Benefits of adolescent fitness to future cardiovascular health possibly overestimated

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There is a well-known relationship between good physical fitness at a young age and a lower risk of cardiovascular disease later in life. However, when researchers adjusted for familial factors by means of

sibling analysis, they found a weaker association, although the link between high body mass index (BMI) and cardiovascular disease remained strong.

The study, "Genetic and environmental factors and cardiovascular disease risk in adolescents," was conducted by researchers from Karolinska Institutet and other universities. It is published in *JAMA Network Open*.

"This does not mean that fitness is irrelevant," says the study's last author Viktor Ahlqvist, doctoral student at the Department of Global Public Health, Karolinska Institutet. "We could still see an association, although it was weaker after taking into account factors shared by full siblings. We also think that adolescence is an important time in life for establishing good habits such as exercising and having a healthy diet."

Many observational studies have previously demonstrated links between various risk factors at a young age and cardiovascular disease in adulthood. However, whether the associations are causal is challenging to prove because of the potential influence of unaccounted genetic and environmental factors.

A collaborative team including researchers from Karolinska Institutet in Sweden has therefore tried to examine if a large proportion of cardiovascular diseases in adulthood could indeed be prevented with a lower BMI, lower blood pressure, improved physical fitness or improved muscle strength in adolescence.

Sourcing data from the Swedish Military Conscription Register and other Swedish registries, the researchers identified over a million 18-year-old males and followed them for 60 years. Almost half of them were full brothers.

"The strength of our study, which makes it more reliable than many other conventional observational studies, is that we have used sibling analyses," says the study's first author Marcel Ballin, researcher at Uppsala University and analyst at Region Stockholm's Center for Epidemiology and Community Medicine.

"By doing so we could examine how the relationship changes when controlling for all shared sibling factors. This includes environmental factors such as childhood environment and half of the genetics."

High BMI is a strong risk factor

The results show that a high BMI in late adolescence was strongly associated with future cardiovascular disease, even after the researchers had controlled for shared familial factors. However, the association between physical fitness and cardiovascular disease was considerably weaker in the sibling analysis, suggesting that many previous observational studies might have overestimated the relevance of adolescent fitness to cardiovascular health later in life.

"Our conclusion is that of the risk factors studied, high BMI is the strongest individual risk factor for cardiovascular disease, and that efforts to tackle the obesity epidemic should continue to be given high priority," says co-author Daniel Berglind, docent at the Department of Global Public Health, Karolinska Institutet.

"A good level of fitness and muscle strength in adolescence doesn't seem as crucial, but physical activity still remains important for public health, as it can bring other health benefits."

Several limitations

The study examined the association between risk factors at a young age and future cardiovascular disease; other disease outcomes were not investigated. The researchers had no data on whether the participants' risk factors varied later in life, and they only studied men, which makes it difficult to extend their findings to women.

The Military Conscription Register also lacks details on certain risk factors for future cardiovascular disease, such as diet, alcohol consumption, smoking, blood lipids and blood glucose.

More information: Marcel Ballin et al, Genetic and Environmental Factors and Cardiovascular Disease Risk in Adolescents, *JAMA Network Open* (2023). DOI: 10.1001/jamanetworkopen.2023.43947

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