How a memory boost from exercising could pass on to your baby

October 15 2014, by James Cooke

Run for yourself and your kids. Credit: Hartwig HKD, CC BY-NC-ND

We all know that exercise is good for our bodies, but current research is revealing that it is also good for our brains. Exercise has been shown to boost executive functions such as planning, working memory and multi-tasking.

In a study published in the journal Lancet Neurology, researchers at the University of Cambridge report that people who take part in intense exercise for an hour or more every week are far less likely to develop dementia. Their risk is reduced to nearly half that of others.

So how does exercise affect our brains? Physical activity is known to increase levels of genes such as BDNF and IGF-1 in the brain. These genes are associated with neuronal survival and plasticity. In animal studies, the growth of the branches that connect neurons has been shown to increase with physical exercise. Those who ran longer had more wiring in their brains.

Exercise also promotes increased neurogenesis – the creation of new brain cells in adulthood – in a part of the brain called the hippocampus, prefrontal and cingulate cortices, which are all areas associated with memory. Exercise, it seems, not only sculpts our bodies, but it also physically shapes our brains as well.

Surprisingly these benefits of exercise may not be limited to your own brain but perhaps even to your offspring. In a recent study, researchers at Dartmouth College wanted to test whether these benefits extend to other forms of memory that are known to rely on other brain areas. One group of pregnant rats was given access to a running wheel while another group was not, in order to manipulate the amount of exercise they engaged in. After the rats gave birth, the researchers waited for the offspring to mature and then tested their ability to remember certain objects.

It is easy to test if a human remembers an object – you just ask them.

But how can you possibly know whether a rat remembers something? The researchers overcame this problem by exploiting a fundamental principle of animal behaviour. Like all mammals, rats are more interested in novel objects than familiar ones. If you let them spend time with a new object and a previously seen one, it will spend more time exploring the new object – but only if it remembers the other one.

The researchers used this phenomenon to measure the memory of the rat offspring. They found that rats whose mothers had exercised regularly while they were pregnant could reliably remember which of the objects they had seen before. Rats in the other group, however, found it impossible to tell novel objects apart. Maternal exercise during pregnancy had endowed their pups with a vastly superior memory – an effect that lasted well into adulthood.

Adult rats who exercise and the pups of active mothers not only show increased neurogenesis and neuronal growth in the hippocampus, but they also have improved spatial memory, which is a crucial function of the hippocampus. The discovery that the hippocampus is involved in this function won this year's Nobel Prize in Physiology or Medicine.

It is still early days for research into the effect of exercise on the brain. While more research needs to be done on whether humans can inherit brain benefits from exercise, the similarity of our brains to a rat's makes it likely that similar effects of maternal exercise may be observed in human offspring. A large-scale study is currently underway at the University of Oxford which hopes to more fully elucidate the effects of physical activity on cognitive health as we age.

But even though you can't currently bet on a few jogs improving your child's future school grades, you can rely on exercise benefiting your own brain. Remembering to run today may just make you less likely to forget in the future.