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Can you really be both 'fat and fit?'

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People "can be obese yet physically healthy and fit and at no greater risk of heart disease or cancer", according to BBC News.

This counterintuitive headline stems from a study that was assessing health outcomes for people who were obese but relatively fit, with only one or no risk factors for "metabolic syndrome". Metabolic syndrome is diagnosed when people have multiple risk factors, such as high blood pressure, that make them more prone to diabetes or cardiovascular disease (CVDs).

Researchers found that the "metabolic healthy" obese group were significantly less likely to develop a CVD or cancer, or die as a result, than people who were similarly obese but were judged to be "metabolic unhealthy". In fact the risks of CVDs and cancers in the "metabolic healthy but obese" group were broadly similar to people with a healthy weight.

However, the research should not be interpreted to mean that being obese is healthy. Waist circumference size is also a risk factor for CVDs, so ideally you should be aiming to have a circumference of less than 94cm (37in) if you're a man and less than 80cm (31.5in) if you're a woman.

The research actually tells us very little that is useful in how fitness levels can affect CVD and cancer risk and whether it is possible to be both "fat and fit".

The main implication of the research is that factors other than weight need to be taken in account when assessing these types of health risks.

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Sweden, the National Institutes of Health, the Spanish Ministry of Science and Innovation, the Swedish Heart-Lung Foundation and the Coca-Cola Company (the funding from Coca-Cola was given as an unrestricted grant; in other words "no strings attached").

The study was published in the [peer-reviewed](#) European Heart Journal.

The media reflected the study findings accurately, but the newspaper headlines should not be interpreted to mean that being obese is healthy. A relevant health message that could have been added is that regular exercise can benefit you even if you remain overweight or obese despite your best efforts to lose weight.

What kind of research was this?

This was a [cohort study](#) aiming to look at the health of obese individuals who are metabolically healthy and without additional risk factors for CVDs. These were described by the researchers as people with "uncomplicated obesity".

The researchers said that there is uncertainty over the extent to which metabolic health in obese people can influence the risk of CVDs and overall mortality. This is what they aimed to examine.

They decided to examine two theories:

Metabolically healthy but obese individuals have a higher fitness level than obese individuals with metabolic abnormalities. Metabolically healthy obese people have reduced risk of CVDs, cancer and mortality compared with obese individuals with metabolic abnormalities – the "theoretically unhealthiest group".

In this study, fitness (according to a treadmill test), obesity and metabolic risk factors all appear to have been measured at one point at the start of the study.

But it is difficult to tell how representative this one-off treadmill test is of the overall fitness level of an obese person, particularly as we don't know how long the person has been obese for.

Measurements on obesity and metabolic health appear to be more reliable than those on fitness.

What did the research involve?

This was an analysis of the Aerobics Center Longitudinal Study (ACLS) which recruited predominantly white professional individuals between 1979 and 2003.

At the time of recruitment a number of assessments were carried out, including:

asking participants to complete a health questionnaire, including medical history and lifestyle habits (such as smoking and alcohol) a physical examination (including measurement of BMI, body fat percentage and blood pressure) and blood tests taken for fasting blood sugar and lipids (triglycerides and high-density lipoprotein (HDL) "good" cholesterol)

They also performed an exercise treadmill test where they were asked to walk or jog slowly on a treadmill that increases its incline gradually. The test is then ended when the participants feel that they no longer

have the stamina to continue (this type of test is known as the Balke treadmill protocol).

A person was defined as metabolically healthy if they met none or only one of the following criteria:

high blood pressure ($\geq 130/85$ mmHg)
 high blood triglycerides (≥ 150 mg/dL)
 low HDL "good" cholesterol (< 40 and 50 mg/dL in men and women, respectively)
 high fasting blood sugar level (≥ 100 mg/dL)

In addition, people with normal blood pressure or fasting blood sugar at the examination, but who reported a history of previously diagnosed high blood pressure or diabetes, were also classed as having these metabolic risk factors.

Participants were followed from recruitment to the end of 2003. Information on mortality came from the National Death Index. Data on non-fatal cardiovascular disease events came from the responses to health surveys in 1982, 1999 and 2004. There was said to be a 65% response rate across surveys.

Eligible participants had no history of cardiovascular disease or cancer at study start (baseline); had complete baseline data on body composition, metabolic risk factors and fitness and completed at least one year of follow-up for health and mortality outcomes.

What were the basic results?

A total 43,265 participants were included in the study (average age 44), a quarter of whom were women.

Of these:

5,649 were obese (13% of the cohort) according to the standard BMI definition ($\text{BMI} \geq 30$ kg/m²)
 12,829 (30%) were classed as obese when using body fat percentage criteria ($\geq 25\%$ for men or $\geq 30\%$ women)

Measuring body fat as opposed to BMI is thought to be a more precise (if time-consuming) method of judging whether a person is overweight or obese.

Within the obese participants, 30% were "metabolically healthy" using BMI-based obesity criteria, and 46% were "metabolically healthy" using body fat percentage criteria.

The average follow-up period was said to be 14 years for mortality and eight years for non-fatal cardiovascular disease.

The main findings were:

"Metabolically healthy" obese participants had a better baseline fitness level on the treadmill test compared with "metabolically abnormal" obese participants (adjusting for age, sex, examination year, smoking and alcohol consumption, and when using either BMI or body fat percentage to define obesity). The difference was the same for men and women.

"Metabolically abnormal" obese participants had significantly increased risk of dying from any cause during follow-up compared with "metabolically healthy" obese participants (adjusting for confounders and using either BMI or body fat percentage to define obesity). When looking at cardiovascular disease outcomes, "metabolically abnormal" obese participants only had increased risk of a fatal or non-fatal cardiovascular disease event compared with "metabolically healthy" obese participants when using body fat percentage to define obesity. There was no difference in risk when using standard BMI definitions.

"Metabolically healthy" obese participants had no difference in risk of dying from any cause, or of fatal or non-fatal cardiovascular disease events compared with "metabolically healthy" normal-weight or fat participants.

How did the researchers interpret the results?

The researchers concluded that metabolically healthy obese individuals have better fitness than their metabolically unhealthy obese counterparts. They also have a better prognosis in terms of mortality and disease risk.

Conclusion

This was an impressive study that benefited from a large sample size, its thorough assessments of medical health and fitness at the study's start and long duration of follow-up.

It found that metabolic health is a predicator of overall health and fitness in obese people. This does not mean that being obese is healthy.

The study did have a number of limitations:

The one-off measure of fitness on the treadmill is hard to interpret as this was assessed at the same time as obesity and metabolic risk factors. We don't know how representative this is of the person's overall fitness in the longer term, which could have varied sharply over time. We also don't know how long the person has been obese for, which makes it difficult to say much about the fitness of people with obesity, with or without metabolic risk factors.

There are possible issues with the follow-up for mortality and cardiovascular outcomes. The recruitment period was 1979 to 2003, and follow-up terminated in 2003. Although the researchers included only people who had been in the study for at least one year, the follow-up of outcomes may be quite short in some cases. Mortality was reliably monitored via the National Death Index, but non-fatal heart disease was reported only from health surveys in 1982, 1999 and 2004, to which there was only a 65% response rate. This means many cases may have been missed. This reduces the reliability of the measurement of the health outcomes described in the study, compared with an objective measure such as reviewing the medical records of participants.

The researchers also acknowledged that the criteria they used to define "metabolically healthy" and "metabolically unhealthy" may differ from other definitions that could have been used. As they said, they did not include information on waist circumference and did not have information on insulin resistance.

The study included predominantly white, middle-aged men, so it isn't representative of all population groups.

Overall, the research plausibly suggests that people who are obese but have no other cardiovascular risk factors may be at lower risk of future diseases compared with obese people who have additional cardiovascular risk factors.

However, the research should not be interpreted to mean that being obese is healthy.

A more valid interpretation of these findings, as the authors said, is that it suggests that accurate assessments of body fat percentage and fitness may contribute to the overall assessment of an obese individual.

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