

This Visceral Tissue Affects How You Think

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STORY AT-A-GLANCE

- › Visceral fat is excess adipose tissue deep in your abdominal cavity that wraps around your organs and plays an active role in creating an inflammatory response in the brain, triggering impaired cognitive function
- › It produces inflammatory molecules that affect the microglia, or immune cells in the brain
- › The inflammatory effect contributes to a higher cardiovascular risk, even in those who are normal weight but with abdominal obesity
- › Visceral adipose tissue is linked to depression and anxiety, which may be a secondary effect of inflammation
- › Your risk can be evaluated by using your waist measurement and waist-to-hip ratio. Address excess visceral fat with nutrition, exercise, stress reduction, hydration and quality sleep

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You may know visceral fat by another name — belly fat. In fact, it goes by several names such as "beer belly" and "middle-age spread." While many see it as an aesthetic problem, carrying extra weight in your midsection has a significant effect on your physical health, including your brain.

You have two basic types of fat. Subcutaneous fat is found just under the skin and is the type that jiggles and dimples. Visceral fat is found under the abdominal muscle, wrapped around your internal organs. This type is more dangerous as it's linked to the production inflammatory cytokines and is considered biologically active.¹

Visceral fat also increases insulin resistance and your risk for metabolic syndrome. It plays a role in the development of Type 2 diabetes, heart disease, breast cancer, colorectal cancer and Alzheimer's disease.²

While many consider their body mass index (BMI) as an indication of whether they fall into a category of overweight or obesity, it is your waist measurement in combination with your waist-to-hip ratio that is a better indication of health.

This measurement of visceral fat helps predict your potential risk for chronic disease and even mortality. Where fat deposits on your body has a distinct impact on your health. Deposits in the hips and thighs result in a pear shape that has a lower potential risk for chronic disease than those with fat deposits in the abdomen, described as an apple shape.

Visceral Fat Associated With Dementia

One of the first studies³ in which researchers evaluated the association between belly fat and dementia was published in 2008. An analysis was conducted of 6,583 people in Northern California. Abdominal measurements were taken and 36 years later researchers looked for recorded diagnoses of dementia in the participants.

Of the cohort, 15.9% were diagnosed with dementia. Researchers compared those with lowest abdominal girth against the highest and found the highest had a three-fold increased risk.

In the past decade the terms "normal weight metabolic obesity," "skinny fat" and "normal weight obesity" have been used to describe those who have a normal BMI but have metabolic characteristics of being obese.⁴ These individuals carry excess belly fat.

One of the risks associated with a high waist-to-hip ratio, even when having a normal weight, is declining cognitive function. But not all studies yield straightforward results linking the two conditions. In a cross-sectional autopsy study,⁵ researchers evaluated 234 participants with abdominal visceral fat measured on autopsy.

They looked for associations between visceral fat and cognitive impairment as defined by clinical dementia. What they found were those who had higher amounts of central obesity had a lower risk of dementia later in life.

Although the authors of other studies found a relationship between obesity and cognitive impairment, the researchers expected those findings since the measurements were made at the same time and the samples were mainly of older adults. In past studies scientists have demonstrated a link between obesity and a higher risk of cognitive function decline, yet when measured later in life the results are conflicting.

The researchers reported on several studies that used a direct measurement of abdominal visceral fat and had demonstrated the same relationship found in this study. In one, a significant reduction in BMI later in life increased the risk of developing dementia in the following three years by 118%.

Study Finds a Pathway That Visceral Fat Affects Cognition

It's not enough to know a link exists. Scientists also want to know what happens at a molecular level. Researchers from Augusta University recently published a study⁶ that showed, for the first time, one pathway visceral fat may use as it damages your brain cells.

The effect influences the microglia, or immune cells in the brain, to change behavior and then trigger functional damage to your neurons.⁷ The results are important, as one of the researchers commented in a press release from the University:⁸

"We have moved beyond correlations saying there is a lot of visceral fat here, and there is cognitive decline here so they may be interacting with each other. We have identified a specific signal that is generated in visceral fat, released

into the blood that gets through the blood brain barrier and into the brain where it activates microglia and impairs cognition."

The signal is a proinflammatory protein called interleukin-1 beta that doesn't often enter the brain. However, visceral fat "generates high, chronic levels of the signal that in turn over-activate the usually protective microglia, the resident immune cells in our brain." Research has demonstrated these reactions were problematic and this offers evidence as to how they are triggering problems.

Using an animal model, the researchers studied the effect on cognitive function and inflammation. These findings help to add pieces to the puzzle of how interleukin-1 beta may affect actions in the central nervous system.

Bigger Belly Predicts Heart Disease Better Than BMI

After a lifetime of exposure to pathogens and toxins, a weakened and overactive immune system may trigger chronic inflammation.⁹ When the inflammatory response triggered by visceral fat is added to this burden it may be a better predictor of heart health than your overall weight. This means those who are normal weight with visceral fat carry a greater risk than they may imagine.

Two studies that were released almost simultaneously revealed similar results – those who carry a spare tire have a greater risk of heart failure or heart disease. The first from the Norwegian University of Science and Technology was a meta-analysis of 23 studies with 650,000 participants. They looked at BMI and the risk of heart failure, finding the risk rose 41% with a rise of five BMI units and accelerated with greater weight gain.¹⁰

Those who were obese had a risk two to three times greater than their normal weight counterparts. The researchers also noted for every 10 centimeters (approximately 4 inches) of an increase in a participant's waist measurement, there was a 29% increased risk of heart failure.

The leaders of several of the studies had adjusted for factors that affect heart health, such as high blood pressure, diabetes and a poor lipid profile, but those with a higher

waist circumference continued to have a greater correlation. One of the scientists from the study commented:

"Overweight individuals had a 35 per cent increased risk of heart failure as compared with normal weight individuals, and our findings indicate that overweight should be considered a clear risk factor for heart failure. Several studies have shown increased concentrations of inflammatory substances in the blood of people with abdominal obesity, and these substances are linked to increased risk of heart failure."

The second study from the Intermountain Medical Center Heart Institute and Johns Hopkins Hospital evaluated the risks of central obesity as a predictor of heart disease in those also suffering Type 1 or Type 2 diabetes without previous symptoms of heart disease.¹¹

The team started with 200 participants who met the criteria and discovered that independent of total body weight, central obesity "was strongly associated with regional left ventricular dysfunction, which is a common cause of heart disease, including congestive heart failure."

The results were presented at the 2016 American College of Cardiology Scientific Session. The co-director of research from Intermountain Medical Center Heart Institute, Dr. Brent Muhlestein, commented on the results of the study and the implications it has on assessment and treatment.¹²

"Our research examined patients with diabetes, who are considered high risk for developing heart disease already, and found that the shape of your body determined if you were at a greater risk to develop left ventricular dysfunction. This study confirms that having an apple-shaped body – or a high waist circumference – can lead to heart disease, and that reducing your waist size can reduce your risks."

Stomach Fat Affects Mental Health

Visceral adipose tissue is also linked to mental health conditions such as depression and anxiety. In one study of postmenopausal women, those with abdominal obesity were more likely to struggle with depression than those without. This led the researchers to conclude that "visceral fat accumulation was an independent and positive factor significantly associated with the presence of depressive symptoms."¹³

Men also suffer from a higher risk of depression with abdominal obesity, as demonstrated by a study of 2,502 men and women. The researchers measured leptin levels and visceral fat and used either an assessment scale or antidepressant prescription to measure depression.¹⁴ They found higher levels of leptin increased the risk of depression in men, leading this team to conclude:

"In older men, high leptin was associated with an increased onset of depressive symptoms especially in the presence of abdominal obesity, suggesting that underlying leptin resistance may play a role in this link."

Differences in visceral fat levels and metabolic consequences may explain the absence of this association in women. These findings suggest a potential biological link between depression, obesity and their joint association with negative health outcomes."

The link between abdominal obesity and depression may be related to the inflammatory response the active fat triggers. Inflammation has a link to depression as demonstrated in several studies. In a literature review¹⁵ of 30 studies with 1,610 participants, researchers found anti-inflammatory agents reduced symptoms of depression when compared to a placebo.

These results support other evidence finding a link between inflammation and depression.^{16,17} Unfortunately, mental health screening may overlook this factor.

Evaluate Your Risk With Waist-to-Hip Ratio

As demonstrated in this short video, using a waist-to-hip ratio is a more reliable indication of your future risk of chronic disease, heart disease and mental health. A

higher ratio is suggestive of more visceral fat accumulation around your abdominal organs, which is far more hazardous to your health than the subcutaneous fat located directly under your skin.

To determine your waist-to-hip ratio you'll want to measure both areas. Start by measuring your waist using a spring-loaded or cloth tape measure. Find your waist, which is your midpoint between your last rib and your iliac crest. These are the bones on the front of your abdomen, as shown in this video.

Measure the area in the middle without pulling the tape measure too tight. Take a couple of measurements, allowing 30 seconds between each one to allow your skin and subcutaneous tissue to return to normal. Be sure to take the measurement at the same place each time. Using just your waist circumference, your risk categories are:

Risk Category	Female	Male
Very Low	<27.5 in (<70 cm)	<31.5 in (<80 cm)
Low	27.5 - 35.0 in (70-89 cm)	31.5 - 39 in (80-99 cm)
High	35.5 - 43.0 in (90-109 cm)	29.5 - 47 in (100-120 cm)
Very High	>43.5 in (>110 cm)	>47 in (>120 cm)

Your hip measurement is taken at the widest part of your buttocks, again without pulling the tape too tightly and taking at least two measurements for accuracy. You get your ratio by dividing your waist measurement by your hip measurement. These are the waist-to-hip ratio norms:

Waist-to-Hip Ratio	Men	Women
Ideal	0.8	0.7

Waist-to-Hip Ratio	Men	Women
Low Risk	<0.95	<0.8
Moderate Risk	0.96 - 0.99	0.81 - 0.84
High Risk	>1.0	>0.85

Approaches to Addressing Belly Fat

As I've written before, doing spot reducing exercises won't burn through subcutaneous or abdominal fat. You may build strong core muscles, but they'll still be hidden under subcutaneous fat. People use the term "spot reduction" to refer to the idea you can affect layers of fat in one area of the body by exercising muscles in that area.

Visceral fat is more dangerous than subcutaneous fat but is also easier to gain and to lose. Along with practicing intermittent fasting and eating a ketogenic diet to support your mitochondrial health and weight loss efforts, these strategies may help you lose both subcutaneous and visceral fat:

- **Reduce stress** — Located on top of each kidney are your adrenal glands. Cortisol is a steroid produced by these glands related to your "fight or flight" response. When you're under chronic stress cortisol increases fat distribution to your abdominal area.¹⁸
- **Stay hydrated** — Drinking water may be one of the easiest ways to reduce psychological and physical stress. Your body is made of more than 60% fluid and your kidneys require fluids to flush toxins from your body. When you're dehydrated it affects the release of cortisol and alters metabolism.¹⁹ You'll know you're well hydrated by the color of your urine, which should be light straw-colored.
- **Quality sleep** — Maintaining adequate amounts of quality sleep will help you control stress. Loss of sleep may alter your production of hormones, including cortisol, and

leave you vulnerable to the effects of daily stress. Sleep deprivation may lead to an increase in cortisol²⁰ leading to a compromised immune system and disruption in metabolism and cognitive impairment.

- **Control insulin level** – Your body produces insulin in response to eating carbohydrates, which works with cortisol to help regulate your blood sugar levels.²¹ By reducing your carbohydrate intake you'll reduce your insulin secretion and may help reduce the accumulation of visceral fat.
- **Optimize vitamin C** – Vitamin C offers resilience against stress²² and plays a role in stabilizing blood sugar, which contributes to the production and release of cortisol. When you eat multiple servings of vegetables and fruit each day, you help maintain your levels of vitamin C. Remember, fresher produce tends to have higher concentrations of vitamins.

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