Exercise Alters Body Fat Metabolism of People With Fatty Liver Disease

Even without weight loss, high-intensity exercise improved metabolism in people with NAFLD.

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High-intensity interval training (HIIT) altered the metabolism of different tissues in people with non-alcoholic fatty liver disease (NAFLD) in various ways. Body fat in these individuals was especially responsive to exercise even in the absence of weight loss, according to study results published in the journal Scientific Reports.

Arising from the accumulation of fat in the liver, NAFLD and its more severe form, non-alcoholic steatohepatitis (NASH), are responsible for a growing proportion of advanced liver disease worldwide. Fatty liver disease is often accompanied by abdominal obesity, hypertension, elevated blood sugar and abnormal blood fat levels, collectively known as metabolic syndrome. As a result of inflammation, NAFLD can lead to the buildup of scar tissue (fibrosis), cirrhosis and even liver cancer. With no effective approved medical therapies, disease management is dependent on lifestyle changes such as weight loss and exercise.

But how exercise benefits people with NAFLD is not well understood. Ambrin Farizah Babu and Ursula Schwab, PhD, of the University of Eastern Finland, and colleagues sought to better characterize the mechanisms underlying how exercise may help.

This randomized controlled intervention study (NCT03995056) included 46 people. For 12 weeks, 21 people participated in high-intensity interval training while 25 others maintained their sedentary lifestyle. Those in the first group underwent exercise training twice a week and worked out independently once a week during the study period. Study participants did not alter their regular diets and did not aim to lose weight.

The researchers compared the clinical and metabolic features at baseline and at the end of the intervention period. They used liquid chromatography-mass spectrometry to analyze metabolic changed biomarkers in adipose (fat) tissue, blood plasma, urine and stool. Of the 46 participants, 42 completed the study and 39 provided samples for analyses. As a result of restrictions due to the COVID-19 pandemic, body fat samples could only be collected at baseline and the end of the study.

Schwab and colleagues found that HIIT significantly reduced waist circumference and fasting

glucose levels. It also improved the participants' maximum oxygen consumption rate and their maximum achieved workload.

Exercise had an impact on metabolic pathways in various tissues. High-intensity exercise led to specific metabolic changes including accumulation of amino acids and their byproducts in fat tissue and blood plasma while their levels dropped in urine and stool. Levels of certain lipids increased in plasma but decreased in stool, while bile acids decreased in fat tissue and urine. In the gut, levels of microbial metabolites changed with exercise, implying some impact of exercise on the types of microbes present or their function.

The researchers suggest that amino acids may have accumulated in adipose tissue due to changes in lipid and glucose metabolism as well as insulin resistance. Furthermore, metabolite levels in fat tissue were linked to clinical features.

Even in the absence of dietary changes and weight loss, exercise seemed to have a positive impact on people with NAFLD. But improvements in abnormal blood lipid levels require dietary guidance, according to the researchers.

"The results highlight especially the role of AT [adipose tissue] in responding to the HIIT challenge, and suggest that altered amino acid metabolism in AT might play a critical role in e.g. improving fasting plasma glucose concentration," they wrote. "Overall, our results indicate that AT might play a critical role in improving plasma glucose concentration and mediating exercise-related benefits. Further, without significant weight loss and dietary changes, exercise might ameliorate NAFLD conditions by regulating glucose metabolism and promoting alterations in amino acid, lipid, and bile acid metabolism upon exercise."

Click here to read the study in the Scientific Reports.
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