Cognitive decline: can diet be a preventive or treatment option?

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Abstract

Cognitive decline has been associated with and accepted as a consequence of ageing. Diets such as the Mediterranean diet have been investigated for their effect on abating cognitive decline. However, diet is not the only aspect of the Mediterranean life that may play a role – social interaction and cultural engagement may also be influential in preserving cognitive function through the ageing process.

This article discusses the perspective on cognitive decline and the influence the Mediterranean diet may have. It highlights that no sole dietary regimen will prevent cognitive decline and the UK healthy eating guidelines reflect those foods included in the Mediterranean diet. The focus should instead be on the way in which people engage with food, society and culture to maintain a healthy body and mind.

Keywords
cognitive impairment, dementia, diet, health promotion, healthy eating, lifestyles, mental health, nutrition, older people
It remains to be demonstrated if these individual nutrients are beneficial in preventing cognitive decline.

It is difficult and would be detrimental to assume a single nutrient could 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, oily fish such as herring, mackerel, salmon, trout and fresh tuna contains omega-3 as well as vitamin D which may also maintain 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 rather than eating dietary sources or exposure to sunlight for vitamin D would benefit cognitive health remains to be demonstrated.

Rather than individual nutrients, foods that contain these nutrients for cognitive health could benefit general health as well and include fish, fruits and vegetables (Calder et al 2015). Indeed, potentially shifting the focus onto wholefoods rather than individual nutrients would provide more meaningful recommendations for the 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 (Harsha et al 1999), portfolio diet for dyslipidaemia (Jenkins et al 2002), the Mediterranean diet for metabolic syndrome and cardiovascular health (Davis et al 2015), and the Okinawa diet for healthy ageing (Willcox et al 2014) (Table 1).

### The Mediterranean diet

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

Numerous scores are available to measure adherence to the Mediterranean diet, but there is limited consensus on scoring criteria among 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 of older 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 of developing Alzheimer’s disease (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 among studies and mean adherence scores range from 23% to 88% (Davis et al 2015). Furthermore, most studies use variations of food-frequency questionnaires with different numbers of food

### Table 1. Summary of dietary approaches

<table>
<thead>
<tr>
<th>Dietary approach to stop hypertension</th>
<th>Features</th>
<th>Purpose</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rich in fruits, vegetables, wholegrains, low-fat dairy products, fish, poultry, beans, nuts and seeds</td>
<td>Designed for cardiovascular health to prevent high blood pressure. It is also lower in saturated and trans fats</td>
<td>Harsha et al (1999)</td>
<td></td>
</tr>
</tbody>
</table>

| Portfolio | A combination of dietary components to reduce low-density lipoprotein (LDL)-cholesterol: plant stanols/sterols, almonds, soya protein and soluble fibre | Designed for cardiovascular health, a combination of cholesterol-lowering dietary components, and low saturated fat intake, to reduce serum LDL-cholesterol | Jenkins et al (2002) |


| Mediterranean | High consumption of extra virgin olive oil, vegetables, fruits, wholegrain cereals, nuts, pulses, legumes, fish, dairy products, red wine, and low intakes of eggs and confectionery | Typical diet of Mediterranean region | Davis et al (2015) |
Mediterranean diet was investigated for its effect on cognitive function in comparison to a control diet group. 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 affected the results (Knight et al 2016b).

In a cross-sectional study by Litwin (2010) on social networks of older people in the Mediterranean (Spain, France, Italy, Greece and Israel) and non-Mediterranean countries (Sweden, Denmark, the Netherlands, Germany, Belgium, Switzerland and Austria), 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 because of greater expectations and need for social contact with familial members (Litwin 2010).

To investigate the possible effects on cognitive health of the wider Mediterranean lifestyle, not just the diet, 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 socialising with a median follow-up of 8.5 years.

Participants 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 compared with those with the lowest adherence (Sánchez-Villegas et al 2016).

Besides diet, certain techniques can improve cognition and abate the decline of cognitive function in ageing. These include (Harada et al 2013):

» Maintaining an active lifestyle.

The Mediterranean diet is one component of a complex interconnection of lifestyle factors that define the Mediterranean populations such as eating freshly prepared meals 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 (Ardi et al 2017).

In an 18-month study of free-living healthy Australians aged 65 years and over, the Mediterranean diet was investigated for its effect on cognitive function in comparison to a control diet group. 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 affected the results (Knight et al 2016b).

A further combination of DASH and the Mediterranean diet includes the Mediterranean-DASH intervention for neurodegenerative delay (MIND) score that used 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 or fast food (Wengreen et al 2013).

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).

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Mediterranean lifestyle or dietary patterns?

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» Engaging in intellectual activities, such as puzzles, discussion groups, reading, playing board and card games, and musical instruments.
» Engaging in physical activities, such as exercise, dancing and gardening.
» Social engagement: travel, cultural events and socialising.
» High educational attainment.

In the English Longitudinal Study of Ageing over a ten-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 and Steptoe 2018). However, this study relied on participant self-reporting of their engagement in cultural activities and focused on engagement over the past year rather than longer.

A multidomain intervention could be the most effective method to prevent cognitive decline. The two-year Finnish Geriatric Intervention Study to Prevent Cognitive Impairment and Disability trial used multidomain lifestyle interventions to assess cognition in 1,260 Finnish people aged 60-77 years (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 individual and group sessions based around diet and lifestyle changes, and recommended foods were fruit, vegetables, wholegrains, low-fat milk, meat products, limiting sucrose intake to less than 50g a day, use of vegetable margarine and rapeseed oil instead of butter, and two portions of fish per week (Ngandu et al 2015). These dietary interventions concord with UK dietary guidelines (Public Health England 2018).

**Application to older people in the UK**

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

Encouraging older people to engage with the Mediterranean diet may be problematic: there must 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, such as chronic kidney disease, which may preclude them from undertaking such a change in diet (Woodside et al 2014, Knight et al 2016a). Psychosocial aspects also need to be considered as depression, loneliness and social isolation are detrimental factors affecting 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 65 years 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 none met the criteria for good adherence.

Hypertension, depression and diabetes were higher in the malnourished group compared with the 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 the recommended intakes of vegetables, fruit, nuts, cereals, pulses and fish, but over-consumed dairy and meat. This study provides insight into the dietary patterns of people living with dementia but is limited by the absence of qualitative assessment of eating behaviour to provide further insight.

The results from Rocaspana-García et al (2018) are supported in an observational analysis of 1,864 older people in Greece by Anastasiou et al (2017). In this analysis people with dementia were found to have a lower Mediterranean diet adherence score and consumed less vegetables, fruit and fish than those without dementia. Anastasiou et al (2017) suggested that a daily serving of fish corresponded to approximately a 69% reduction in the risk of dementia or a weekly serving of fish conferred an approximately 10% reduction.

**Implications for practice**

- **Focus on modifiable risk factors to maintain cognitive health:**
  - Hypertension
  - Dyslipidaemia
  - Smoking cessation
  - Food choices
  - Social and physical activities

- **Recommend healthy eating principles according to individual choice and needs:**
  - Vegetables
  - Fish
  - Nuts
  - Pulses
  - Wholegrains
  - Fruit
  - Moderate alcohol

- **Recommend people maintain an active social and physical life according to individual choice and needs:**
  - 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 or dementia:**
  - Direct to support services as necessary
The ageing process will indiscriminately affect all people, but lifestyle factors adversely associated with ageing can be modified, especially the diet and the way in which people engage with each other. This article has highlighted that there is no sole specific dietary regimen that will prevent cognitive decline, and the 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.

References


