

# Cognitive decline: Can diet be a preventive or treatment option?

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## *Cognitive decline – can diet be a preventative or treatment option?*

### *Abstract*

Cognitive decline has been associated and accepted as a consequence of ageing. Diets such as the Mediterranean diet have been investigated with respect to abating cognitive decline however, the diet is not the only aspect of the Mediterranean that may play a role as social interaction and cultural engagement may also be influential in preserving cognitive function through the ageing process. This article discusses the current perspective on cognitive decline and the influence the Mediterranean diet may have.

Keywords: cognitive decline, ageing, Mediterranean diet, risk factors, lifestyle

### *Introduction*

Cognitive decline is a feature of the ageing process that is manifested by impairment in mental faculties such as memory, reasoning, executive functions, and information processing speed (Deary et al 2009; Kirova et al 2015). The causes of cognitive decline are different from person to person and can arise through a variety of mechanisms such as genetics, health status, biological processes, neurochemical changes, lifestyle, and diet (Deary et al 2009). These proposed causes can co-exist exerting adverse effects on the person as part of interconnecting networks therefore, it is difficult to ascertain specific aetiology of cognitive decline and even more difficult to provide targeted therapeutics to prevent, treat, and abate cognitive impairment. The problem is further compounded by the nature of cognitive decline in that it is on a continuum for individual people and dependent on biologically external factors such as education, social interaction, and mental well-being (Wu et al 2017). Cognitive decline and dementia are characterised by changes in the ability to maintain independent living through activities and social functioning (Livingston et al 2017). Elements that may influence dementia are: education, smoking, chronic diseases such as hypertension, cardiovascular disease, and diabetes, and the occurrence of post-stroke dementia but there is unlikely to be one single factor (Kalaria et al 2016; Wu et al 2017). An integrative approach is necessary to attempt to mediate the risk of cognitive decline and developing dementia by focusing on modifiable risk factors, namely lifestyle and diet, and this article will discuss how modifying the diet may be advantageous in maintaining cognitive, as well as corporeal, health.

### *Nutrition – a modifiable lifestyle factor*

Nutrients of interest pertaining to cognitive health include omega-3 polyunsaturated fatty acids, polyphenols, vitamin D and the B vitamins (Calder et al 2018). A recent review by the Scientific Advisory Committee on Nutrition (The Scientific Advisory Committee on Nutrition (SACN), 2018) suggested the evidence is insufficient and inconclusive to support the notion that individual nutrients (vitamins C, E, and the B vitamins, omega-3, polyphenols, flavonoids, and caffeine) could prevent cognitive decline. It remains to be demonstrated whether these individual nutrients are beneficial in preventing cognitive decline.

It is difficult and would be detrimental to assume a single nutrient would be the elixir to cure all ailments including cognitive decline. However, it would be sensible to appreciate the synergistic relationship of nutrients to influence physiological and cognitive function. For example, fish oils have been presumed to be beneficial for brain health because of their omega-3 composition but the evidence for fish oil and omega-3 supplementation does not indicate it would be useful for preservation of cognitive health (Dangour et al 2012). However, consuming oily fish such as herring, mackerel, salmon, trout, and fresh tuna would contain omega-3 as well as vitamin D which may also play a role in maintaining brain health and mediate cognitive decline. Low vitamin D concentrations have been associated with accelerated decline in cognitive function across ethnicities (Miller et al 2015). However, whether taking vitamin D supplements to improve vitamin D status over consuming dietary sources or exposure to sunlight for vitamin D would be of benefit to cognitive health remains to be demonstrated.

Rather than individual nutrients, foods that contain these nutrients for cognitive health could be advantageous for general health as well and include fish, fruits, and vegetables (Calder et al 2018). Indeed, potentially shifting the focus onto whole foods rather than individual nutrients would provide more meaningful recommendations for healthcare management of people with or at risk of cognitive

decline. Dietary regimens have been suggested as interventions to treat disease such as the Dietary Approaches to Stop Hypertension (DASH) diet for hypertension, Portfolio diet for dyslipidaemia, and the Mediterranean diet for metabolic syndrome and cardiovascular health, and the Okinawa diet for healthy ageing (Willcox et al 2014).

### *The Mediterranean diet*

The Mediterranean diet has been offered as a defence against ill-health and proposed as a means to healthy ageing and cognitive health (Yannakoulia et al 2015). The Mediterranean diet is characterised by high intakes of extra virgin olive oil, vegetables including leafy green vegetables, fruits, wholegrain cereals, nuts, pulses, legumes, fish, dairy products, red wine, and low intakes of eggs and confectionary (Davis et al 2015).

There are numerous scores available to measure adherence to the Mediterranean diet but there is limited consensus on scoring criteria amongst studies despite it being a useful tool for identifying the dietary patterns (Zaragoza-Martí et al 2018). The two most widely used scores are Trichopoulou et al (1995) and Panagiotakos et al (2006). Trichopoulou et al (1995) derived the first Mediterranean diet adherence score from the dietary patterns among old people in three Greek villages which positively reflected life expectancy. However, Panagiotakos et al (2006) derived their Mediterranean adherence score and compared it with biochemical data demonstrating the score was inversely associated with systolic blood pressure, C-reactive protein, total serum cholesterol, and oxidised low density lipoproteins.

Higher adherence to the Mediterranean diet has been associated with a reduced risk of cognitive decline and also of a reduced risk to developing Alzheimer's disease (Scarmeas et al 2009; Tangney et al 2011; Lourida et al 2013; Martínez-Lapiscina et al 2013; Valls-Pedret et al 2015; Petersson and Philippou 2016). However, although the components of the Mediterranean diet are similar, the amounts and frequencies of consumption are inconsistent amongst studies and mean adherence scores range from 22.7% to 87.7% (Davis et al 2015). Furthermore, the majority of studies utilise variations of food-frequency questionnaires of varying items of foods that estimate dietary intake over a year therefore, may introduce bias and hinder reliability. These studies also lack biochemical data to verify the associated benefits, and study of brain activity to support the proposed associations with health and cognition. To compound matters, the majority of studies investigating the effect of the Mediterranean diet on cognitive function are observational therefore extrapolation of causality is not possible, and these studies do not use the same methodology to ascertain cognition it is difficult to meaningfully compare the results (SACN, 2018).

The effects of the Mediterranean diet have also been investigated in combination with other dietary regimes on cognitive health. The combination of DASH with the Mediterranean diet scores and their effect on cognitive health was investigated and higher intakes of whole grains, nuts, and legumes were associated with higher cognitive function in older people over an 11yr period. The DASH combination diet includes fruit, vegetables, low-fat dairy products, whole grains, poultry, fish, and nuts (Wengreen et al 2013). A further combination of DASH and the Mediterranean diets include the Mediterranean-Dietary Approach to Systolic Hypertension (DASH) diet intervention for neurodegenerative delay (MIND) diet score that specifically utilised postulated neuroprotective dietary groups: green leafy vegetables, other vegetables, nuts, berries, beans, wholegrains, seafood, poultry, olive oil, and wine, and five unhealthy food groups: red meats, butter and stick margarine, cheese, pastries and sweets, and fried/fast food (Morris et al 2015). In a community-based study of older people, the MIND approach was assessed alongside cognition and demonstrated higher MIND scores were associated with slower cognitive decline (Morris et al 2015).

### *Mediterranean lifestyle or just dietary patterns?*

The Mediterranean diet is one component of a complex interconnection of lifestyle factors that define the Mediterranean populations such as eating freshly prepared meals that are shared with others as part of a society and culture (Yannakoulia et al 2015; Knight et al 2016a). Beyond the geographic Mediterranean area, there is little evidence to suggest the Mediterranean diet has a positive effect on maintaining cognitive health and preserving cognitive function (Aridi et al 2017).

In a study of free-living healthy Australians aged 65yr old and over, the Mediterranean diet was investigated with regards to its effect on cognitive function in comparison to a control diet group over an 18-month period. This study concluded that the Mediterranean diet had no statistically different effect on cognitive ability. The authors acknowledged that the relatively short study period may have had an impact on the results (Knight et al 2016b). In a cross-sectional study by Litwin (2010) on social networks of older people in Mediterranean (Spain, France, Italy, Greece, and Israel) and non-Mediterranean (Sweden, Denmark, the Netherlands, Germany, Belgium, Switzerland, and Austria) countries, it was suggested that differences were apparent in social, familial, and care structures between the Mediterranean and non-Mediterranean countries. Mediterranean societies place more emphasis on familial culture with adult children supporting older people more than in non-Mediterranean countries, and Mediterranean societies have a higher regard and reliance on socialisation and social contact (Litwin, 2010). Mediterranean respondents were less highly educated than their non-Mediterranean counterparts and had lower household incomes. The study highlighted that older women in the Mediterranean countries reported greater loneliness than their non-Mediterranean counterparts, but this perception did not correspond with poorer mental health. It was also noted that among Mediterranean women, greater frequency of contact correlated with more depressive symptoms possibly on account of greater expectations and need for social contact with familial members (Litwin, 2010). To investigate the possible effects of the wider Mediterranean lifestyle, not just the diet, on cognitive health Sánchez-Villegas et al (2016) studied a Spanish cohort of university graduates prospectively. The Mediterranean lifestyle was defined as the joint exposure to Mediterranean diet, level of physical activity, and level of socializing with a median follow-up of 8.5 years. It was suggested that those with the highest adherence to the Mediterranean lifestyle (combination of high adherence to Mediterranean diet, high adherence to physical activity, and high adherence to social activity) showed a 50% relative risk reduction in depression risk as compared to those participants with the lowest adherence (Sánchez-Villegas et al 2016).

Besides diet, it is suggested that certain techniques can improve cognition and abate the decline of cognitive function in ageing. These include maintaining an active lifestyle, engaging in activities such as puzzles, discussion groups, reading, playing board and card games, musical instruments; physical activity: exercise, dancing, gardening; social engagement: travel, cultural events, socialising; and high education attainment (Harada et al 2013). In the English Longitudinal Study of Ageing over a 10-year study period, cognitive function was measured in those over the age of 52 who engaged in three types of cultural engagement (visiting museums/galleries/exhibitions, going to the theatre/concert/opera and going to the cinema). Memory and semantic fluency at baseline and follow-up were measured and it was suggested that visiting museums/galleries/exhibitions and going to the theatre/concert/opera were associated with a lesser decline in cognitive function but not going to the cinema (Fancourt & Steptoe, 2018). However, this study relied on participant self-reporting of their engagement in cultural activities and focused on only engagement over the past year rather than longer habit.

A multidomain intervention could be the most effective method to prevent cognitive decline. The 2-year Finnish Geriatric Intervention Study to Prevent Cognitive Impairment and Disability (FINGER) trial used multidomain lifestyle interventions to assess cognition in 1260 Finns aged 60-77yr old (Rosenberg et al 2018). The trial used diet, exercise, cognition, and vascular risk management interventions and demonstrated a small but positive change in cognitive function. Despite the small effect size, this intervention demonstrates that lifestyle modification in multiple domains may offer cognitive benefit in the ageing process. Furthermore, as this intervention used the national nutritional guideline for Finland it indicates that the Mediterranean diet need not be the focal point for dietary interventions. The nutritional intervention included both individual and group sessions based around diet and lifestyle changes and recommended foods were fruit, vegetables, wholegrain cereal products, low-fat milk, meat products, limiting sucrose intake to less than 50 g/day, use of vegetable margarine and rapeseed oil instead of butter, and 2 portions of fish per week (Ngandu et al 2015). These dietary interventions are concordant with the current UK dietary guidelines (Public Health England, 2016).

#### *Application to older people in the UK*

As the Mediterranean diet is a cumulative consequence of historical, agricultural, cultural, and social factors over hundreds over years, applying it to external populations may be unrealistic. In a UK-based study investigating barriers to adhering to a Mediterranean diet in people aged over 50yrs old, cultural differences, limited knowledge of its composition, reluctance to implement dietary changes, concerns about finances and availability of foods were identified (Moore et al 2018). Encouraging older people

to engage with the Mediterranean diet may be problematic as there needs to be consideration of palatability, finances, food acquisition and preparation, dexterity, knowledge, and the other physiological consequences of ageing such as reduced vision and co-morbidities which may preclude them from undertaking such a change in diet such as chronic kidney disease (Woodside et al 2014; Knight et al 2016a). Psycho-social factors also need to be considered as depression, loneliness, and social isolation are detrimental factors afflicting older people (Woodside et al 2014).

In a study investigating adherence to the Mediterranean diet and cognitive function in 111 people with Alzheimer's disease who were aged 65yrs and over, and still living at home, 68% presented with a risk of malnutrition and 19% were malnourished (Rocaspana-García et al 2018). Furthermore, 73% showed low adherence to the Mediterranean diet and 27% showed moderate adherence but, nobody met the criteria for good adherence. Hypertension, depression, and diabetes were higher in the malnourished group compared with non-malnourished and those at risk of malnutrition groups but not statistically different however, caregiver burden was statistically higher in the malnourished group. The participants consumed less than recommended vegetables, fruit, nuts, cereals, pulses, and fish but over-consumed dairy and meat. This study provides insight into dietary patterns of those living with dementia, but this study is limited by the absence of qualitative assessment of eating behaviour to provide further insight into those older people living with cognitive impairment and their interactions with foods and requirement for social contact.

The results from Rocaspana-García et al (2018) are supported in an observational analysis of 1864 older people in Greece by Anastasiou et al (2017) whereby people with dementia were found to have a lower Mediterranean diet adherence score and consumed less vegetables, fruit, and fish than those people without dementia. It was suggested by Anastasiou et al (2017) that a daily serving of fish corresponded to approximately 69% reduction in the risk of dementia, or a weekly serving of fish conferred an approximately 10% reduction.

### *Conclusion*

Despite the inevitable fact that the ageing process will indiscriminately affect all people, lifestyle factors adversely associated with the ageing process can be modified especially the diet and the way in which people choose to engage with each other. This article has highlighted that there is no specific dietary regimen currently known that will solely prevent cognitive decline, and the current UK healthy eating guidelines are concordant with those foods included in the Mediterranean diet. Instead, the focus should be on the way in which people engage with food, society, and culture to maintain a healthy body and mind embodied in the Latin phrase *mens sana in corpore sano*.

### *Considerations for nursing practice for older people*

- Focus on modifiable risk factors to maintain cognitive health
  - Hypertension
  - Dyslipidaemia
  - Smoking cessation
  - Food choices
  - Social and physical activities
- Help patients to maintain health by recommending healthy eating principles according to individual choice and needs:
  - Vegetables
  - Fish
  - Nuts
  - Pulses
  - Wholegrain cereals
  - Fruit
  - Moderate alcohol
- Recommend people maintain an active social and physical life
  - Maintain or engage in new hobbies
  - Join a social group

- Ensure carers are well supported in their roles caring for family and friends with cognitive decline/ dementia
  - Sign-post to support services as necessary

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