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Measuring Obesity

Comparing Different Body Measurements

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Canadians are getting fatter (Katzmarzyk 2002), contributing to a reduced quality of life and higher death rates associated with obesity-related diseases. High levels of total body fat, especially centrally located fat (visceral fat) increase the risk of many metabolic conditions, including altered glucose metabolism and lipid metabolism. This combination of key metabolic disturbances, the "metabolic syndrome," strongly links to an increased risk for Type 2 diabetes, coronary heart disease, and other illnesses.

Of the three body measurement methods described in the following article, waist circumference is the only measurement known to be a powerful independent predictor of visceral adipose tissue. This measurement is easy to administer and is the best anthropometric indicator of the amount of visceral adipose tissue. As Despres et al. (2001) state, "waist girth should be considered as a 'vital sign' and recorded in the medical chart of every patient."

Possible changes to BMI and waist and hip circumference over 20 years

	20 years old	40 years old
BMI	24	34
Waist (cm)	82	102
Hip (cm)	102	127
Waist-to-hip ratio	.80	.80

Another reason to support this measurement is that visceral fat is more easily released compared to other fat storage sites (Lafontan & Berlan, 2003; Lemieux, Prud'homme, Tremblay, Bouchard, & Despres, 1996). Other body composition measurements may not detect these visceral fat changes. Both waist and hip circumference often change as we age. The table on this page shows increases in BMI and waist and hip circumferences over 20 years. Combining these changes may lead to an unaltered waist-to-hip ratio that might hide a problem. Yet a look at waist circumference alone leads to a different conclusion.

BMI does not evaluate waist circumference changes or reflect visceral adipose tissue stores. The simplicity and effectiveness of waist circumference, both as an assessment method and for monitoring change over time, should make it the tool of choice for all health practitioners. We've targeted the part of the body that creates the problem, so let's target the same part of the body for its treatment.

Which is Best? Comparing Body Composition Assessments

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The Problem

According to the 2003 Canadian Community Health Survey, 14.9% of adult Canadians are obese and 33.3% are overweight (Statistics Canada, 2004). Overweight and obesity are serious health problems that reduce life expectancy and increase the risk of developing Type 2 diabetes, abnormal concentrations of lipids in the blood (dyslipidemia), hypertension, coronary heart disease, gallbladder disease, obstructive sleep apnea, and certain cancers (Health Canada 2003).

Overweight and obesity result from people consuming more calories than they spend through daily physical activity. Health practitioners from many disciplines promote physical activity and healthy eating to help people maintain or reduce weight and decrease the risk of serious chronic diseases.

Health practitioners use body composition measures to educate and identify people at risk for chronic disease. In addition, a lot of health-promotion literature includes a body composition assessment. This article is intended to inform health practitioners about ways to measure body composition and compare each method's effectiveness in predicting the risk of chronic disease.

According to many researchers, it is not the total amount of fat that causes chronic disease, but the location of the fat. Centralized fat on the trunk (rather than a general pattern of fat under the skin) links more directly to cardiovascular disease, colon cancer, carbohydrate and/or lipid metabolism disorders, and possibly hypertension (Despres, Lemieux, & Prud'homme, 2001; Foucan, Hanley, Deloumeaux, & Suissa, 2002; Health Canada, 2003; Moore et al., 2004; Seidell, Perusse, Despres, & Bouchard, 2001).

Comparing Body Composition Indexes

Unfortunately, researchers have not defined the best body composition index or combination of indexes. The various indexes do not account for differences between men and women, the young and the elderly, the fit and the unfit, and differences in the body build of certain ethnic groups (Health Canada, 2003).

Below, we briefly describe the indexes currently found in health-promotion literature as well as the pros and cons of using these assessments in your practice.

Body Mass Index (BMI)

The BMI is one of the most common measures of a healthy weight (Dalton et al., 2003; Health Canada, 2003). The BMI is frequently used to indicate whether people's weight is appropriate for their height.

To calculate the BMI, divide weight by height squared (kg/m^2). The BMI assumes that the higher the score, the more body fat and the greater the chance of developing a weight-related health problem over time.

Health Risk Classification According to BMI

BMI	Weight Classification	Risk of Developing a Health Problem
<18.5	Underweight	Increased risk
18.5–24.9	Normal weight	Least risk
25.0–29.9	Overweight	Increased risk
30 and over	Obese	High
30.0–34.9	Obese Class I	High risk
35.0–39.9	Obese Class II	Very high risk
>40.0	Obese Class III	Extremely high risk

Source: Health Canada, 2003.

Pros: The BMI is considered a useful indicator of the health risks associated with being underweight, overweight, or obese (Health Canada, 2003).

Cons: The general public has difficulty in calculating their correct BMI because of inaccuracies in self-reported height and weight measurement (Janssen, Katzmarzyk, & Ross, 2004).

The BMI also does not identify the location of the excessive body weight or what makes up the body weight composition. For example, an athletic person might have a high BMI because he/she has a greater muscle mass and bone tissue (denser and heavier than fat). The BMI is also limited in predicting visceral abdominal fat accumulation.

Health Canada (2003) also cautions about using the BMI with certain populations. Groups that require special consideration include

- young adults who are not fully grown;
- adults who are naturally very lean;
- adults with very muscular body builds;
- adults over 65 years;
- certain ethnic or racial groups.

Researchers have also found that people with similar BMIs can vary considerably in abdominal-fat mass (Dalton et al., 2003). As mentioned earlier, evidence suggests that the more important factor is where the fat accumulates on the body.

Waist-to-Hip Ratio

The waist-to-hip ratio estimates the relative accumulation of fat in the abdomen, hips, and thighs. This ratio is often equated with the "apple" and "pear" body shapes.

Although each type of fat pattern (the apple or pear) can occur in both sexes, generally speaking, men tend to be apples and women tend to be pears. Typically, men distribute fat around their abdomen (apple shape), and women deposit high amounts of fat around their hips, buttocks, and thighs (pear shape).

To assess your waist-to-hip ratio, place a measuring tape horizontally around your waist at the narrowest part of your torso. (Take this measurement after a normal exhalation.) For the hip, place the tape measure horizontally at the greatest protuberance of the buttock. To determine the waist-to-hip ratio, divide your waist measurement by hip measurement.

Health Risk Classification According to Waist-Hip-Ratio

	Ratio	Level of Risk
Men	1 or higher	High risk
Women	0.8 or higher	High risk

Source: Adapted from Heyward (2002).

Pros: The waist-to-hip ratio describes relative differences between abdominal and hip girth.

Cons: The waist-to-hip ratio has the greatest rate of measurement error. The measure can vary depending on where people place the tape measure when calculating the girth of the hips and abdomen and how tightly they hold the tape measure (Molarius, Seidell, Sans, Tuomilehto, & Kuulasmaa, 1999).

Differences in waist circumference come from differences in subcutaneous fat (fat under the skin) and visceral fat (fat deep in the abdomen surrounding internal organs). On the other hand, variation in hip circumference includes variation in bone structure (pelvic width), gluteal muscle, and subcutaneous gluteal fat (Seidell et al., 2001).

Recent research has found that a narrow waist and large hips may actually protect against cardiovascular disease. At the very least, excessive body fat in the buttocks and thighs is not a threat to cardiovascular health in premenopausal women (Bigaard et al., 2004; Despres et al., 2001; Seidell et al., 2001).

Waist Circumference

Waist circumference is a girth measurement of total abdominal fat that includes both subcutaneous fat and visceral fat. Ribisl (2004) sees waist circumference as a better measure of abdominal visceral adipose tissue than the waist-to-hip ratio in both men and women.

To measure waist circumference, place a tape measure horizontally around your waist at the narrowest part of your torso (for obese people, measure at the navel/belly button), keeping the tape measure level or parallel to the floor. (Take the waist circumference measurement at the end of a relaxed expiration.)

Health Canada (2003) has adopted cut-off points (identified by Lemieux, Prud'homme, Bouchard, Tremblay, & Despres, 1996) for abdominal girth measurement in both men and women. A waist circumference greater than the cut-off point indicates an increased risk of Type 2 diabetes, coronary heart disease, and hypertension.

Health Risk Classification According to Waist Circumference

	Waist Circumference Cut-off Points	Health Risk
Men	>102 cm (40 in.)	Increased risk of developing health problems
Women	>88 cm (35 in.)	

Source: Health Canada, 2003.

Pros: Considerable evidence associates excess visceral abdominal fat with a greater risk of Type 2 diabetes, coronary heart disease, and cancer (Despres, et al., 2001; Foucan et al., 2002; Health Canada, 2003; Janssen, Heymsfield, Allison, Kotler, & Ross, 2002; Moore et al., 2004; Ribisl, 2004).

Waist circumference not only predicts abdominal visceral fat, but can also monitor changes over time (Despres et al., 2001).

Cons: Several researchers have proposed different cut-off points based on a person's age and sex. A range of waist circumference measurements that gradually increases would better assess the level of health risk than the single cut-off points currently used (Despres et al., 2001; Janssen et al., 2004).

Comparing Ways to Measure Fat

Most studies reviewed for this article agree that waist circumference is the best simple measure of visceral and subcutaneous abdominal fat. Fat that accumulates around the trunk (waist, chest, and back) indicates greater health risks than fat in other areas. Chan, Watts, Barrett, and Burke (2002) found little value in measuring waist-to-hip ratio or BMI in men because the waist circumference "is the anthropometric index that most uniformly predicts the distribution of adipose tissue among several fat compartments in the abdominal region."

Janssen et al. (2004) found "compelling evidence that BMI coupled with WC [waist circumference] does not predict an increase in obesity-related health risk better than does WC alone when the two values are examined on a continuous scale."

In fact, Janssen et al. (2004) found that overweight and obese people have a health risk comparable to that of normal weight people with the same waist circumference. Therefore, waist circumference and not BMI is the better body composition measurement to determine obesity-related health risk (Janssen et al., 2004).

References

References for this article can be found at www.centre4activeliving.ca/Publications/WellSpring/index.html.

Mission Statement of the Alberta Centre for Active Living

Working with practitioners, organizations, and communities to improve the health and quality of life of Albertans through physical activity.

IF YOU HAVE ANY SUGGESTIONS OR QUESTIONS, WE'D LIKE TO HEAR FROM YOU.

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