



SIGNAL & NOISE™

— No. 02

Body Composition Testing:

How Accurately Can We Measure Body Fat?

A physician's closer look at the science behind modern health practices.

Walk into a modern gym, wellness clinic or longevity centre and you may be offered something that once belonged largely to research laboratories: a detailed map of your body. A DEXA scan may report body-fat percentage, lean mass, regional fat distribution and estimated visceral fat. A bioimpedance machine may produce an even longer report, sometimes dividing muscle and fat between individual limbs, while consumer smart scales promise versions of the same information at home.

The numbers can look remarkably precise: 23.7% body fat, 31.4 kg of skeletal muscle, perhaps a visceral-fat score to monitor over time. But precision on a screen is not necessarily precision in the underlying biology. Body composition certainly matters; fat distribution, muscle mass and their changes with age are associated with health. The more difficult question is whether measuring them with increasing technological sophistication gives us information that meaningfully improves our health decisions—or simply gives us more numbers to track.

The Claim

The argument for body-composition testing is compelling. Weight and BMI cannot distinguish fat from muscle or show where fat is stored, and two people with identical BMIs can have very different amounts of muscle and abdominal adiposity. Technologies such as dual-energy X-ray absorptiometry (DXA, commonly called DEXA) and bioelectrical impedance analysis (BIA) promise to look beneath body weight and provide a more meaningful picture.

There is truth in that claim. The more important question is how accurate that picture is, what it tells us about health, and whether the additional information is useful enough to influence what we actually do.

What Are These Tests Actually Measuring?

DEXA uses low-energy X-rays to estimate bone mineral, fat mass and lean soft tissue. It can provide regional measurements and, with appropriate software, estimate visceral adipose tissue. It is sophisticated and highly reproducible, but it does not directly count fat cells or weigh someone's muscles. Body-composition values remain estimates derived from the way tissues attenuate X-rays, and testing conditions and methodology can influence serial measurements.¹

Bioimpedance works differently. A small electrical current passes through the body and the device measures impedance. Because water-rich tissues conduct electricity differently from fat, equations are then used to estimate total body water, fat-free mass and body fat. This distinction is important because the attractive body diagram on a BIA report is several inferential steps removed from what the machine actually measured: electrical impedance. Hydration, recent food intake, exercise and testing conditions can therefore influence the result.²

What Does the Human Evidence Show?

DEXA is generally the stronger method for detailed body-composition assessment, but even DEXA should not be mistaken for an error-free measure of biological truth. BIA provides a particularly useful illustration of the difference between **reliability and accuracy**: a machine can give very similar results when someone is tested repeatedly without those numbers necessarily representing their true body composition.

A 2025 real-world study comparing multi-frequency BIA with DEXA in 1,000 healthy adults found excellent test-retest reliability. Yet BIA underestimated body-fat percentage by an average of 4.2 percentage points in men and 2.8 points in women compared with DEXA, while agreement was weaker for visceral fat.³ A 2026 systematic review comparing BIA with four-compartment reference models reached a similar conclusion. Across 12 studies, average bias in body-fat percentage ranged from -3.5 to +4.4 percentage points, while the limits of agreement for individuals commonly spanned approximately 15–20 percentage points.⁴

This does not make BIA useless; it tells us what kind of information it provides. A scale displaying 22.6% body fat is producing an estimate that may be useful for certain purposes. The presence of a decimal point does not transform that estimate into biological certainty.

Where Signal Becomes Noise

This is where body-composition testing becomes particularly interesting. The signal is real: **body composition matters, and technology can estimate it**. The noise begins when an estimate is treated as an exact measurement and small movements in that estimate are interpreted as meaningful biological change.

If a BIA result moves from 24.1% to 22.8% body fat, it is tempting to conclude that 1.3 percentage points of body fat have been lost. Depending on the device and testing conditions, however, some of that difference may reflect measurement variability rather than fat loss. DEXA reduces some of this uncertainty but does not eliminate it, particularly when serial measurements are being used to detect relatively small changes.

This illustrates a broader issue in modern health technology. Our ability to generate measurements is advancing rapidly, but our ability to determine what every measurement means has not necessarily advanced at the same pace. The more precise a number appears, the easier it becomes to forget the uncertainty that produced it.

Does Knowing Your Body Composition Predict Your Health?

This is arguably the more important question. Visceral and central adiposity are associated with metabolic and cardiovascular risk, and DEXA can estimate visceral adipose tissue. It therefore seems reasonable to assume that measuring visceral fat directly should improve our assessment of future health, but the evidence is more complicated.

In a 2025 prospective study of 4,866 middle-aged adults followed for a median of 7.9 years, greater DEXA-estimated visceral fat was associated with subsequent cardiovascular and coronary events. After adjustment for BMI and waist circumference, however, visceral fat was no longer independently associated with cardiovascular events. The researchers concluded that further work is needed to establish whether DEXA improves risk discrimination beyond ordinary anthropometric measures.⁵

The Tromsø Study produced a similar message. Among 3,675 adults, DEXA-derived visceral fat had statistically stronger associations with some cardiometabolic risk factors than conventional measurements, yet the clinical differences were small. The researchers concluded that simple anthropometric measures were satisfactory substitutes for identifying cardiometabolic risk.⁶

This is an important distinction. A sophisticated measurement can contain genuine biological information without necessarily adding enough information to change a health decision. Knowing precisely how much visceral fat someone has may be interesting, but if waist circumference and established cardiovascular

risk factors lead to essentially the same clinical conclusion, the additional measurement may have limited practical value.

What About Muscle?

Muscle provides an even more revealing example. Maintaining muscle as we age matters, so it seems intuitive that accurately measuring lean mass should tell us something important about future health. Yet how much muscle someone has and what that muscle can do are not the same thing.

The Sarcopenia Definition and Outcomes Consortium examined evidence from multiple cohorts and clinical datasets. Low grip strength and slow gait speed predicted outcomes including falls, mobility limitation, hip fracture and mortality, whereas DXA-derived lean mass was not a good predictor of these adverse outcomes in community-dwelling older adults.⁷ This does not make lean mass irrelevant, particularly in clinical populations where muscle loss or nutritional status matters, but it demonstrates that **function can sometimes tell us more than structure**.

A scan can estimate how much lean tissue someone has. It cannot tell us how strong they are, how easily they climb stairs, how quickly they walk or how physically capable they will remain as they age. Those may ultimately be the outcomes that matter more.

Risks & Trade-offs

For most healthy people, the principal downside of body-composition testing is not physical harm. BIA is non-invasive, while DEXA uses a small amount of ionizing radiation. The more relevant questions are cost, interpretation and what happens to the information afterwards.

A baseline measurement may be interesting, and repeated measurements can sometimes help track substantial changes during weight loss, nutritional treatment or training. Testing becomes less useful when small fluctuations become targets in themselves, particularly when those fluctuations may fall within the uncertainty of the measurement.

There is also an opportunity cost. Repeatedly measuring visceral fat, lean mass and body-fat percentage may add relatively little if someone is already following waist circumference, blood pressure, metabolic markers, strength, fitness and other established indicators of health. More data become valuable when they lead to better decisions, not simply because they can be collected.

What We Still Don't Know

Body-composition technology continues to improve. Modern multi-frequency BIA is more sophisticated than early consumer devices, while DEXA software increasingly provides regional and visceral-fat estimates. What remains less certain is their **clinical utility for routine testing in otherwise healthy people**.

We need better evidence identifying when detailed body-composition testing adds enough predictive or decision-making value beyond simpler measurements to justify routine use. That is different from its use in selected clinical populations, research, nutritional assessment or circumstances where ordinary body weight and BMI may be misleading. The relevant endpoint is not whether a machine can generate another metric, but whether that metric helps someone make a better health decision.

The Practical Takeaway

So, is body-composition testing worth it? For most healthy adults, I would regard it as **useful information rather than essential health information**. A well-performed DEXA scan can provide an informative baseline of fat distribution, lean tissue and bone, particularly when there is a specific reason to look beyond weight and BMI. A good multi-frequency BIA device can also be useful for following broad trends

when it is inexpensive or readily available, provided measurements are taken under reasonably consistent conditions and small changes are not overinterpreted.

The more important question is what the result will change. If your body-fat percentage falls while your waist circumference, blood pressure, metabolic health and physical performance remain unchanged, the significance of that number is uncertain. Conversely, if your waist is shrinking, strength and fitness are improving and your metabolic markers are healthy, an expensive scan may add surprisingly little to the story.

Body composition matters, and measuring it can sometimes be useful. **But the ability to measure something more precisely does not necessarily make it more important, nor does it guarantee that knowing the number will improve your health. That is where the signal currently ends.**

References

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