

Body phenotypes say a lot, but not everything, about a person's health, according to new research

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Concordia researchers studying body phenotypes—the observable characteristics like height, behavior, appearance and more

measurables—found that regardless of the muscle they had, high levels of fat mass in an individual were associated with poorer overall health.

The findings, published in the journal *Preventive Medicine*, used data from a United States [longitudinal study](#). They show that the negative impact of excess adiposity—fat tissue—on a person's cardiometabolic health was not offset even by high levels of [muscle mass](#).

The researchers based their study on data from NHANES, a cross-sectional representative sample of the US population collected between 1999 and 2006. The data was collected using dual energy X-ray absorptiometry (DEXA), a diagnostic framework that analyzes adiposity and [muscle](#) mass. Based on which side of the 50th percentile they ranked, individuals were categorized into one of four proposed phenotypes: low-adiposity/high-muscle, high-adiposity/high-muscle, low-adiposity/low-muscle or low-adiposity/low-muscle.

The researchers looked at how the adiposity/muscle phenotypes related to lipid levels, including cholesterol and triglycerides, as well as blood sugar glucose and blood pressure. Results were also adjusted for age, sex, race and education.

"We wanted to see whether this proposed categorization was better than the traditional body-mass index (BMI) at predicting all these different cardiometabolic outcomes," says Sylvia Santosa, an associate professor in the Department of Health, Kinesiology and Applied Physiology and one of the authors of the paper.

Surprisingly, they found BMI, though far from perfect, was in some cases a better predictor of cardiometabolic risks like diabetes and hypertension.

Associate professor Lisa Kakinami, Concordia alumna and current

Rhodes Scholar Sabine Plummer, BSc 22, Ph.D. student Jessica Murphy and Tamara Cohen of the University of British Columbia co-authored the paper.

Benefits of BMI

Nevertheless, the data did reveal several striking findings. In comparison to the low-adiposity/high-muscle group, which was the healthiest of the four, the researchers noted the following results:

- The two high-adiposity groups were less likely to be physically active and more likely to have abnormal lipids and less healthy diets.
- The high-adiposity/low-muscle group had higher total cholesterol levels, lower levels of high-density lipoprotein ("good" cholesterol) and lower nutrient intake. This group was also 56 to 66 percent less likely to meet weekly physical activity recommendations.
- The high-adiposity/high-muscle group had unfavorable values for all cardiometabolic and adiposity measures. Nutrient intake was also lower. This group was also 49 to 67 percent less likely to meet physical activity recommendations, roughly 80 percent more likely to have hypertension and 23 to 35 percent more likely to exceed recommended saturated fat intake. Overall, the high-adiposity/high-muscle phenotype was the least likely to meet physical activity and nutrient recommendations and was at the greatest risk of poor cardiometabolic health.
- The low-adiposity/low-muscle group had significantly lower BMI and waist circumferences. This group also had the lowest grip strength across the four phenotypes.

"If we are looking at cardiometabolic risk at the [population level](#), BMI can give you cheap and quick idea about what is happening," Santosa

says.

More information: Lisa Kakinami et al, Body-composition phenotypes and their associations with cardiometabolic risks and health behaviours in a representative general US sample, *Preventive Medicine* (2022). [DOI: 10.1016/j.ypmed.2022.107282](https://doi.org/10.1016/j.ypmed.2022.107282)

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