Mr Tan 75 year old man...

Widowed, lives with single daughter who works full time as a school teacher. Alone in the day, and may go out on his own but less now as he feels more easily tired. Suffers from hypertension, diabetes, hyperlipidemia, ischemic heart disease, prostatic enlargement, OA knees, poor vision & hearing. Ambulant but has fallen 3x this year and has difficulty climbing stairs. Increased frequency of micturition, nocturia, sleeps poorly at night.

Aspirin 100mg om, Famotidine 20mg bd, Atorvastatin 10mg on, Enalapril 10mg bd, Terazosin 2mg ON, Hyroxyzine 25mg ON, Ferrous fumarate 200mg om, Calcium et Vit D 2 om, Neuroforte 1 tab om, Glipizide 10mg BD, Metformin 850mg tds, Glucosamine 1500mg om
Frailty

- A biologic syndrome
  - multisystem decline
  - diminished physiologic reserve
  - increased vulnerability to stressors

Geriatric Medicine: An Evidence-Based Approach
Increased risk of adverse outcomes such as disability, hospitalization, institutionalisation & mortality

Rockwood et al. CMAJ 2005
Frailty

- Who is frail?
  - Eye balling “I know it when I see it”
  - Objective criteria
    - Phenotype
    - Accumulation of deficits
- Related to but distinct from comorbidity and disability
## Frailty Phenotype

<table>
<thead>
<tr>
<th>FRAIL</th>
<th>Fried Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatigue</td>
<td>Exhaustion</td>
</tr>
<tr>
<td>Resistance (strength)</td>
<td>Weakness</td>
</tr>
<tr>
<td>Ambulation</td>
<td>Slowness</td>
</tr>
<tr>
<td>Illness (5 or more)</td>
<td>Decreased activity</td>
</tr>
<tr>
<td>Loss of weight</td>
<td>Loss of weight</td>
</tr>
</tbody>
</table>

Robust: No component  
Pre-frail: 1 to 2 components  
Frail: 3 -5 components  

Morley J et al  
J Nutr Health Aging 2012

---

**Prevalence of frailty and its association with sociodemographic and clinical characteristics, and resource utilization in a population of Singaporean older adults**

Jaikaih Ajit, Vaingankar, Slow Ann Chong, Edimansyah Abdin, Louisa Picco, Boon Yang Chua, Saleha Shafie, Hui Lin Ong, Sherilyn Chang, Esmond Seow, Derrick Heng, Peak Chiang Chiam, Mythily Subramaniam

First published: 31 August 2016  
DOI: 10.1111/guo.12891  
View article history  
Cited by: 0 articles  
Funding information

Prevalence of frailty among the older adult population was 5.7%
A study spanning 14 years and counting has found that half of the elderly here are frail — especially the low-income, and those who are single, divorced or widowed due to factors including malnutrition, lack of exercise and having chronic diseases.

**Nutritional, Physical, Cognitive, and Combination Interventions and Frailty Reversal Among Older Adults: A Randomized Controlled Trial**

Tze Pin Ng, MD,† Liang Fong, PhD,‡ Ma Shwe Zin Nyunt, PhD,† Lei Feng, PhD,§ Mathew Niti, PhD,‡ Boon Yeow Tan, MMED,‖ Erikson Chan, MSc,† Sue Anne Khoo, MPsyCh(Clin),‡ Sue Mei Chan, MHealthSc (Mgmt),‡ Philip Yap, MRCP,§ Keng Bee Yap, FRCP(Edin)‖

†Gerontology Research Programme, Department of Psychological Medicine, National University of Singapore, Singapore; ‡Performance and Technology Assessment, Ministry of Health, Singapore; §St. Luke's Hospital, Singapore; "Khoo Teck Puat Hospital, Singapore; "Alexandra Hospital, Singapore.
584 community-living older persons aged ≥65 years assessed for eligibility

246 pre-frail and frail without cognitive impairment (MMSE 23/24) randomized

Nutrition (N=49)
Cognitive (N=50)
Physical (N=48)
Combined (N=49)
Placebo (N=50)

13 discontinued intervention
- 1 clinician decision
- 6 refused

6 discontinued intervention
- 1 unable to contact
- 4 refused

6 discontinued intervention
- 2 clinician decision
- 1 refused

6 discontinued intervention
- 1 clinician decision
- 4 refused

Intention-to-treat analysis: N=49
Intention-to-treat analysis: N=50
Intention-to-treat analysis: N=48
Intention-to-treat analysis: N=49
Intention-to-treat analysis: N=50

Baseline (OM) and 3M, 6M, 12M Follow-Up Visits
Frailty Assessments: strength, body weight, gait speed, energy and physical activity
Depression: GDS-15
Cognition: MMSE, Rey Auditory Verbal Learning Test, Brief Visuospatial Memory Test (Revised); Digit Span, Block Design, and Colour Trails Tests
IADL, BADL, Hospitalization, SF-12 Quality of Life

Intervention

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Details</th>
</tr>
</thead>
</table>
| Physical exercise    | • 90mins 2 days per week for 12 weeks with daily assignments  
                        • Followed by 12 weeks of home based exercise  
                        • Focus on strength & balance |
| Cognitive training   | • Weekly sessions of 2 hours for 12 weeks  
                        • Followed by fortnightly booster sessions for another 12 weeks  
                        • Memory, attention & speed, reasoning & problem solving |
| Nutrition (24weeks)  | • Fortisip Multi Fibre (Nutricia, Dublin, Ireland) supplying 300 kcal with carbohydrate (49%), fat (35%), protein (35%), fiber (4.6 g per 200 mL)  
                        • Iron & Folate (Sangbion), B6 & B12 (Neuroforte). Calcium & vitamin D (Caltrate D) |
Frailty is reversible!

Frailty score and status over 12 months were reduced in all groups, including control (15%), but were significantly higher (35.6% to 47.8%) in the nutritional (odds ratio [OR] 2.98), cognition (OR 2.89), and physical (OR 4.05) and combination (OR 5.00) intervention groups. Improvements in physical frailty domains were most evident for knee strength, physical activity, gait speed & energy.

Courtesy of Ng TP

Mr Tan 75 year old man...

Widowed, lives with single daughter who works full time as a school teacher. Alone in the day, and may go out on his own but less now as he feels more easily tired. Suffers from hypertension, diabetes, hyperlipidemia, ischemic heart disease, prostatic enlargement, OA knees, poor vision & hearing. Ambulant but has fallen 3x this year and has difficulty climbing stairs. Increased frequency of micturition, nocturia, sleeps poorly at night.

Of late, his daughter notes he has been more forgetful, often repeating himself & questions. He also misplaces his personal belongings. He can still go out on his own, albeit not beyond the immediate neighbourhood.
Physical Frailty, Cognitive Impairment, and the Risk of Neurocognitive Disorder in the Singapore Longitudinal Ageing Studies

Liang Feng,1 Ma Shwe Zin Nyunt,1 Qi Gao,1 Lei Feng,1 Tih Shih Lee,2 Tung Tsoi,3 Mei Sian Chong,4,5 Wee Shiong Lim,4,5 Simon Collinson,6 Philip Yap,7 Keng Bee Yap,8 and Tze Pin Ng1

1Gerontology Research Program, Department of Psychological Medicine, National University of Singapore, Singapore. 2Neuroscience and Behavioral Disorders Program, Duke-National University of Singapore Graduate Medical School, Singapore. 3Department of Psychological Medicine, National University Hospital, Singapore. 4Institute of Geriatrics and Active Ageing and 5Department of Geriatric Medicine, Tan Tock Seng Hospital, Singapore. 6Department of Psychology, National University of Singapore, Singapore. 7Department of Geriatric Medicine, Khoo Teck Puat Hospital, Singapore. 8Department of Geriatric Medicine, Alexandra Hospital, Singapore.
### Cross-sectional Analyses

<table>
<thead>
<tr>
<th></th>
<th>Cognitive Impairment</th>
<th>NCD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n1/n2</td>
<td>OR (95% CI)</td>
</tr>
<tr>
<td>Robust</td>
<td>421/1,044</td>
<td>1.00</td>
</tr>
<tr>
<td>Prefrail</td>
<td>52/902</td>
<td>1.72 (1.14–2.59)</td>
</tr>
<tr>
<td>Frail</td>
<td>11/29</td>
<td>7.26 (2.89–19.7)</td>
</tr>
<tr>
<td>Linear trend</td>
<td>p</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

### Longitudinal Analyses

<table>
<thead>
<tr>
<th></th>
<th>Incident Cognitive Impairment</th>
<th>Incident NCD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n1/n2</td>
<td>OR (95% CI)</td>
</tr>
<tr>
<td>Robust</td>
<td>14/984</td>
<td>1.00</td>
</tr>
<tr>
<td>Prefrail</td>
<td>22/436</td>
<td>2.90 (1.41–5.99)</td>
</tr>
<tr>
<td>Frail</td>
<td>2/14</td>
<td>4.43 (0.77–25.7)</td>
</tr>
<tr>
<td>Linear trend</td>
<td>p</td>
<td>&lt;.003</td>
</tr>
</tbody>
</table>
Cognitive Frailty

- Both physical frailty & CI
- Decreased cognitive reserve, increased vulnerability
- Mild CI, not amounting to dementia
- Neuropsychological profile
  - More impairment in executive dysfunction, attention & processing speed?
- Mechanism
  Physical frailty $\rightarrow$ CI (Cognitive frailty)
  CI $\rightarrow$ Physical frailty (Neurodegenerative)
Cognitive frailty

Declining Physical function →

Declining cognitive function →

Alz Disease  Cognitive Frailty

BAGL = basic activities of daily living.
Pathways to dementia

Neurodegeneration → MCI → DEMENTIA

Physical Frailty

Delirium in the presence of the pathologic processes of dementia is associated with accelerated cognitive decline beyond that expected for delirium or the pathologic process itself. These findings suggest that additional unmeasured pathologic processes specifically relate to delirium. Age-related cognitive decline has many contributors, and these findings at the population level support a role for delirium acting independently and multiplicatively to the pathologic processes of classic dementia.
Mechanisms underlying Cognitive Frailty

- Vascular
- Inflammatory
- Metabolic
- Nutritional
- Genetics
Unobtrusive assessment of activity patterns associated with mild cognitive impairment

T.L. Hayes1,3,*, F. Abendroth2,3, A. Adami4, M. Pavel1,3, T.A. Zitelberger2,3, and J.A. Kaye1,2,3
Motoric Cognitive Risk Syndrome
Gait Slowing
Cognitive complaints
Inc dementia risk

Vergheze J et al. Neurology 2014

Dementia Related to AD and CVD

Large Vessel Occlusion
Large Cortical Infarcts
Small Vessel Occlusion
Small Infarcts (Lacunes)
Vascular Remodeling
Impaired autoregulation
White Matter Lesions

Risk Factors, Genetic Factors, Age, Lifestyle
Plaques Aβ
Dementia Cognitive, Functional, and Behavioral Impairments
Cell loss or dysfunction
Neuronal Death
NFT (τ)

VaD
AD
The Interaction of AD and CVD

Cerebrovascular Risk Factors ● Additive or synergistic interaction (eg. stroke, hypertension)
● Shared genetic risk factors (eg. Apo E)
● Direct causal influences (eg. inc AD pathology)

Zlokovic BV Nat Rev Neurosci 2011
Mr Tan 75 year old man...

Widowed, lives with single daughter who works full time as a school teacher. Alone in the day, and may go out on his own but less now as he feels more easily tired. Suffers from hypertension, diabetes, hyperlipidemia, ischemic heart disease, prostatic enlargement, OA knees, poor vision & hearing. Ambulant but has fallen 3x this year and has difficulty climbing stairs. Increased frequency of micturition, nocturia, sleeps poorly at night.

Of late, his daughter notes he has been more forgetful, often repeating himself & questions. He also misplaces his personal belongings. He can still go out on his own, albeit not beyond the immediate neighbourhood.

Dementia is not all about pathology

Brain Pathology | Brain Reserve

DEMENTIA
 Associations Between Midlife Vascular Risk Factors and 25-Year Incident Dementia in the Atherosclerosis Risk in Communities (ARIC) Cohort

<table>
<thead>
<tr>
<th>Variable</th>
<th>Hazard Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Full Eligible Cohort</td>
</tr>
<tr>
<td></td>
<td>(n = 15,407)</td>
</tr>
<tr>
<td>Visit 1 smoking³</td>
<td></td>
</tr>
<tr>
<td>Current</td>
<td>1.41 (1.23-1.61)</td>
</tr>
<tr>
<td>Former</td>
<td>1.00 (0.89-1.13)</td>
</tr>
<tr>
<td>Never</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>Educational attainment</td>
<td></td>
</tr>
<tr>
<td>≤High school or GED</td>
<td>1.37 (1.20-1.57)</td>
</tr>
<tr>
<td>High school</td>
<td>1.05 (0.93-1.20)</td>
</tr>
<tr>
<td>&gt;High school</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>Visit 1 diabetes</td>
<td>1.77 (1.53-2.04)</td>
</tr>
<tr>
<td>Visit 1 hypertension</td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>Prehypertension</td>
<td>1.31 (1.14-1.51)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1.39 (1.22-1.59)</td>
</tr>
</tbody>
</table>
Incident dementia and blood pressure lowering in the Hypertension in the Very Elderly Trial cognitive function assessment (HYVET-COG): a double-blind, placebo controlled trial

Ruth Peters, PhD, Nigel Beckett, MBchB, Francoise Forette, MD, Jaakko Tuomilehto, MD, Robert Clarke, FRCP, Craig Ritchie, MRCPsych, Adam Waldman, PhD, Ivan Walton, FRCP, Ruth Poulter, BSc, Shuping Ma, MD, Marius Comsa, MD, Lisa Burch, BSc, Astrid Fletcher, PhD, Christopher Bulpitt, MD

The Lancet Neurology August 2008

<table>
<thead>
<tr>
<th></th>
<th>Active (N/n)</th>
<th>Placebo (N/n)</th>
<th>Hazard ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROGRESS RR*2</td>
<td>305/193</td>
<td>3054/217</td>
<td>0.89 (0.74-1.07)</td>
</tr>
<tr>
<td>Syst-Rx RR*3</td>
<td>1238/11</td>
<td>1180/21</td>
<td>0.50 (0.35-1.02)</td>
</tr>
<tr>
<td>SHEP RR*2</td>
<td>2365/77</td>
<td>2372/44</td>
<td>0.84 (0.55-1.30)</td>
</tr>
<tr>
<td>HYVET RR</td>
<td>1680/126</td>
<td>1648/137</td>
<td>0.90 (0.73-1.13)</td>
</tr>
<tr>
<td>Combined (random)</td>
<td>6652/492</td>
<td>6574/472</td>
<td>0.97 (0.76-1.20)</td>
</tr>
</tbody>
</table>

Cochran Q=2.409; p=0.491
Test for overall effect; p=0.045

Livingston G et al. Lancet 2017
Figure 3: Forest plot of the effect of hearing loss on incidence of dementia 9–17 years later in cognitively healthy people.

Hearing loss was measured by pure-tone audiometry. RR-risk ratio.
### Table 2. Cross-sectional analyses: association of hearing loss with prevalent MCI and dementia \((n = 2,599)\)

<table>
<thead>
<tr>
<th>Prevalent MCI and dementia</th>
<th>Association with hearing loss</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>unadjusted ( \text{OR} )</td>
<td>(95% \text{ CI} )</td>
<td>(p)</td>
<td>adjusted ( \text{OR} )</td>
<td>(95% \text{ CI} )</td>
</tr>
<tr>
<td>MCI</td>
<td>1.07</td>
<td>0.59 – 1.94</td>
<td>0.320</td>
<td>0.93</td>
<td>0.59 – 1.71</td>
</tr>
<tr>
<td>Dementia</td>
<td>2.05</td>
<td>1.04 – 4.09</td>
<td>0.042</td>
<td>3.63</td>
<td>1.16 – 11.4</td>
</tr>
<tr>
<td>MCI or dementia (all cases)</td>
<td>1.79</td>
<td>1.07 – 2.99</td>
<td>0.027</td>
<td>1.16</td>
<td>0.67 – 2.03</td>
</tr>
</tbody>
</table>

Adjusted: sex, age, ethnicity, education, central obesity, hypertension, diabetes, dyslipidemia, smoking, alcohol, leisure time activity, cardiac diseases, depressive symptoms.

### Table 4. Longitudinal analyses of SLAS-1 participants free of MCI or dementia at baseline: association of hearing loss with incident MCI and MCI or dementia \((n = 1,515)\)

<table>
<thead>
<tr>
<th>Incident MCI and dementia</th>
<th>Association with baseline hearing loss</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>unadjusted ( \text{HR} )</td>
<td>(95% \text{ CI} )</td>
<td>(p)</td>
<td>adjusted ( \text{HR} )</td>
<td>(95% \text{ CI} )</td>
</tr>
<tr>
<td>MCI</td>
<td>1.53</td>
<td>0.67 – 3.50</td>
<td>0.311</td>
<td>1.85</td>
<td>0.78 – 4.40</td>
</tr>
<tr>
<td>MCI or dementia</td>
<td>1.93</td>
<td>0.94 – 3.96</td>
<td>0.074</td>
<td>2.30</td>
<td>1.08 – 4.92</td>
</tr>
</tbody>
</table>

Adjusted: sex, age, ethnicity, education, central obesity, hypertension, diabetes, dyslipidemia, smoking, alcohol, leisure time activity, cardiac diseases, depressive symptoms.

---

**Physical Activity: A Viable Way to Reduce the Risks of Mild Cognitive Impairment, Alzheimer’s Disease, and Vascular Dementia in Older Adults**

**Physical Activity**
- AD Pathogenesis [65]
- Cardiovascular System [67, 68]
- Muscular Skeletal System [for review see: 125]
- Frail Conditions [88, 90]
- Physical Frailty [for review see: 126]
- Cognitive Frailty [52]

PA provides primary and secondary prevention of chronic diseases, [9, 81, 86]
- Improve cerebrovascular health [7/8, 105, 110]
- Decrease chronic inflammation [114]
- Improve vascular endothelial function [115, 117]

**Aging**
- Chronic Conditions and Diseases: Hypertension, Hypotension, Diabetes, Depression, Cancer, Obesity, Hypercholesterolemia, Sleep quality and deficiency, Osteoporosis, Disability

**Cognitive Function** [10, 109]

**Brain Health**

Gallaway PJ
Brain Sci 2015

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23/08/2017
Benefits of exercise

• Longitudinal cohort studies
  – Exercise associated with reduced risk of dementia & decreased mortality
• Lack robust RCT to show exercise prevents dementia
• Exercise can
  – Improve balance, prevent falls
  – Improve mood & function
  – Improve cognition in MCI

Effect of Physical Activity on Cognitive Function in Older Adults at Risk for Alzheimer Disease
A Randomized Trial

Results In an intent-to-treat analysis, participants in the intervention group improved 0.26 points (95% confidence interval, −0.89 to 0.54) and those in the usual care group deteriorated 1.04 points (95% confidence interval, 0.32 to 1.82) on the ADAS-Cog at the end of the intervention. The absolute difference of the outcome measure between the intervention and control groups was −1.3 points (95% confidence interval, −2.38 to −0.22) at the end of the intervention. At 18 months, participants in the intervention group improved 0.73 points (95% confidence interval, −1.27 to 0.03) on the ADAS-Cog, and those in the usual care group improved 0.04 points (95% confidence interval, −0.46 to 0.88).

Lautenschalger N et al. JAMA 2008
Exercise in people with dementia

Forbes D et al. Cochrane Reviews 2015

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Exercise</th>
<th>Usual care</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N Mean(SD)</td>
<td>N Mean(SD)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>12</td>
<td>149 (2.2)</td>
</tr>
<tr>
<td>Eggermont 2009a</td>
<td>51</td>
<td>0.24 (0.78)</td>
</tr>
<tr>
<td>Eggermont 2009b</td>
<td>20</td>
<td>0.07 (0.37)</td>
</tr>
<tr>
<td>Hwang 2010</td>
<td>10</td>
<td>289 (11.8)</td>
</tr>
<tr>
<td>Kerssou 2010</td>
<td>16</td>
<td>203 (7.66)</td>
</tr>
<tr>
<td>Van de Wouden 2004</td>
<td>15</td>
<td>15.33 (4.44)</td>
</tr>
<tr>
<td>Venturelli 2011</td>
<td>11</td>
<td>12 (0.2)</td>
</tr>
<tr>
<td>Völkers 2012</td>
<td>50</td>
<td>0.14 (0.5)</td>
</tr>
<tr>
<td>Vreugdenhil 2012</td>
<td>20</td>
<td>239 (5)</td>
</tr>
</tbody>
</table>

Subtotal (95% CI) | 215 | 194 | 100.0 % | 0.43 [-0.05, 0.92] |

Heterogeneity: Tu^2 = 0.62; Chi^2 = 40.91, df = 8 (P<0.0001); I^2 = 60%
Test for overall effect: Z = 1.75 (P = 0.081)
Adherence to Mediterranean diet and risk of developing cognitive disorders: An updated systematic review and meta-analysis of prospective cohort studies

Lei Wu & Dali Sun

Recent articles have presented inconsistent findings on the impact of Mediterranean diet in the occurrence of cognitive disorders; therefore, we performed an updated systematic review and meta-analysis to evaluate the potential association and dose-response pattern with accumulating evidence. We searched the PubMed and the Embase for the records relevant to this topic. A generic inverse-variance method was used to pool the outcome data for continuous variable, and categories of high vs. low, median vs. low of Mediterranean diet score with a random-effects model. Generalized least-squares trend estimation model was used to estimate the potential dose-response patterns of Mediterranean diet score on incident cognitive disorders. We identified 9 cohort studies involving 34,168 participants. Compared with the lowest category, the pooled analysis showed that the highest Mediterranean diet score was inversely associated with the developing of cognitive disorders, and the pooled RR (95% CI) was 0.79 (0.70, 0.89). Mediterranean diet score of the median category was not significantly associated with cognitive disorders. Dose-response analysis indicated a trend of an approximately linear relationship of the Mediterranean diet score with the incident risk of cognitive disorders. Further studies of randomized controlled trials are warranted to confirm the observed association in different populations.

Wu L, Sun D
Scientific Reports 2017
Featured Articles

MIND diet associated with reduced incidence of Alzheimer’s disease

Martha Clare Morris*a, Christy C. Tangney*b, Yamin Wangc, Frank M. Sacksc,
David A. Bennettd,e, Neelum Taggarwaf,g

*aDepartment of Internal Medicine and the Rush Alzheimer’s Disease Center at Rush University Medical Center, Chicago, IL, USA
*bDepartment of Clinical Nutrition and the Rush Alzheimer’s Disease Center at Rush University Medical Center, Chicago, IL, USA
*dDepartment of Statistics, Harvard School of Public Health, Boston, MA, USA
*eDepartment of Behavioral Sciences and the Rush Alzheimer’s Disease Center at Rush University Medical Center, Chicago, IL, USA
*fDepartment of Neurology and the Rush Alzheimer’s Disease Center at Rush University Medical Center, Chicago, IL, USA

corresponding author. E-mail addresses: morris@rush.edu (M.C. Morris), christy.tangney@rush.edu (C.C. Tangney), yamin.wang@rush.edu (Y. Wang), frank.sacks@rush.edu (F.M. Sacks), david.bennett@rush.edu (D.A. Bennett), neelum.taggarwa@rush.edu (N. Taggarwa)
Mediterranean diet improves cognition: the PREDIMED-NAVARRA randomised trial

Elena H Martinez-Lapiscina,1,2 Pedro Clavero,3 Estefania Toledo,1,4 Ramon Estruch,4,5 Jordi Salas-Salvadó,4,6 Beatriz San Julián,1 Ana Sanchez-Tainta,1 Emilio Ros,4,7 Cinta Valls-Pedret,4,7 Miguel Á Martinez-Gonzalez1

Table 4 Multivariable-adjusted means after a 6½-year follow-up and differences versus control (95% CI) in each intervention group

<table>
<thead>
<tr>
<th></th>
<th>MedDiet+EVOO (n=224) Mean (95% CI)</th>
<th>p Value (vs control)</th>
<th>MedDiet+Nuts (n=166) Mean (95% CI)</th>
<th>p Value (vs control)</th>
<th>Control (low-fat diet) (n=132) Mean (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMSE</td>
<td>27.73 (27.27 to 28.19)</td>
<td></td>
<td>27.88 (27.20 to 28.16)</td>
<td>0.015</td>
<td>27.11 (26.61 to 27.61)</td>
</tr>
<tr>
<td>Adjusted diff. versus control (95% CI)</td>
<td>+0.62 (+0.18 to +1.05)</td>
<td>0.005</td>
<td>+0.57 (+0.11 to +1.03)</td>
<td>0.015</td>
<td>0 (reference)</td>
</tr>
<tr>
<td>CDT</td>
<td>5.31 (4.98–5.64)</td>
<td></td>
<td>5.13 (4.78–5.47)</td>
<td></td>
<td>4.80 (4.44–5.16)</td>
</tr>
<tr>
<td>Adjusted diff. versus control (95% CI)</td>
<td>+0.31 (+0.20 to +0.82)</td>
<td>0.001</td>
<td>+0.33 (+0.03 to +0.67)</td>
<td>0.048</td>
<td>0 (reference)</td>
</tr>
</tbody>
</table>

General Linear Models. The PREDIMED-NAVARRA trial.
CCT, Clock Drawing Test; EVOO, extra virgin olive oil; MedDiet, Mediterranean diet; MMSE, Mini-Mental State Examination.
Adjusted for sex, age, education, family history of cognitive impairment or dementia, ApoE genotype, hypertension, dyslipidaemia, diabetes, smoking status, alcohol intake, body mass index, physical activity and total energy intake.

Martinez-Lapiscina EH, et al.
J Neurol Neurosurg Psychiatry 2013
A point increase in cognitive activity score was associated with a 33% reduction in AD.

2802 older people received 10 group cognitive training sessions. The results showed improvements in the domains trained and functional benefits on 10 year follow up.
Cognitive Stimulation and Cognitive and Functional Decline in Alzheimer’s Disease: The Cache County Dementia Progression Study

Katherine A. Treiber,1 Michelle C. Carlson,2 Chris Corcoran,3,4 Maria C. Norton,1,4,5 John C. S. Breitner,6,7 Kathleen W. Piercy,4,5 Michael Scott DeBerard,1 David Stein,1 Beth Foley,8 Kathleen A. Welsh-Bohmer,9 Amber Frye,1 Constantine G. Lyketsos,10,9 and JoAnn T. Tschanz1,4,*

Figure S: Effect of cognitive stimulation therapy versus usual care on cognition
Reproduced from Huntley and colleagues,10 by permission of BMJ Publishing Group. Measured by MMSE.
Frailty in seniors linked to social, economic factors

Older adults from lower-income groups who are single and have no formal education tend to suffer from physical frailty. Low social activity, physical activity and cognitive stimulation can help reverse the tide, according to two studies by the National University of Singapore (NUS), which were released recently.

The correlation between socio-economic factors and frailty emerged from a frailty study of 1,600 residents, which was conducted as part of the Singapore Longitudinal Ageing Study (SLAS).

The SLAS tracked 3,000 Singapore residents aged 55 and above since 1991.

(Adapted) Morley J
JAMDA 2013

Original Study

Social Frailty and Functional Disability: Findings From the Singapore Longitudinal Ageing Studies

Nigel Teo BSocSci (Hons)a, Qi Gao PhDb, Ma Shwe Zin Nyunt PhDb, Shiu Liang Wee PhDa, c, Tze-Pin Ng MDa, b, e

aGeriatric Education and Research Institute, Singapore
bGerontology Research Programme, Department of Psychological Medicine, National University of Singapore, Singapore
cHealth and Social Sciences Cluster, Singapore Institute of Technology, Singapore

Live Alone
No Education
No confidant
Infrequent contact (visits, calls or request for help)
Infrequent social activities
Financial Difficulty (To a great extent)
Social economic deprivation (1-2 room flats & others)

Teo N et al. JAMDA 2017
A 2 year multidomain intervention of diet, exercise, cognitive training, and vascular risk monitoring versus control to prevent cognitive decline in at-risk elderly people (FINGER): a randomised controlled trial

- 1260 participants
- 69.4 (60-77) years
- MMSE 26.7+2
- 2 year study

**INTERVENTION**
- Mediterranean Diet
- Aerobic Exercise
- Resistance Exercise
- Computer based cognitive training
- Social activity

**CONTROL**
- Intensive education

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**Graphs:**
- NTB total score
- Executive functioning
- Processing speed
- Memory

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A life course approach...

Livingston G et al. Lancet 2017
Tips: Keeping An Active Mind
如何拥有敏捷的思维

- Regular Exercise: Brisk walking, swimming, taiji
  拍动运动: 快步走、游泳、太极拳

- Healthy Diet: Such as Vegetables, Fruits and Fish
  健康饮食: 例如蔬菜、水果、鱼

- Mental Stimulation: Puzzles or play chess with friends
  激发脑力活动: 智力游戏、下棋

- Active Social Life: Enrol in programmes held at the senior activity centre near you!
  丰富的社交生活: 参与社近乐中心的活动！