Introduction
Despite a half century of scientific study, the cure for Alzheimer’s disease remains elusive and therapies are virtually ineffective. The disease is common, rising exponentially with older age, [1] and its central characteristic, loss in memory and other cognitive abilities, is one of the most feared consequences of aging. The human and economic costs loom large as the oldest age groups continue to grow, foretelling a public health crisis. Whereas the therapeutic drug trials conducted in recent years have experienced a 99.6% failure rate, [2] far greater success has been achieved in the identification of protective risk factors and lifestyle interventions. Among these are diet, physical activity, alcohol consumption, positive social encounters and cognitive training. In this review, we highlight the key studies and findings in this important area of dementia prevention.

Diet
Since the earliest reported studies of diet and dementia twenty years ago, a number of diet components have been identified in the development of the disease, including seafood, [3,4] vegetables (especially leafy greens), [5-7] berries, [8,9] nuts, [7-10] extra virgin olive oil, [11] and nutrients such as vitamin E, [12,13] folate, [14,15] n-3 fatty acids, [16] carotenoids [13,17,18] and flavonoids [13,19,20]. Fat composition that is higher in unsaturated fats also appears to be important for brain health [21-23]. More recent studies have focused on dietary patterns, with many finding decreased risk of dementia with various healthy diets including the Mediterranean [24-26] and DASH (Dietary Approach to Stop Hypertension) diets [25,27]. It should be noted that this literature is by no means consistent; about half of the prospective studies of healthy diet patterns reported no association with dementia outcomes [28]. Interpretations of study findings are hampered by methodological flaws in the analyses of the nutritional data. A new diet called MIND (Mediterranean-DASH Intervention for Neurodegenerative Delay) that was created specifically for brain health was significantly associated with lower risk of Alzheimer’s disease [25] and with slower cognitive decline [29], and is currently being tested in a randomized trial.

Alcohol Consumption
A number of prospective epidemiologic studies world-wide have examined the relation of self-reported alcohol consumption to risk of developing dementia and cognitive decline. The findings from these studies indicate a U-shaped association, with abstainers and heavy drinkers at increased risk of impairment compared with those who consume light to moderate amounts [30-34]. Determination of the dose level associated with the lowest risk is complicated by cultural differences both in alcohol consumption patterns and in reporting stigma, but appears to be somewhere in the range of 1 to 6 drinks weekly up to 2 drinks per day in several meta-analyses [45-47]. Three of the studies reported protective relations with wine consumption only [35,36,44]. An international randomized trial investigating the effects of moderate alcohol consumption on cardiovascular outcomes is currently underway with plans for cognitive outcomes as well.

Physical Activity
Moderate to vigorous physical activity at a frequency that is roughly equivalent to one to three times per week has been associated with slower cognitive decline [48-50] and with lower risk of dementia by about 40 to 60% compared with little or no activity [51-56] in multiple prospective studies. There have been a number of randomized intervention trials, but unfortunately, the majority of these trials were small (n≤155) and of short duration (≤1 year) and thus likely underpowered to observe significant differences between the groups [57-62]. The largest trial reported to date investigated the effects of a 2-year moderate physical activity program consisting of walking, strength, and flexibility on physical and cognitive performance in 1,476 older adults [63]. No overall difference was observed in cognition compared with the health education control group, however, among diabetics the moderate physical activity intervention had protective effects on overall cog-
Cognitive and Social Activities

A developed body of literature provides evidence that participation in cognitive and social activities helps to maintain brain functioning into old age. The theory of cognitive reserve, whereby greater neural connections allow the brain to function despite the presence of neuropathologies, has been proposed as the underlying biologic mechanism for the protective relations of these activities [30,33-42,64]. In prospective epidemiological studies, higher participation in cognitive activities such as reading, playing musical instruments and board games, and doing crossword and other puzzles, has been associated with lower risk of dementia [65-72] and slower decline in cognitive abilities [73,74]. Multiple randomized trials of cognitive training interventions support the findings of the observational studies [75-77]. A meta-analysis of 31 randomized trial found that cognitive training improved performance on tests of executive function (working memory and processing speed), memory (face-name recall, immediate recall, paired associates) and subjective cognitive function [78]. To date, it is not clear, however, whether cognitive training improves everyday functioning.

Greater number and frequency of social contacts, providing they are positive interactions, have also been associated with lower risk of dementia [70,79-82] and slower cognitive decline [83-86]. Alternatively, loneliness and social isolation have been associated with increased dementia risk [87,88].

References

1. Evans DA, Bennett DA, Wilson RS, Bienias JL, Morris MC, et al. (2003) Incidence of Alzheimer’s disease in a biracial urban community: relation to apolipoprotein E allele status. Arch Neurol 60: 185-189.

2. Cummings JL, Morstorf T, Zhong K (2014) Alzheimer’s disease drug-development pipeline: few candidates, frequent failures. Alzheimers Res Ther 6: 37.

3. Morris MC, Evans DA, Bienias JL, Tangney CC, Bennett DA, et al. (2003) Consumption of fish and n-3 fatty acids and risk of incident Alzheimer disease Arch Neurol 60: 940-946.

4. Barberger-Gateau P, Raffaitin C, Letenneur L, Berr C, Tzourio C, et al. (2007) Dietary patterns and risk of dementia: the Three-City cohort study. Neurology 69: 1921-1930.

5. Kang JH, Ascherio A, Grodstein F (2005) Fruit and vegetable consumption and cognitive decline in aging women. Ann Neurol 57: 713-720.

6. Morris MC, Evans DA, Tangney CC, Bienias JL, Wilson RS (2006) Associations of vegetable and fruit consumption with age-related cognitive change. Neurology 67: 1370-1376.

7. Nooyens AC, Bueno-de-Mesquita HB, van Boxtel MP, van Gelder BM, Verhagen H, et al. (2011) Fruit and vegetable intake and cognitive decline in middle-aged men and women: the Doetinchem Cohort Study. Br J Nutr 106: 752-761.

8. Devore EE, Kang JH, Breteler MM, Grodstein F (2012) Dietary intakes of berries and flavonoids in relation to cognitive decline. Ann Neurol 72: 135-143.

9. Miller MG, Hamilton DA, Joseph JA, Shukitt-Hale B (2017) Dietary blueberry improves cognition among older adults in a randomized, double-blind, placebo-controlled trial. Eur J Nutr.

10. Joseph JA, Shukitt-Hale B, Willis LM (2009) Grape juice, berries, and walnuts affect brain aging and behavior. J Nutr 139: 1813S-1817S.

11. Martinez-Lapiscina EH, Clavero P, Toledo E (2013) Virgin olive oil supplementation and long-term cognition: the PREDIMED-NAVARRA randomized, trial. J Nutr Health Aging 17: 544-552.

12. Morris MC, Evans DA, Bienias JL, et al. (2002) Dietary intake of antioxidant nutrients and the risk of incident Alzheimer’s disease in a biracial community study. Jama 287: 3230-3237.

13. Engelhart MJ, Geerlings Mi, Ruitenberg A, van Swieten JC, Hofman A, et al. (2002) Dietary intake of antioxidants and risk of Alzheimer disease. JAMA 287: 3223-3229.

14. Durga J, van Boxtel MP, Schouten EG (2007) Effect of 3-year folic acid supplementation on cognitive function in older adults in the FACIT trial: a randomised, double blind, controlled trial. Lancet 369: 208-216.

15. Corrada MM, Kawas CH, Halffrisch J, Muller D, Brookmeyer R (2005) Reduced risk of Alzheimer’s disease with high folate intake: the Baltimore Longitudinal Study of Aging. Alzheimers Dement 1: 11-18.

16. Schaefer EJ, Bongard V, Beiser AS, et al. (2006) Plasma phosphatidylserine:docosahexaenoic acid content and risk of dementia and Alzheimer disease: the Framingham Heart Study. Arch Neurol 63: 1545-1550.

17. Johnson EJ, McDonald K, Caidarella SM, Chung HY, Troen AM, et al. (2008) Cognitive findings of an exploratory trial of docosahexaenoic acid and lutein supplementation in older women. Nutr Neurosci 11: 75-83.

18. Devore EE, Kang JH, Stampfer MJ, Grodstein F (2013) The association of antioxidants and cognition in the Nurses’ Health Study. Am J Epidemiol 177: 33-41.

19. Devore EE, Kang JH, Breteler MM, Grodstein F (2012) Dietary intakes of berries and flavonoids in relation to cognitive decline. Ann Neurol 72: 135-143.

20. Commenges D, Scotet V, Renaud S, Jacqmnn-Gadda H, Barberger-Gateau P, et al. (2000) Intake of flavonoids and risk of dementia. European Journal of Epidemiology 16: 357-363.

21. Morris MC, Tangney CC (2014) Dietary fat composition and dementia risk. Neurobiol Aging 35 Suppl 2: S59-64.

22. Devore EE, Stampfer MJ, Breteler MM, Rosner B, Kang JH, et al. (2009) Dietary fat intake and cognitive decline in women with type 2 diabetes. Diabetes Care 32: 635-640.

23. Okereke OI, Rosner BA, Kim DH, Kang JH, Cook NR, et al. (2012) Dietary fat types and 4-year cognitive change in community-dwelling older women. Ann Neurol 72: 124-134.

24. Scarmeas N1, Stern Y, Tang MX, Mayeux R, Luchsinger JA (2006) Mediterranean diet and risk for Alzheimer’s disease. Ann Neurol 59: 912-921.

25. Morris MC, Tangney CC, Wang Y, Sacks FM, Bennett DA, et al. (2015) MIND diet associated with reduced incidence of Alzheimer’s disease. Alzheimers Dement 11: 1007-1014.
Citation: Morris MC, Krishnan KRR, Villanueva M (2017) Lifestyle Factors and Risk of Dementia. J Psychiatry Cogn Behav 2: 128. DOI: 10.29011/2574-7762.000028
61. Ponce-Bravo H, Ponce C, Feriche B, Paladí P (2015) Influence of Two Different Exercise Programs on Physical Fitness and Cognitive Performance in Active Older Adults: Functional Resistance-Band Exercises vs. Recreational Oriented Exercises. J Sports Sci Med 14: 716-722.

62. Muscari A, Giannoni C, Pierpaoli L, et al. (2010) Chronic endurance exercise training prevents aging-related cognitive decline in healthy older adults: a randomized controlled trial. Int J Geriatr Psychiatry 25: 1055-1064.

63. Espeland MA, Lipska K, Miller ME, et al. (2017) Effects of Physical Activity Intervention on Physical and Cognitive Function in Sedentary Adults with and Without Diabetes. J Gerontol a Biol Sci Med Sci 72: 861-866.

64. Stern Y (2006) Cognitive reserve and Alzheimer disease. Alzheimer Dis Assoc Disord 20: 112-117.

65. Dartigues JF, Foubert-Samier A, Le GM (2013) Playing board games, cognitive decline and dementia: a French population-based cohort study. BMJ Open 3: e002998.

66. Hughes TF, Chang CC, Vander BJ, Ganguli M (2010) Engagement in reading and hobbies and risk of incident dementia: The MoVIES project. Am J Alzheimers Dis Other Demen 25: 432-438.

67. Bryan J, Calvarese E, Hughes D (2002) Short-term folate, vitamin B-12 or vitamin B-6 supplementation slightly affects memory performance but not mood in women of various ages. J Nutr 132: 1345-1356.

68. Wilson RS, Bennett DA, Bienias JL, Aggarwal NT, Mendes De Leon CF, et al. (2002) Cognitive activity and incident AD in a population-based sample of older persons. See comment in PubMed Commons below Neurology 59: 1910-1914.

69. Wilson RS, Scherr PA, Schneider JA, Tang Y, Bennett DA (2007) Relation of cognitive activity to risk of developing Alzheimer disease. Neurology 69: 1911-1920.

70. Wang HX, Karp A, Winblad B, Fratiglioni L (2002) Late-life engagement in social and leisure activities is associated with a decreased risk of dementia: a longitudinal study from the Kungsholmen project. Am J Epidemiol 155: 1081-1087.

71. Sattler C, Toro P, Schonknecht P, Schroder J (2012) Cognitive activity, education and socioeconomic status as protective factors for mild cognitive impairment and Alzheimer’s disease. Psychiatry Res 196: 90-95.

72. Scarmeas N, Levy G, Tang MX, Manly J, Stern Y (2001) Influence of leisure activity on the incidence of Alzheimer’s disease. Neurology 57: 2236-2242.

73. Wilson RS, Bennett DA, Bienias JL, Mendes De Leon CF, Morris MC, et al. (2003) Cognitive activity and cognitive decline in a biracial community population. Neurology 61: 812-816.

74. Wilson RS, Barnes LL, Krueger KR, Hoganson G, Bienias JL, et al. (2005) Early and late life cognitive activity and cognitive systems in old age. J Int Neuropsychol Soc 11: 400-407.

75. Ball K, Berch DB, Helmers KF (2002) Effects of cognitive training interventions with older adults: a randomized controlled trial. Jama 288: 2271-2281.

76. Corbett A, Owen A, Hampshire A, et al. (2015) The Effect of an Online Cognitive Training Package in Healthy Older Adults: An Online Randomized Controlled Trial. J Am Med Dir Assoc 16: 990-997.

77. Peretz C, Korczyn AD, Shattil E, Aharonson V, Birnboim S, et al. (2011) Computer-based, personalized cognitive training versus classical computer games: a randomized double-blind prospective trial of cognitive-stimulation. Neuroepidemiology 36: 91-99.

78. Kelly ME, Loughrey D, Lawlor BA, Robertson IH, Walsh C, et al. (2014) The impact of cognitive training and mental stimulation on cognitive and everyday functioning of healthy older adults: a systematic review and meta-analysis. Ageing Res Rev 15: 28-43.

79. Fratiglioni L, Wang HX, Ericsson K, Maytan M, Winblad B (2000) Influence of social network on occurrence of dementia: a community-based longitudinal study. Lancet 355: 1315-1319.

80. Crooks VC, Lubben J, Petitti DB, Little D, Chiu V (2008) Social network, cognitive function, and dementia incidence among elderly women. Am J Public Health 98: 1221-1227.

81. Crowe M, Andel R, Pedersen NL, Johansson B, Gatz M (2003) Does participation in leisure activities lead to reduced risk of Alzheimer’s disease? A prospective study of Swedish twins. J Gerontol B Psychol Sci Soc Sci 58: P249-255.

82. Szczurgo O, Pfeifer LA, Masaki K, Korf ES, Laurin D, et al. (2006) The effect of social engagement on incident dementia: the Honolulu-Asia Aging Study. Am J Epidemiol 163: 433-440.

83. Zunzunegui MV, Alvarado BE, Del ST, Otero A (2003) Social networks, social integration, and social engagement determine cognitive decline in community-dwelling Spanish older adults. J Gerontol B Psychol Sci Soc Sci 58: S93-S100.

84. Wilson RS, Boyle PA, James BD, Leurgans SE, Buchman AS, et al. (2015) Negative social interactions and risk of mild cognitive impairment in old age. Neuropsychology 29: 561-570.

85. Barnes LL, Mendes de Leon CF, Wilson RS, Bienias JL, Evans DA (2004) Social resources and cognitive decline in a population of older African Americans and whites. Neurology 63: 2322-2326.

86. James BD, Wilson RS, Barnes LL, Bennett DA (2011) Late-life social activity and cognitive decline in old age. J Int Neuropsychol Soc 17: 998-1005.

87. Holwerda TJ, Deeg DJ, Beekman AT, et al. (2014) Feelings of loneliness, but not social isolation, predict dementia onset: results from the Amsterdam Study of the Elderly (AMSTEL). J Neurol Neurosurg Psychiatry 85: 135-142.

88. Shankar A, Hamer M, McMunn A, Steptoe A (2013) Social isolation and loneliness: relationships with cognitive function during 4 years of follow-up in the English Longitudinal Study of Ageing. Psychosom Med 75: 161-170.