

Genes influence aerobic training success

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(PhysOrg.com) -- An international team of researchers has found an explanation for why some people seem to be more responsive than others to regular endurance exercise - which, in turn, might increase their chances of having a long and healthy life. The cause lies in their DNA, where the scientists have been able to identify 11 gene variants that are particularly important in the maximisation of the body's aerobic capacity.

The results, which are presented in an article in [Journal of Applied Physiology](#), can have a bearing on the recommendations given by medical specialists for reducing the risk of [cardiovascular disease](#), type II diabetes and [obesity](#).

What inspired the research was the long acknowledged link between health and the ability to take up and use oxygen in connection with maximal physical effort, what is commonly referred to as aerobic fitness. The more blood the heart manages to pump around the body, the more oxygen can enter the muscles, and the lower the risk of disease and [premature death](#). This is one of the reasons why health experts recommend brisk walks, jogging, swimming, cycling and other physical activities. One problem, however, is that people do not seem to have the same capacity to benefit from the hours spent on the jogging track or in the swimming pool.

To examine this phenomenon, the researchers compared the results from two exercise studies from Europe with one from America. All participants, 514 in all, underwent a series of monitored cycling-based

endurance programmes for 6 to 20 weeks to improve their fitness. In spite of the fact that the average improvement in all groups was around 15 per cent, one in five participants increased their maximal [aerobic capacity](#) by only five per cent or less. These people thus demonstrated an indisposition to respond to this kind of endurance exercise.

The scientists took muscle samples before and after the training period, and using an advanced analytical tool they were able to show the presence of a strong correlation between the activity of some 30 genes and a person's response to aerobic training. They also found that 11 gene variants (SNPs) coincide with the ability to benefit performance-wise from endurance training.

"It might one day be possible to customise prescriptions of physical exercise for optimal health effects," says associate professor Carl Johan Sundberg at Karolinska Institutet, who led one of the three studies that make up the present article. "For some people weight training might be better, while others might benefit more from endurance exercise." He adds that "it is possible that those persons that do not respond with a performance increase could very well improve their blood pressure, blood lipids and glucose metabolism which would help prevent cardiovascular disease". Those analyses were not part of this study, however.

"We can now take a biological sample and say whether a person is likely to increase his or her maximal aerobic capacity through aerobic training," says Professor James Timmons of the Royal Veterinary College in London, who led the study with Professor Claude Bouchard of the Pennington Biomedical Research Center in Louisiana. "This could help doctors prevent and treat, say, cardiovascular disease, by giving a patient tailored advice based on the knowledge they have of his or her personal genetic makeup."

More information: Using molecular classification to predict gains in maximal aerobic capacity following endurance exercise training in humans, *Journal of Applied Physiology*, online 4 feb 2010.

[jap.physiology.org/cgi/content ... bstract/01295.2009v1](http://jap.physiology.org/cgi/content...bstract/01295.2009v1)

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