How can physical activity help to optimise cognitive health?

Nicola T Lautenschlager, FRANZCP, MD
There is increasing evidence that PA can help to optimise cognitive health.

Current knowledge suggests a combination of aerobic PA and resistance training.

Information about the benefits of PA for people with and without cognitive impairment should be promoted as widely as possible.

More PA research is needed in relation to cognitive health (intensity, type, combinations of interventions, modern technology, translation, etc.).

More emphasis should be given to identifying enablers for behaviour change to be able to generate practical knowledge informing future guidelines, policies and community programs.
## Risks factors for Alzheimer's Disease

### Norton et al., 2014

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Worldwide</th>
<th>USA</th>
<th>Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diabetes mellitus</strong></td>
<td>6.4%</td>
<td>10.3%</td>
<td>6.9%</td>
</tr>
<tr>
<td>Adult prevalence of diagnosed diabetes mellitus between the ages of 20 years and 79 years</td>
<td>2.9% (1.3-4.7)</td>
<td>4.5% (2.0-7.3)</td>
<td>3.1% (1.4-5.0)</td>
</tr>
<tr>
<td><strong>Midlife hypertension</strong></td>
<td>8.9%</td>
<td>14.3%</td>
<td>12.0%</td>
</tr>
<tr>
<td>Adult midlife prevalence of hypertension between the ages of 35 years and 64 years</td>
<td>5.1% (1.4-9.9)</td>
<td>8.0% (2.2-15.1)</td>
<td>6.8% (1.9-13.0)</td>
</tr>
<tr>
<td><strong>Midlife obesity</strong></td>
<td>3.4%</td>
<td>13.1%</td>
<td>7.2%</td>
</tr>
<tr>
<td>Adult midlife prevalence of body-mass index greater than 30 kg/m² between the ages of 35 years and 64 years</td>
<td>2.0% (1.1-3.0)</td>
<td>7.3% (4.3-10.8)</td>
<td>4.1% (2.4-6.2)</td>
</tr>
<tr>
<td><strong>Physical inactivity</strong></td>
<td>17.7%</td>
<td>32.5%</td>
<td>31.0%</td>
</tr>
<tr>
<td>Proportion of adults who do not do either 20 min of vigorous activity on 3 or more days or 30 min of moderate activity on 5 or more days per week</td>
<td>12.7% (3.3-24.0)</td>
<td>21.0% (5.8-36.6)</td>
<td>20.3% (5.6-35.6)</td>
</tr>
<tr>
<td><strong>Depression</strong></td>
<td>13.2%</td>
<td>19.2%</td>
<td>18.5%</td>
</tr>
<tr>
<td>Lifetime prevalence of major depressive disorder using Diagnostic and Statistical Manual of Mental Disorders or International Classification of Diseases criteria</td>
<td>7.9% (5.3-10.8)</td>
<td>11.1% (7.5-15.0)</td>
<td>10.7% (7.2-14.5)</td>
</tr>
<tr>
<td><strong>Smoking</strong></td>
<td>27.4%</td>
<td>20.6%</td>
<td>26.6%</td>
</tr>
<tr>
<td>The proportion of adult smokers</td>
<td>13.9% (3.9-24.7)</td>
<td>10.8% (3.0-19.8)</td>
<td>13.6% (8.5-18.6)</td>
</tr>
<tr>
<td><strong>Low educational attainment</strong></td>
<td>40.0%</td>
<td>13.3%</td>
<td>26.6%</td>
</tr>
<tr>
<td>The proportion of adults with an International Standard Classification of Education level of 2 or less (pre-primary, primary, and lower secondary education)</td>
<td>19.1% (12.3-25.6)</td>
<td>7.3% (4.4-10.3)</td>
<td>13.6% (8.5-18.6)</td>
</tr>
<tr>
<td><strong>Combined</strong></td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Adjusted combined</strong></td>
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</tbody>
</table>

### Number of attributable cases in 2010 (95% CI)

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Worldwide</th>
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</tr>
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<tbody>
<tr>
<td>Diabetes mellitus</td>
<td>969 (428-1592)</td>
<td>425 (119-798)</td>
<td>240 (107-389)</td>
</tr>
<tr>
<td>Midlife hypertension</td>
<td>1746 (476-3369)</td>
<td>428 (308-1942)</td>
<td>452 (136-934)</td>
</tr>
<tr>
<td>Midlife obesity</td>
<td>678 (387-1028)</td>
<td>386 (226-570)</td>
<td>386 (263-544)</td>
</tr>
<tr>
<td>Physical inactivity</td>
<td>4297 (1103-8122)</td>
<td>1115 (308-1942)</td>
<td>1195 (277-1745)</td>
</tr>
<tr>
<td>Depression</td>
<td>2679 (1781-3671)</td>
<td>588 (395-796)</td>
<td>774 (520-1049)</td>
</tr>
<tr>
<td>Smoking</td>
<td>4718 (1338-8388)</td>
<td>574 (159-1050)</td>
<td>978 (614-1342)</td>
</tr>
<tr>
<td>Low educational attainment</td>
<td>6473 (4163-8677)</td>
<td>386 (236-544)</td>
<td>1461 (401-2564)</td>
</tr>
<tr>
<td>Combined</td>
<td>--</td>
<td>--</td>
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</tr>
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Based on physical inactivity prevalence of 56% (ABS health survey 2012-2013)

**Proportion of dementia in Australia explained by common modifiable risk factors**

Kimberly Ashby-Mitchell¹, Richard Burns¹, Jonathan Shaw² and Kaarin J. Anstey¹

| Physical inactivity | The proportion of adults not meeting physical activity guidelines based on self-reported physical activity engagement in the past 7 days and pedometer data (150–300 minutes of moderate intensity physical activity or 75–150 minutes of vigorous intensity physical activity, or an equivalent combination of both moderate and vigorous activities, each week) |

**Table 3** PAR of dementia for each risk factor and number of cases attributable in 2010

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Prevalence of risk factor</th>
<th>PAR % (95% CI)</th>
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<tr>
<td>Midlife obesity</td>
<td>32.0</td>
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<td>41,222 (23,795–58,788)</td>
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<td>Physical inactivity</td>
<td>56.0</td>
<td>17.9 (8.2–27.3)</td>
<td>43,468 (19,941–66,162)</td>
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<td>Smoking</td>
<td>16.1</td>
<td>4.3 (−0.2 to 8.8)</td>
<td>10,460 (−391 to 21,362)</td>
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<td>Low educational attainment</td>
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<td>35,730 (26,906–45,410)</td>
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<td>Midlife hypertension</td>
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<td>13.7 (4.0–24.4)</td>
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<tr>
<td>Combined</td>
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<td>57.0 (33.7–73.6)</td>
<td>138,020 (81,716–178,454)</td>
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<td>48.4 (28.1–64.2)</td>
<td>117,294 (68,233–155,634)</td>
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Dementia cases 2010 = 242,500 [33]

CI confidence interval, PAR population attributable risk
Based on physical inactivity prevalence of 56% (ABS health survey 2012-2013)

Proportion of dementia in Australia explained by common modifiable risk factors

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Dementia cases 2010 = 242,500 [33]

CI confidence interval, PAR population attributable risk
Physical activity (PA): the benefits

- Decreases morbidity and mortality (Warburton et al., 2006; Almeida et al., 2014)
- Reduces risk of cancer, chronic diseases, cardiovascular disease, etc. (Dubbert, 2002, Warburton et al., 2006)
- Effective in the prevention and management of depression, stress and sleep problems (Castro et al., 2002, King et al., 2002)
- In older people improves balance, strength, gait, endurance and general quality of life (Blake et al., 2009)
- Delays mobility limitation and further disability which supports independent living (Bennett et al., 2011)
- In older people can contribute to improvements in mood, well-being and cognition (Kerse et al. 2008; Lautenschlager 2012, 2013)
Global PA data for adolescents (11-17 years) and adults (≥ 18 years)

WHO data: available for 146 countries: 82% of HICs, 75% of U-MICs, 69% of L-MICs, 77% of LICs. Prevalence of inactivity: 23.3%; Women worse than men (137 countries); worse with age: 55.3% aged 80+ (compared to 19.4% in 18-29 years)
WHO: status of national policy on PA in 160 countries; 91% compared to 29% 10 years ago

Implimitation of the policy: in 2015 still app. one quarter of national policies on PA are not being put into practice

3 main barriers:
1) Insufficient workforce
2) Lack of multisector partnerships
3) Unclear what actions most likely will be effective and feasible
The Australian Government Department of Health recommends:

// Participation in at least 30 minutes of moderate intensity physical activity like brisk walking, on most days

Or

// Vigorous activity for 75-150 minutes each week.

Potential underlying mechanisms

Indirect Effects on the Body:
- Reduced vascular disease
- Reduced metabolic disorders
- Reduced impacts of chronic stress, oxidation, inflammation

Direct Effects of the Brain:
- Increased cerebral blood flow
- Increased neurogenesis
- Higher levels of brain-derived neurotropic factor (BDNF)
- Structural and functional brain changes

Better cognitive function
Reduced dementia risk

Physical Activity

Barnes & Lautenschlager, 2013
AIBL Study: The long slow build up of pathology towards clinical AD

“The time between Aβ deposition and neurodegenerative or cognitive variables also requires caution: cognitive reserve, cardiovascular or cerebrovascular factors, and concurrent diseases might contribute to inter-individual variations in these intervals”

Villemagne et al., 2013
physical activity & cognitive health

And what about genes?

Figure: Schematic overview of genes linked to Alzheimer’s disease
The colours in the key show the pathways in which these genes are implicated. Genes that are known to affect APP metabolism are circled in red, whereas those that affect the tau pathway are circled in yellow. The interior colours provide further information on what functions the genes have. When there are two colours, the gene might have functional roles in two different biological pathways. Many of the genes have been related to APP processing or trafficking (red or red border), suggesting the central importance of APP metabolism in Alzheimer’s disease. The figure was adapted with permission from Karch et al., 2015.
116 healthy AIBL participants, stratified by APOE

PA measured with International Physical Activity Questionnaire (IPAQ) previous 7 days

work, transport, housework, leisure
AIBL Active Study: fMRI resting-state functional connectivity and ApoE e4

- Only ApoE e4+ participants (n=22 e4+; n=58 e4-) had an increased connectivity between the ventral and dorsal posterior cingulate cortex (PCC) and the medial and lateral prefrontal cortex. This has been shown in the literature (only dorsal) for healthy APOE e4 carriers and in MCI (Fillipini, et al., 2009; Fleisher et al., 2009; Sheline et al., 2010; Zhang et al., 2009).

- Only ApoE e4+ participants had a significant positive correlation between physical activity measures (6-min walk tests + number of steps/week) and connectivity between the ventral PCC and the supplementary motor area (SMA). Increases in connectivity have been shown for some brain areas (but not for the SMA) with healthy older adults (but not with SMC or MCI) in relation to physical activity (Voss et al., 2010; Li et al., 2014).

Kerestes et al., 2015
Synergy of cognitive and cerebrovascular reserve?

Barnes JN, 2015
AIBL study: Anxiety and the risk of cognitive decline

N = 333 healthy participants
SMC or not

Slopes are adjusted for age, educational level, full-scale IQ, APOE genotype, subjective memory complaints, number of vascular risk factors, and depressive symptoms.

Pietrzak et al., jamapsychiatry, 2015
AIBL study: subjective memory decline, depression and risk of cognitive decline

Fig. 2. Mean rankings (Mann-Whitney U) of both groups on baseline age, cognitive function, mood, PiB SUVR, gray matter, and hippocampal volumes. Effect size for each analysis: 0.1 = small, 0.3 = medium, and 0.5 = large. Abbreviations: PiB, $^{11}$C-Pittsburgh compound B; SUVR, standardized uptake value ratio; MMSE, mini-mental state examination.
Physical activity interventions for people with mental illness Systematic review & meta-analysis

n=20 RCTs of 1,298 adults with a clinician confirmed diagnosis of a mental illness

- Physical activity interventions reduce symptoms of depression regardless of psychiatric diagnoses.
- Physical activity reduces positive and negative symptoms of schizophrenia.
- Based on the available evidence, clinicians should refer patients to physical activity interventions to improve both mental and physical health outcomes.

Rosenbaum et al., 2014

<table>
<thead>
<tr>
<th>Study</th>
<th>ES (95% CI)</th>
<th>% Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abt, 2006</td>
<td>0.40 (0.30 to 1.09)</td>
<td>4.77</td>
</tr>
<tr>
<td>Armstrong et al, 2003</td>
<td>1.47 (0.52 to 2.43)</td>
<td>4.08</td>
</tr>
<tr>
<td>Armstrong and Edwards, 2004</td>
<td>1.11 (0.18 to 2.04)</td>
<td>4.15</td>
</tr>
<tr>
<td>Berlin et al, 2003</td>
<td>0.45 (0.17 to 1.07)</td>
<td>4.96</td>
</tr>
<tr>
<td>Blumenthal et al, 2007 (HBE)</td>
<td>0.15 (0.24 to 0.53)</td>
<td>5.51</td>
</tr>
<tr>
<td>Blumenthal et al, 2007 (SE)</td>
<td>0.16 (0.23 to 0.55)</td>
<td>5.50</td>
</tr>
<tr>
<td>Daley et al, 2008</td>
<td>0.06 (0.63 to 0.74)</td>
<td>4.80</td>
</tr>
<tr>
<td>Knubben et al, 2007</td>
<td>0.72 (0.08 to 1.37)</td>
<td>4.91</td>
</tr>
<tr>
<td>Mather et al, 2002</td>
<td>0.17 (0.25 to 0.59)</td>
<td>5.44</td>
</tr>
<tr>
<td>Mota-Pereira et al, 2011</td>
<td>5.47 (3.88 to 7.06)</td>
<td>2.63</td>
</tr>
<tr>
<td>Netz et al, 1994</td>
<td>0.72 (0.24 to 1.68)</td>
<td>4.07</td>
</tr>
<tr>
<td>Nguyen, 2008</td>
<td>4.67 (3.63 to 5.72)</td>
<td>3.84</td>
</tr>
<tr>
<td>Schuch et al, 2011</td>
<td>0.33 (0.42 to 1.09)</td>
<td>4.61</td>
</tr>
<tr>
<td>Singh et al, 1997</td>
<td>3.05 (1.45 to 4.66)</td>
<td>2.60</td>
</tr>
<tr>
<td>Veale et al, 1992</td>
<td>0.01 (0.52 to 0.54)</td>
<td>5.19</td>
</tr>
<tr>
<td>Viera et al, 2006</td>
<td>2.46 (1.27 to 3.65)</td>
<td>3.48</td>
</tr>
<tr>
<td>Dunn et al, 2005 (LD)</td>
<td>0.09 (0.76 to 0.94)</td>
<td>4.36</td>
</tr>
<tr>
<td>Dunn et al, 2005 (PHD)</td>
<td>0.66 (0.15 to 1.47)</td>
<td>4.46</td>
</tr>
<tr>
<td>Lavertsky et al, 2011</td>
<td>0.59 (0.11 to 1.08)</td>
<td>5.31</td>
</tr>
<tr>
<td>Herring et al, 2011</td>
<td>0.30 (0.44 to 1.04)</td>
<td>4.65</td>
</tr>
<tr>
<td>Chalder et al, 2012</td>
<td>0.11 (0.09 to 0.32)</td>
<td>5.79</td>
</tr>
<tr>
<td>Yeung et al, 2012</td>
<td>0.11 (0.54 to 0.77)</td>
<td>4.88</td>
</tr>
<tr>
<td>Overall (I² = 86.0%, P = .000)</td>
<td>0.84 (0.49 to 1.18)</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Abbreviations: ES = effect size, HBE = home-based exercise, LD = low dose, PHD = public-health dose, SE = supervised exercise.
Participants: n=12201 WA men (65-83y)
PA: 16.9% were physically active at baseline
Follow-up: 10-13 y; n= 7058 still alive and 46.8% accept re-assessment

Figure 1  Survival of participants according to whether they were physically active. Participants who reported being vigorously active had lower hazard of dying between the assessments than inactive men (n=582/2058 vs 4111/10 143; HR=0.74, 95% CI 0.68 to 0.81; the
Physical activity leads to 60% increased chance of healthy ageing

Table 2  Clinical outcomes of older men according to their level of physical activity

<table>
<thead>
<tr>
<th>Clinical outcomes at the follow-up assessment</th>
<th>Physically inactive N=2535 n (%)</th>
<th>Physically active N=741 n (%)</th>
<th>Risk ratio*</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>168 (7.6)</td>
<td>36 (5.4)</td>
<td>0.71</td>
<td>0.50 to 1.01</td>
</tr>
<tr>
<td>Cognitive impairment</td>
<td>730 (33.0)</td>
<td>190 (28.4)</td>
<td>0.86</td>
<td>0.75 to 0.98</td>
</tr>
<tr>
<td>Impaired IADL</td>
<td>1460 (57.6)</td>
<td>349 (47.1)</td>
<td>0.82</td>
<td>0.75 to 0.89</td>
</tr>
<tr>
<td>Impaired ADL</td>
<td>958 (37.8)</td>
<td>220 (29.7)</td>
<td>0.79</td>
<td>0.70 to 0.89</td>
</tr>
<tr>
<td>No mood, cognitive or functional impairment*</td>
<td>680 (26.8)</td>
<td>259 (34.9)</td>
<td>1.30</td>
<td>1.16 to 1.47</td>
</tr>
</tbody>
</table>

Outcomes were collected 11 years after the assessment of physical activity.
We considered physically active men who reported 150 min or more of vigorous exertion during a typical week.
*Risk ratio of the outcome of men who are physically active relative to their insufficiently active counterparts.
†Risk ratio=1.21 (95% CI 1.08 to 1.35) after adjustment for age, education, marital status, smoking, alcohol use, body mass, hypertension, diabetes, coronary heart disease and cerebrovascular disease at the time of entry into the study.
IADL, instrumental activities of daily living; ADL, activities of daily living.

Table 3  Risk of being healthy after 11 years according to whether men were physically active at the baseline and the follow-up assessments

<table>
<thead>
<tr>
<th></th>
<th>Not healthy N=2337 n (%)</th>
<th>Healthy N=939 n (%)</th>
<th>Adjusted risk ratio*</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inactive at baseline and follow-up</td>
<td>1390 (59.5)</td>
<td>421 (44.8)</td>
<td>1</td>
<td>Reference</td>
</tr>
<tr>
<td>Inactive at baseline, active at follow-up</td>
<td>465 (19.9)</td>
<td>259 (27.6)</td>
<td>1.35</td>
<td>1.17 to 1.54</td>
</tr>
<tr>
<td>Active at baseline, inactive at follow-up</td>
<td>305 (13.0)</td>
<td>119 (12.7)</td>
<td>1.07</td>
<td>0.90 to 1.30</td>
</tr>
<tr>
<td>Active at baseline and follow-up</td>
<td>177 (7.6)</td>
<td>140 (14.9)</td>
<td>1.59</td>
<td>1.36 to 1.86</td>
</tr>
</tbody>
</table>
What are the key findings?

- Men aged 65–83 years who are physically active (>150 min/week of vigorous physical activity) are more likely than their counterparts to live an additional 10–13 years.
- Older men who are physically active have greater chance than their counterparts of surviving 10–13 years free of cognitive and functional impairment, as well as of depression.
- Older men who were active and became inactive lost some of the health benefits associated with physical activity. Those who reported <150 min/week of vigorous physical activity and subsequently became active gained health benefits, whereas those who remained physically active benefited the most: 60% increased chance of healthy ageing.
Participants: 170, 50 years and older with Subjective Memory Complaints (SMC) with or without Mild Cognitive Impairment (MCI)
Primary outcome: cognition (ADAS-cog)
Aim: to perform for 24 weeks at least 150 min of moderate intensity physical activity in blocks of 3 sessions per week
Theory: stages of change and self efficacy
Results: 1.3 points difference on the ADAS-cog
Steps: 9000 more
Adherence: 78.2%
Significant group x time interaction at 6 months: Self efficacy scores were 2.37 point higher (0.58, 4.16, < 0.01)
Focus group with 50 older adults with normal cognition with or without subjective memory complaints, MCI, AD

What are attitudes, barriers & beliefs towards PA in the context of brain health?

What are the attributes of the ideal PA program?

Overwhelming positive attitude irrespective of cognitive status

PA programs should be advertised by primary care and media

Needs to be affordable and individually tailored

Gender specific preferences

Those with cognitive impairment are keen on easy to follow, light and safe activities

Those with no cognitive impairment want a challenge
Can older adults change their behaviour?

Meta-analysis on effectiveness to change PA behaviour at age 55-70 2000-2010; 21 trials (objective and >12months)
Individually tailored + goal setting + local information works best
Not enough data on long-term effects (maintenance)

Hobbs et al., 2013

Figure 2 Trials reporting pedometer step-counts (steps/day) at 12 months.
Participants: examples of individual goals

- To achieve the set minimum target of 150min PA per week.
- To improve physical health.
- To get fitter to be ready for future plans (e.g. travel/ excursions).
- To walk to the train instead of taking the car, etc.
- To walk to the shops back and forth.
- To be able to go for long beach walks with family.
- To improve self-esteem, e.g. to try more ambitious activities later on.
- To learn to be less stressed and more relaxed.
- To increase motivation for later activities (e.g. joining a walking group).
- To improve stamina to be able to keep up with others for future holiday activities.
- To improve cardiovascular health.
- To improve leg strength to reduce need to sit too much during the day.
- To get walking fit before buying a new dog.
- To get fit enough again to play social tennis.
- To increase fitness and confidence to ride the bike to work instead of using car.
- To reduce feelings of fatigue, increase energy levels and mental attitude.
- To increase energy levels for more creative activities.
- To get fitter and more confident to use public transport to do more things.
- To get fit enough to play 18 holes of golf.
- To improve mood.
physical activity & cognitive health

Steps for professionals promoting physical activity

- Assess current physical activity level
- Identify potential barriers
- Review medical conditions
- Goal setting and preferences
- Select appropriate type physical activity and setting
- Identify monitoring tools
- Provide feedback and positive reinforcement
- Identify potential for social support
- Provide progressive reports on progress

Lautenschlager & Cox, 2016
“Launching in late October 2015, the Global Council on Brain Health (GCBH) is an independent collaborative of scientists, doctors, scholars and policy experts convened to provide the best thinking on what people and professionals can do to maintain and improve brain health. GCBH members will debate the latest scientific advancements in brain health research. Their recommendations on what works and what doesn’t will provide practical, trustworthy information on brain health. AARP founded the GCBH in collaboration with Age UK”

1. Does exercise help your brain function better as you age? How? What type is best?
2. What do we know about how often and how long?
3. Can we see change in the brain after exercise?
4. Can exercise stop cognitive decline and disease?
5. Can we motivate behavior change to promote sustained exercise for all people?
6. What level of evidence do we need to make recommendations on exercise and brain function?
Expert Consensus

1. Physical activity has a positive impact on brain health.
   a. A physically active lifestyle (e.g. walking, using the stairs, gardening, etc.) provides benefits for brain health.
   b. Purposeful exercise (e.g. brisk walking, cycling, strength training, group exercise classes, etc.) provides benefits for brain health.

2. People can change their behavior to become more physically active at any age.

3. Based on randomized controlled trials, people who participate in purposeful exercise show beneficial changes in brain structure and function.

4. Based on epidemiological evidence, people who lead a physically active lifestyle have lower risk of cognitive decline.¹

5. In spite of the link between physical activity and brain health, there is not yet sufficient scientific evidence that physical activity can reduce risk of brain diseases that cause dementia (e.g. Alzheimer’s disease).

Expert Recommendations

1. For purposeful exercise, follow current public health recommendations of 150 minutes of weekly, moderate-intensity aerobic activity and two or more days a week of moderate-intensity, muscle-strengthening activities.² In addition to purposeful exercise, lead a physically active lifestyle throughout the day.

PRACTICAL TIPS

a. Identify what exercises or activities you may already do and do more unless you are already extremely active.

b. Try new physical exercises and physical activities that you think that you will enjoy.

c. Engage in strength training and exercises that improve flexibility and balance in addition to aerobic exercise; a variety of physical activities is better than one kind alone.

d. In a safe community or area, walk to your destination, or park farther away from the entrance of wherever you are going.

e. Take the stairs instead of the elevator.

f. Communities should consider closing streets on holidays and weekends to encourage biking, walking, and other physical activities in public spaces on a regular basis.

g. Get moving throughout your day.
2. Identify meaningful and enjoyable ways to increase and maintain physical activity.

**PRACTICAL TIPS**

a. Know that whatever your age or current health status, there are options to be physically active.

b. Challenge yourself a little bit more over time, for example:
   
   III. If you are not very active, start stretching and walking at a leisurely pace.
   
   IV. If you are already a walker or jogger, increase your pace or distance.
   
   V. If you are an active runner, keep running and start strength/resistance training.

c. Be patient and persistent.

d. To stay motivated, consider doing physical activities with other people. Social aspects of physical activity can help inspire you to continue your efforts.

e. Make concrete plans to move your body – think about when, where and with whom you will be physically active.

3. Incorporate physical activity as a part of a healthy lifestyle to help reduce the risk of cognitive decline.

4. When focusing on the impact of physical activity on brain health, stakeholders and policy makers should take into account the breadth of scientific evidence (i.e. animal studies, epidemiological studies, and randomized controlled trials) while recognizing the knowledge gaps.
AS WE AGE, AN ACTIVE LIFESTYLE + REGULAR EXERCISE = BETTER BRAIN FUNCTION

Experts agree...
Regular exercise added to an active lifestyle ALSO helps your mind stay fit.

HERE'S WHAT YOU CAN DO...

Move more throughout the day
- Elevator vs. stairs

Add regular exercise
- Aerobic: 2.5 hours a week enjoy a moderate-intensity aerobic activity
- Strength: 2+ days a week tone and strengthen those muscles

Make concrete plans to move your body
- Water Aerobics at 8.00 AM with Sue

Do more of what you love to do now or try something new with others

Global Council on Brain Health
A COLLABORATIVE FROM AARP

The Brain Body Connection: OCBIH Recommendations on Physical Activity; www.globalcouncilonbrainhealth.org
Contact: Nick Bancias at nbanicas@fidelity.org
Consult your doctor before starting a new exercise regimen.
For more brain health tips see www.stayingsharp.org
GET MOVING!

PHYSICAL ACTIVITY FOR OLDER PEOPLE

What is physical activity?
What are the health benefits of PA?
How does PA support brain health?
Can PA reduce my risk of cognitive decline?
How do I get started?
How much PA do I need to do?
Tips to stay motivated
Where can I find more information?
References

http://aupoa.unimelb.edu.au

physical activity & cognitive health
What are vascular risk factors?

Hypertension

High cholesterol

Diabetes

Obesity

Stroke

Smoking

What can I do & Where can I find more information?

References

http://aupoa.unimelb.edu.au
Mixed pathologies including chronic traumatic encephalopathy account for dementia in retired association football (soccer) players

Helen Ling¹,²,³ · Huw R. Morris⁴ · James W. Neal⁵ · Andrew J. Lees¹,² · John Hardy¹,²,³ · Janice L. Holton¹,²,³ · Tamas Revesz¹,²,³ · David D. R. Williams⁶

The Impact of Traumatic Brain Injury on the Aging Brain

Jacob S. Young¹ · Jonathan G. Hobbs² · Julian E. Bailes³

Table 1: List of diseases associated with repetitive head trauma

<table>
<thead>
<tr>
<th>Disease</th>
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</thead>
<tbody>
<tr>
<td>Mild cognitive impairment</td>
</tr>
<tr>
<td>Alzheimer’s disease (AD)</td>
</tr>
<tr>
<td>Frontotemporal lobar dementia (FTLD)</td>
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<tr>
<td>Amyotrophic lateral sclerosis (ALS)</td>
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<tr>
<td>Parkinson’s disease (PD)</td>
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<tr>
<td>Multiple sclerosis (MS)</td>
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<tr>
<td>Chronic traumatic encephalopathy (CTE)</td>
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<tr>
<td>Depression</td>
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<tr>
<td>Anxiety</td>
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</tbody>
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mTBI:

Soccer  
Football  
Boxing  
Concussions in sport  
Military
physical activity & cognitive health

Summary

- There is increasing evidence that PA can help to optimise cognitive health.
- Current knowledge suggest a combination of aerobic PA and resistance training.
- Information about the benefits of PA for people with and without cognitive impairment should be promoted as widely as possible.
- More PA research is needed in relation to cognitive health (intensity, type, combinations of interventions, modern technology, translation, etc.).
- More emphasis should be given to identifying enablers for behaviour change to be able to generate practical knowledge informing future guidelines, policies and community programs.

Thank you for your attention.

Questions? Comments?