Lifestyle Factors and Risk of Dementia

Martha Clare Morris^{1*}, K Ranga Rama Krishnan², Michelle Villanueva¹

¹Department of Internal Medicine, Division of Digestive Diseases and Nutrition, Rush Medical College, Illinois, USA

²The Henry P. Russe, MD, Dean, Rush Medical College, Professor, Department of Psychiatry, Rush Medical College, Illinois, USA

***Corresponding author:** Martha Clare Morris, Department of Internal Medicine, Rush Medical College, 1645 W Jackson Blvd, Suite 675 Chicago, IL 60612, USA. Tel: +13129423223; Email: Martha_Morris@rush.edu

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

Received Date: 05 September, 2017; **Accepted Date:** 07 October, 2017; **Published Date:** 17 October, 2017

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 ($n \leq 155$) 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-

dition as well as delayed memory. Other trials of physical activity are currently underway that should clarify whether aerobic forms of exercise are required for protective benefit [59].

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

- 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.
- Cummings JL, Morstorf T, Zhong K (2014) Alzheimer's disease drug-development pipeline: few candidates, frequent failures. *Alzheimers Res Ther* 6: 37.
- 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.
- 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.
- Kang JH, Ascherio A, Grodstein F (2005) Fruit and vegetable consumption and cognitive decline in aging women. *Ann Neurol* 57: 713-720.
- 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.
- 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.
- 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.
- 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*.
- Joseph JA, Shukitt-Hale B, Willis LM (2009) Grape juice, berries, and walnuts affect brain aging and behavior. *J Nutr* 139: 1813S-1817S.
- 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.
- 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.
- 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.
- 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.
- Corrada MM, Kawas CH, Hallfrisch 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.
- Schaefer EJ, Bongard V, Beiser AS, et al. (2006) Plasma phosphatidylcholine docosahexaenoic acid content and risk of dementia and Alzheimer disease: the Framingham Heart Study. *Arch Neurol* 63: 1545-1550.
- Johnson EJ, McDonald K, Caldarella 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.
- 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.
- 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.
- Commenges D, Scotet V, Renaud S, Jacqmin-Gadda H, Barberger-Gateau P, et al. (2000) Intake of flavonoids and risk of dementia. *European Journal of Epidemiology* 16: 357-363.
- Morris MC, Tangney CC (2014) Dietary fat composition and dementia risk. *Neurobiol Aging* 35 Suppl 2: S59-64.
- 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.
- 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.
- Scarmeas N1, Stern Y, Tang MX, Mayeux R, Luchsinger JA (2006) Mediterranean diet and risk for Alzheimer's disease. *Ann Neurol* 59: 912-921.
- 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.

26. Tangney CC, Kwasny MJ, Li H, Wilson RS, Evans DA, et al. (2011) Adherence to a Mediterranean-type dietary pattern and cognitive decline in a community population. *Am J Clin Nutr* 93: 601-607.
27. Tangney CC, Li H, Wang Y, Barnes L, Schneider JA, et al. (2014) Relation of DASH- and Mediterranean-like dietary patterns to cognitive decline in older persons. *Neurology* 83: 1410-1416.
28. van de Rest O, Berendsen AA, Haveman-Nies A, de Groot LC (2015) Dietary patterns, cognitive decline, and dementia: a systematic review. *Adv Nutr* 6: 154-168.
29. Morris MC, Tangney CC, Wang Y, et al. (2015) MIND diet slows cognitive decline with aging. *Alzheimers Dement* 11: 1015-1022.
30. Ganguli M, Vander BJ, Saxton JA, Shen C, Dodge HH (2005) Alcohol consumption and cognitive function in late life: a longitudinal community study. *Neurology* 65: 1210-1217.
31. Stampfer MJ, Kang JH, Chen J, Cherry R, Grodstein F (2005) Effects of moderate alcohol consumption on cognitive function in women. *N Engl J Med* 352: 245-253.
32. Ruitenberg A, van Swieten JC, Witteman JC, Mehta KM, van Duijn CM, et al. (2002) Alcohol consumption and risk of dementia: the Rotterdam Study. *Lancet* 359: 281-286.
33. Espeland MA, Gu L, Masaki KH, et al. (2005) Association between reported alcohol intake and cognition: results from the Women's Health Initiative Memory Study. *Am J Epidemiol* 161: 228-238.
34. Langballe EM, Ask H, Holmen J (2015) Alcohol consumption and risk of dementia up to 27 years later in a large, population-based sample: the HUNT study, Norway. *Eur J Epidemiol* 30: 1049-1056.
35. Luchsinger JA, Tang MX, Siddiqui M, Shea S, Mayeux R (2004) Alcohol intake and risk of dementia. *J Am Geriatr Soc* 52: 540-546.
36. Nooyens AC, Bueno-de-Mesquita HB, van Gelder BM, van Bortel MP, Verschuren WM (2014) Consumption of alcoholic beverages and cognitive decline at middle age: the Doetinchem Cohort Study. *Br J Nutr* 111: 715-723.
37. Mukamal KJ, Kuller LH, Fitzpatrick AL, Longstreth WT, Jr Mittleman MA, et al. (2003) Prospective study of alcohol consumption and risk of dementia in older adults. *Jama* 289: 1405-1413.
38. Richard EL, Kritz-Silverstein D, Laughlin GA, Fung TT, Barrett-Connor E, et al. (2017) Alcohol Intake and Cognitively Healthy Longevity in Community-Dwelling Adults: The Rancho Bernardo Study. *J Alzheimers Dis* 59: 803-814.
39. Sabia S, Elbaz A, Britton A, Bell S, Dugravot A, et al. (2014) Alcohol consumption and cognitive decline in early old age. *Neurology* 82: 332-339.
40. Stott DJ, Falconer A, Kerr GD, et al. (2008) Does low to moderate alcohol intake protect against cognitive decline in older people?. *J Am Geriatr Soc* 56: 2217-2224.
41. Wright CB, Elkind MS, Luo X, Paik MC, Sacco RL (2006) Reported alcohol consumption and cognitive decline: The northern Manhattan study. *Neuroepidemiology* 27: 201-207.
42. Virtaa JJ, Jarvenpaa T, Heikkila K, et al. (2010) Midlife alcohol consumption and later risk of cognitive impairment: a twin follow-up study. *J Alzheimers Dis* 22: 939-948.
43. Anttila T, Helkala EL, Viitanen M, et al. (2004) Alcohol drinking in middle age and subsequent risk of mild cognitive impairment and dementia in old age: a prospective population based study. *BMJ* 329: 539.
44. Handing EP, Andel R, Kadlecova P, Gatz M, Pedersen NL (2015) Midlife Alcohol Consumption and Risk of Dementia Over 43 Years of Follow-Up: A Population-Based Study from the Swedish Twin Registry. *J Gerontol a Biol Sci Med Sci* 70: 1248-1254.
45. Anstey KJ, Mack HA, Cherbuin N (2009) Alcohol consumption as a risk factor for dementia and cognitive decline: meta-analysis of prospective studies. *Am J Geriatr Psychiatry* 17: 542-555.
46. Panza F, Frisardi V, Seripa D, et al. (2012) Alcohol consumption in mild cognitive impairment and dementia: harmful or neuroprotective?. *Int J Geriatr Psychiatry* 27: 1218-1238.
47. Peters R, Peters J, Warner J, Beckett N, Bulpitt C (2008) Alcohol, dementia and cognitive decline in the elderly: a systematic review. *Age Ageing* 37: 505-512.
48. Rajan KB, Barnes LL, Skarupski KA, Mendes De Leon CF, Wilson RS, et al. (2015) Physical and Cognitive Activities as Deterrents of Cognitive Decline in a Biracial Population Sample. *Am J Geriatr Psychiatry* 23: 1225-1233.
49. Yaffe K, Barnes D, Nevitt M, Lui LY, Covinsky K (2001) A prospective study of physical activity and cognitive decline in elderly women: women who walk. *Arch Intern Med* 161: 1703-1708.
50. Willey JZ, Gardener H, Caunca MR, et al. (2016) Leisure-time physical activity associates with cognitive decline: The Northern Manhattan Study. *Neurology* 86: 1897-1903.
51. Lytle ME, Vander BJ, Pandav RS, Dodge HH, Ganguli M (2004) Exercise level and cognitive decline: the MoVIES project. *Alzheimer Dis Assoc Disord* 18: 57-64.
52. Scarmeas N, Luchsinger JA, Schupf N, Brickman AM, Cosentino S, et al. (2009) Physical activity, diet, and risk of Alzheimer disease. *JAMA* 302: 627-637.
53. Larson EB (2008) Physical activity for older adults at risk for Alzheimer disease. *JAMA* 300: 1077-1079.
54. Laurin D, Verreault R, Lindsay J, MacPherson K, Rockwood K (2001) Physical activity and risk of cognitive impairment and dementia in elderly persons. *Arch Neurol* 58: 498-504.
55. Rovio S, Spulber G, Nieminen LJ, et al. (2010) The effect of midlife physical activity on structural brain changes in the elderly. *Neurobiol Aging* 31: 1927-1936.
56. Llamas-Velasco S, Contador I, Villarejo-Galende A, Lora-Pablos D, Bermejo-Pareja F (2015) Physical Activity as Protective Factor against Dementia: A Prospective Population-Based Study (NEDICES). *J Int Neuropsychol Soc* 21: 861-867.
57. Liu-Ambrose T, Nagamatsu LS, Resistance training and executive functions: a 12-month randomized controlled trial. Graf P, Beattie BL, Ashe MC, et al. (2010) *Arch Intern Med* 170: 170-178.
58. Lautenschlager NT, Cox KL, Flicker L, Foster JK, van Bockxmeer FM, et al. (2008) Effect of physical activity on cognitive function in older adults at risk for Alzheimer disease: a randomized trial. *JAMA* 300: 1027-1037.
59. Erickson KI, Voss MW, Prakash RS, Basak C, Szabo A, et al. (2011) Exercise training increases size of hippocampus and improves memory. *Proc Natl Acad Sci U S A* 108: 3017-3022.
60. Kimura K, Obuchi S, Arai T, et al. (2010) The influence of short-term strength training on health-related quality of life and executive cognitive function. *J Physiol Anthropol* 29: 95-101.

61. Ponce-Bravo H, Ponce C, Feriche B, Padial 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 Dement* 25: 432-438.
67. Bryan J, Calvaresi 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 preventive 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, Shatil 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. Saczynski JS, 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.