

# Physical fitness and lifetime cognitive change

**Ian J. Deary, PhD, Lawrence J. Whalley, MD, G. David Batty, PhD and John M. Starr, MD**

From the Department of Psychology (I.J.D.), School of Philosophy, Psychology and Language Sciences, University of Edinburgh, Edinburgh, UK; Department of Mental Health (L.J.W.), University of Aberdeen, Aberdeen, UK; Medical Research Council Social and Public Health Sciences Unit (G.D.B.), Glasgow, UK; and Department of Geriatric Medicine (J.M.S.), University of Edinburgh, Edinburgh, UK.

Address correspondence and reprint requests to Dr. Ian J. Deary, Psychology, University of Edinburgh, 7 George Square, Edinburgh, EH8 9JZ, UK; e-mail: [I.Deary@ed.ac.uk](mailto:I.Deary@ed.ac.uk)

**Objective:** To test the hypothesis that physical fitness is associated with more successful cognitive aging.

**Methods:** Surviving participants (N = 460) of the Scottish Mental Survey of 1932 were tested on the same general cognitive test at age 11 and 79 years. Measures of grip strength, 6-meter walk time, and lung function (forced expiratory volume from the lungs in 1 second [FEV<sub>1</sub>]) were assessed at age 79 years.

**Results:** A latent physical fitness trait, derived by principal components analysis of the three fitness measures, was significantly associated with successful cognitive aging. Cognitive score at age 11, sex, social class, and *APOE*-4 genotype were included as covariables. Higher childhood IQ was associated with better lung function in old age.

**Conclusions:** Physical fitness is associated with cognitive reserve. Intervention studies aimed at making older people fitter are good candidates to improve cognitive aging.

The study was funded by the United Kingdom's Biotechnology and

Biological Sciences Research Council.

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: [Dementia, Multiple Sclerosis](#)

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## **Fitness And Childhood IQ Indicators Of Cognitive Ability In Old Age**

*Science Daily* — How well your mind works in old age depends on physical fitness and your IQ score as a child, according to a study published in the October 10, 2006, issue of *Neurology*, the scientific journal of the American Academy of Neurology.

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In determining whether physical fitness is associated with more successful cognitive aging, the study examined 460 men and women who had been participants of the Scottish Mental Survey of 1932. The participants were tested using the same cognitive test at age 11 and age 79.

Results show physical fitness contributed more than three percent of the differences in cognitive ability in old age after accounting for participant's test scores at age 11. Physical fitness is defined by time to walk six meters, grip strength and lung function.

"The other remarkable result was that childhood IQ was significantly related to lung function at age 79," said study author Ian Deary, PhD, FRCPE, with the University of Edinburgh in Scotland. "Participants with a high IQ as a child were more likely to have better lung function at age 79. This could be because people with higher intelligence might respond more favorably to health messages about staying fit."

However, the study found physical fitness has a greater impact on cognitive ability in old age than childhood IQ.

"The important result of the study is that fitness contributes to better cognitive ability in old age," says Deary. "Thus, two people starting out with the same IQ at age 11, the fitter person at age 79 will, on average, have better cognitive function."

The study also found occupation and education were associated with fitness at age 79. People in more professional occupations and with more education had better fitness and higher cognitive test scores.

Deary says intervention programs aimed at making older people fitter are good candidates to improve cognitive aging.

The United Kingdom's Biotechnology and Biologic Sciences Research Council supported the study.

0. *Note: This story has been adapted from a news release issued by American Academy of Neurology. **Renaud M, Bherer L.***

Centre de recherche, Institut universitaire de gériatrie de Montréal et Département de psychologie, Université du Québec, Montréal.

Cognitive vitality is one of the determining factors of autonomy in the elderly. Aging is often accompanied by important changes in the central nervous system, which may lead to cognitive decline. Several factors seem however to modulate the effect of aging on cognition. For instance, older adults who engage in regular physical activity have better performances in tests implying decision-making process, memory and problems solving. This article draws up a portrait of normal aging while being interested in the impact of the physical fitness on cognition in the elderly. Although further researches are needed to elucidate the mechanisms by which physical fitness enhance cognition in old age, recent studies have

shown that improving physical fitness leads to better performances in tasks assessing a diversity of cognitive domains. Moreover, the impact of physical fitness appears to be heterogeneous, being of greater amplitude in tasks that tap executive functions. It thus seems that physical training could serve to enhance and maintain cognitive vitality in older adults.

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The effects of Florida's Personal Fitness Course were studied on 60 secondary students' cognitive achievement, physical fitness, and attitude toward physical activity. Significant improvement in knowledge of fitness concepts, selected physical fitness parameters, and over-all attitude toward participation in physical activity suggests the course was effective.

## Effects of Physical Activity on Cognitive Functioning in Middle Age: Evidence From

# the Whitehall II Prospective Cohort Study

Posted 11/29/2005

**Archana Singh-Manoux, PhD; Melvyn Hillsdon, PhD; Eric Brunner, PhD; Michael Marmot, PhD, MBBS, FFPHM, FRCP**

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## **Abstract and Introduction**

### **Abstract**

**Objectives:** We examined the association between physical activity and cognitive functioning in middle age. **Methods:** Data were derived from a prospective occupational cohort study of 10 308 civil servants aged 35-55 years at baseline (phase 1; 1985-1988). Physical activity level, categorized as low, medium, or high, was assessed at phases 1, 3 (1991-1994), and 5 (1997-1999). Cognitive functioning was tested at phase 5, when respondents were 46-68 years old. **Results:** In both prospective (odds ratio [OR] = 1.65; 95% confidence interval [CI] = 1.30, 2.10) and cross-sectional (OR = 1.79; 95% CI = 1.38, 2.32) analyses, low levels of physical activity were a risk factor for poor performance on a measure of fluid intelligence. Analyses aimed at assessing cumulative effects (summary of physical activity levels at the 3 time points) showed a graded linear relationship with fluid intelligence, with persistently low levels of physical activity being particularly harmful (OR = 2.21; 95% CI = 1.37, 3.57). **Conclusions:** Low levels of physical activity are a risk factor for cognitive functioning in middle age, fluid intelligence in particular.

### **Introduction**

Poor cognitive functioning is a predictor of mortality at all ages<sup>[1-5]</sup> and, as such, can be seen as a marker of general health status. Leisure-time physical activity has been shown to have a beneficial impact on cognitive functioning among older adults.<sup>[6-12]</sup> It also appears to offer protection against cognitive impairment and dementia in the elderly.<sup>[13,14]</sup> A meta-analysis that focused on randomized aerobic fitness intervention trials with intervention periods of less than a year showed fitness training to be associated with improved cognitive performance.<sup>[15]</sup> Despite the wealth of evidence in this domain, questions remain. The most important question relates to whether the association between physical activity and cognitive

functioning is specific to old age or evident earlier in adulthood. It also remains unclear whether benefits of physical activity over several years have a cumulative effect on cognitive functioning. This issue is relevant for the elaboration of public health messages on leisure-time physical activity. Cross-sectional studies are not adequate to model long-term effects of physical activity, and, because of their relatively short intervention periods (typically 3-4 months), the same is true of studies involving experimental designs.

We examined the association between physical activity over a span of several years and cognitive functioning in middle age. We contend that it is important to examine the relationship between physical activity and cognitive functioning in younger, healthier populations and to assess whether subtle neuropsychological deficits are evident among members of these age groups who are not physically active. Poor cognitive performance in early adulthood or in middle age is clinically relevant, given studies showing that individuals with mild cognitive impairment progress to clinically diagnosed dementia at an accelerated rate.<sup>[16,17]</sup>

We also sought to identify specific cognitive domains that might be particularly vulnerable to low levels of physical activity. Different studies have revealed beneficial effects of physical activity on fluid intelligence,<sup>[6,7]</sup> visuospatial performance,<sup>[10]</sup> reaction time,<sup>[8]</sup> and memory.<sup>[18,19]</sup> However, multiple cognitive domains often have not been examined in the same study. Establishing specific associations would enable elaboration of the pathways and mechanisms through which physical activity influences cognitive functioning.