

# Cheap solutions for big problems?

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Has anyone noticed the various electronic game machines that claim to be able to train your brain and body from the comfort of your lounge room? Quite convenient that. From observing my children and their friends, I see the Nintendo Wii has them leaping and jumping and the new Sony PlayStation has them boxing and dancing. Forget sending them to the gym or on long boring runs, this gives parents extra comfort that their loved ones are improving their health when in the company of the electronic babysitter.

For us geriatrics, it is a comforting thought that we can "train" our brain to stave off the ravages of cognitive decline from the safety of an armchair using the trusty remote control. Now we don't even have to feel guilty playing solitaire on our PC. This is medical therapy at its best. Mind you, you have to read the fine print. The manufacturers simply claim that their machines stimulate the brain or help you "flex" your mental muscles. Nowhere does it guarantee the extra few IQ points we all need.

Mind you, we should be worried. The community annual incidence of Alzheimer disease ranges from 0.6% (95% confidence interval (CI) 0.3% to 0.9%) for persons aged 65 to 69 years to 8.4% (95% CI 3.7% to 13.1%) for persons aged 85 years and older, resulting in a substantial healthcare burden.<sup>12</sup>

The issue of exercise and improving brain function has been much eulogised down the ages, Marcus Tullius Cicero stated as far back as 65 BC, that "*It is exercise alone that supports the spirits, and keeps the mind in vigor*". On the opposing side, however, the acerbic literary giant Mark Twain expressed his disdain for exercise in the statement "*I take my only exercise acting*

*as pallbearer at the funerals of my friends who exercise regularly*" and car maker Henry Ford famously stated that "*Exercise is bunk. If you are healthy, you don't need it, and if you are sick, you shouldn't take it*".

But does it work?

Epidemiological studies do show a significant, and occasionally long-lasting, relationship between physical activity and cognitive function in normal individuals as well as those with dementia.<sup>34</sup> However, it is important to note that other studies have failed to find such relationships.<sup>5</sup> Clearly, there are many methodological reasons why inconsistent associations might be observed across studies, particularly the failure to assess duration, intensity and frequency of exercise as well as our greater appreciation of the role of genetic factors on fitness itself.

Human clinical trials tentatively suggest a causal relationship between fitness training and improved cognition, more efficient brain function, and spared brain volume in older humans. Additional intervention studies will be needed to further examine the relationship between different fitness training protocols and measures of brain structure and function.

Molecular biological studies also show that exercise increases cognitive performance in both young and aged animals and increases mRNA and protein levels of brain derived neurotrophic factor (BDNF), which may be contributing to exercise-induced neurogenesis in the dentate gyrus of the hippocampus. Neurotransmitter systems are also affected by exercise and reveal exercise as a potentially important intervention in treating, off-setting or preventing some pathological disease states. In addition, insulin-like growth factor 1 (IGF-I) may

be mediating the effects of exercise on BDNF, neurogenesis and cognitive performance. Animal studies provide information on the effects of exercise that is difficult to obtain in human intervention studies. The sum of these animal studies overlaps with results from human studies and suggests that exercise is an effective enhancer of neurocognitive functioning in both young and old animals.<sup>6</sup>

Given the ageing populations in many countries throughout the world, there is an increasing interest in lifestyle factors and interventions that will enhance the cognitive vitality of older adults and reduce the risk for age-related neurological disorders, such as Alzheimer disease and minimal cognitive impairment. Although the early literature is supportive of the concept,<sup>156</sup> few studies have been done where the nature of the exercise intervention is accurately quantified or is determined a priori. One of the striking features reading this literature is the complete absence of sports physicians utilising their skills of quantifying exercise and designing exercise interventions in ageing populations. So far, it is the physiologists leading the way. It is time to redress this balance.

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## ***Expression of concern about content of which Dr Paul McCrory is a single author***

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This paper is authored by Dr Paul McCrory. During 2021 and 2022 there was an investigation by BJSM and BMJ which found that some of his work was the product of publication misconduct. Such misconduct includes plagiarism, duplicate publication, misquotation and misrepresentation in publications in respect of which he was listed as the sole author.<sup>1</sup> We are placing a notice to readers on all content in relation to which he is identified as the sole author to alert them to the conclusions of our investigation.

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