



# *ASSESSING BODY COMPOSITION*

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# *COMPOSITION OF THE HUMAN BODY*

- *Reference Man*
- *Reference Woman*
- *Minimal Standards for Leanness*



*REFERENCE MAN*



# *REFERENCE WOMAN*



*MINIMAL STANDARDS FOR  
LEANNESS*

# *VALIDITY OF A TEST*

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- *Is the test measuring what it is suppose to measure?*

# *RELIABILITY OF A TEST*

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- *Can you repeat the same measurement over time?*

# *COMMON TECHNIQUES*

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- *Hydrostatic Weighing*
- *Anthropometric Assessment: Skinfold*
- *Bioelectrical Impedance*
- *Near-Infrared Interactance (NIRI)*

# *HYDROSTATIC WEIGHING*

- *Research History*
- *How it Works*
- *Validity*
- *Reliability*
- *Advantages / Disadvantages*

# *RESEARCH HISTORY*

- *The use of whole body density to estimate human body composition had its roots in the 1930s when the U.S. Navy became interested in developing a practical method of assessing body fat in divers.*

# *RESEARCH HISTORY*

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- *Assumptions for body density were developed from measurement taken on cadavers*

# *RESEARCH HISTORY*

- *The body is composed of two compartments, fat mass and fat-free mass, each of which has a known and constant density.*
- *Fat Mass: .9 kilograms per liter.*
- *Fat-Free Mass: 1.1 kilograms per liter.*

# *ASSUMPTIONS*

- *The densities of the fat and lean components are known.*
- *The densities of the components are relatively constant between individuals.*
- *The density of the bone and muscle of the lean component are constant within and among individuals.*

# *ASSUMPTIONS*

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- *The proportional contributions of bone and muscle to the density of the lean component remain constant.*

# *HOW IT WORKS*

- *It is based on Archimedes' principle for determining body density or specific gravity.*
- *The density of the whole body is the ratio of total body weight to total body volume.*

# *HOW IT WORKS*

- *Total body volume is estimated by the weight of the volume of water displaced when the body is completely submerged underwater.*
- *From this density measure, you can estimate the percentage of body fat and lean body weight.*

# *VALIDITY*

- *Is the technique measuring what it is suppose to measure?*
- *One can increase Validity of the technique by considering age, gender and ethnicity.*

# *RELIABILITY*

- *Can you repeat the same measurement over time?*
- *Standard Deviation: +/- 3.8 to 4.6 percent body fat.*

# *ADVANTAGES*

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- *Technique is easy to use.*
- *Economical*
- *Highly repeatable*
- *Reliable*



# *DISADVANTAGES*

# *ERROR RANGE*

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- *+/- 3% TO 4%.*

# *Anthropometric Assessment: SKINFOLD*

- *Research History*
- *How it Works*
- *Validity*
- *Reliability*
- *Advantages*
- *Disadvantages*

# *RESEARCH HISTORY*

- *Brozek and Keys : 1951*
- *Predictions of Body Density from anthropometric measurements.*
- *Measurement of Subcutaneous Fatfolds (skinfolds).*
- *General Equations.*

# *ASSUMPTIONS*

- *Skin compressibility is constant*
- *Skinfold fraction is constant*
- *Adipose tissue patterning is fixed*
- *Fat Fraction in adipose tissue is constant*
- *There is a fixed proportion of internal to external fat.*

# *HOW IT WORKS*

- *Calipers*
- *Standardized pressure on the measurement site.*
- *Measuring the thickness of a double fold of skin and compressed subcutaneous adipose tissue.*



*VALIDITY*



# *RELIABILITY*

# *ADVANTAGES*

- *Convenient*
- *Accurate*
- *Reproducible*
- *Valid*



# *DISADVANTAGES*

# *BIOELECTRICAL IMPEDANCE*

- *Research History*
- *How it Works*
- *Validity*
- *Reliability*
- *Advantages*
- *Disadvantages*

# *RESEARCH HISTORY*

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- *This method was developed to monitor fluid volumes in people who were on dialysis machines because of kidney dysfunction.*

# *HOW IT WORKS*

- *Electrical resistance of the body is measured where changes in electrolyte levels are detected.*
- *Principle: lean tissue has a far greater electrolyte content than fat.*

# *VALIDITY*

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- *Need for more validated standard prediction equations.*



# *RELIABILITY*

# *ADVANTAGES*

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- *Quick.*
- *Easy to use.*
- *Less investigator error.*



# *DISADVANTAGES*

# *ERROR RANGE*

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- *+/- 3% TO 6%*

# *NEAR - INFRARED INTERACTANCE (NIRI)*

- *Research History*
- *How it Works*
- *Validity*
- *Reliability*
- *Advantages*
- *Disadvantages*

# *RESEARCH HISTORY*

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- *It was developed for agricultural studies that measured moisture, protein, and fat in the foods we eat.*

# *HOW IT WORKS*

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- *Principles of light absorption.*
- *Reflection.*
- *Near-Infrared spectroscopy.*

# *VALIDITY*

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- *Prediction Equations.*
- *Need for more studies.*



# *RELIABILITY*

# *ADVANTAGES*

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- *Easy to perform*
- *Noninvasive*



# *DISADVANTAGES*

# *ERROR RANGES*

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- *No general consensus*

# *ASSESSING the ASSESSMENTS*

- *Validity*
- *Reliability*
- *Population*
- *Available Equipment*

# *INTERPRETATION OF RESULTS*

- *Current Available Norms*
- *Error Range*
- *Healthy Ranges*



# *AVAILABLE NORMS*



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# *ERROR RANGE*



# *HEALTHY RANGES*

## TECHNIQUES

HYDROSTATIC  
WEIGHING  
GOLD STANDARD  
METHOD

SKINFOLD  
+/- 3.5% TO 3.9%  
VALID  
RELIABLE

BIOELECTRICAL  
IMPEDANCE  
+/-3% TO 6%  
VALIDITY: LOW

NIRI  
NO CONSENSUS  
VALIDITY:low  
RELIABILITY: