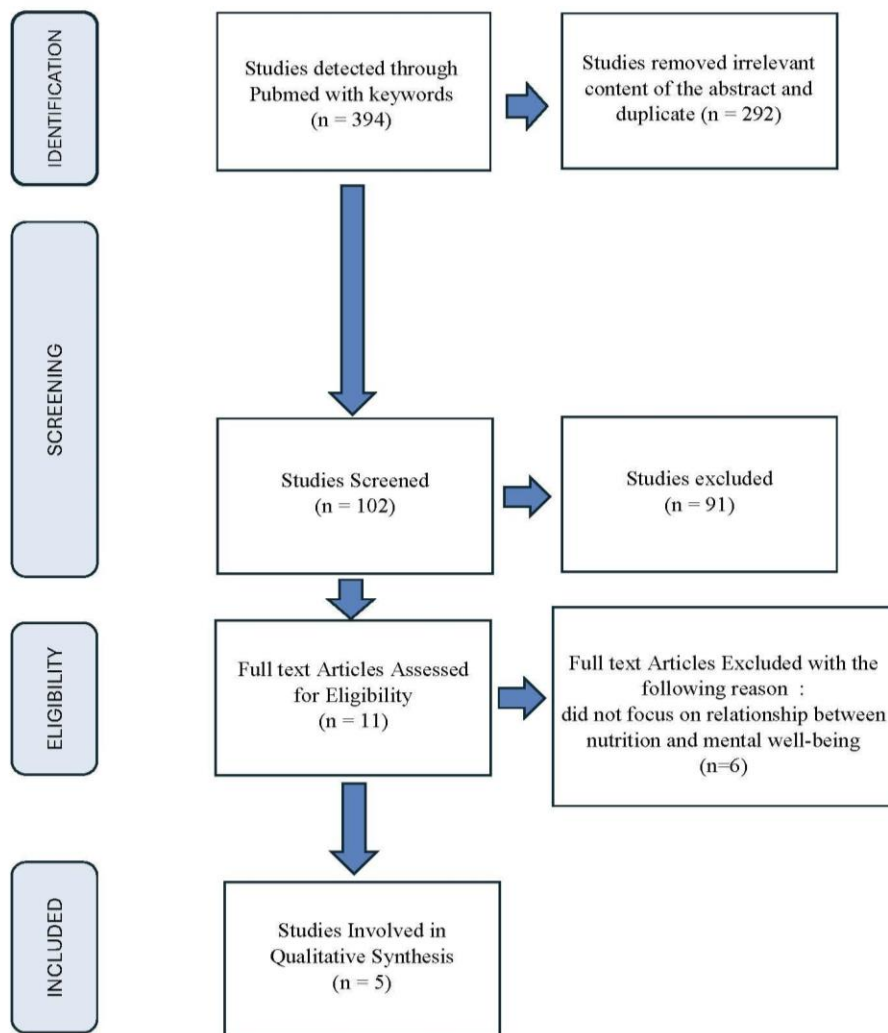


Figure 1. Overview of the selection procedure

Table 2 Overview of five selected studies exploring nutritional choices related on mental well-being in older adults

Author	Study Design	Participants	Intervention	Control Conditions	Outcome Measures	Key Results
Chong-Su Kim, et al.	Randomized, Double-Blind, Placebo-Controlled, Multicenter Trial	- Age: ≥65 years - Probiotics Group: 32 - Placebo Group: 31 - Healthy older adults living independently	- Consumed probiotics containing Bifidobacterium bifidum BGN4 and Bifidobacterium longum BORI twice a day for 12 weeks	- Received placebo capsules containing 500 mg of soybean oil	- Cognitive Function (CERAD-K) - Mood status : Stress (Self-Reported Questionnaire), Quality of Life (SWLS), Depression (GDS-K), PANAS (Positive Affect and Negative Affect Schedule) - Gut Microbial Composition - Serum BDNF level	- CERAD-K (Improved only in mental flexibility item, P<0.05) - No significant improvement in Quality of life, Depression and PANAS. - Stress Score: Decreased in the probiotics group at Week 12 (P<0.05) - Gut Microbiota: Significant changes in the probiotics group (P<0.05) - Serum BDNF Level: Increased in the

						probiotics group at Week 12 (P<0.05)
						- ACE-R: Improved in the omega group compared to placebo (P<0.001)
						- MMSE: Improved in the omega group compared to placebo (P=0.011)
						- STROOP: Improved in the omega group compared to placebo (P<0.037)
						- No significant in TMT
						- Symbol cancellation test in have less error in omega group (p=0.001)
						- STS 60 and 30 showed significant improvement
Pinelopi S. Stavrinou, et al.	Randomized, Double-Blind, Placebo-Controlled Trial	- Age: 78.8 ± 7.3 years - Omega Group: 18 - Placebo Group: 18 - Conditions: Older adults with mild cognitive impairment (MCI)	- 20 mL formula containing omega-3 (810 mg EPA and 4140 mg DHA) and omega-6 fatty acids (1800 mg GLA and 3150 mg LA) with vitamins A and E for 6 months	- Received 20 mL placebo containing olive oil	- Cognitive Function (ACE-R, MMSE, STROOP, TMT, Symbol cancellation test) - Functional Capacity (STS tests, TUG, 6MWT, HGS) - Body Composition - Quality of Life (SF-36) - Sleep Quality (PSQI) - Daily Sleepiness (ESS) - Fatigue (FSS)	

in omega group
(P=0.005, P=0.002)
-. No significant in TUG
and STS-5 compared to
placebo
- 6MWT: Improved in
the omega group
(P=0.028)
- Body composition
improved to lower total
body fat in omega group
(P=0.03)
-SF-36 improved in
omega group (P=0.005)
-Sleep quality improved
in omega group
(p=0.033)
- Improved in daily
sleepiness in omega
group (P=0.007)

						- Fatigue: Decreased in the omega group (P<0.001)
						- MOCA: Improved in the intervention group (P<0.001)
						- MMSE overall score not showing significant differences between the two groups but only improved in specific item which is item of orientation in the intervention group (P=0.038)
María José Rodrigo-Gonzalo, et al.	Randomized Controlled Clinical Trial (Parallel Groups)	- Age: >70 years - Intervention Group: 40 - Control Group: 40 - Conditions: Healthy older adults	- Consumed 50 g of Málaga muscatel raisins per day added to their usual diet for 6 months	- No supplement received	- Cognitive Function (MOCA, MMSE, RAVLT) - Quality of Life (WHOQOL-AGE, EQ-5D, EQ-VAS) - Functional Activities (Pfeffer FAQ)	- RAVLT: Improved in immediate and delayed recall in the intervention group (P=0.01, P=0.008) - WHOQOL-AGE: Improved in the

intervention group
(P=0.015)
- No significant
differences between
Group in the
measurements of EQ-5D
and EQ-VAS (P=0.839,
P=0.851)
- Pfeffer FAQ: Improved
in the intervention group
(P=0.001)

					- Vascular Endothelial Function (FMD)	- FMD: Improved in the
					- Cognitive Function : (Auditory Verbal Learning Task(AVLT), Corsi Blocks, Serial Subtraction and Task-switching Task(TST))	WBB group (P<0.001)
		- Age: 65-80 years				- Immediate Recall (AVLT): Improved in the
		- Wild	- Consumed 26 g	- Received placebo		WBB group (P=0.043)
	Double-Blind, Randomized Controlled Trial	Blueberry (WBB) Group: 31	freeze-dried WBB powder (equivalent to 178 g fresh WBB, containing 302 mg anthocyanins) daily for 12 weeks	powder matched for appearance, macronutrients, fibre, and vitamin C, but containing no anthocyanins		- TST Accuracy: Improved in the WBB group (P=0.026)
Eleanor Wood, et al.	(Parallel Groups)	- Placebo Group: 30			- Arterial stiffness (PWV,Alx)	- Plasma and Urinary (Poly)phenols: Increased in the WBB group (P=0.001)
		- Conditions: Healthy older adults			- Blood Pressure (BP)	
					- Cerebral Blood Flow (CBF)	- No significant differences in other secondary outcomes were found (Arterial stiffness, CBF, Blood lipid plasma, gut microbiota composition)
					- Gut Microbiota Composition	
					- Mood (PANAS)	
					- Blood lipid plasma	
					- Plasma and Urinary (Poly)phenol Metabolites	

<p>Rebecca Power, et al.</p>	<p>Parallel group, double-blind, placebo-controlled, block-randomized clinical trial</p>	<p>- Age: ≥ 65 years - Active Group: 30 (mean age 69.03 ± 4.41 years, 56.7% female) - Placebo Group: 30 (mean age 69.77 ± 3.74 years, 70% female) - Conditions: Cognitively healthy older adults</p>	<p>- 1 g fish oil (430 mg DHA, 90 mg EPA), 22 mg carotenoids (10 mg lutein, 10 mg meso-zeaxanthin, 2 mg zeaxanthin), 15 mg vitamin E daily for 24 months - Placebo (sunflower oil)</p>	<p>- RBANS Total Scale Score - Cognitive Function using Working Memory (SWM), Attention, Episodic Memory - Serum Carotenoid Concentrations , Serum Xanthophyll, Plasma Omega-3 Fatty Acid Concentrations and Serum Vitamin E - Relationships between change in nutrition status and change in cognitive function</p>	<p>- RBANS Total Scale Score shows no significant Time-group Effect ($\eta^2 = 0.054$ (90% CI [0, 0.131]) - Significant improvements in Working Memory in intervention group compared to the control group ($\eta^2 = 0.105$ (90% CI [0.012, 0.207]) - Significant increase in tissue serum carotenoid concentrations, serum Xanthophyll and plasma Omega-3 Fatty Acid (medium to large effect size) - No significant change in Serum Vitamin E ($\eta^2 =$</p>
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0.024 (90% CI [0,
0.085])

- There is medium to
large relationship
between changes in
nutritional status and
cognitive improvements

DISCUSSION

The studies included in this systematic review collectively emphasize the significant role of nutrition in influencing mental health outcomes in older adults. Each study provides unique insights into how specific dietary components can affect mental well-being.

Probiotic Supplementation: Probiotic supplementation improves mental flexibility and reduces stress levels in older adults. The increase in serum brain-derived neurotrophic factor (BDNF) levels in the probiotics group suggests a link between gut health and brain function, highlighting the potential of probiotics in supporting mental well-being. Probiotics may influence brain health by modulating gut microbiota, which in turn affects the production of neurotrophic factors like BDNF. The specific items in cognitive function indicate that probiotics work on specific areas in the brain. Other studies have also looked at the relationship between probiotics and cognition. For example, *Lactobacillus belveticus*, a probiotic found in fermented milk, has been shown to be correlated with cognitive function.⁹ In one study, it was found that there is a shift in the composition of bacteria in the gut that leads to inflammation. After probiotics were given, bacteria such as Eubacterium, Allisonella, and Prevotellaceae were significantly

reduced. These bacteria are pro-inflammatory microbiota, and some studies have suggested that they may be related to autoimmune and inflammatory diseases in the gut. This bacteria is also related to condition dysbiosis which is there is a disruption of microflora inside the gut that reduce the expression of BDNF.^{10,11} The innovative approach to linking gut and brain health is a strength of the study. However, the small sample size and reliance on self-reported psychological assessments pose significant limitations. Larger studies with objective measurements of mental health outcomes are needed to confirm these findings and elucidate the underlying mechanisms.⁹

Omega-3 & Omega-6 PUFA and Antioxidant Vitamins : The supplementation of omega-3 and 6 fatty acids and antioxidant vitamins over a 6-month period demonstrated significant improvements in cognitive function and functional capacity in older adults. Older adults with mild cognitive impairment seem to benefit more from this PUFA supplementation. Additionally, older individuals experiencing cognitive decline are likely to also manifest physical frailty. These effects are attributed to the incorporation of EPA/DHA and LA/GLA into the cell membrane, leading to reduced inflammation.¹² Furthermore, the antioxidant effects of certain vitamins are

thought to reduce inflammation by limiting free radicals such as reactive oxygen species (ROS) and reactive nitrogen species (RNS). This study shows promising results regarding how specific nutrients can impact mental well-being in older adults. However, it is important to note that the study has limitations, including uncontrolled dietary intake and varying levels of physical activity among the participants.¹³

Polyphenol-Rich Diet: A diet rich in polyphenols, particularly through the consumption of raisins, showed modest improvements in cognitive performance and quality of life. This supports the hypothesis that polyphenols have neuroprotective effects and can positively influence mental health in older adults. Polyphenols, such as flavonoids and phenolic acids, have been shown to improve cognitive function by enhancing vascular health and reducing oxidative stress. These compounds help maintain the integrity of blood vessels, ensuring adequate blood flow to the brain, which is critical for cognitive function and mental well-being. The large sample size and real-world applicability of using commercially available food items are notable strengths. However, the inability to blind participants and the low concentration of polyphenols in the diet limit the conclusions. Future research should aim for higher polyphenol

doses and more precise dietary assessments to better understand their impact on mental health.¹⁴

Wild Blueberry (Polyphenols diet): This study shows that consuming wild blueberries has a positive impact on FMD (Flow-Mediated Dilation) and is also related to improvement in cognitive functions. It is hypothesized that the mechanism is through the reduction of NO (Nitric Oxide) bioavailability.^{15,16} Additionally, diets rich in polyphenols from other studies have also shown that the mechanism of this nutrient is to reduce oxidative stress.¹⁴ The same author has also conducted another study that shows improvement of FMD after consuming wild blueberries is related to the decreasing of Nicotinamide Adenine Dinucleotide Phosphate Hydrogen (NADPH) oxidase activity and changes in gene expression involved in immune response, migration, cell adhesion, and differentiation.¹⁷ This study shows promising effects of how a polyphenol-rich diet can increase FMD and cognitive function, which will affect the mental well-being of older people. Larger studies are needed to confirm these findings and to explore the exact mechanism of action.¹⁸

Omega-3 fatty acid, carotenoid, and Vitamin E: Supplementation of omega-3 fatty acids, carotenoids, and vitamin E is positively correlated with improvements in spatial working memory, as well as tissue

and serum concentrations of these nutrients. This mechanism operates through the neuroprotective effects of omega-3 and carotenoid substances.^{19,20} Another study from this systematic review also highlights the relationship between omega-3 and cognitive function.¹³ Both are positively correlated with improved cognitive function, especially in older adults. This study strengthens the evidence that omega-3 may play an important role in enhancing mental well-being in older adults. Conducting wider population and multi-center studies can confirm whether these findings can be generalized to other populations.²⁰

The majority of studies included in this review are randomized, double-blind, placebo-controlled trials, reducing the risk of bias in several key domains. However, the study by María José Rodrigo-Gonzalo et al. has potential performance and detection biases due to the lack of reported blinding. Other studies maintain low risk across assessed domains, ensuring high internal validity and reliability of findings. Using the GRADE approach, the overall quality of evidence was rated as moderate to high. The high-quality evidence was primarily due to the robust study designs and consistent findings across multiple studies. Despite these limitations, the evidence strongly supports the beneficial effects of dietary interventions on cognitive

function and mental well-being in older adults. Further large-scale, long-term studies are recommended to confirm these findings and address any remaining uncertainties.

CONCLUSION

This systematic review confirms that specific dietary components that most likely have a strong correlation with mental well-being are omega-3 and polyphenols. Other supplementations such as probiotics, carotenoids, and vitamin E also showed a significant improvement in cognitive function and mental well-being in older adults. The systematic review highlights several novel insights into the impact of nutrition on mental well-being in older adults. Notably, probiotic supplementation significantly improved mental flexibility and reduced stress levels, suggesting a strong gut-brain connection. Omega-3, Omega-6 fatty acids, carotenoids, and vitamin E were shown to enhance working memory, attention, and global cognition, reinforcing their importance in cognitive health. A polyphenol-rich diet, particularly through raisin consumption or wild blueberry, modestly improved cognitive performance and quality of life. These findings underscore the critical role of specific dietary components, such as probiotics, omega-3, omega-6 fatty acids, polyphenols, vitamin E, and carotenoids in

promoting mental well-being among the elderly. It emphasizes the importance of a holistic approach to nutrition, considering the synergistic effects of various nutrients in maintaining and enhancing mental well-being in the elderly.

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