

## **Physical Exercise and Brain Health**

- By Dr. Pascale Michelon

Have you heard of or read John Ratey's book "[Spark: The Revolutionary New Science of Exercise and The Brain](#)"? According to Harvard Psychiatry Professor John Ratey nothing beats exercise for promoting brain health.

I am sure you have also heard that exercising your mind promotes brain health.

What is the connection between physical and mental exercises? Do they have additive effects on brain health? Are they redundant?

Let's start by reviewing what we know about the effects of physical exercise on the brain.

### **The effect of physical exercise on cognitive performance**

Early studies compared groups of people who exercised to groups of people who did not exercise much. Results showed that people who exercised usually had better performance in a range of cognitive tasks compared to non-exercisers.

Laurin and colleagues (2001) even suggested that moderate and high levels of physical activity were associated with lower risk for Alzheimer's disease and other dementias.

The problem with these studies is that the exercisers and the non-exercisers may differ on other factors than just exercise. The advantage that exercisers show may not come from exercising but from other factors such as more resources, better brain health to start with, better diet, etc.

The solution to this problem is to randomly assign people to either an aerobic training group or a control group. If the exerciser group and the non-exerciser group are very similar to start with and if the exerciser group shows less decline or better performance over time than the non-exerciser group, then one can conclude that physical exercise is beneficial for brain health.

In 2003, Colcombe and Kramer, analyzed the results of 18 scientific studies published between 2000 and 2001 that were conducted in the way described above.

The results of this meta-analysis clearly showed that fitness training increases cognitive performance in healthy adults between the ages of 55 and 80.

Another meta-analysis published in 2004 by Heyn and colleagues shows similar beneficial effects of fitness training on people over 65 years old who had cognitive impairment or dementia.

### **What is the effect of fitness training on the brain itself?**

Research with animals has shown that in mice, increased aerobic fitness (running) can increase the number of new cells formed in the hippocampus (the hippocampus is crucial for learning and memory). Increased exercise also has a beneficial effect on mice's vascular system.

Only one study has used brain imaging to look at the effect of fitness on the human brain. In 2006, Colcombe and colleagues randomly assigned 59 older adults to either a cardiovascular exercise group, or a nonaerobic exercise control group (stretching and toning exercise). Participants exercised 3h per week for 6 months. Colcombe et al. scanned the participants' brains before and after the training period.

After 6 months, the brain volume of the aerobic exercising group increased in several areas compared to the other group. Volume increase occurred principally in frontal and temporal areas of the brain involved in executive control and memory processes. The authors do not know what underlying cellular changes might have caused these volume changes. However they suspect, based on animal research, that volume changes may be due to an increased number of blood vessels and an increased number of connections between neurons.

### **How does physical exercise compare to mental exercise?**

Very few studies have tried to compare the effect of physical exercise and mental exercise on cognitive performance.

When looking at each domain of research one notices the following differences:

- The effects of cognitive or mental exercise on performance seem to be very task specific, that is trained tasks benefit from training but the benefits do not transfer very well to tasks in which one was not trained.

- The effects of physical exercise on performance seem broader. However they do not generalize to all tasks. They benefit mostly tasks that involve executive-control components (that is, tasks that require planning, working memory, multitasking, resistance to distraction).

To my knowledge only one study tried to directly compare cognitive and fitness training:

Fabre and colleagues, in 1999, randomly assigned subjects to 4 groups: an aerobic training group (walking or running for 2 h per week for 2 months), a memory training group (one 90 min session a week for 2 months), a combined aerobic and mental training group, or a control group (no training).

Results showed that compared to the control group, the memory performance of all 3 groups increased. The combined group showed greater increase than the other 2 training groups.

This suggests that the effects of cognitive and fitness training may be additive... However this study involved only 8 participants per group! More research is clearly needed before anything can be safely concluded.

In the meantime let's play it safe and combine fitness and cognitive training for better brain health...!

## References

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