

Table B.1.g. Cognitive function outcomes: Association between physical activity and measures of cognitive function among adults

See the [Supplementary materials](#) for description of evidence of US PAGAC by outcome

Systematic review evidence	No. of studies/ Study design	Quality Assessment					Description of evidence	Certainty
		Risk of bias	Inconsistency	Indirectness†	Imprecision	Other		
Review credibility Amagasa 2018 (2) Low	No. of participants 2 cross-sectional studies N=435	No serious risk of bias	Serious inconsistency	Serious indirectness	No serious imprecision	None	Two cross-sectional studies among older adults (mean age 64 and 65 years) that studied objectively measured LPA (as a continuous measure or vs. replacing 30 min of SB with LPA). One study found that LPA was significantly associated with higher cognitive functioning whereas the other study found no associations between LPA and spatial working memory and task switching .	VERY LOW ^a
Brasure 2018 (13) High	14 RCTs N=2,824	No serious risk of bias ^b	Serious inconsistency	Serious indirectness	Serious imprecision	None	Multicomponent physical activity interventions (including flexibility, strength, balance, endurance, and aerobic training) were tested in 4 trials (n=1,885). All trials included older adults aged >60 years without cognitive impairment and represented mostly white women. A wide range of neuropsychological tests were used to assess cognitive function ; only 3/25 comparisons showed a statistically significant benefits with multicomponent PA interventions compared with attention controls, including one trial that report no difference in the incidence of MCI or dementia between groups at 2 years. Six trials (n=531) tested aerobic training vs. attention controls in healthy older adults. One study found that older adults in the aerobic exercise group were significantly less likely to receive a dementia diagnosis at 18 months; 11/35 comparisons showed statistically significant benefit on measures of cognitive function whereas 24/35 showed no statistically significant difference between groups. Three trials examined resistance training vs. usual care among frail, older adults. No trial reported diagnostic outcomes; less than a third of comparisons favoured the interventions on measures of executive function, attention and processing speed, and memory . One small trial tested tai chi vs. attention control in older adults aged 60-79 years; 1/2 outcomes for executive function, attention, and processing speed showed a significant benefit.	LOW ^c

Systematic review evidence Review credibility	No. of studies/ Study design No. of participants	Quality Assessment					Description of evidence Summary of findings	Certainty
		Risk of bias	Inconsistency	Indirectness†	Imprecision	Other		
Engeroff 2018 (21) Moderate	9 cross-sectional studies 14 longitudinal N=11,707	No serious risk of bias	Serious inconsistency	Serious indirectness	Serious imprecision	None	<p>Most PA was self-reported using questionnaires not previously validated, and all measures of PA were different between studies. All studies measured cognitive function among older adults aged ≥60 years.</p> <p>There was an inconsistent association between MVPA and global cognitive function; 3/4 longitudinal studies showed no association between lifetime PA and MMSE scores whereas 1/4 longitudinal study found showed a beneficial association between levels of PA at age 74 years and MMSE scores at age 84 years. Most cross-sectional studies found no association between PA and measures of global cognitive function. There was mixed evidence on the relationship between PA and the specific cognitive domains of executive function and memory, but no evidence of an association with attention or working memory.</p>	VERY LOW ^d
Northey 2018 (50) Moderate	39 RCTs N=NR	Serious risk of bias	Serious inconsistency	Serious indirectness	No serious imprecision	None	<p>Studies evaluated relationship between PA interventions of at least 4 weeks and cognitive function measures among adults aged 50 years and older. Interventions included aerobic exercise (18 studies), resistance training (13 studies), multicomponent training (10 studies), tai chi (4 studies) and yoga (2 studies).</p> <p>A multi-level analysis combining multiple measures of cognitive per study (333 dependent effect sizes in 36 studies) found a significant effect of physical activity interventions vs. no PA on measures of cognition (SMD = 0.29 [95% CI 0.17 to 0.41]).</p>	MODERATE ^e
Rathore 2017 (57) Low	15 RCTs N=1,315	No serious risk of bias	No serious inconsistency	Serious indirectness	Serious imprecision	None	<p>Highly heterogenous studies including sample populations (7 studies among youth 5-17-years, 3 studies among adults 18-64 years, and 5 studies among older adults ≥65 years. Seven studies evaluated acute PA (1 session) whereas eight studies evaluated chronic PA (more than 1 PA sessions from 4 weeks to 6 months). Review was limited to working memory performance.</p> <p>10/15 studies reported a statistically significant improvement in working memory performance among those in a physical activity intervention vs. no PA. Chronic PA interventions (ES = 0.27 [95% CI, 0.12 to 0.42], 8 RCTS, n=1,139) were significantly associated with improvements in working memory performance in pooled analysis compared with no exercise. There was no association between acute PA interventions vs. no PA on working memory (ES = -0.15 [95% CI, -0.33 to -0.63], 7 RCTS, n=1,098).</p>	LOW ^f

Systematic review evidence Review credibility	No. of studies/ Study design No. of participants	Quality Assessment					Description of evidence Summary of findings	Certainty
		Risk of bias	Inconsistency	Indirectness†	Imprecision	Other		
Stanmore 2017 (66) Low	17 RCTs N=926	Serious risk of bias	Serious inconsistency	Serious indirectness	Serious imprecision	None	<p>Mean age 69 years (range = 17-85 years), six studies were among clinical samples among patients with Parkinson's , MCI, sub-acute stroke, or schizophrenia and one study was among healthy adolescents. All interventions used active video games/exergames that lasted an average of 10 weeks (range = 4-24 weeks) with an average of 3.2 sessions per week for 15-60 min of exercise per session.</p> <p>Exergames were significantly associated with improved global cognitive function vs. no exergame control conditions in pooled analysis (ES = 0.436 [95% CI 0.18 to 0.69], 17 RCTs, n=926). Results were consistent when stratified by type of control group (attention controls only, PA intervention controls), population (clinical, non-clinical, and older adults only), and length of intervention (<12 weeks, ≥12 weeks). Statistically significant effects were also seen for individual domains of cognitive function including executive function, task-switching, inhibitory control, and attentional processing speed; but were not found for working memory, reasoning, verbal learning and memory, spatial learning and memory, and language.</p>	VERY LOW ⁹

Abbreviations: CI = confidence interval; ES = effect size; LPA = light physical activity; MCI = mild cognitive impairment; MMSE = mini-mental state exam; NR = not reported; PA = physical activity; RCT = randomized clinical trial; SB = sedentary behaviour

† Serious indirectness indicates measurement of intermediate/indirect outcomes or heterogeneity in exposures and comparisons assessed; certainty of evidence was not always downgraded for indirectness if it was not judged to impact the certainty in the findings for the outcome evaluated in the review

^a Certainty of evidence not upgraded

^b Review was limited to studies with low to moderate risk of bias, although review authors notes a medium rating for study limitations

^c Strength of evidence rated as Low by review authors for multicomponent physical activity interventions given indirectness in outcome measures, unknown consistency, and imprecision. All other interventions were rated as having Insufficient strength of evidence given limited data.

^d Certainty of evidence downgraded given serious inconsistency in measures of effects within and between studies and across domain-specific measures of cognition, serious indirectness in measures of physical activity and cognitive function, and serious imprecision (wide confidence interval)

^e Certainty of evidence assigned by review authors as Moderate owing to the level of uncertainty across each domain of the risk of bias tool

^f Certainty of evidence related to chronic (>1 session) PA interventions; downgraded due to serious indirectness in outcome measures and serious imprecision of effects in individual trials and pooled effect

⁹ Certainty of evidence downgraded given serious risk of bias in included evidence, serious inconsistency ($I^2 > 60\%$ in all pooled analysis), serious indirectness (heterogeneous comparisons and outcome measures), and serious imprecision in effect estimates