(Body Composition
&
Weight Management)

ترکیب بدن و مدیریت وزن

دکترمحمد صمدی

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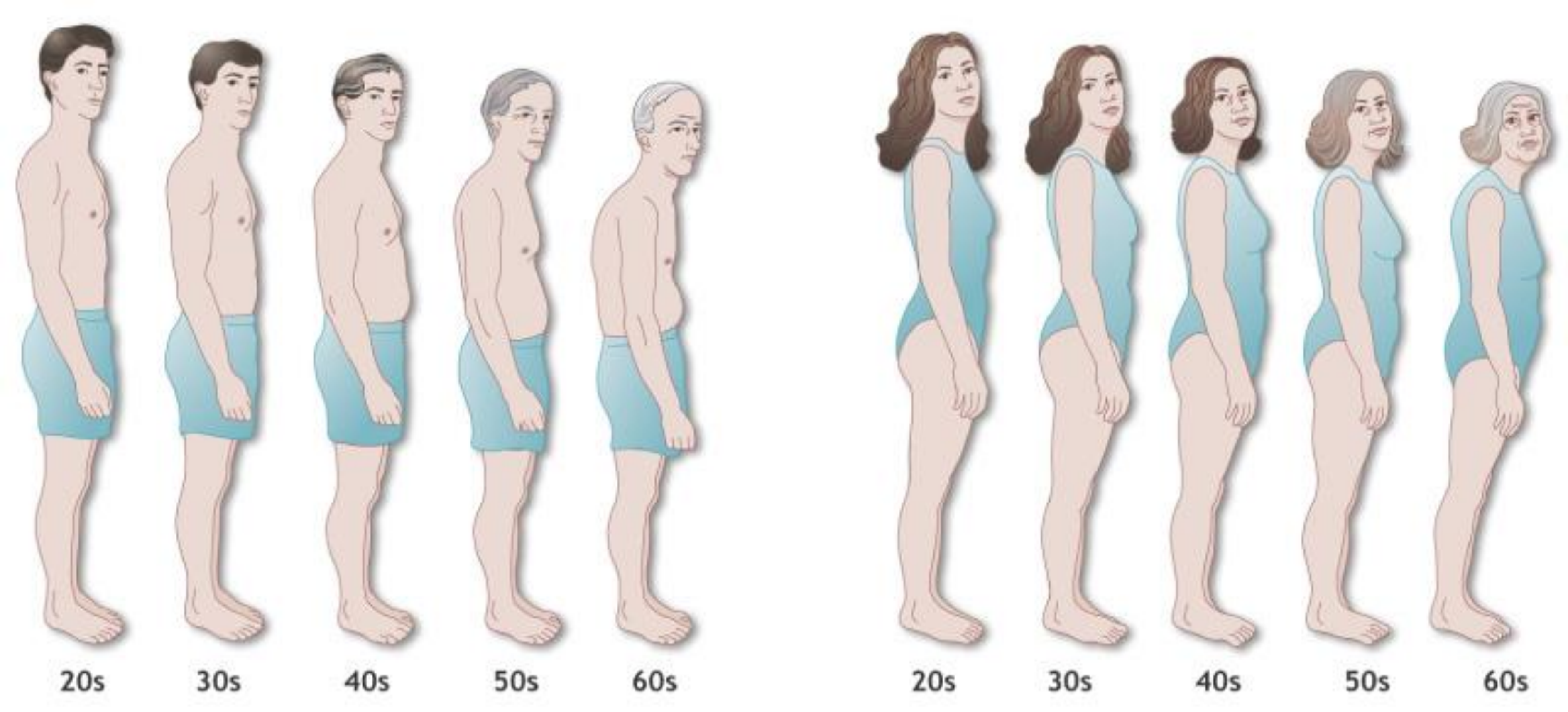
We All Change in Many Ways


20s
30s
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60s

وزن بدن(Body weight) و ترکیب بدن (Body Composition)

- وزن بدن و ترکیب بدن دو عامل اصلی تاثیر گذار بر عملکرد ورزشی می باشند.
- وزن بدن بر روی شاخص های سرعت، استقامت و توان و ترکیب بدن بر روی قدرت، چابکی و تناسب اندام تاثیر گذارند.

DIMITAR DILKOFF/AFP/Getty Images

Body composition and weight are important in sports with weight classes (e.g., figure skating, gymnastics).

BODY COMPOSITION

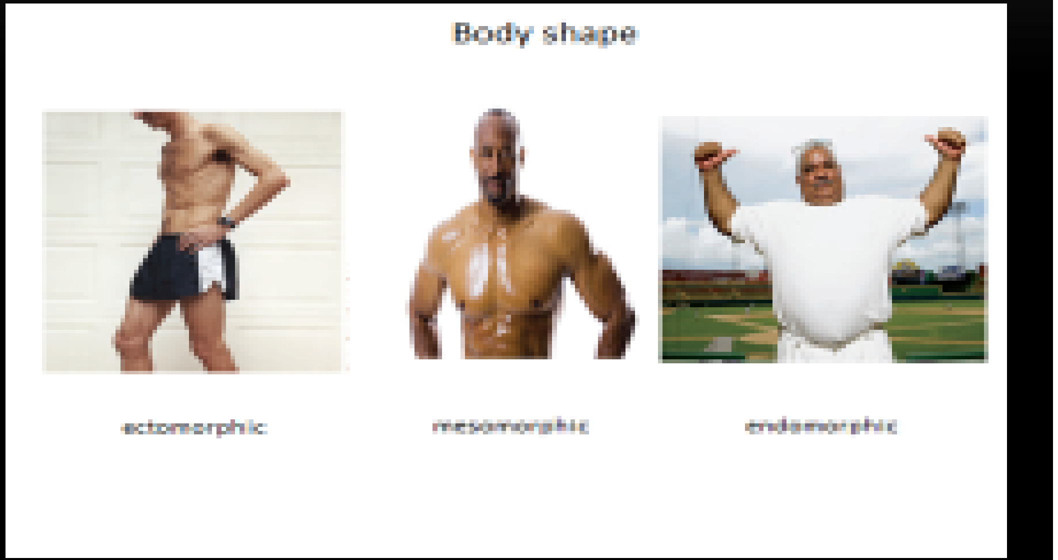
ترکیب بدن نسبت به اندازه و وزن بدن، نمایه دقیق تر و بهتری برای تناسب اندام می باشد.

Being over-fat (not necessarily over weight) has a negative impact on athletic performance.

واژه ها

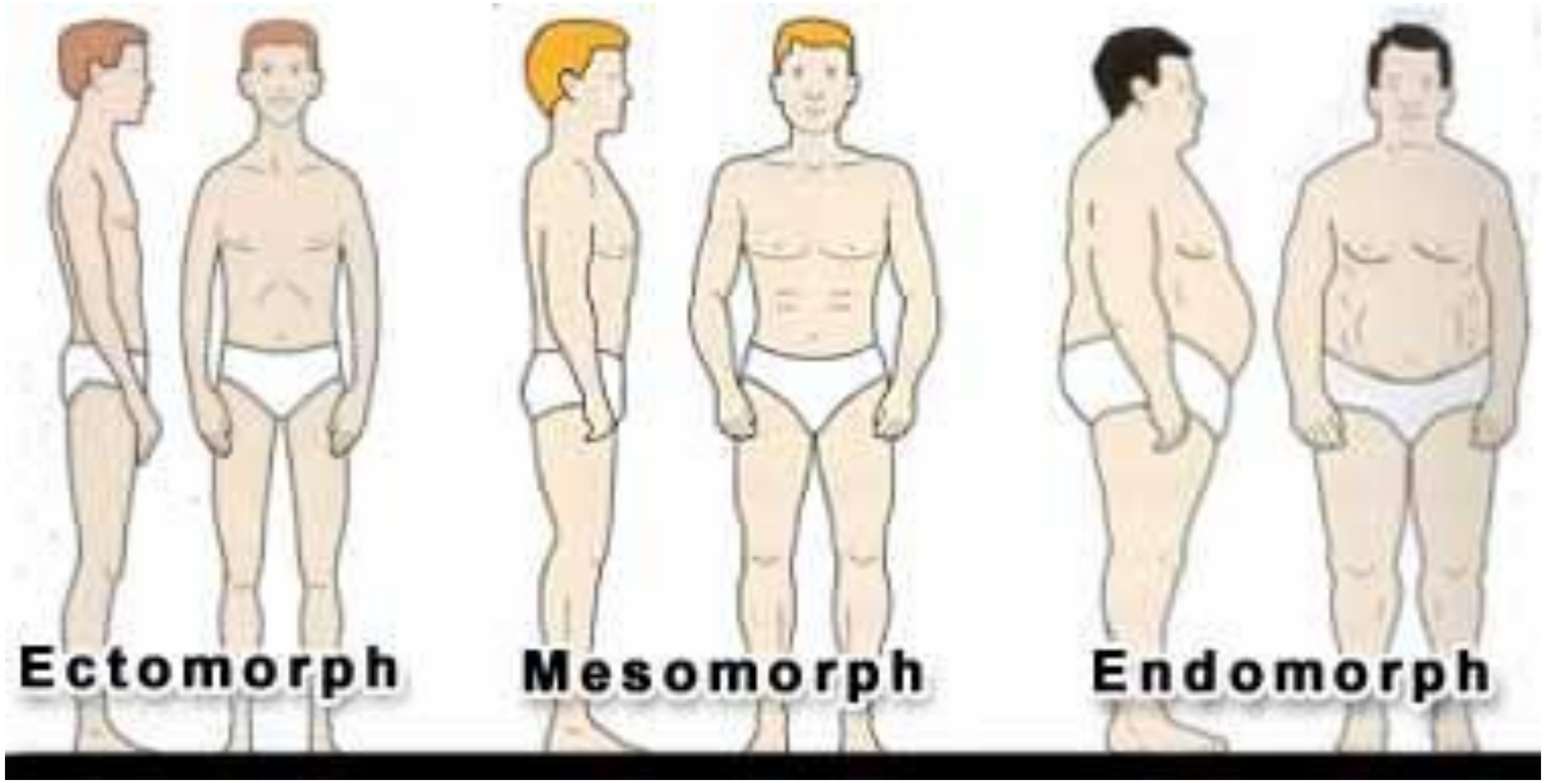
BODY SHAPE, SIZE, AND COMPOSITION

- Body shape- form or structure of the body
  - Muscularity (mesomorphy)
  - Linearity (ectomorphy)
  - Fatness (endomorphy)


Body shape
ectomorphic
mesomorphic
endomorphic

- Body size- determined by height and weight
- Body composition- refers to the proportional make-up of the body

3 Main Body Types


Ectomorph
Mesomorph
Endomorph

اکتومورف

- لگن و شانه ها باریک
- صورت باریک و لاغر
- سینه و شکم باریک و لاغر
- چربی خیلی کم
- دست ها و پاها لاغر

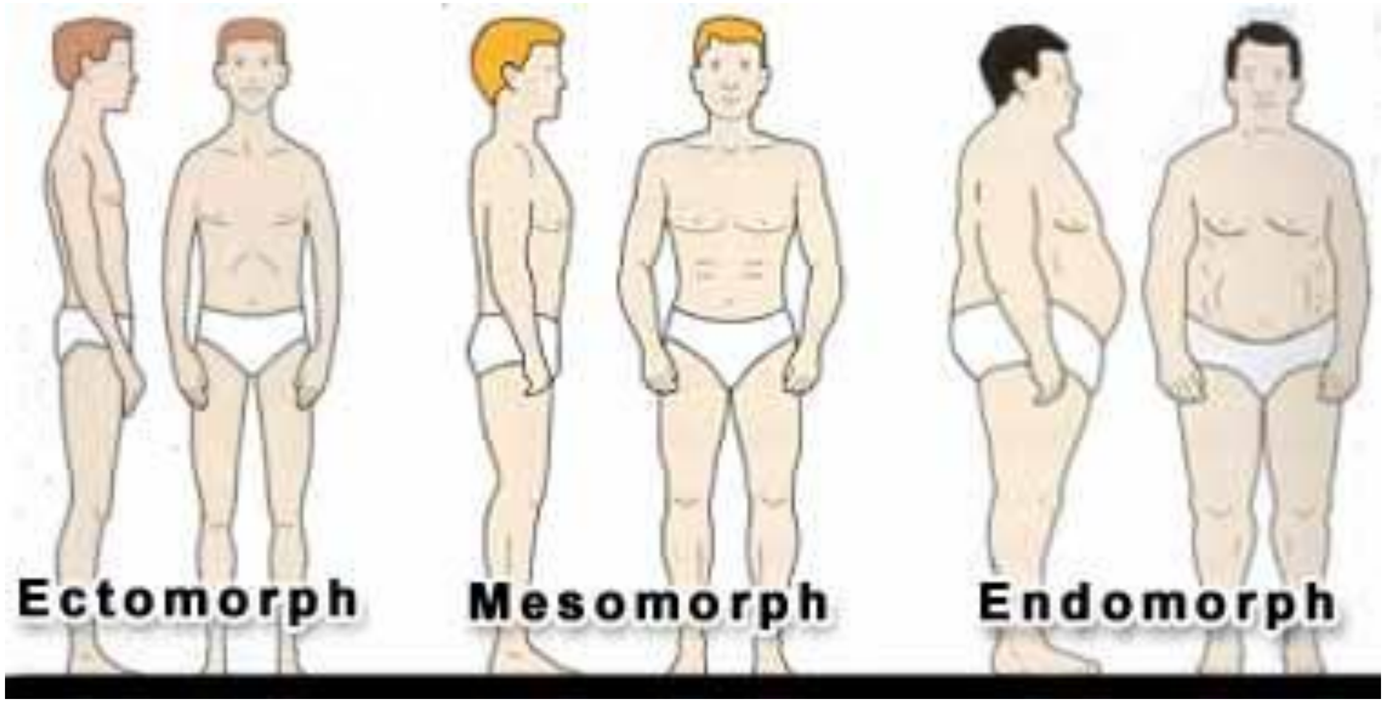
مزومورف

- سر بزرگ، شانه های پهن و کمر باریک (به شکل گوه).
- بدن عضلانی، با ساعد و ران قوی
- مقدار بسیار ناچیزی چربی بدن
- استعداد ژنتیکی . بیشترین پتانسیل بدنسازی.
- تنه بلند، قفسه سینه کامل، نسبت دور شانه به کمر خوب .

اندومورف

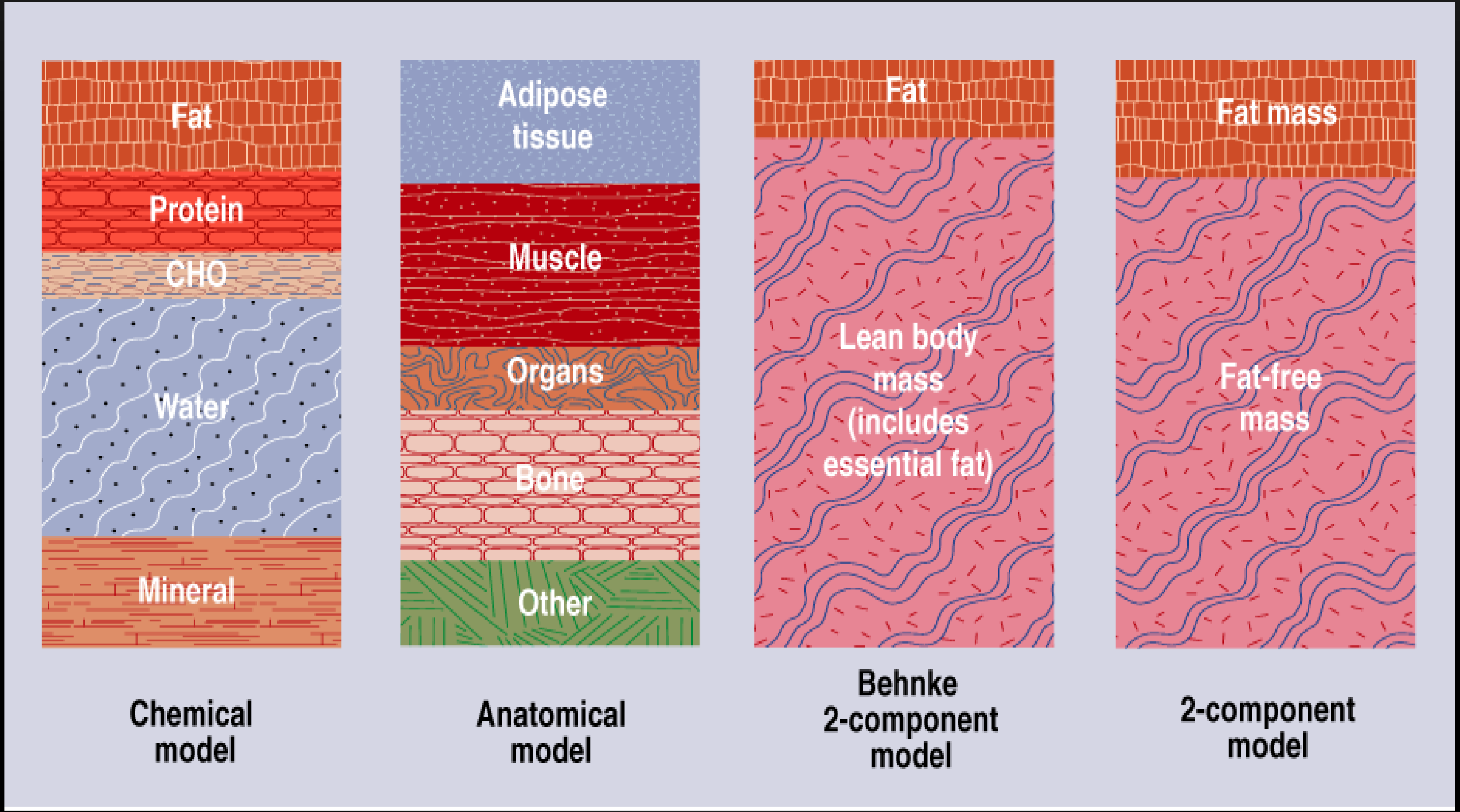
- باسن پهن و شانه های باریک، گلابی شکل.
- مقدار زیادی چربی در سراسر بدن، از جمله بازوها و ران ها.
- ساختار استخوانی پهن است.
- سوخت و ساز بدن آهسته تر است.
- افزایش وزن آسان است، از دست دادن چربی دشوار است.
- تمایل به ذخیره چربی، که عضلات را پنهان می کند.

So..What Body Type Are You??

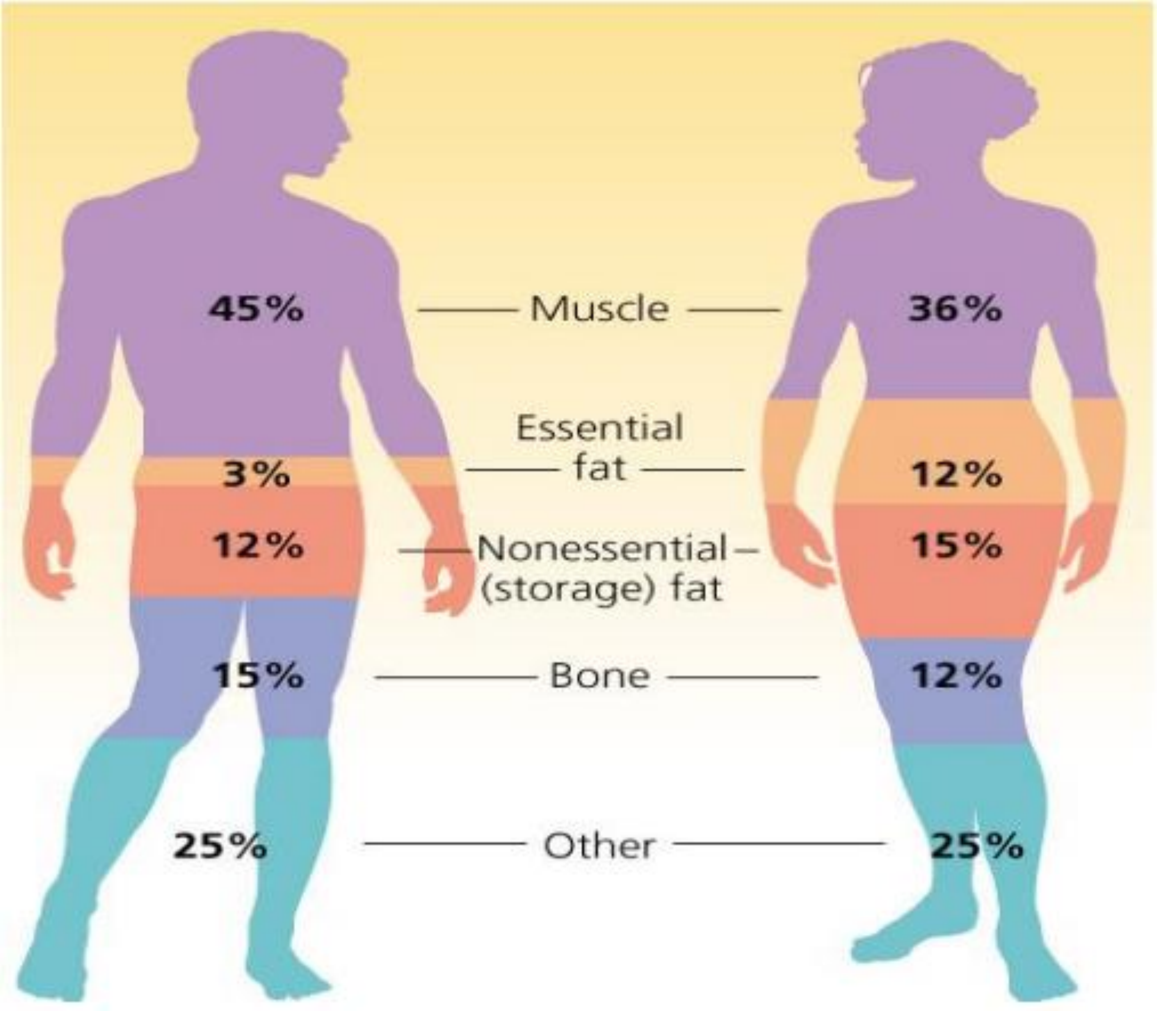

Ectomorph
Mesomorph
Endomorph

- Body Mass
- Fat Mass (FM)
- Percent Body Fat (% BF)
- Fat-Free Mass (FFM)
- Essential Fat
- Lean Body Mass

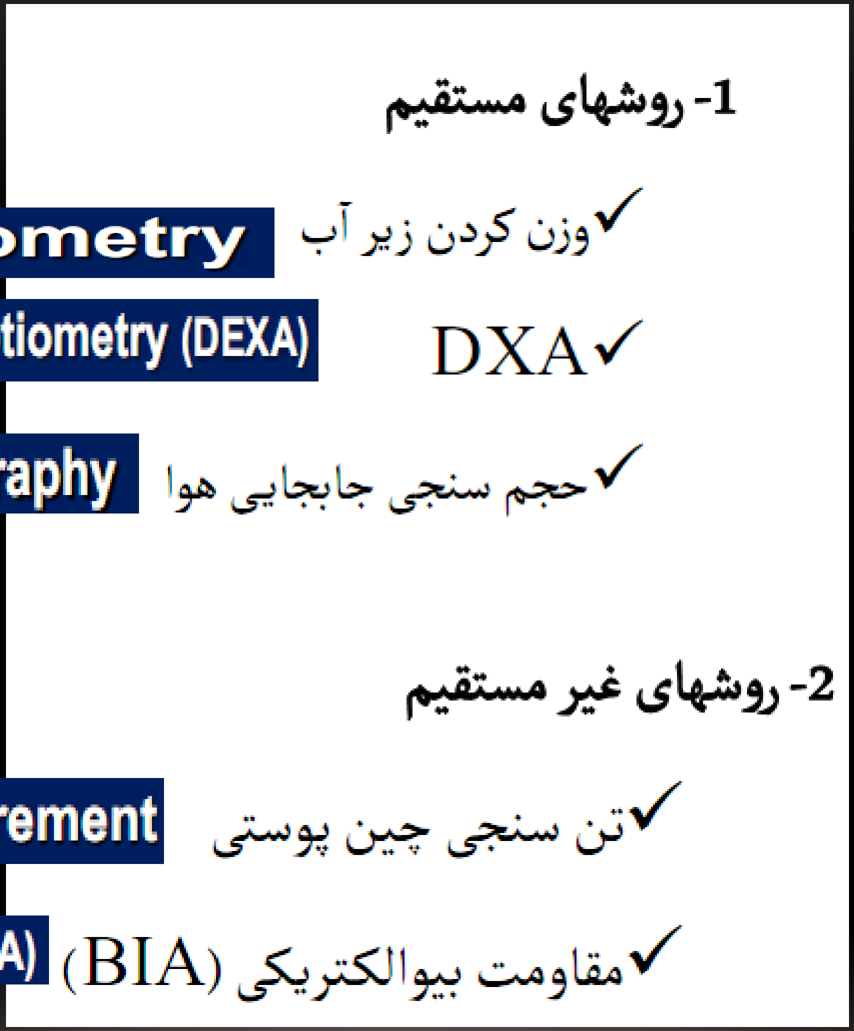
MODELS OF BODY COMPOSITION


Fat
Protein
CHO
Water
Mineral
Chemical model
Adipose tissue
Muscle
Organs
Bone
Other
Anatomical model
Fat
Lean body mass (includes essential fat)
Behnke 2-component model
Fat mass
Fat-free mass
2-component model

مقایسه ترکیب بدنی زنان و مردان



روش های سنجش ترکیب بدن



1- روشهای مستقیم

- ✓وزن کردن زیر آب

Hydro-Densitometry

- ✓DXA

Dual-Energy X-Ray Absorptiometry (DEXA)

- ✓حجم سنجی جابجایی هوا

Air Displacement Plethysmography

2- روشهای غیر مستقیم

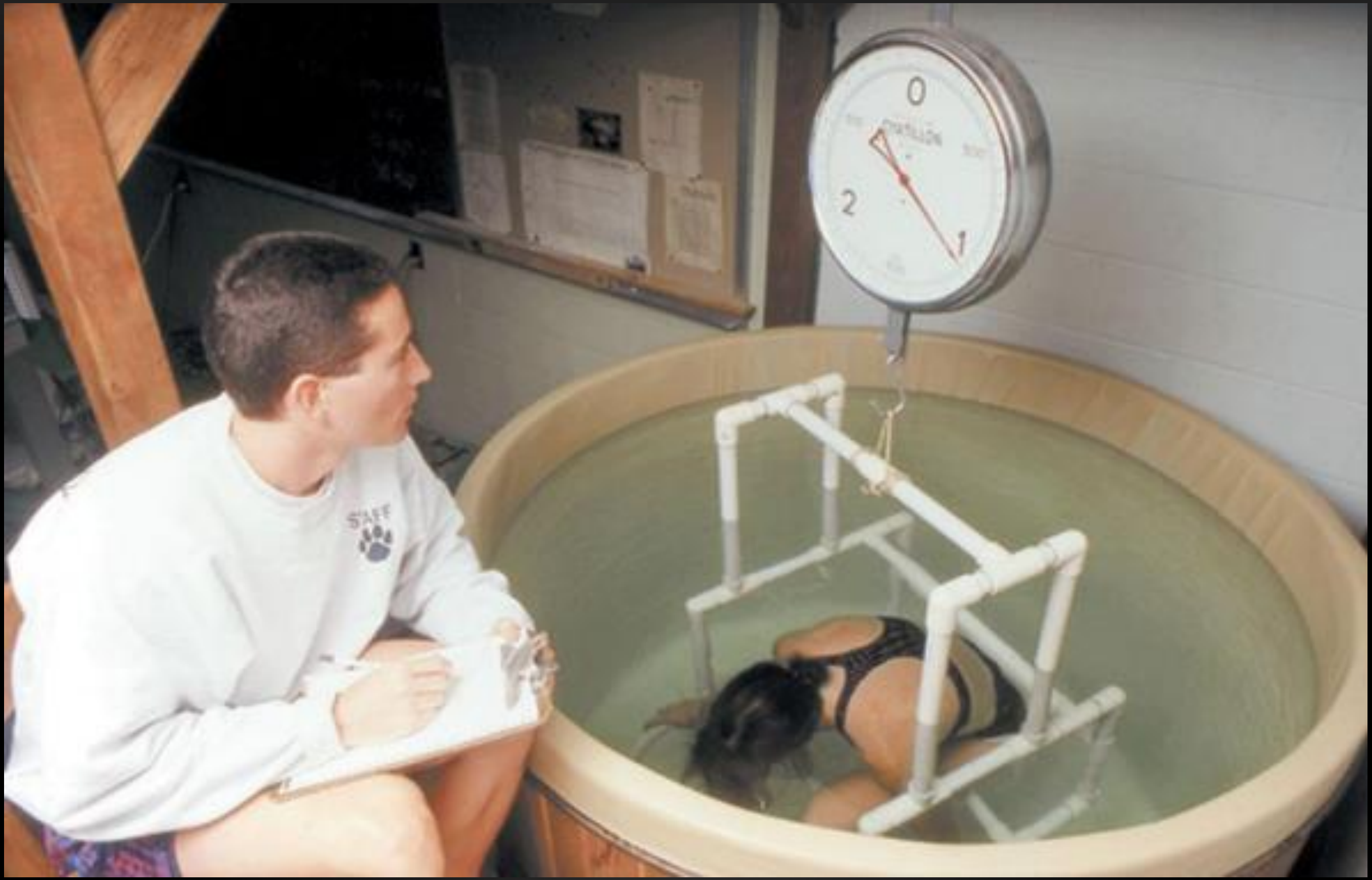
- ✓تن سنجی چین پوستی

Skinfold Measurement

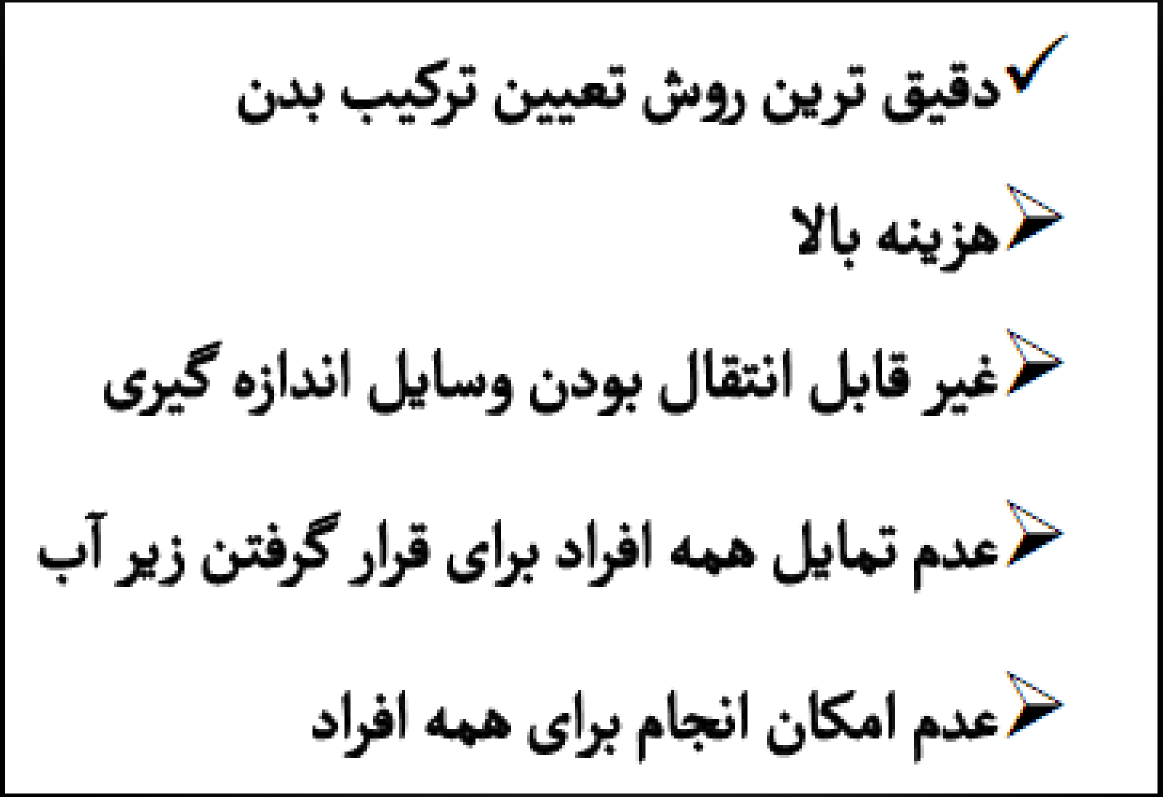
- ✓مقاومت بیوالکتریکی (BIA)

Bioelectrical Impedance Analysis (BIA)

Hydrostatic Weighing


0
CHATILLON
2
1
STAFF

مزایا و معایب



✓ دقیق ترین روش تعیین ترکیب بدن

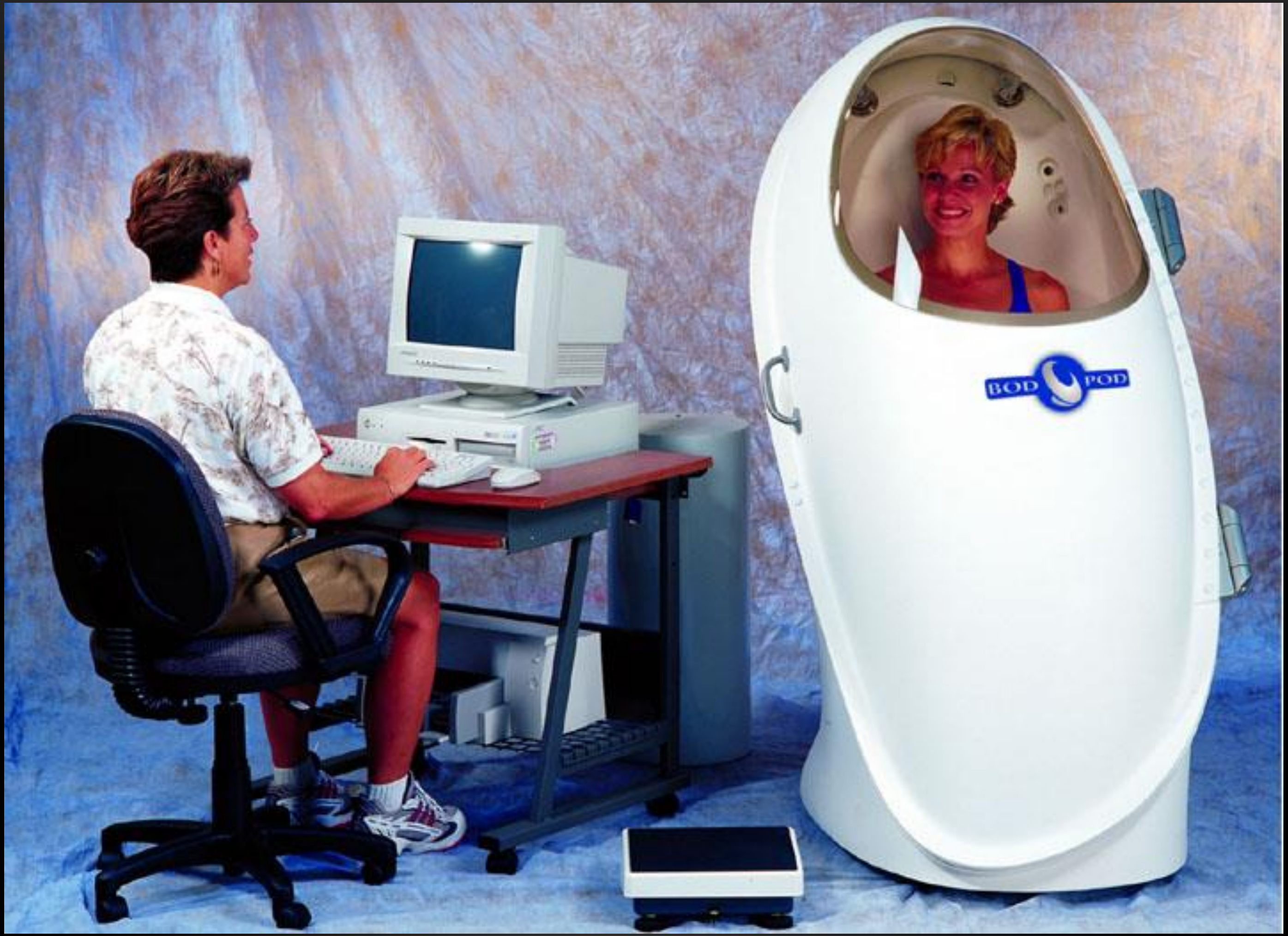
➢ هزینه بالا

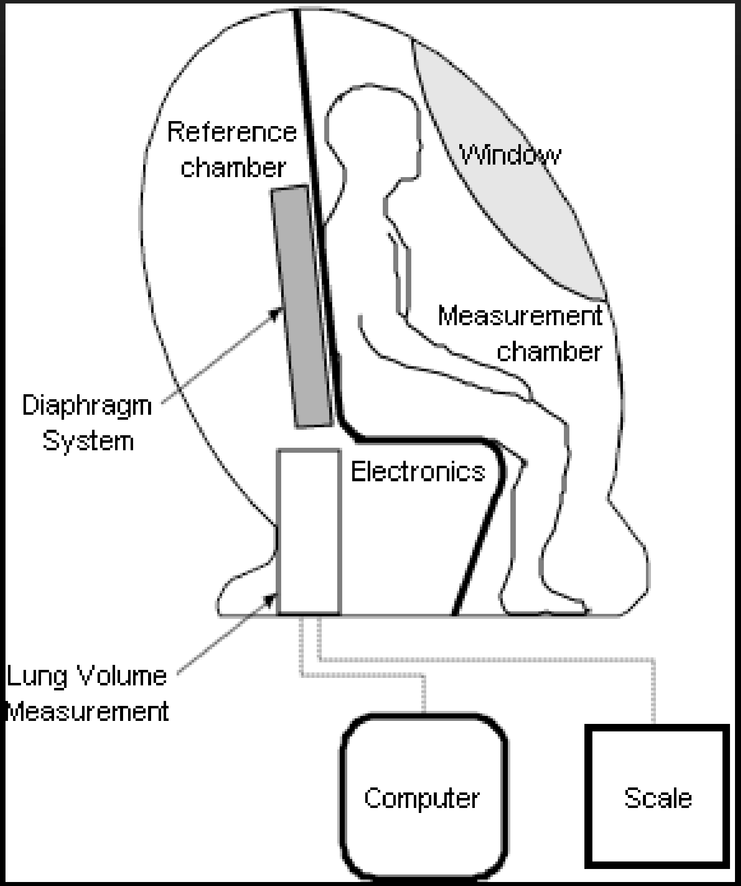
➢ غیر قابل انتقال بودن وسایل اندازه گیری

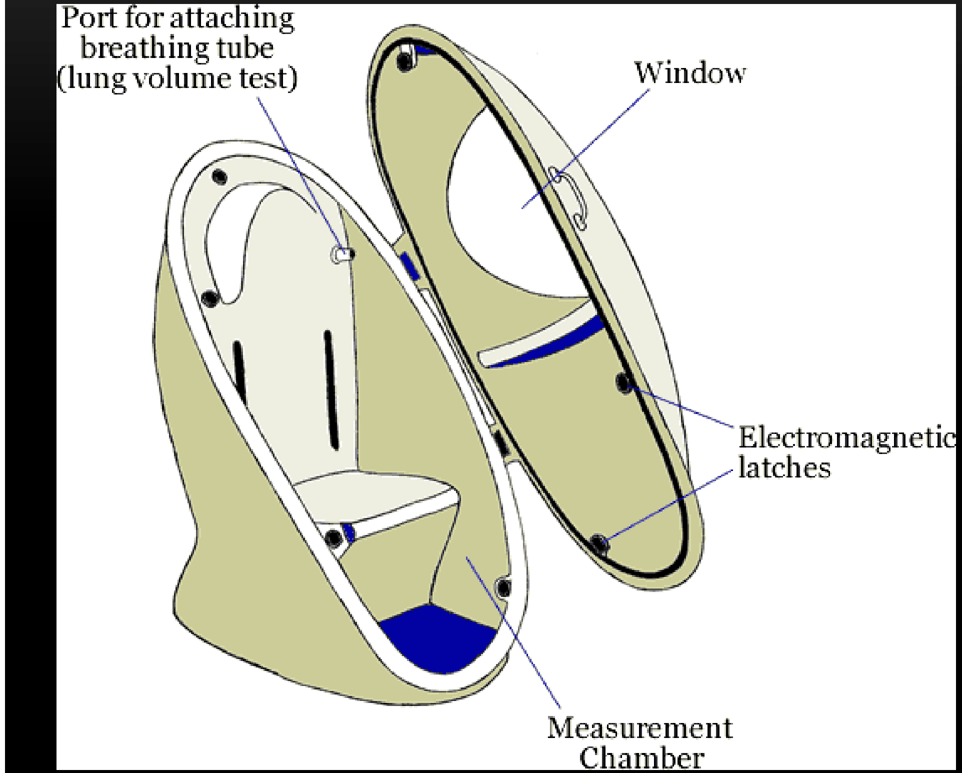
➢ عدم تمایل همه افراد برای قرار گرفتن زیر آب

➢ عدم امکان انجام برای همه افراد

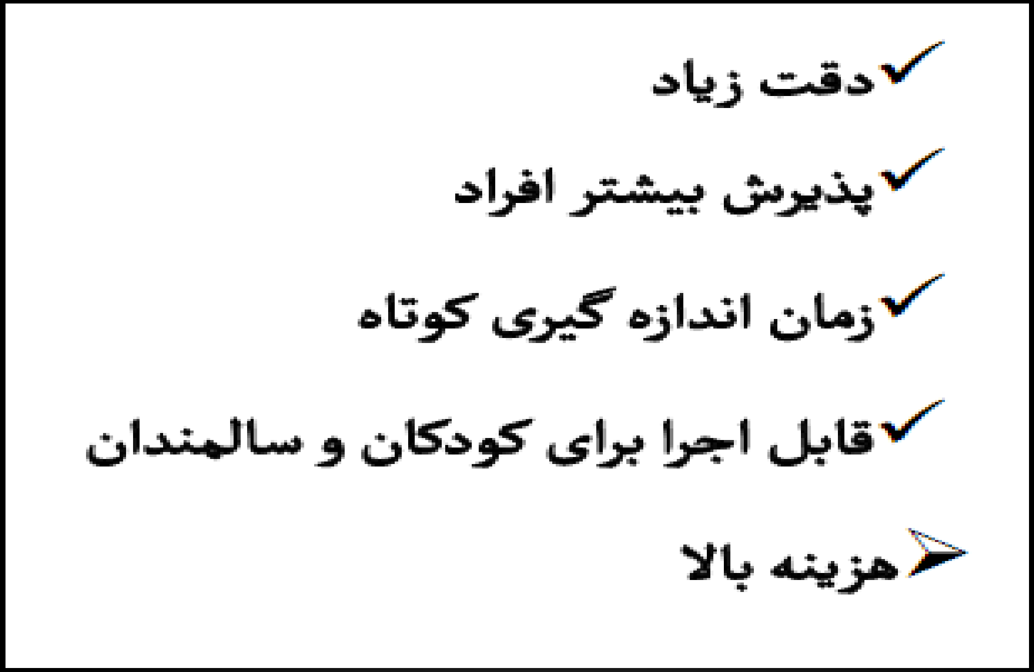
AIR PLETHYSMOGRAPHY




Reference chamber
Window
Measurement chamber
Diaphragm System
Electronics
Lung Volume Measurement
Computer
Scale


Port for attaching breathing tube (lung volume test)
Window
Electromagnetic latches
Measurement Chamber

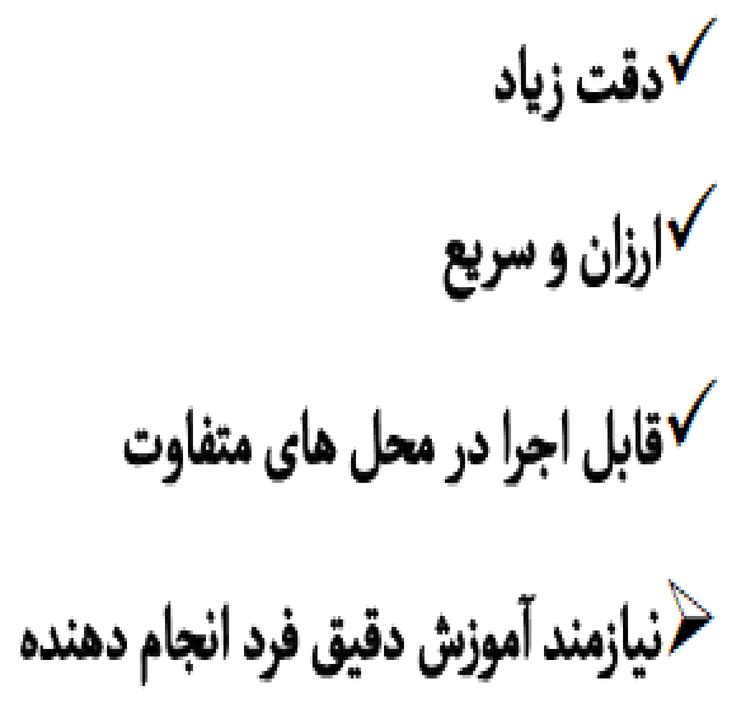
مزایا و معایب



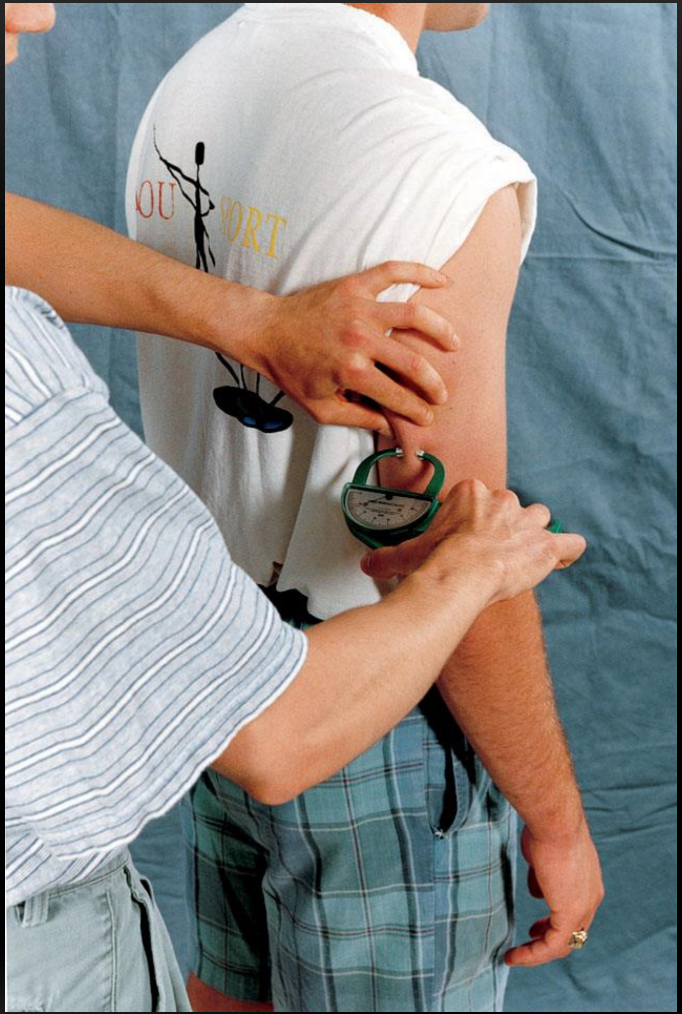
- ✓دقت زیاد
- ✓پذیرش بیشتر افراد
- ✓زمان اندازه گیری کوتاه
- ✓قابل اجرا برای کودکان و سالمندان
- ➢هزینه بالا

MEASURING SKINFOLD FAT THICKNESS

مزایا و معایب



- ✓ دقت زیاد
- ✓ ارزان و سریع
- ✓ قابل اجرا در محل های متفاوت
- ➢ نیازمند آموزش دقیق فرد انجام دهنده



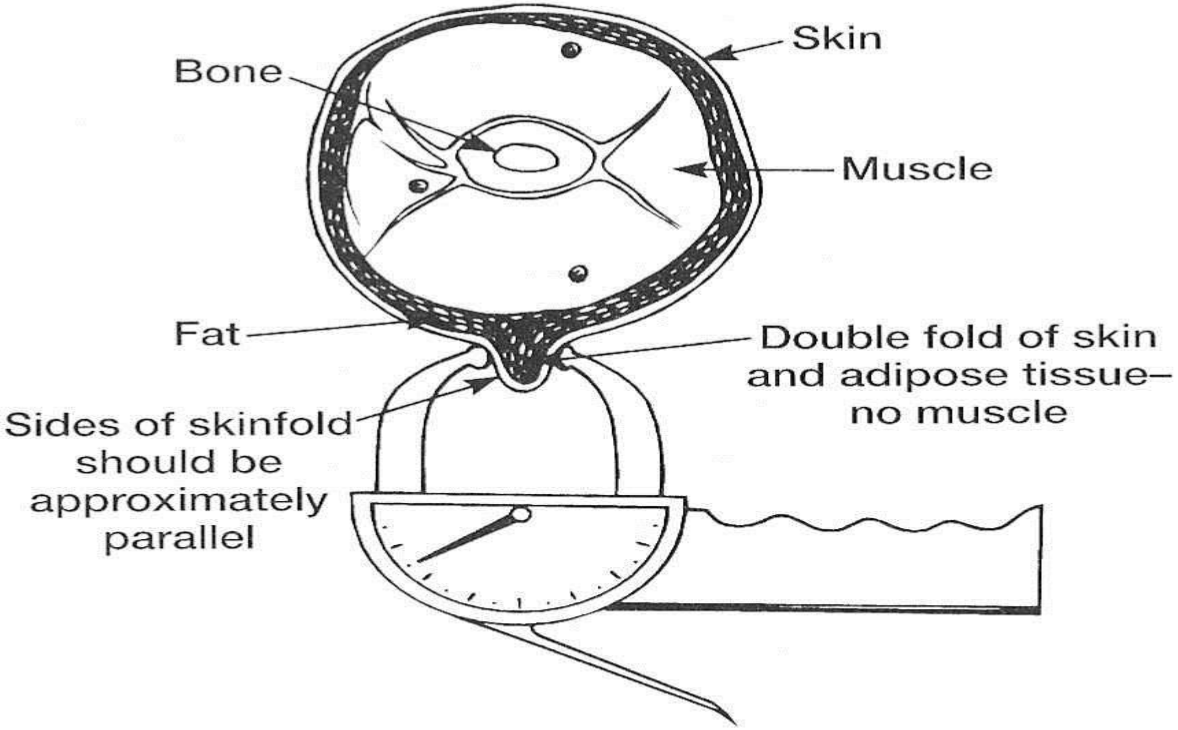

Skin
Bone
Muscle
Fat
Double fold of skin and adipose tissue– no muscle
Sides of skinfold should be approximately parallel

Figure 6.15
The double fold of skin and adipose tissue between the tips of the skinfold caliper should be large enough to form approximately parallel sides. Care should be taken to elevate only skin and adipose tissue, not muscle.

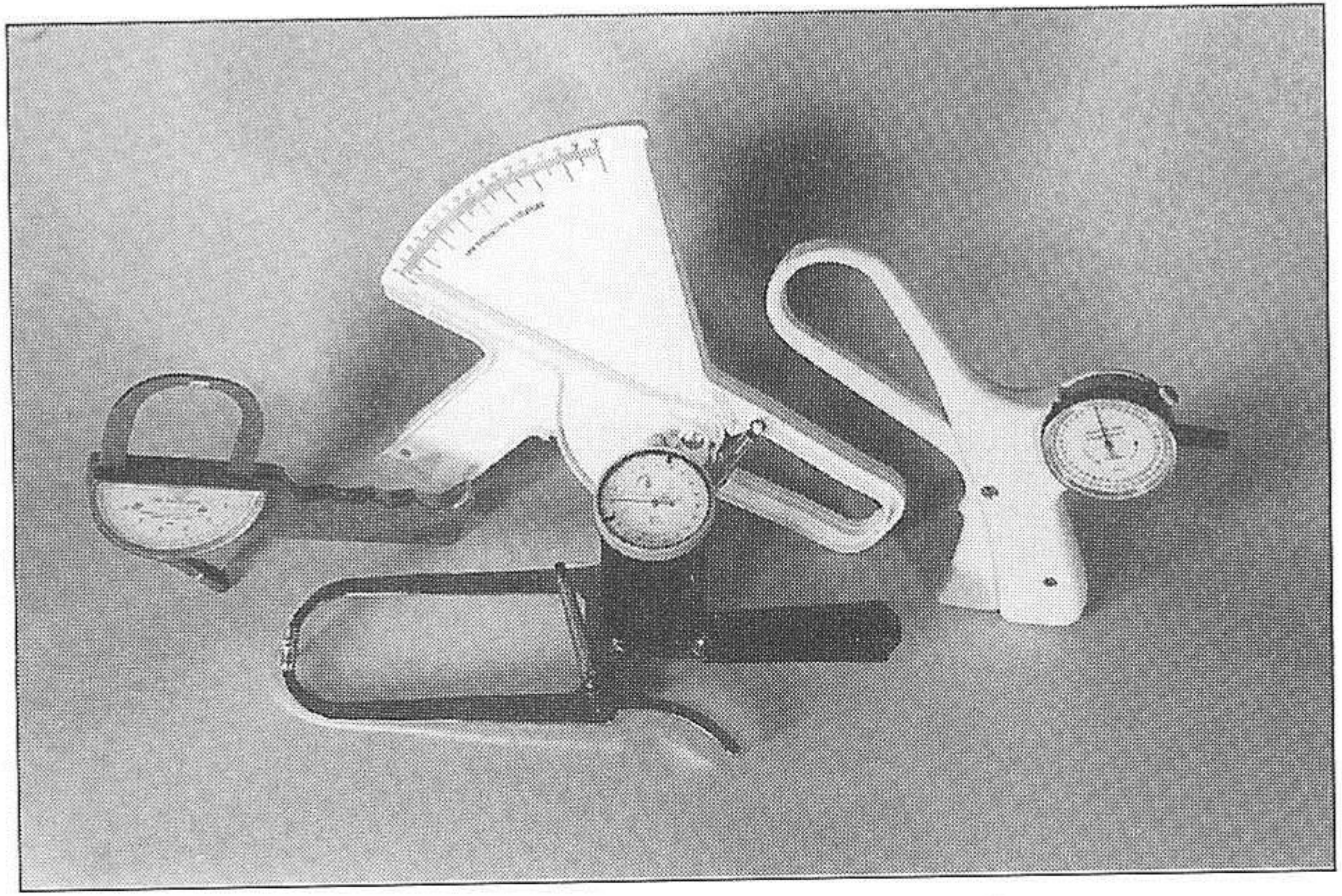
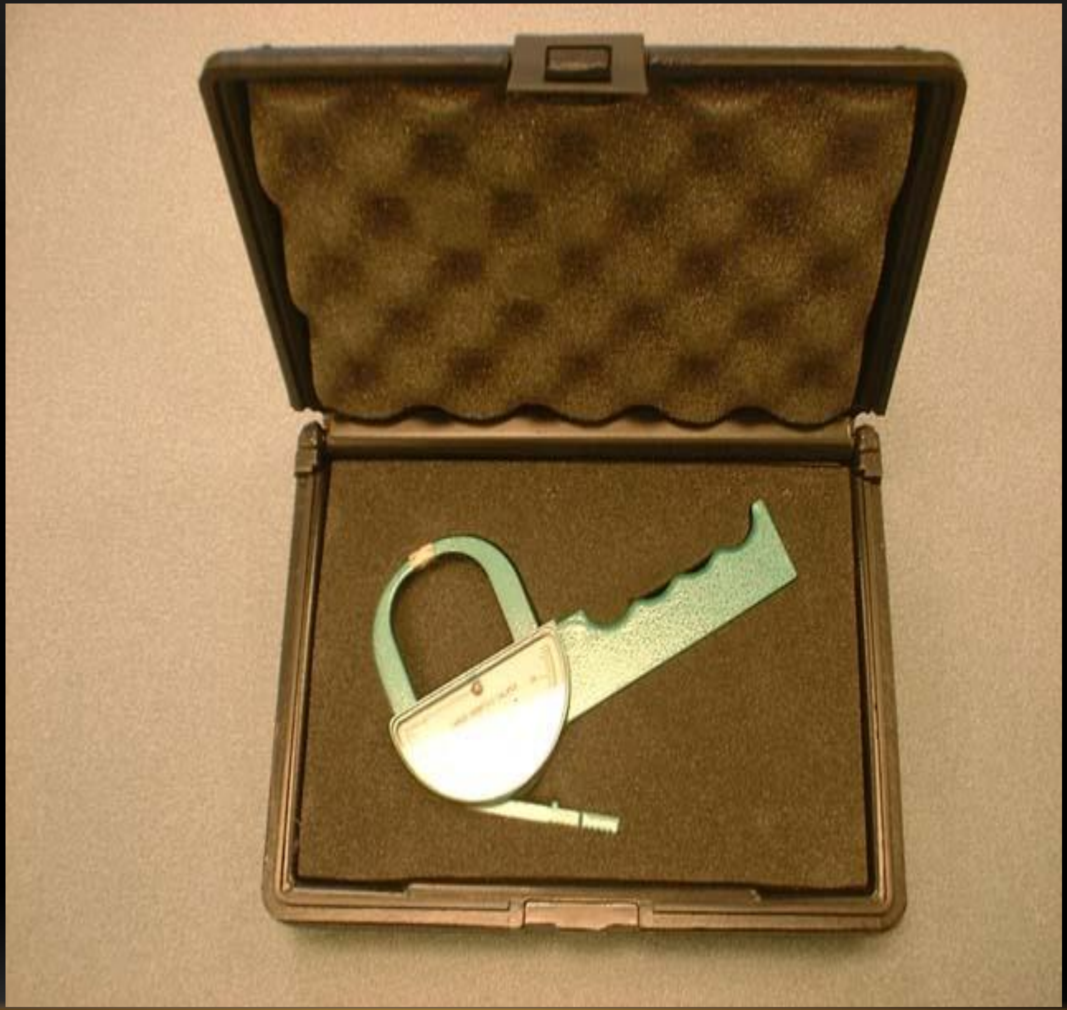


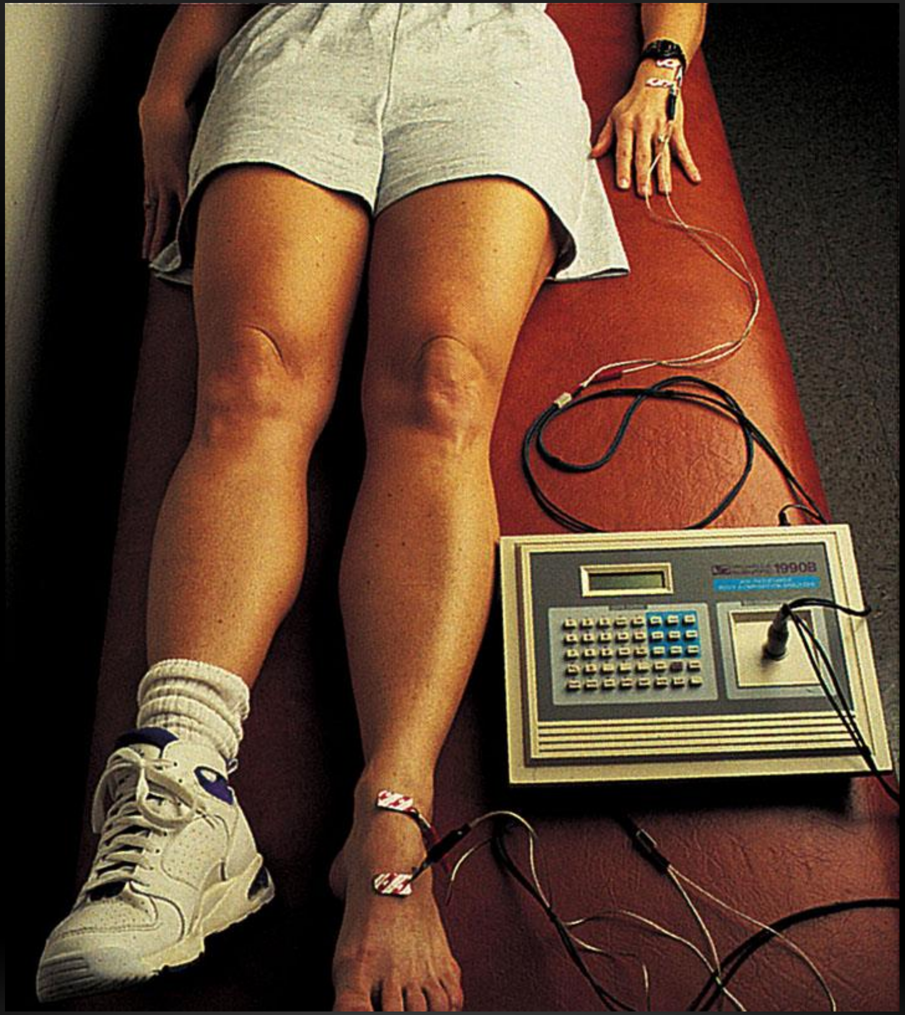
Figure 6.17 **Examples of commercially available skinfold calipers. Back row, left to right: Lange, Slim Guide, Holtain. Front: Harpenden.**

Source: Photo by M. Ware.

Lange Skinfold Calipers

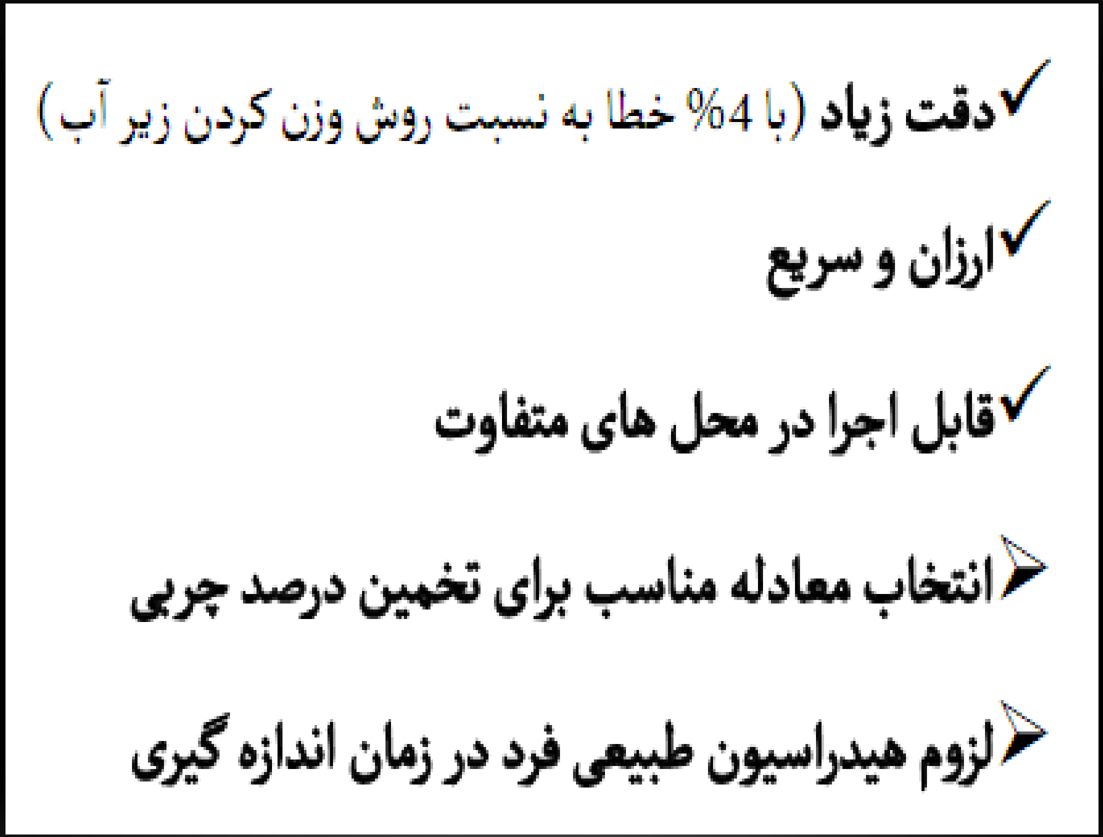


BIOELECTRICAL IMPEDANCE ANALYSIS (BIA)



InBody230

مزایا و معایب



✓ **دقت زیاد** (با 4% خطا به نسبت روش وزن کردن زیر آب)

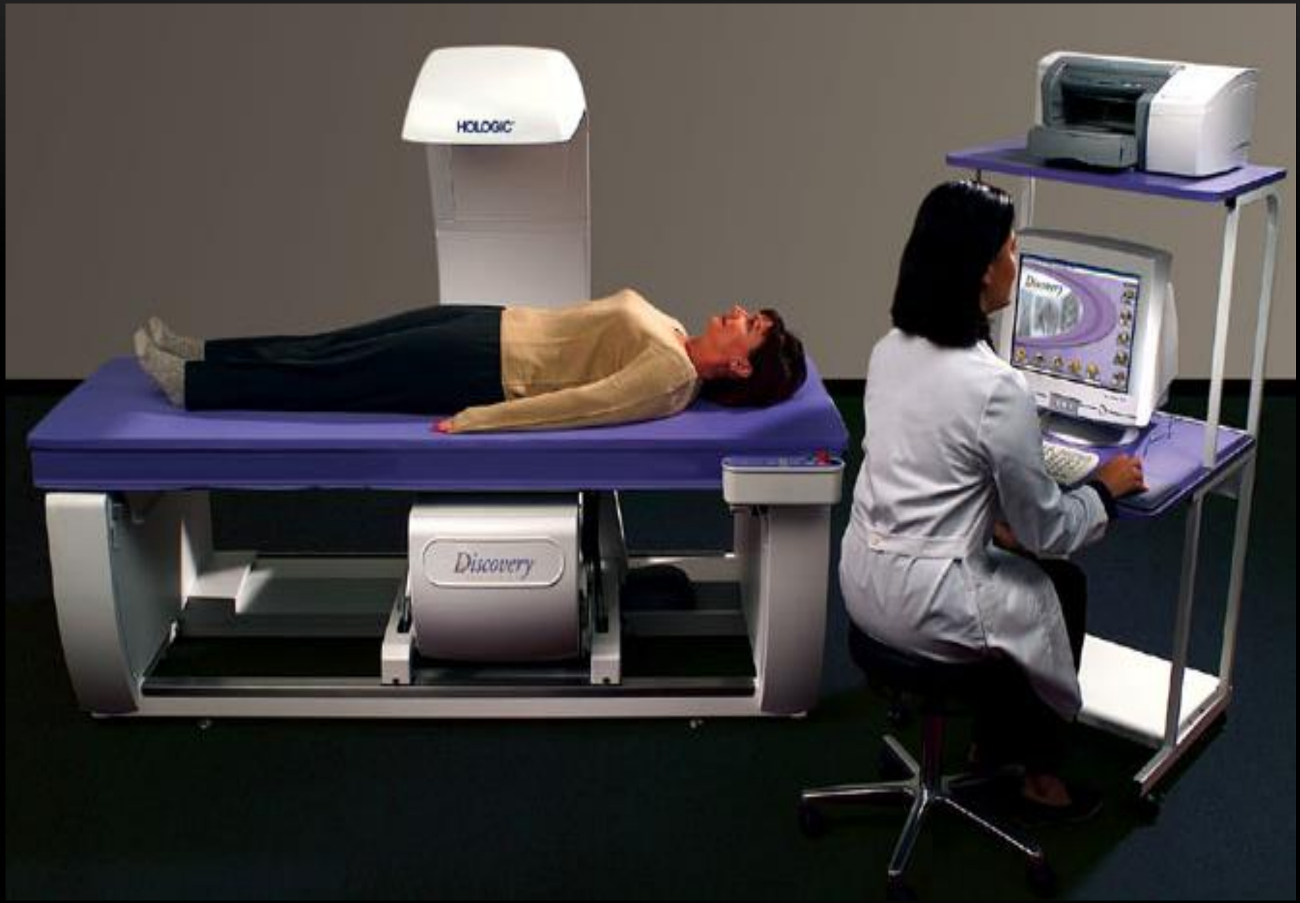
✓ **ارزان و سریع**

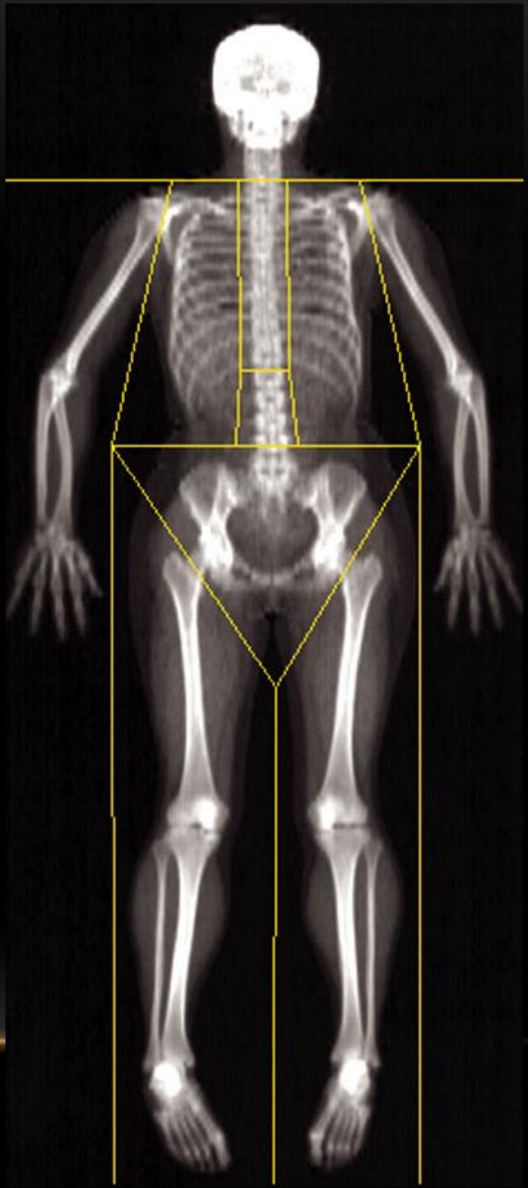
✓ **قابل اجرا در محل های متفاوت**

➢ **انتخاب معادله مناسب برای تخمین درصد چربی**

➢ **لزوم هیدراسیون طبیعی فرد در زمان اندازه گیری**

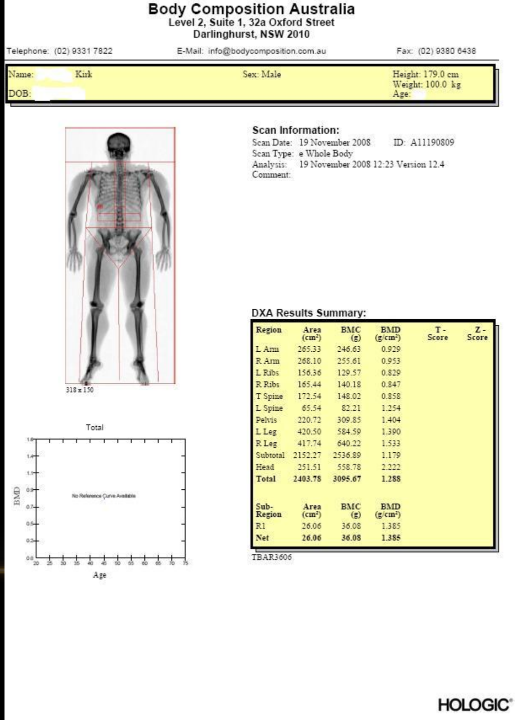
DUAL-ENERGY X-RAY ABSORPTIOMETRY (DEXA)


HOLOGIC
Discovery



DEXA

- 3 component model
  - bone, fat, fat-free mass



Body Composition Australia
Level 2, Suite 1, 32a Oxford Street
Darlinghurst, NSW 2010

Telephone: (02) 9331 7822 E-Mail: info@bodycomposition.com.au Fax: (02) 9380 6438

Name: [redacted] Kirk Sex: Male Height: 179.0 cm
DOB: [redacted] Weight: 100.0 kg
Age: [redacted]

Scan Information:
Scan Date: 19 November 2008 ID: A11190809
Scan Type: e Whole Body
Analysis: 19 November 2008 12:23 Version 12.4
Comment:

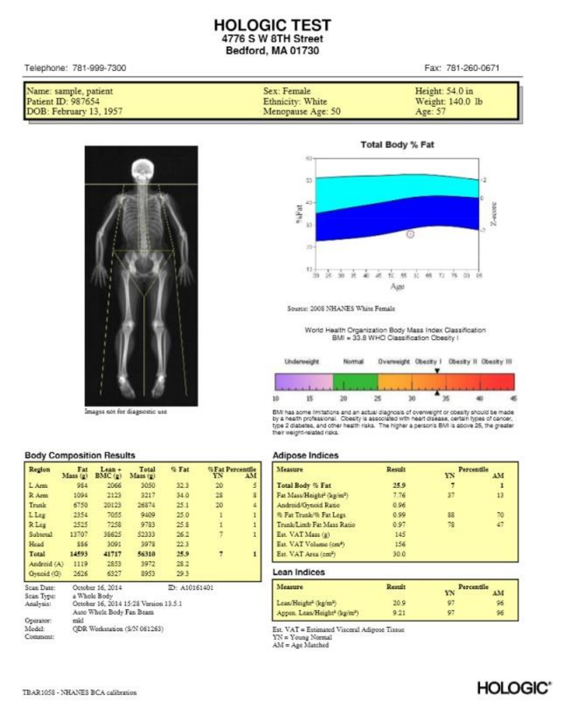
DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T - Score	Z - Score
L Arm	265.33	246.63	0.929		
R Arm	268.10	255.61	0.953		
L Ribs	156.36	129.57	0.829		
R Ribs	165.44	140.18	0.847		
T Spine	172.54	148.02	0.858		
L Spine	65.54	82.21	1.254		
Pelvis	220.72	309.85	1.404		
L Leg	420.50	584.59	1.390		
R Leg	417.74	640.22	1.533		
Subtotal	2152.27	2536.89	1.179		
Head	251.51	558.78	2.222		
Total	**2403.78**	**3095.67**	**1.288**		

Sub-Region	Area (cm²)	BMC (g)	BMD (g/cm²)
R1	26.06	36.08	1.385
Net	**26.06**	**36.08**	**1.385**

TBAR3606

318 x 150
Total
No Reference Curve Available
BMD
Age
HOLOGIC



HOLOGIC TEST
4776 S W 8TH Street
Bedford, MA 01730

Telephone: 781-999-7300 Fax: 781-260-0671

Name: sample, patient Sex: Female Height: 54.0 in
Patient ID: 987654 Ethnicity: White Weight: 140.0 lb
DOB: February 13, 1957 Menopause Age: 50 Age: 57

Images not for diagnostic use

Total Body % Fat
%Fat
Z-score
Age

Source: 2008 NHANES White Female

World Health Organization Body Mass Index Classification
BMI = 33.8 WHO Classification Obesity I

BMI has some limitations and an actual diagnosis of overweight or obesity should be made by a health professional. Obesity is associated with heart disease, certain types of cancer, type 2 diabetes, and other health risks. The higher a person's BMI is above 25, the greater their weight-related risks.

Body Composition Results

Region	Fat Mass (g)	Lean + BMC (g)	Total Mass (g)	% Fat	%Fat Percentile YN	AM
L Arm	984	2066	3050	32.3	20	5
R Arm	1094	2123	3217	34.0	28	8
Trunk	6750	20123	26874	25.1	20	4
L Leg	2354	7055	9409	25.0	1	1
R Leg	2525	7258	9783	25.8	1	1
Subtotal	13707	38625	52333	26.2	7	1
Head	886	3091	3978	22.3		
Total	**14593**	**41717**	**56310**	**25.9**	**7**	**1**
Android (A)	1119	2853	3972	28.2		
Gynoid (G)	2626	6327	8953	29.3		

Scan Date: October 16, 2014 ID: A10161401
Scan Type: a Whole Body
Analysis: October 16, 2014 15:28 Version 13.5.1
Auto Whole Body Fan Beam
Operator: mkl
Model: QDR Workstation (S/N 061263)
Comment:

Adipose Indices

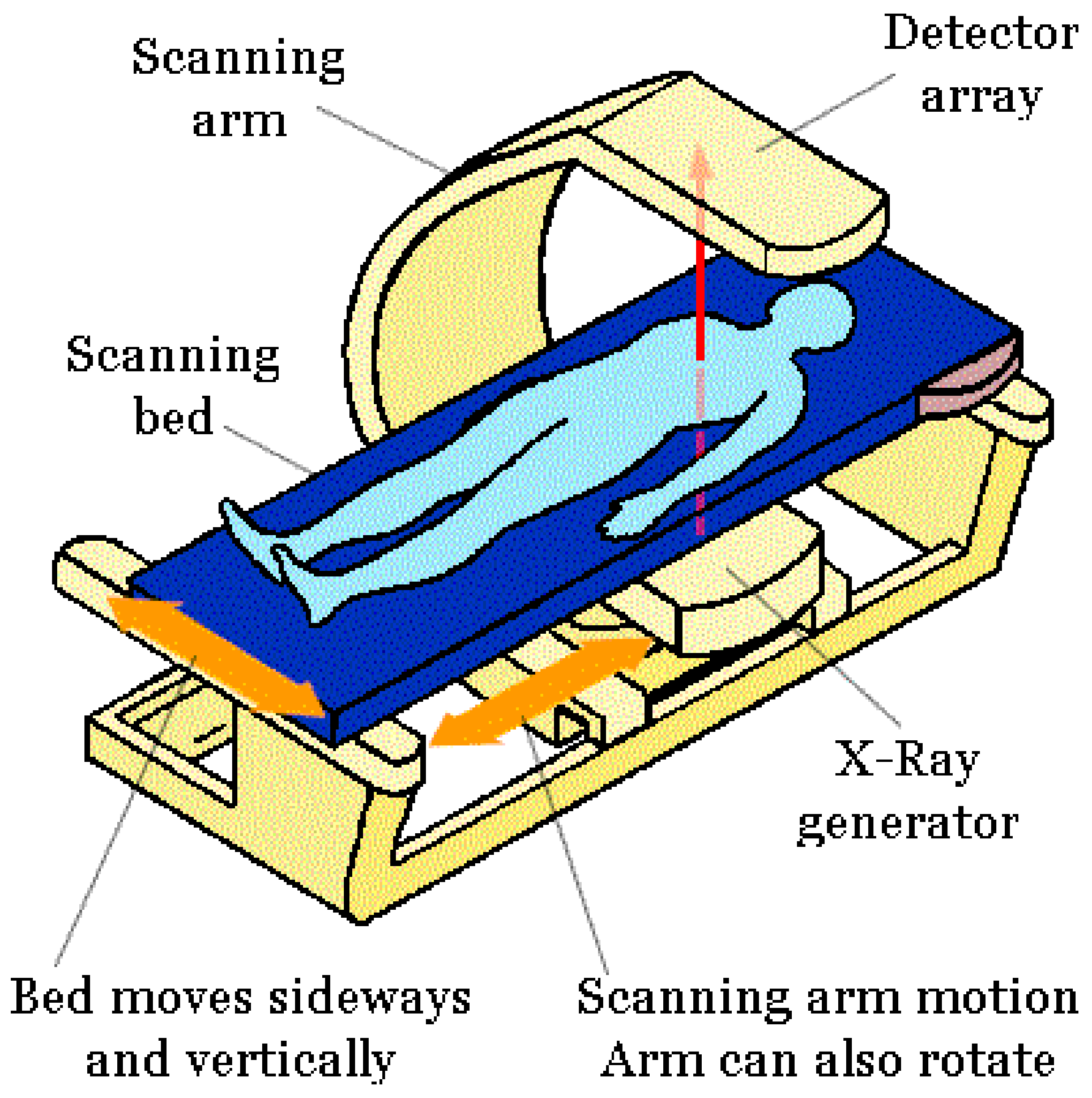
Measure	Result	Percentile YN	AM
Total Body % Fat	**25.9**	**7**	**1**
Fat Mass/Height² (kg/m²)	7.76	37	13
Android/Gynoid Ratio	0.96		
% Fat Trunk/% Fat Legs	0.99	88	70
Trunk/Limb Fat Mass Ratio	0.97	78	47
Est. VAT Mass (g)	145		
Est. VAT Volume (cm³)	156		
Est. VAT Area (cm²)	30.0		

Lean Indices

Measure	Result	Percentile YN	AM
Lean/Height² (kg/m²)	20.9	97	96
Appen. Lean/Height² (kg/m²)	9.21	97	96

Est. VAT = Estimated Visceral Adipose Tissue
YN = Young Normal
AM = Age Matched

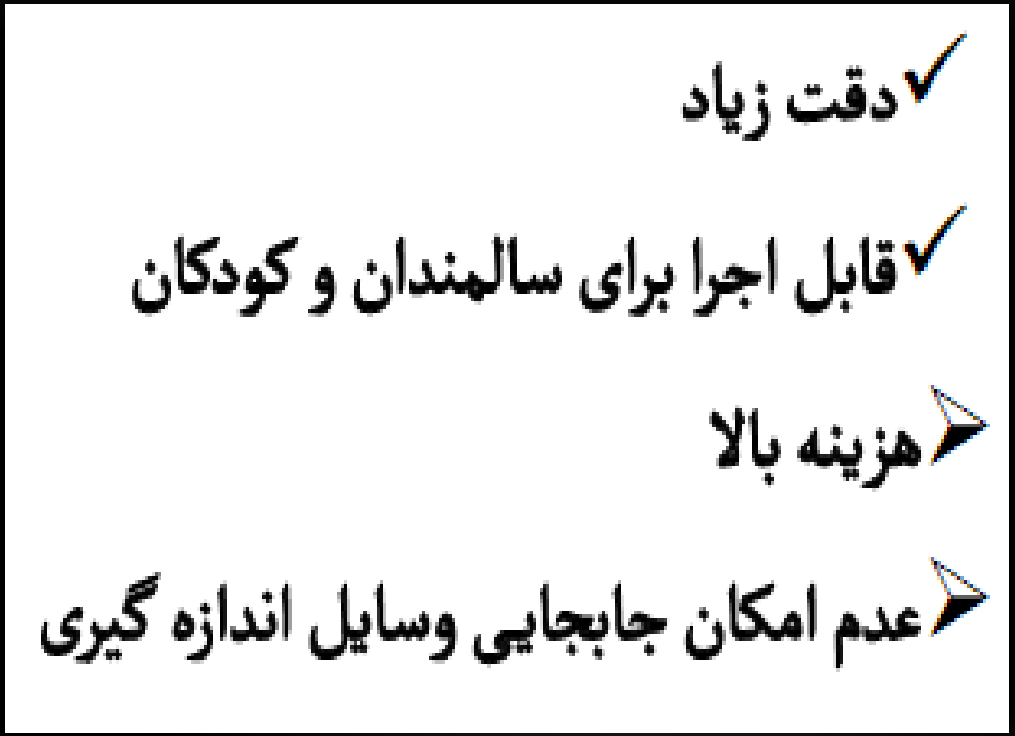
TBAR1058 - NHANES BCA calibration


Scanning arm
Detector array
Scanning bed
X-Ray generator
Bed moves sideways and vertically
Scanning arm motion Arm can also rotate

DEXA, DXA

- Two different energy level X-rays
- Lean, fat, and bone mass each reduce (attenuate) the X-ray signal in unique ways
- Computer analyzes scan point by point to determine body composition

مزایا و معایب



✓ دقت زیاد

✓ قابل اجرا برای سالمندان و کودکان

➢ هزینه بالا

➢ عدم امکان جابجایی وسایل اندازه گیری

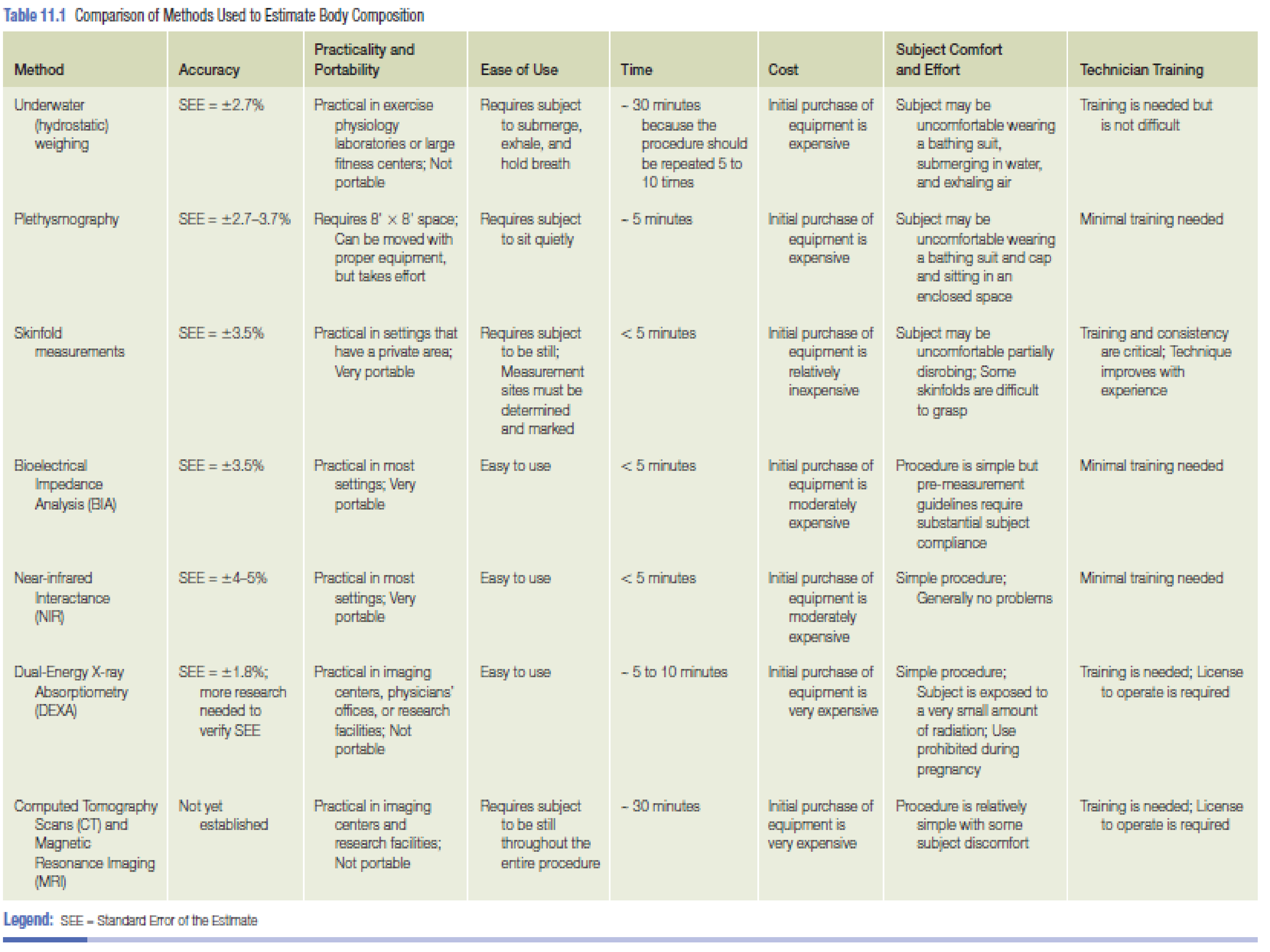
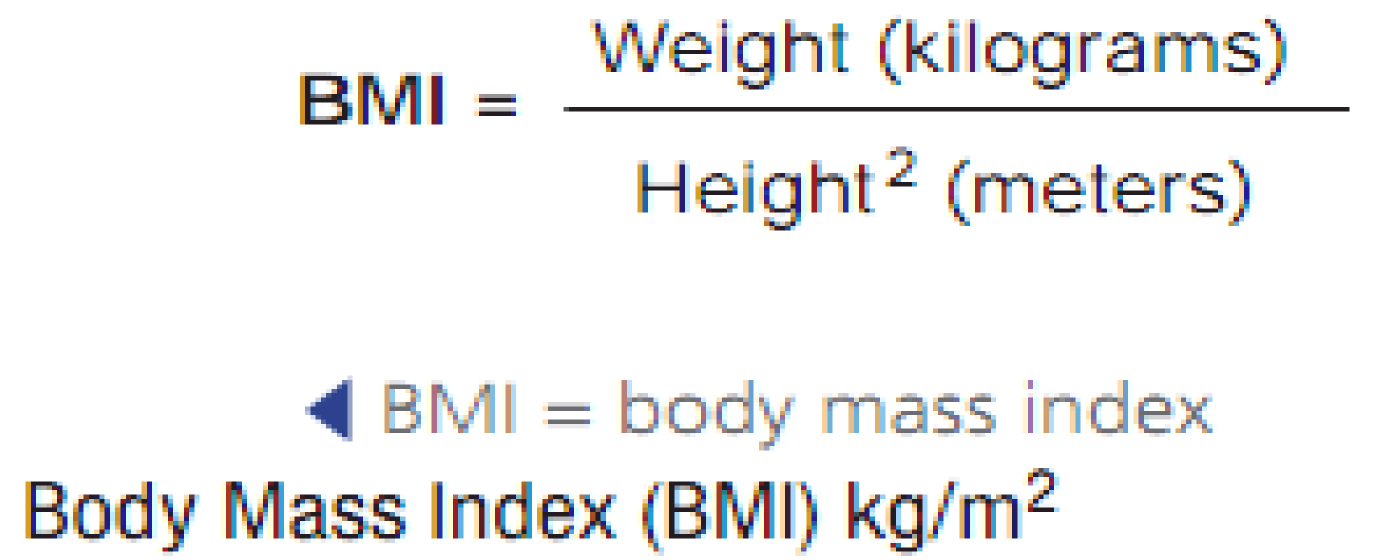


Table 11.1 Comparison of Methods Used to Estimate Body Composition

Method	Accuracy	Practicality and Portability	Ease of Use	Time	Cost	Subject Comfort and Effort	Technician Training
Underwater (hydrostatic) weighing	SEE = ±2.7%	Practical in exercise physiology laboratories or large fitness centers; Not portable	Requires subject to submerge, exhale, and hold breath	~ 30 minutes because the procedure should be repeated 5 to 10 times	Initial purchase of equipment is expensive	Subject may be uncomfortable wearing a bathing suit, submerging in water, and exhaling air	Training is needed but is not difficult
Plethysmography	SEE = ±2.7–3.7%	Requires 8′ × 8′ space; Can be moved with proper equipment, but takes effort	Requires subject to sit quietly	~ 5 minutes	Initial purchase of equipment is expensive	Subject may be uncomfortable wearing a bathing suit and cap and sitting in an enclosed space	Minimal training needed
Skinfold measurements	SEE = ±3.5%	Practical in settings that have a private area; Very portable	Requires subject to be still; Measurement sites must be determined and marked	< 5 minutes	Initial purchase of equipment is relatively inexpensive	Subject may be uncomfortable partially disrobing; Some skinfolds are difficult to grasp	Training and consistency are critical; Technique improves with experience
Bioelectrical Impedance Analysis (BIA)	SEE = ±3.5%	Practical in most settings; Very portable	Easy to use	< 5 minutes	Initial purchase of equipment is moderately expensive	Procedure is simple but pre-measurement guidelines require substantial subject compliance	Minimal training needed
Near-infrared Interactance (NIR)	SEE = ±4–5%	Practical in most settings; Very portable	Easy to use	< 5 minutes	Initial purchase of equipment is moderately expensive	Simple procedure; Generally no problems	Minimal training needed
Dual-Energy X-ray Absorptiometry (DEXA)	SEE = ±1.8%; more research needed to verify SEE	Practical in imaging centers, physicians' offices, or research facilities; Not portable	Easy to use	~ 5 to 10 minutes	Initial purchase of equipment is very expensive	Simple procedure; Subject is exposed to a very small amount of radiation; Use prohibited during pregnancy	Training is needed; License to operate is required
Computed Tomography Scans (CT) and Magnetic Resonance Imaging (MRI)	Not yet established	Practical in imaging centers and research facilities; Not portable	Requires subject to be still throughout the entire procedure	~ 30 minutes	Initial purchase of equipment is very expensive	Procedure is relatively simple with some subject discomfort	Training is needed; License to operate is required

Legend: SEE = Standard Error of the Estimate



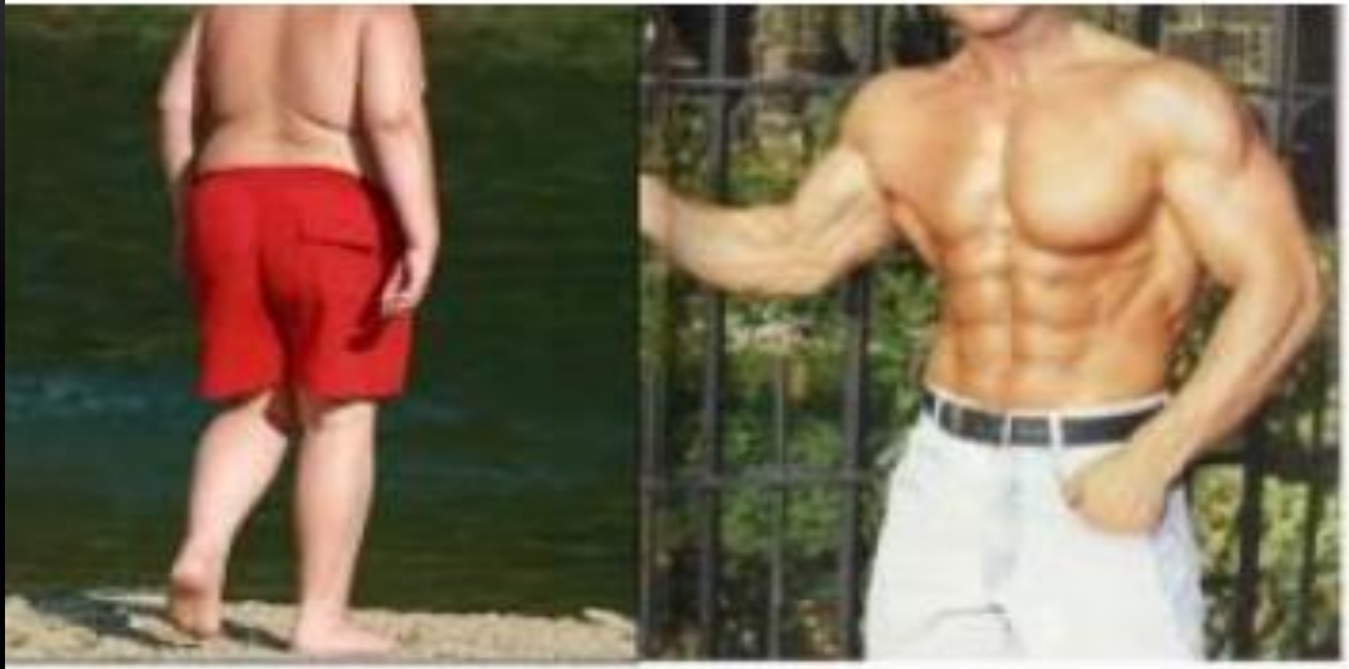
$$\text{BMI} = \frac{\text{Weight (kilograms)}}{\text{Height}^2\text{ (meters)}}$$

◀ BMI = body mass index

Body Mass Index (BMI) kg/m^2

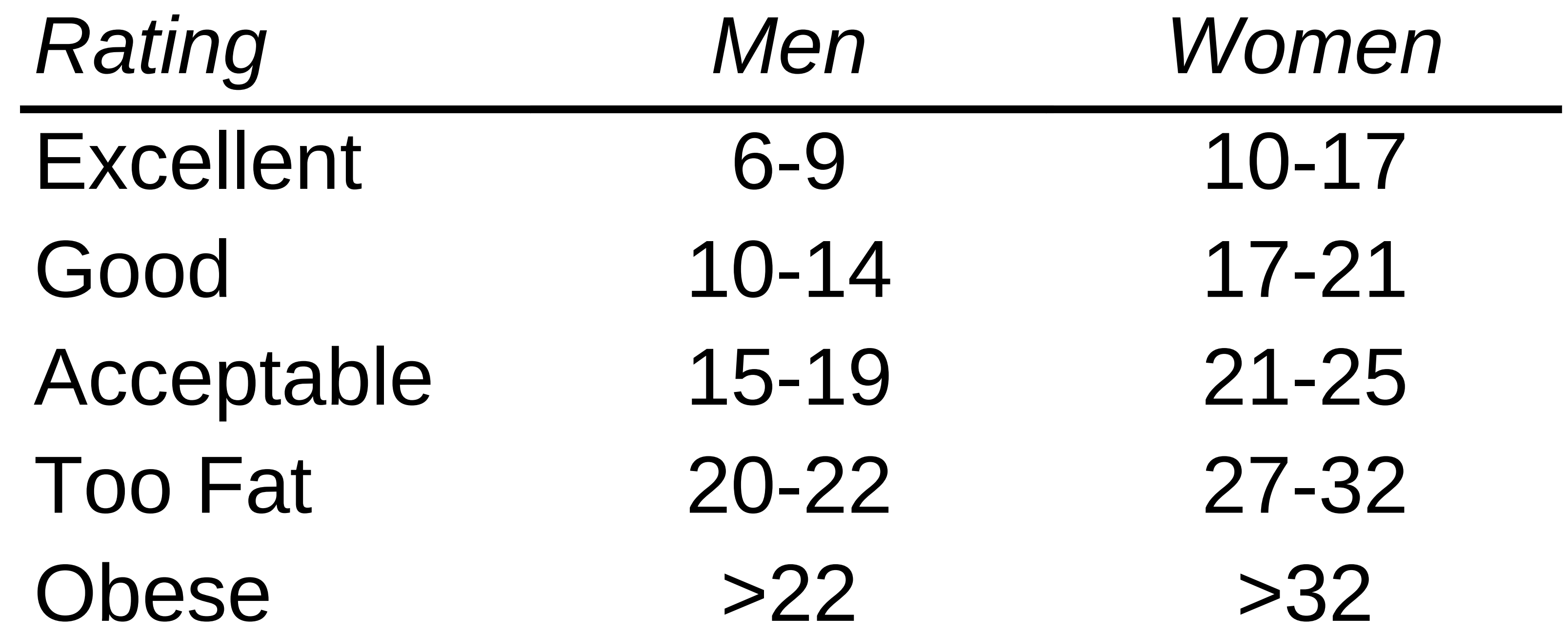
Classifications for BMI

Classification	**BMI**
Underweight	<18.5 kg/m^2
Normal weight	18.5 - 24.9 kg/m^2
Overweight	25 - 29.9 kg/m^2
Obesity (Class 1)	30 - 34.9 kg/m^2
Obesity (Class 2)	35 - 39.9 kg/m^2
Extreme Obesity (Class 3)	$\geq$ 40 kg/m^2



Height:172 cm	Height:172 cm
Weight:85 Kg	Weight:85 Kg
BMI: 28.7	BMI: 28.7
BAI: 24.1	BAI: 19.7

RATINGS OF % FAT (AGES 20-29 YR)



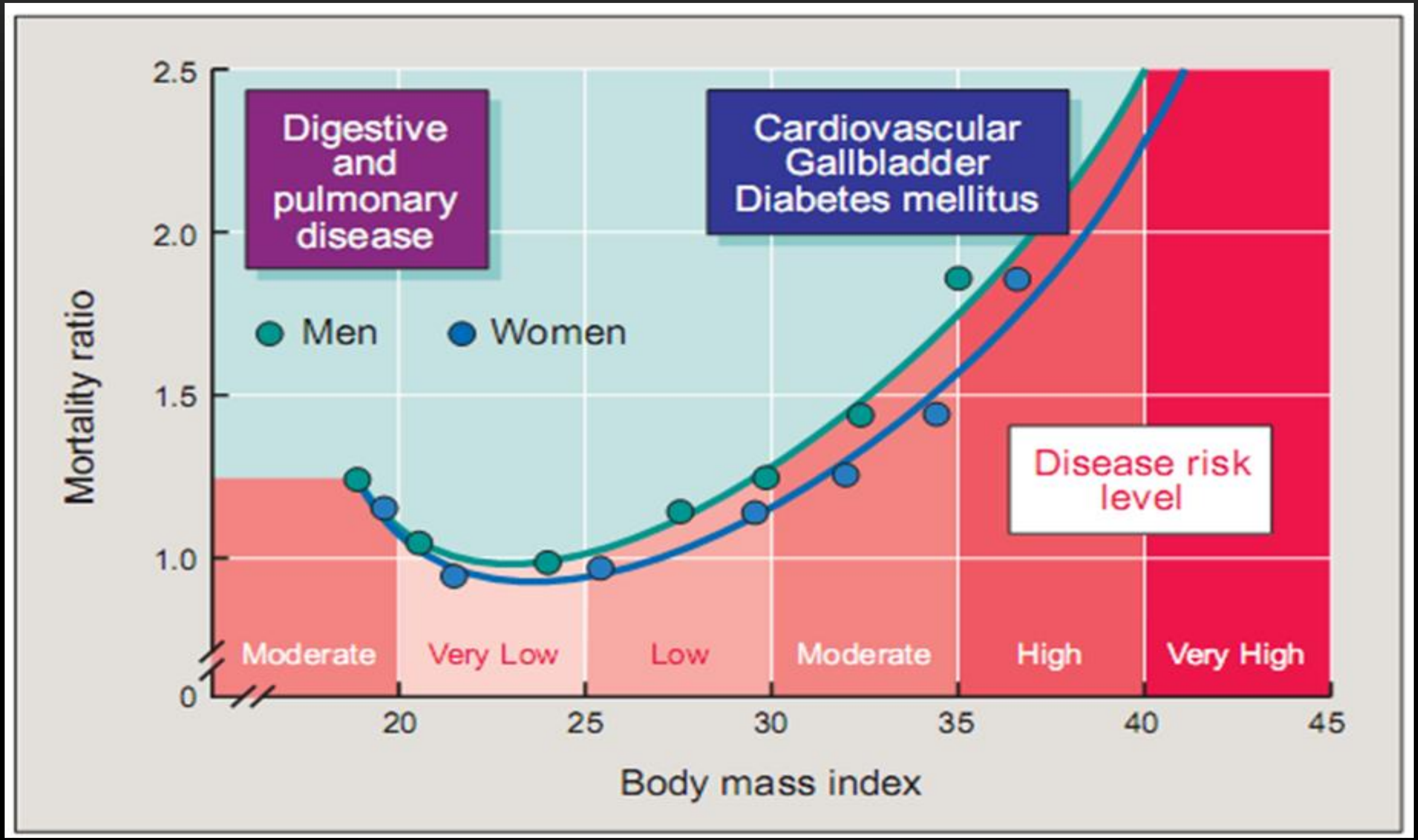
Rating	*Men*	*Women*
Excellent	6-9	10-17
Good	10-14	17-21
Acceptable	15-19	21-25
Too Fat	20-22	27-32
Obese	>22	>32

IS IT POSSIBLE TO BE TOO LEAN?

- Less than 8% for women and less than 5% for men.

- Extreme has been linked to problems with:
  - Reproductive
  - Immune system disorders

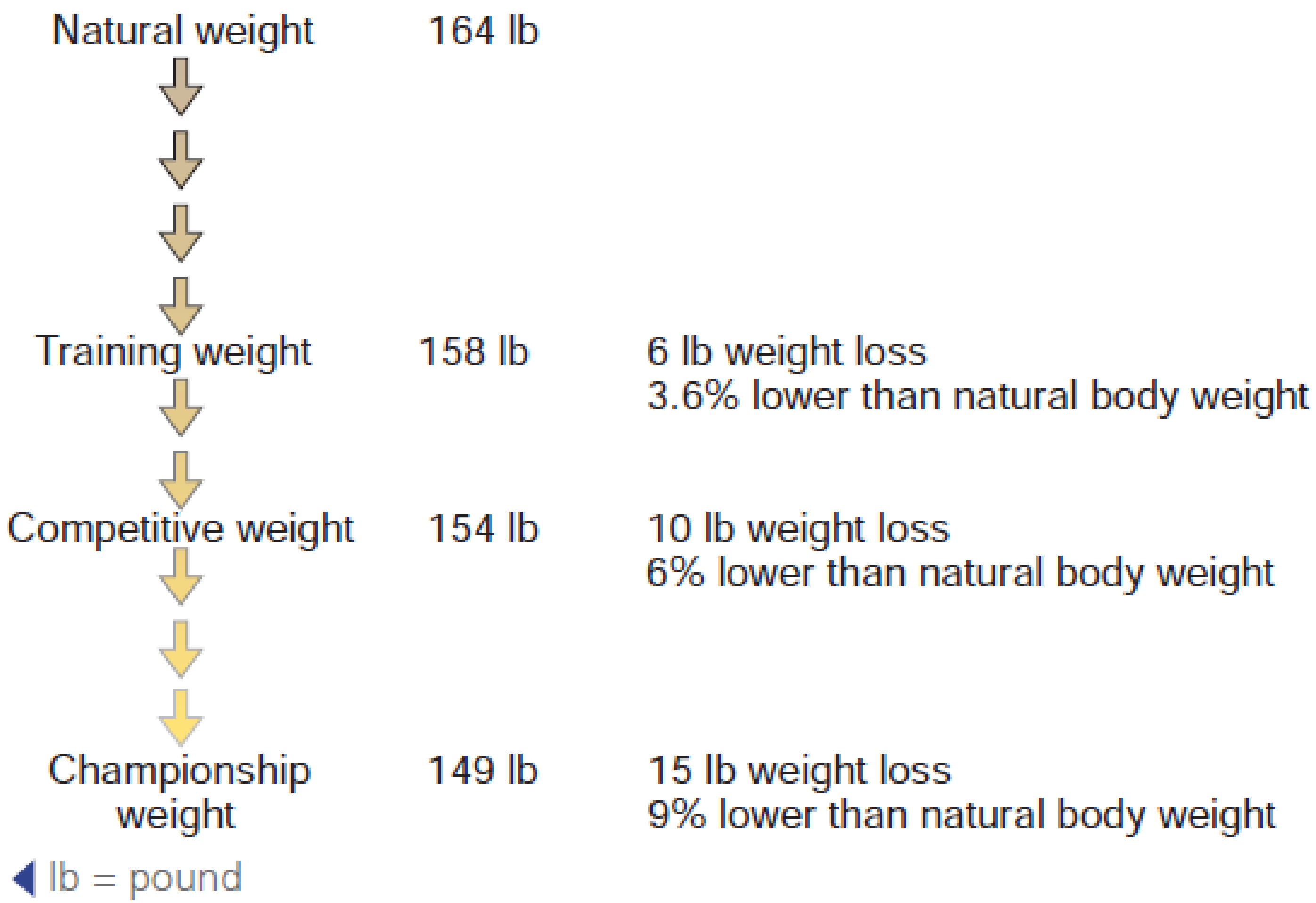
- ارتباط ترکیب بدن(وزن بدن) با سلامتی



BODY COMPOSITION AND PERFORMANCE

- Maximizing fat-free mass
  - Desirable for strength, power, and muscular endurance
  - Undesirable for endurance or jumping sports if result is weight gain
- Minimizing body fat
  - Desirable, especially in sport in which the body weight is moved through space
  - Improves speed, endurance, balance, agility, and jumping ability

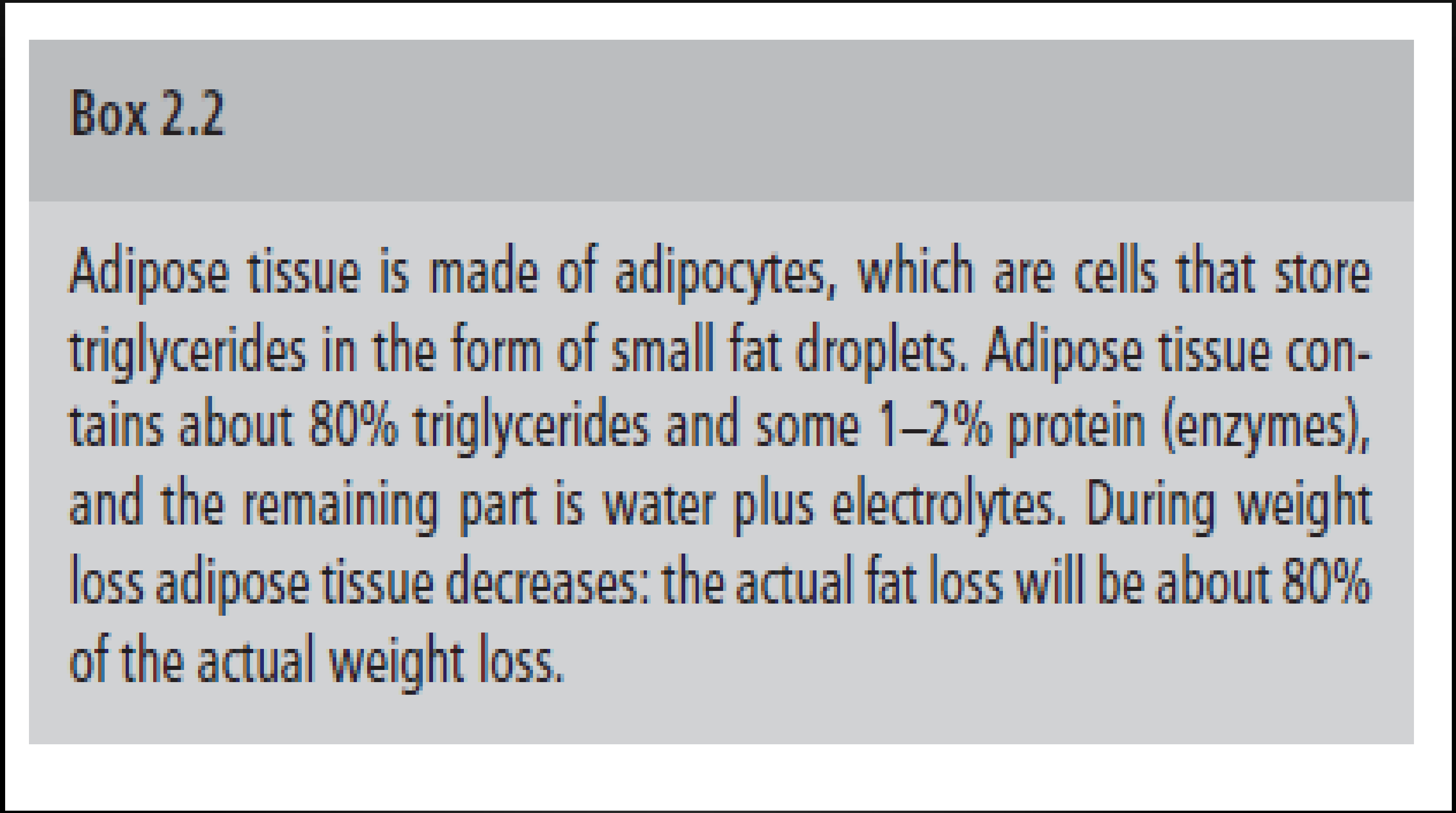
مدیریت وزن



Natural weight	164 lb	
Training weight	158 lb	6 lb weight loss 3.6% lower than natural body weight
Competitive weight	154 lb	10 lb weight loss 6% lower than natural body weight
Championship weight	149 lb	15 lb weight loss 9% lower than natural body weight

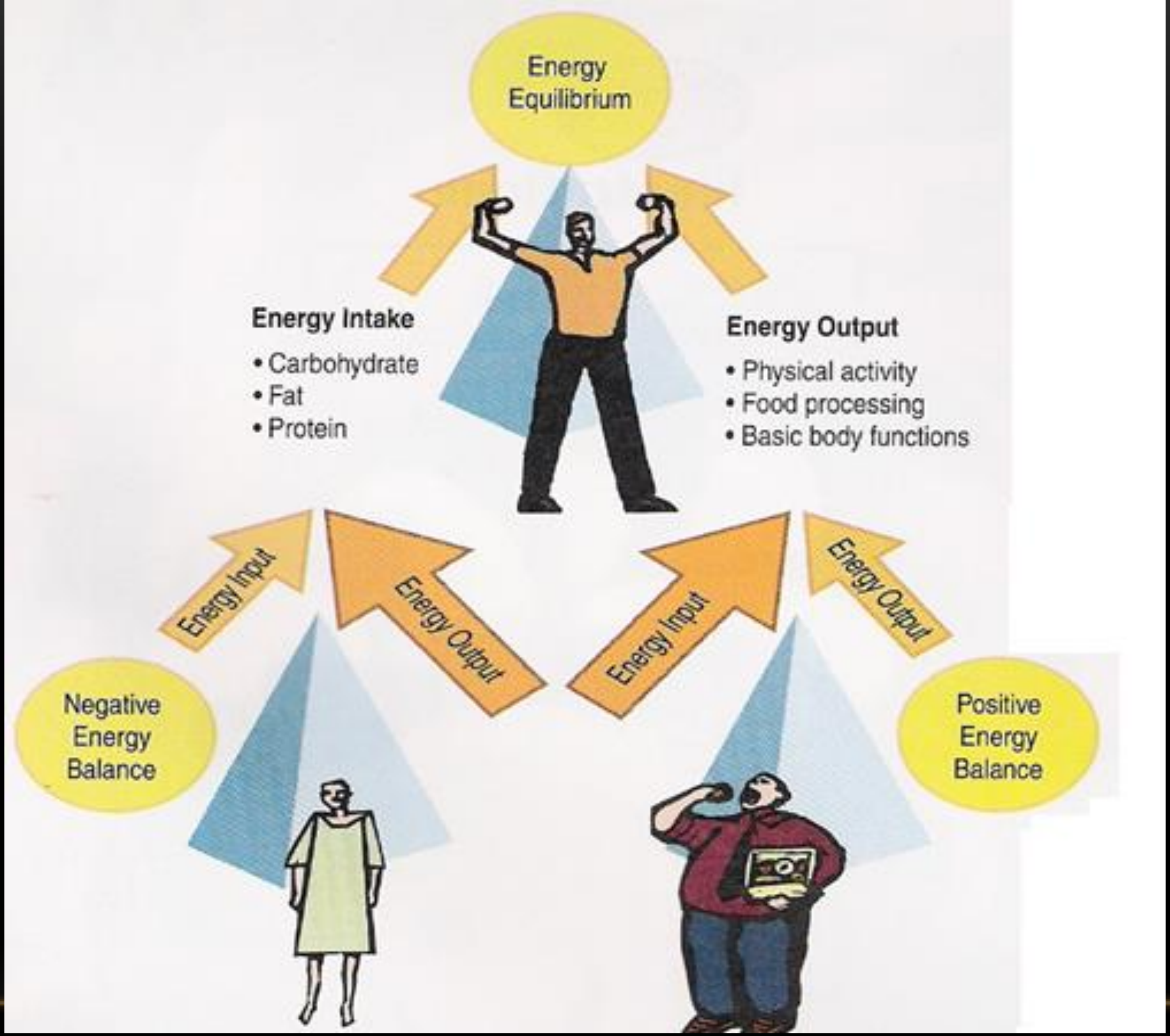
◀ lb = pound

Figure 11.18 Progression of Weight Loss in Amateur Boxers

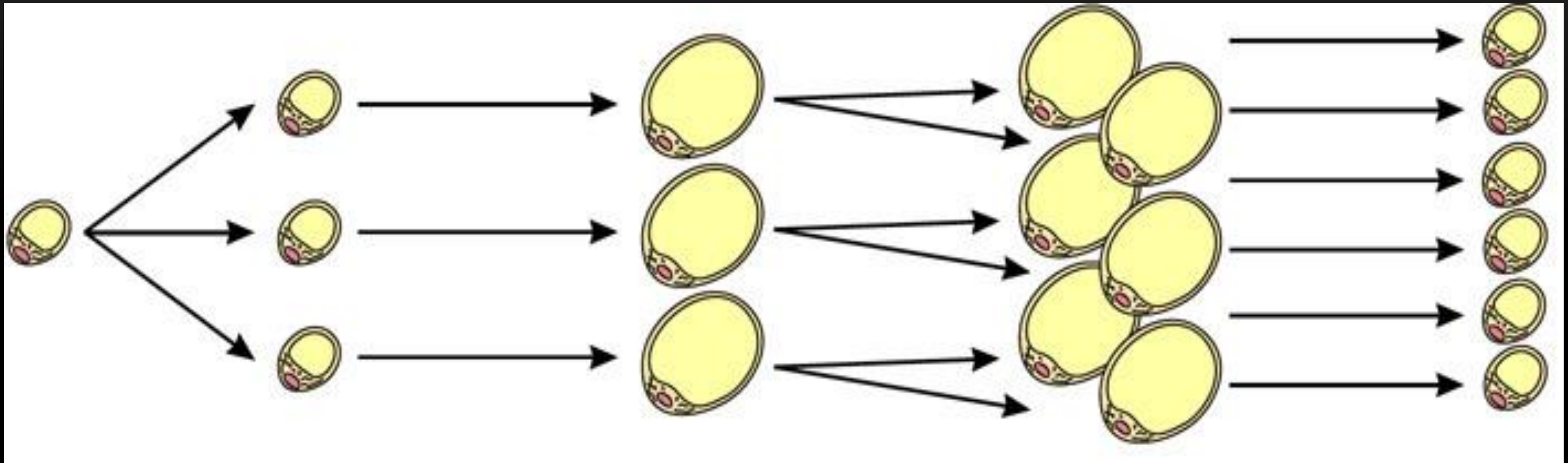


Box 2.2

Adipose tissue is made of adipocytes, which are cells that store triglycerides in the form of small fat droplets. Adipose tissue contains about 80% triglycerides and some 1–2% protein (enzymes), and the remaining part is water plus electrolytes. During weight loss adipose tissue decreases: the actual fat loss will be about 80% of the actual weight loss.


Energy Equilibrium
Energy Intake
• Carbohydrate
• Fat
• Protein
Energy Output
• Physical activity
• Food processing
• Basic body functions
Energy Input
Energy Output
Energy Input
Energy Output
Negative Energy Balance
Positive Energy Balance

Fat Cell Development



During periods of growth in late childhood/early puberty, # on fat cells increase

During periods of excess intake, fats cell size increases

When fat cells have reached their maximum size, the cell number increases

Even with fat loss, the cells may shrink but not the number

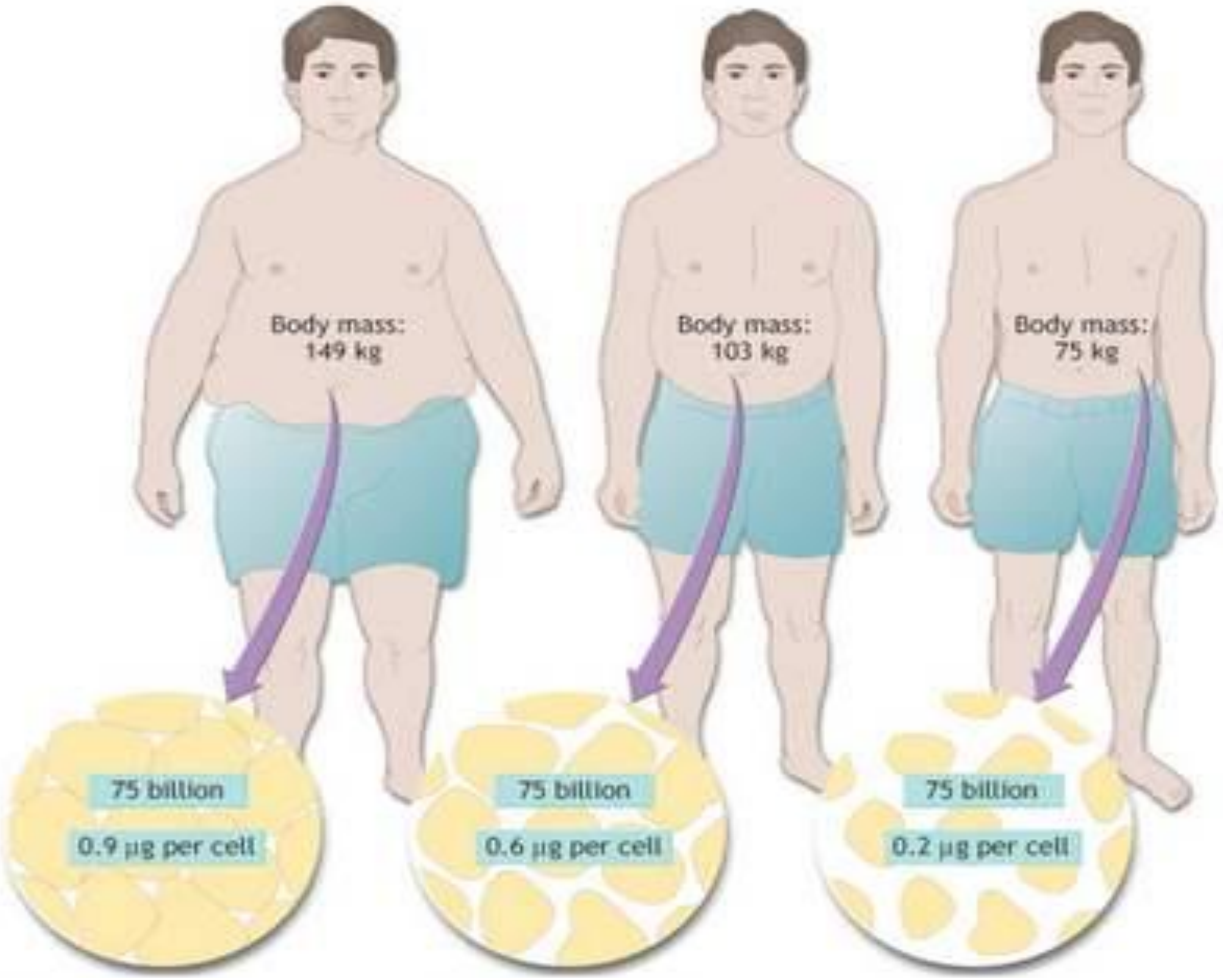
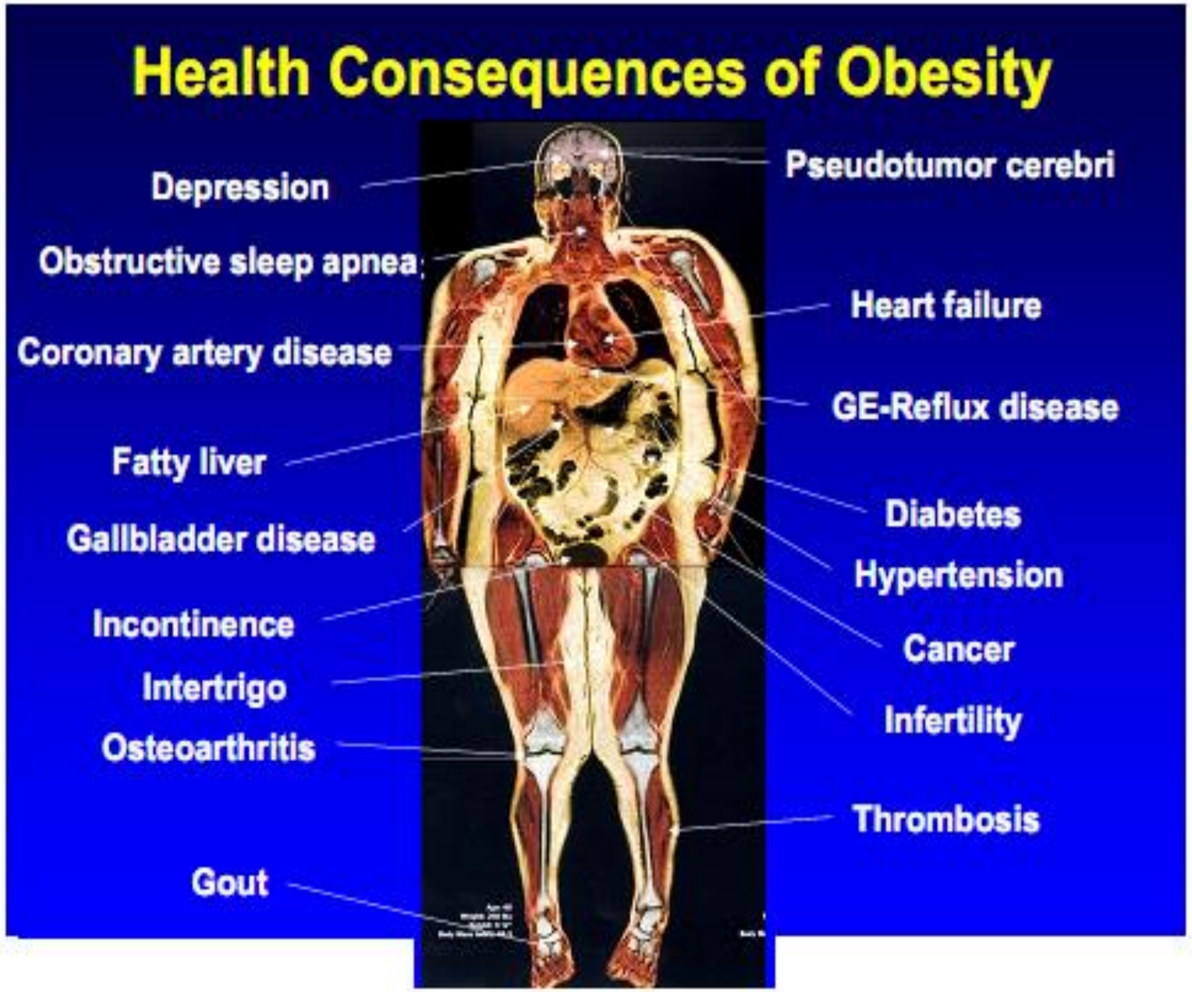

Body mass:
149 kg
Body mass:
103 kg
Body mass:
75 kg
75 billion
0.9 µg per cell
75 billion
0.6 µg per cell
75 billion
0.2 µg per cell

Figure 30.13. Changes in adipose cellularity with weight reduction in obese subjects. (Data from Hirsch J. Adipose cellularity in relation to human obesity. In: Stollerman GH, ed. Advances in internal medicine, vol 17. Chicago: Year-Book, 1971.)

Copyright © 2001 Lippincott Williams & Wilkins



Health Consequences of Obesity

Depression

Obstructive sleep apnea

Coronary artery disease

Fatty liver

Gallbladder disease

Incontinence

Intertrigo

Osteoarthritis

Gout

Pseudotumor cerebri

Heart failure

GE-Reflux disease

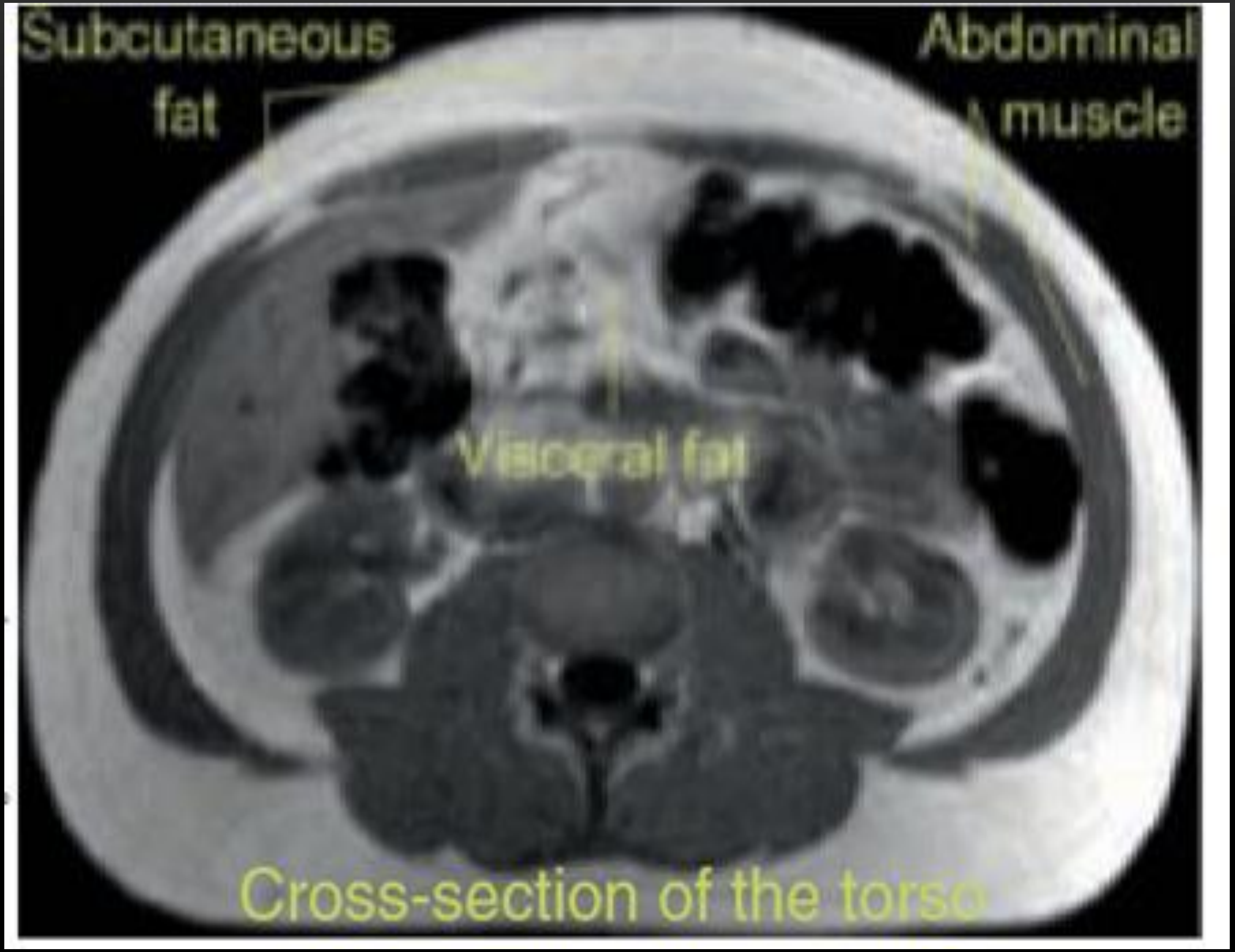
Diabetes

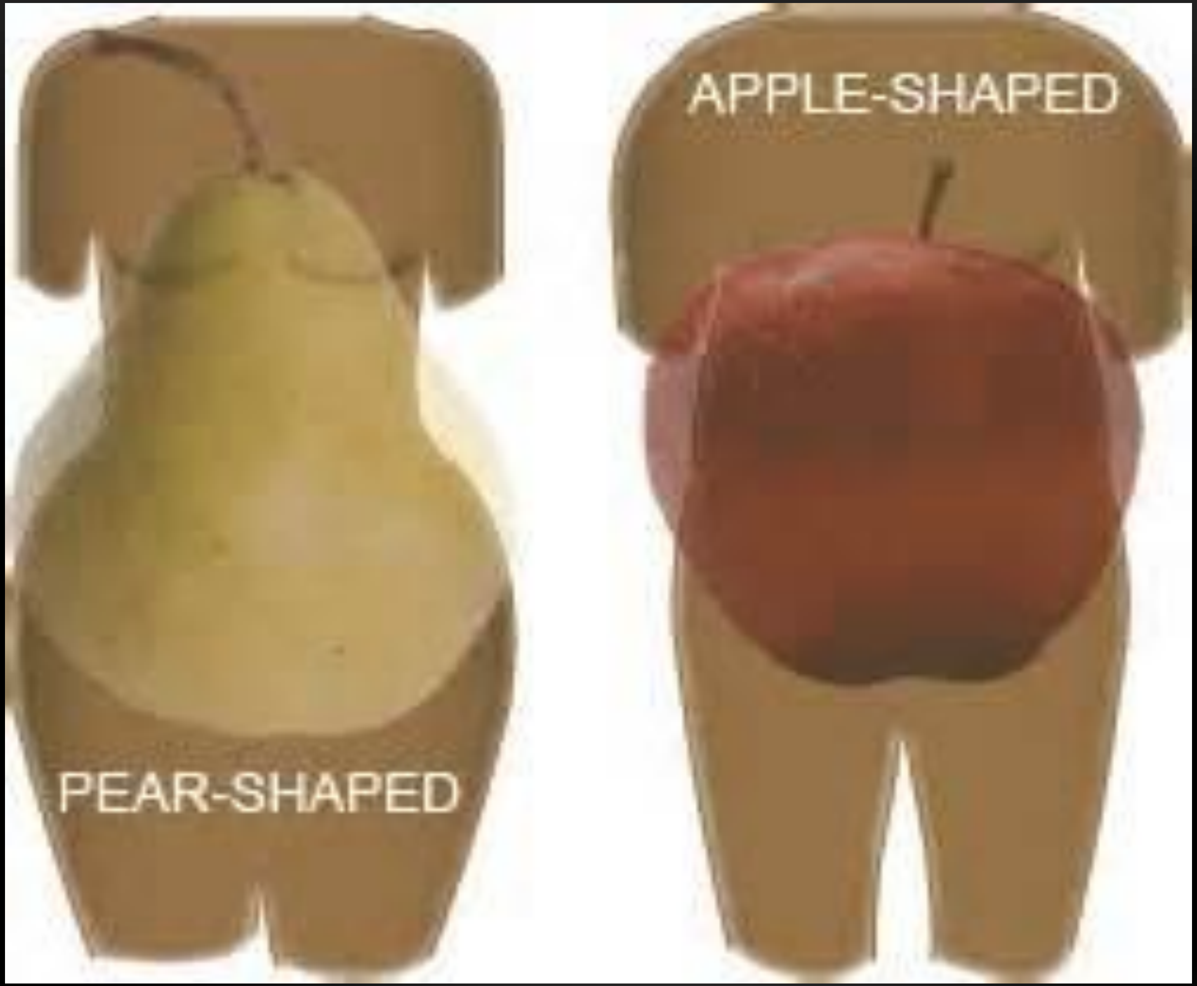
Hypertension

Cancer

Infertility

Thrombosis


Subcutaneous fat
Abdominal muscle
Visceral fat
Cross-section of the torso


APPLE-SHAPED
PEAR-SHAPED

Ideal Body Weight

Hamwi Method

Female = 45 kg for the first 152.4 cm + 0.9 kg for each additional cm.

M = 48 kg for the first 152.4 cm + 1.1 kg for each additional cm.

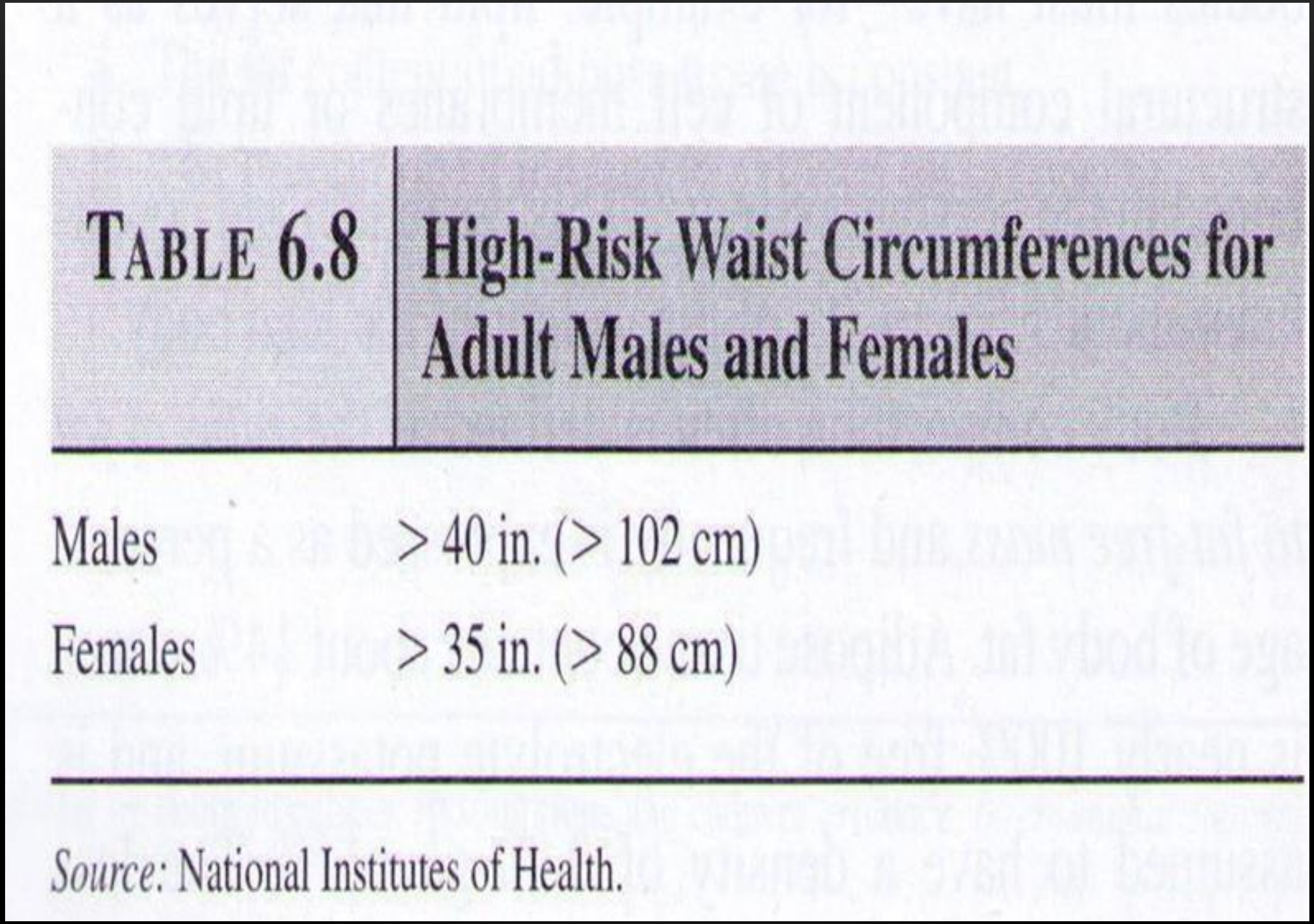
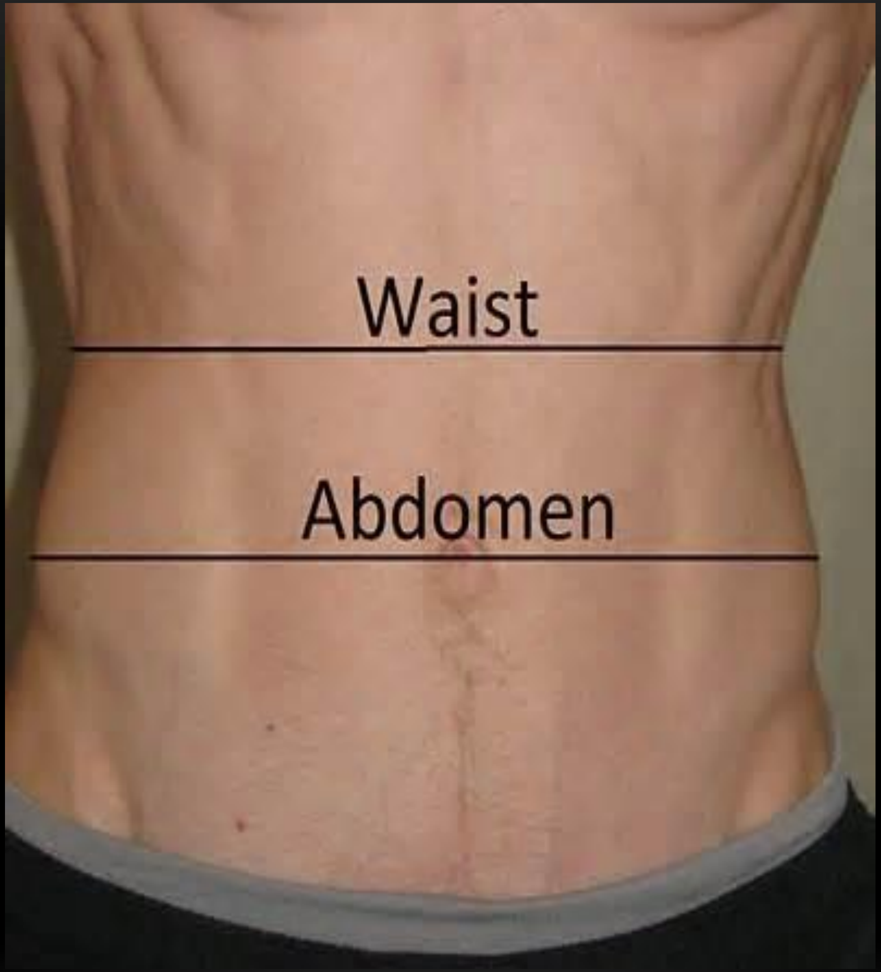
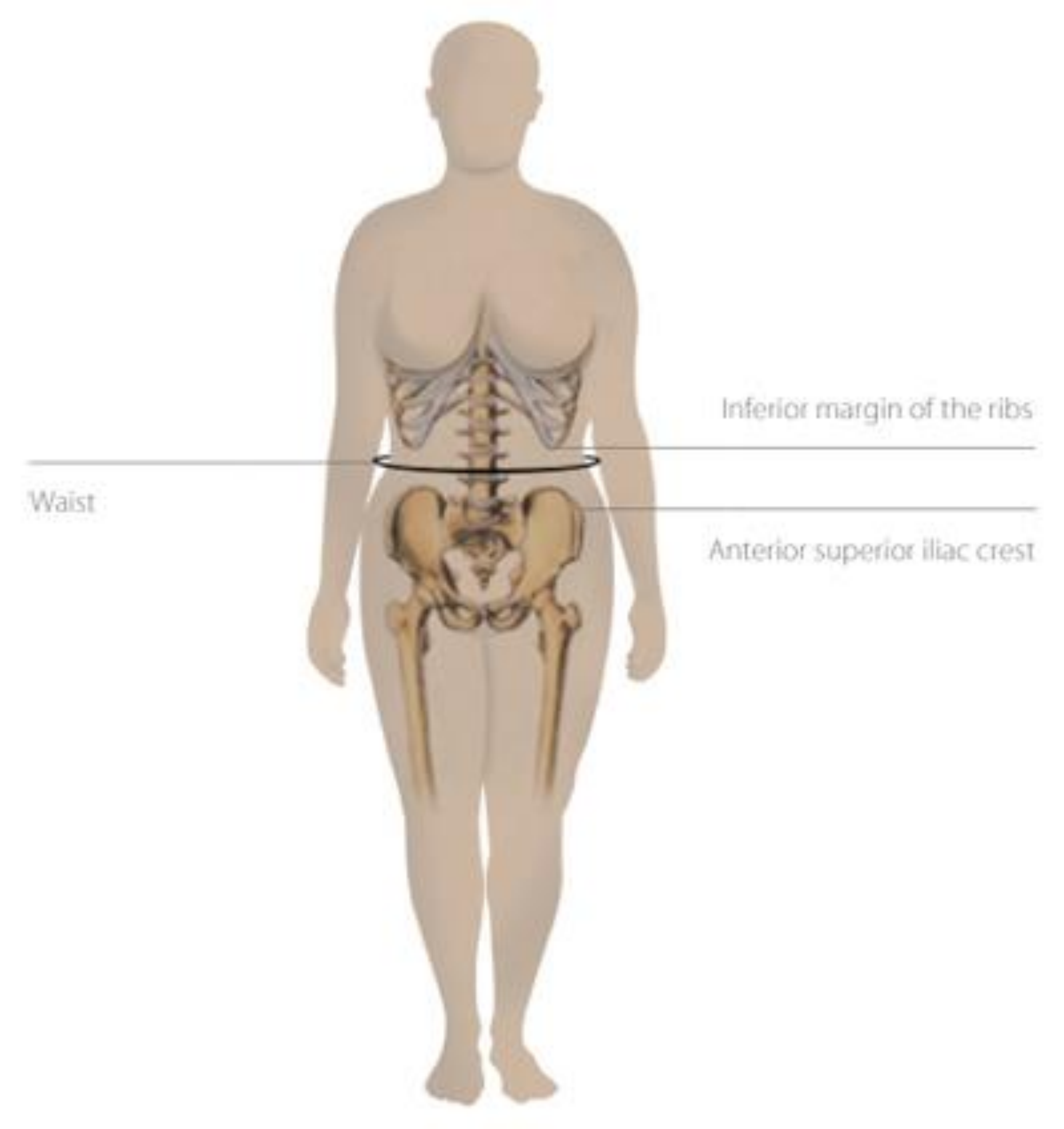


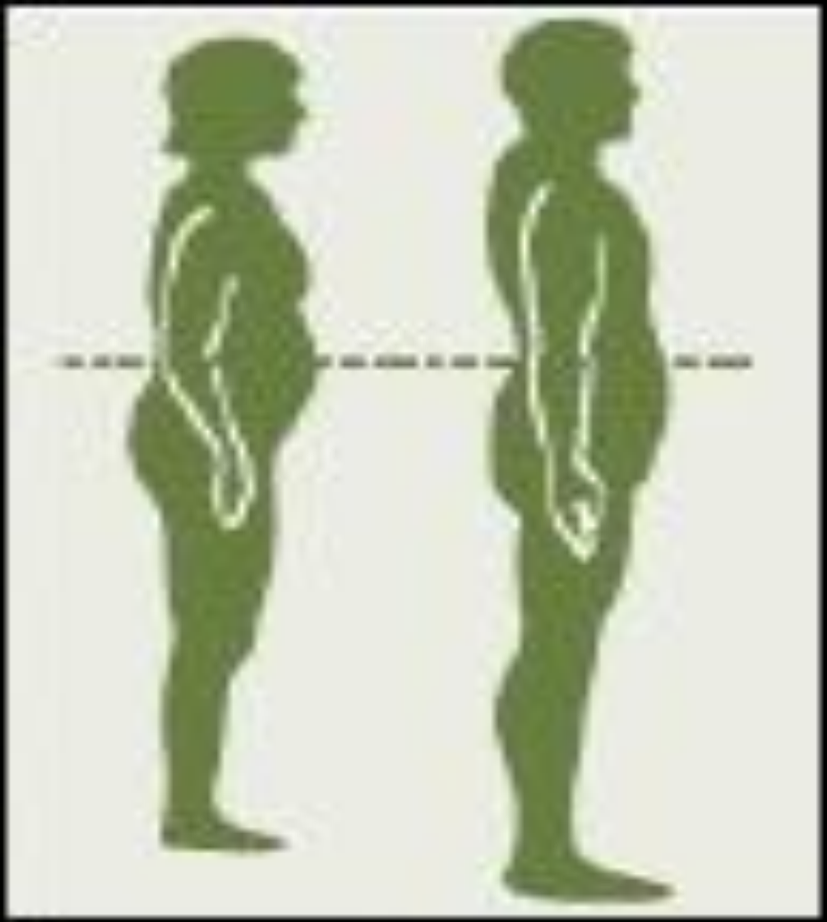
TABLE 6.8 **High-Risk Waist Circumferences for Adult Males and Females**

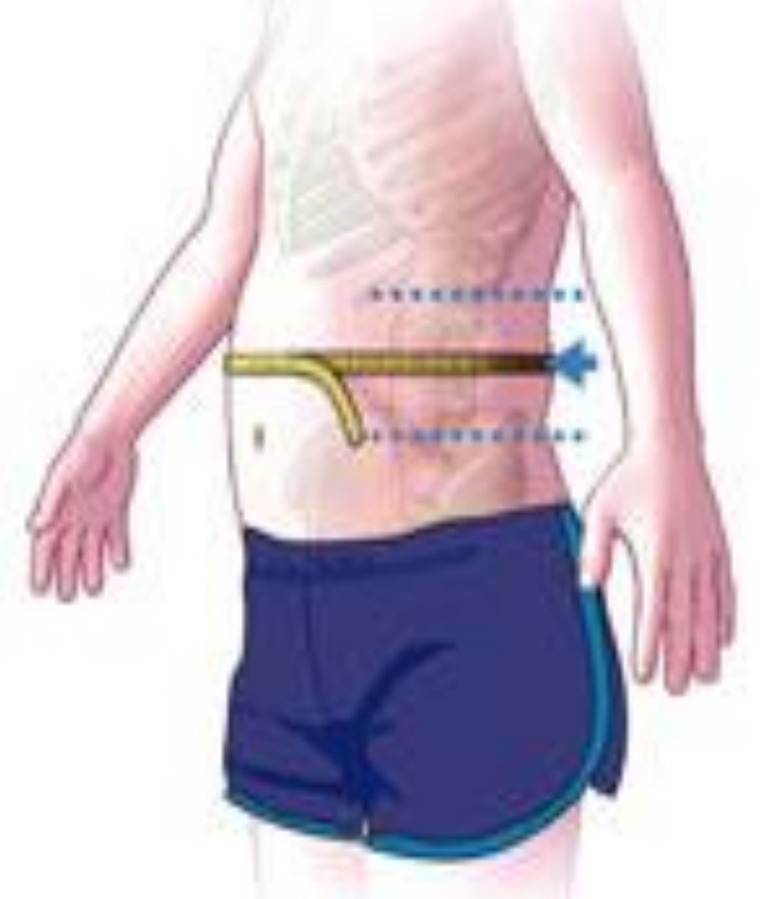
Males	> 40 in. (> 102 cm)
Females	> 35 in. (> 88 cm)

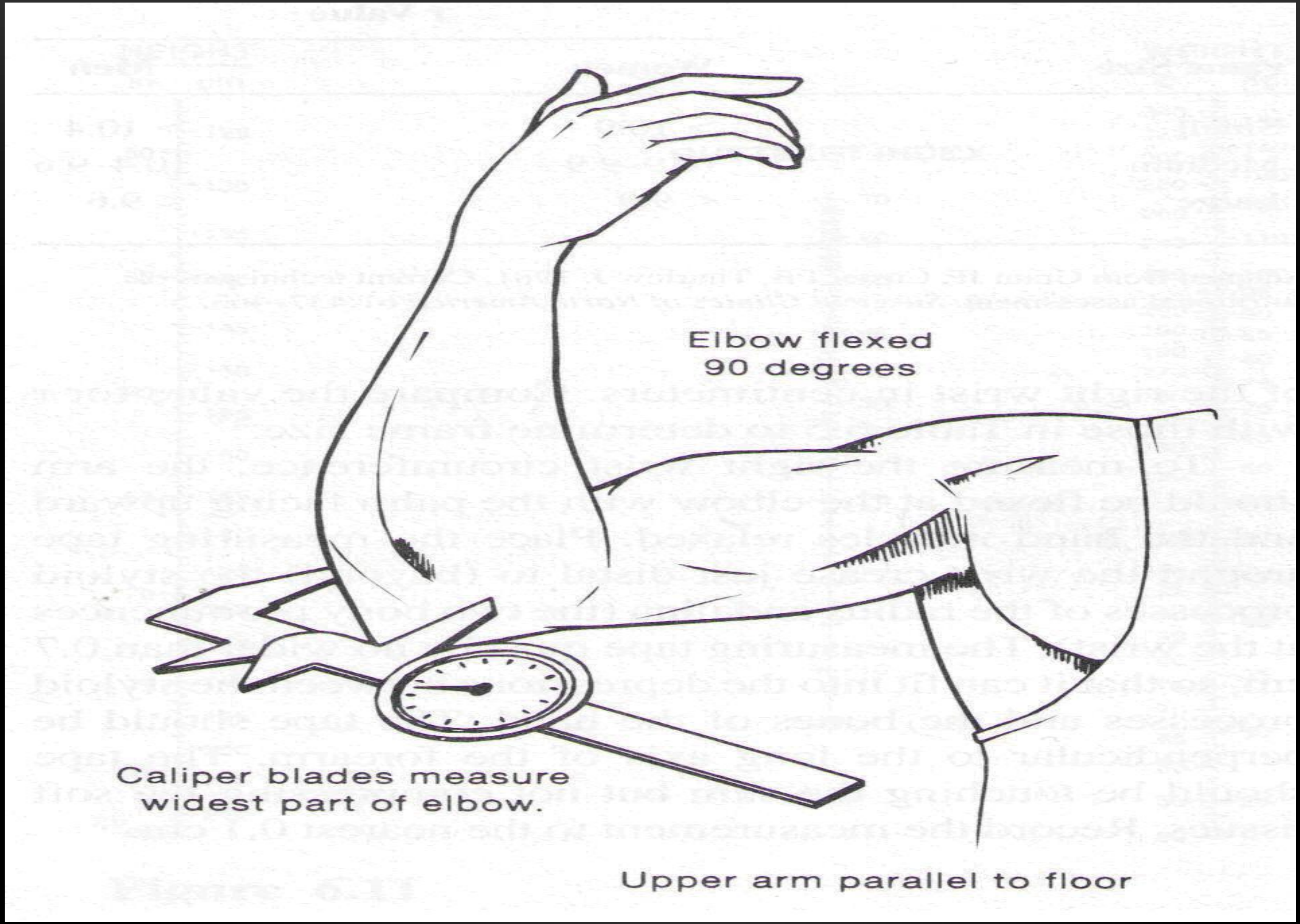
Source: National Institutes of Health.


Waist
Abdomen


Inferior margin of the ribs
Waist
Anterior superior iliac crest

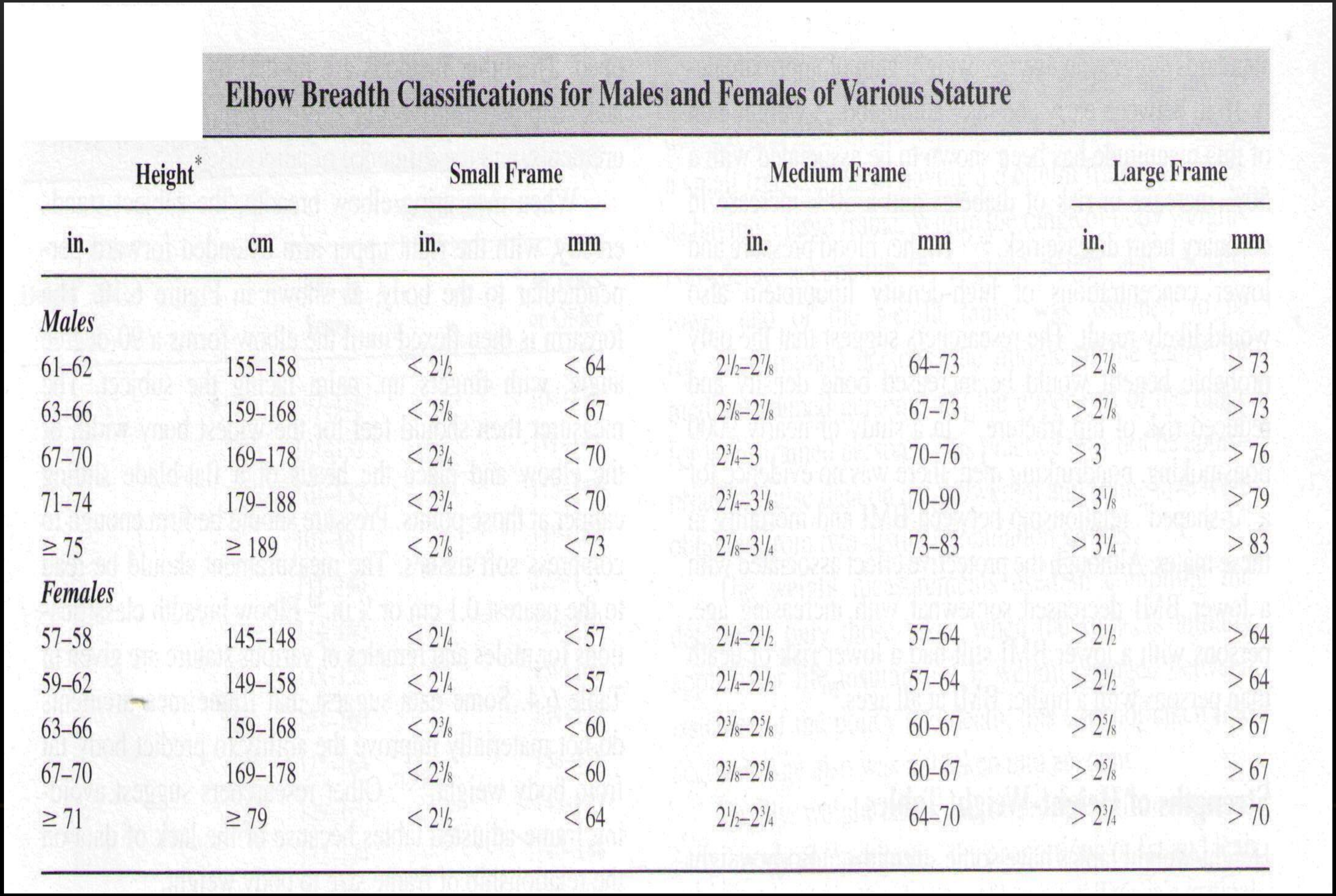





Elbow flexed 90 degrees
Caliper blades measure widest part of elbow.
Upper arm parallel to floor

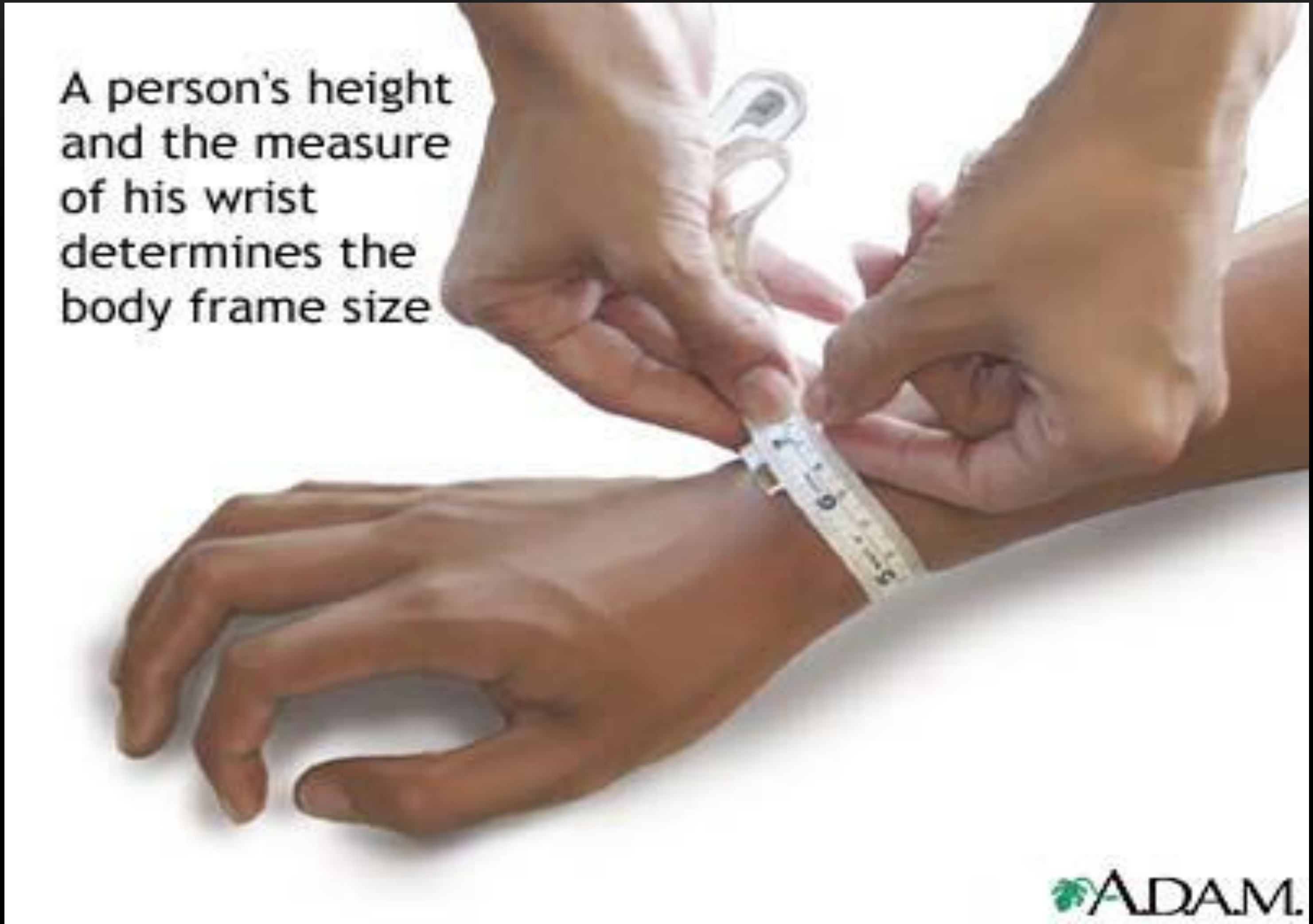
اندازه گیری پهنای آرنج به منظور تعیین نوع استخوان بندی

طبقه‌بندی استخوان بندی مردان و زنان با توجه به قد و پهنای استخوان آرنج

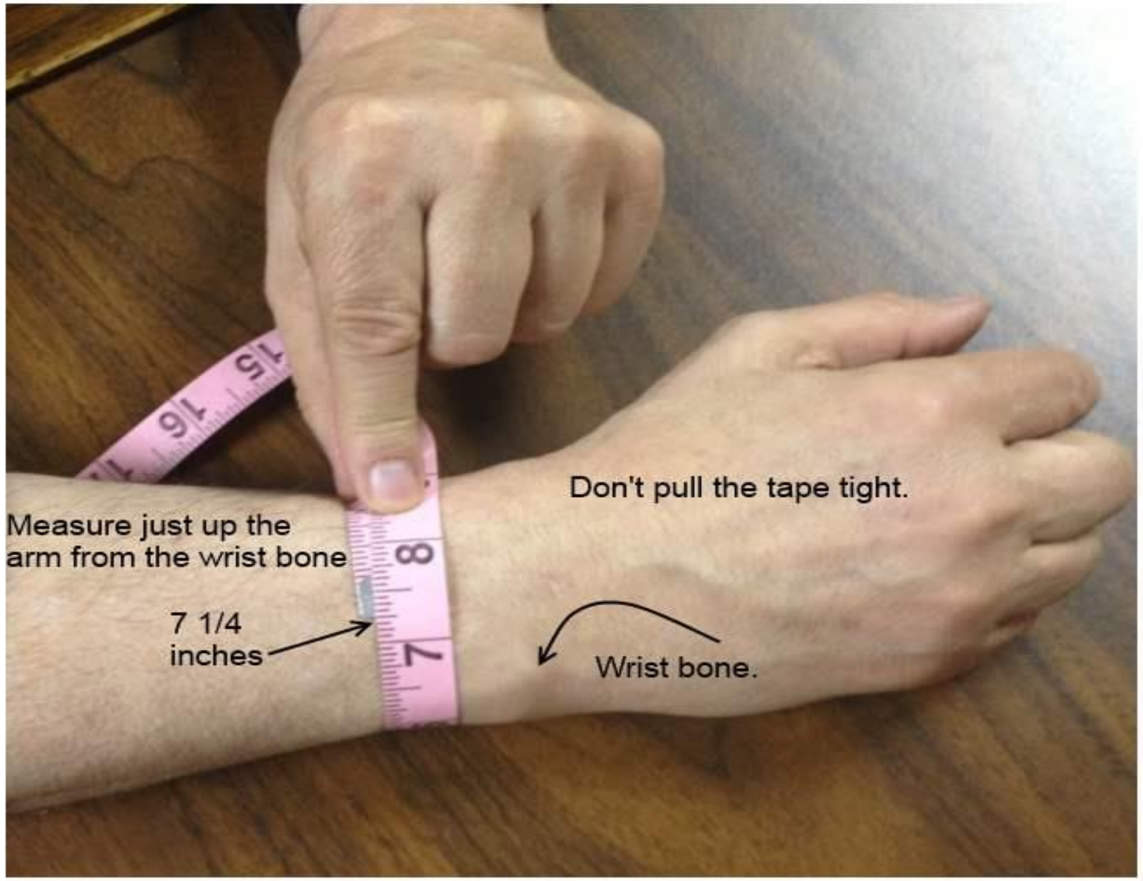


Elbow Breadth Classifications for Males and Females of Various Stature

Height*		Small Frame		Medium Frame		Large Frame	
in.	cm	in.	mm	in.	mm	in.	mm
Males							
61–62	155–158	< 2½	< 64	2½–2⅞	64–73	> 2⅞	> 73
63–66	159–168	< 2⅝	< 67	2⅝–2⅞	67–73	> 2⅞	> 73
67–70	169–178	< 2¾	< 70	2¾–3	70–76	> 3	> 76
71–74	179–188	< 2¾	< 70	2¾–3⅛	70–90	> 3⅛	> 79
≥ 75	≥ 189	< 2⅞	< 73	2⅞–3¼	73–83	> 3¼	> 83
Females							
57–58	145–148	< 2¼	< 57	2¼–2½	57–64	> 2½	> 64
59–62	149–158	< 2¼	< 57	2¼–2½	57–64	> 2½	> 64
63–66	159–168	< 2⅜	< 60	2⅜–2⅝	60–67	> 2⅝	> 67
67–70	169–178	< 2⅜	< 60	2⅜–2⅝	60–67	> 2⅝	> 67
≥ 71	≥ 79	< 2½	< 64	2½–2¾	64–70	> 2¾	> 70



A person's height and the measure of his wrist determines the body frame size


Measure just up the arm from the wrist bone
7 1/4 inches
Don't pull the tape tight.
Wrist bone.

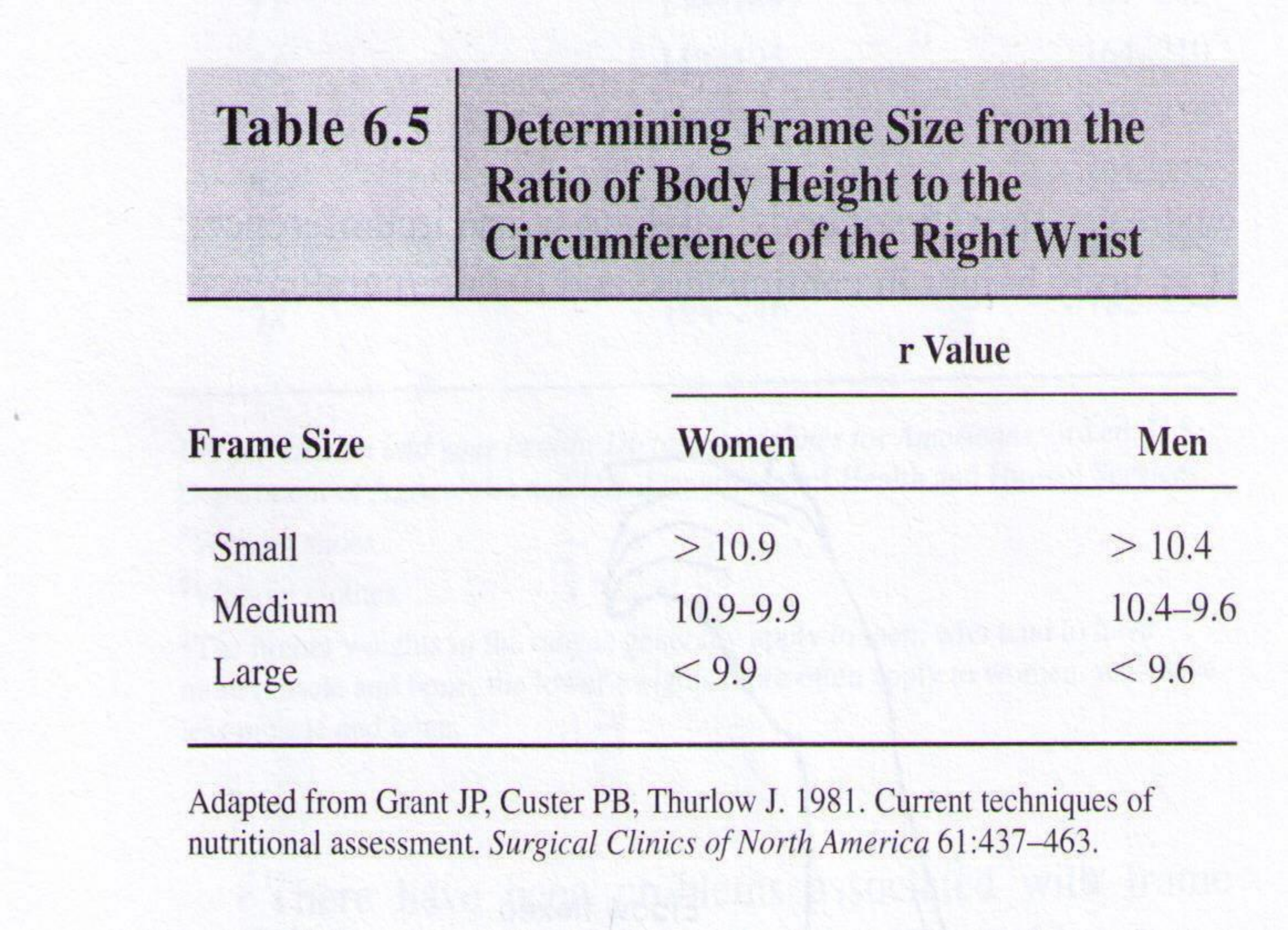


Table 6.5 **Determining Frame Size from the Ratio of Body Height to the Circumference of the Right Wrist**

	r Value	
Frame Size	**Women**	**Men**
Small	> 10.9	> 10.4
Medium	10.9–9.9	10.4–9.6
Large	< 9.9	< 9.6

Adapted from Grant JP, Custer PB, Thurlow J. 1981. Current techniques of nutritional assessment. *Surgical Clinics of North America* 61:437–463.

$R = H/C$

Weight Change

- Athletes often want to increase or decrease their body weight to meet sports demands.

- Weight change should occur slowly during the off-season, or beginning of the beginning before competition begins.

METHODS USED TO MAKE WEIGHT

- Food restriction
- Fluid restriction
- Fasting
- Sauna
- Rubber suits
- Laxatives
- Vomiting
- Diuretics
- Appetite suppressants

Specific Gravity Testing Instrument

Refractometer

- Weight loss can be accomplished by decreasing calorie intake by 500 calories per day while maintaining a healthy diet.

- Weight loss should be gradual, approximately 0.5-1kg/week.)(1.5%/week).

- Slow weight loss contributes to a loss in body fat while maintaining muscle.

- Rapid weight loss increases the risk of losing muscle and regaining weight.

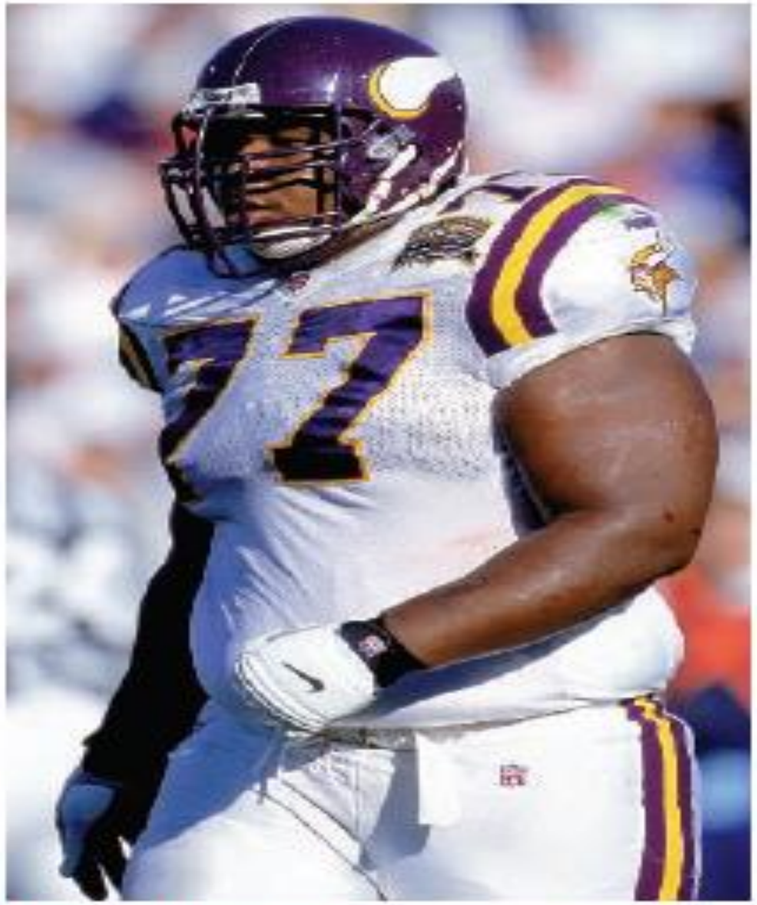
- Weight loss techniques involving loss of body water are dangerous.

- Water loss results in decreased blood volume and reduced blood flow to the kidneys, skin, and muscles.

- This hinders the body's ability to sweat and regulate body temperature, and increases the risk of dehydration.

A loss of only 1 percent body weight as water can result in measurable increases in body temperature.

It is estimated that for every 1 percent of body weight that is lost as water, core temperature will be elevated 0.1°C–0.23°C (Sawka and Coyle, 1999).


National Football League all-star Korey Stringer died in 2001 as a result of heat stroke.

During November 7-December 9, 1997, three previously healthy collegiate wrestlers in different states died while each was engaged in a program of rapid weight loss to qualify for competition.

In the hours preceding the official weigh-in, all three wrestlers engaged in a similar rapid weight-loss regimen that promoted dehydration through perspiration and resulted in hyperthermia. The wrestlers restricted food and fluid intake and attempted to maximize sweat losses by wearing vapor-impermeable suits under cotton warm-up suits and exercising vigorously in hot environments.

- **Case 1.** During November 6-7, over a 12-hour period, a 19-year-old man in North Carolina attempted to lose 15 lbs to compete in the 195-lb weight class of a wrestling tournament scheduled for November 8. His preseason weight on August 27 was 233 lbs, and during the next 10 weeks he lost 23 lbs. On November 6, from 3 p.m. to 11:30 p.m., using the weight-loss regimen described above, he lost an additional 9 lbs. After a 2-hour rest, he resumed his weight-loss regimen on November 7 at 1:45 a.m. At approximately 2:45 a.m., he stopped exercising but began to experience extreme fatigue and became incommunicative; an hour later, he developed cardiorespiratory arrest. Resuscitation was unsuccessful. Chemistry findings in vitreous humor obtained 7 hours after death were sodium, 152 mmol/L (normal postmortem: 135-151 mmol/L); urea nitrogen, 40 mg/dL (normal postmortem: less than or equal to 40 mg/dL); and urine myoglobin, less than 20 ng/mL (normal antemortem: 0-40 ng/mL); creatinine results were unavailable. **Anatomic findings from the autopsy were insufficient to determine the cause of death.**

- **Case 2.** On November 21, over a 4-hour period, a 22-year-old man in Wisconsin attempted to lose 4 lbs to compete in the 153-lb weight class of a wrestling tournament scheduled for November 22. His preseason weight on September 6 was 178 lbs. During the next 10 weeks he lost 21 lbs, of which 8 lbs were lost during November 17-20. On November 21 at 5:30 a.m., he initiated the same weight-loss regimen as in case 1. An hour later, he complained of shortness of breath but continued exercising. By 8:50 a.m., he had lost 3.5 lbs. He drank approximately 8 oz of water, rested for 30 minutes, and resumed exercise. At 9:30 a.m., he stopped exercising and indicated he was not feeling well. Efforts were made to cool him, and his clothing was removed. He became unresponsive and developed cardiorespiratory arrest; resuscitation was unsuccessful. Chemistry findings in antemortem blood were serum sodium, 161 mmol/L (normal: 136-145 mmol/L); urea nitrogen, 34 mg/dL (normal: 7-18 mg/dL); and creatinine, 5.0 mg/dL (normal: 0.8-1.3 mg/dL). Serum myoglobin was greater than 5000 ng/mL (normal: 0-110 ng/mL). Rectal temperature was 108 F (42 C) at the time of death. **The autopsy report cited the cause of death as hyperthermia.**

- **Case 3.** On December 9, over a 3-hour period, a 21-year-old man in Michigan attempted to lose 6 lbs to compete in the 153-lb weight class of a wrestling meet scheduled for December 10. His preseason weight on September 4 was 180 lbs. During the next 13 weeks he lost 21 lbs, of which 11 lbs were lost during December 6-8. On December 9, from 3:30 p.m. to 5 p.m., he lost 2.3 lbs and weighed 156.7 lbs. After wrestling practice, he initiated the same weight-loss regimen as in case 1; after 75 minutes, he had lost an additional 2 lbs. After a 15-minute rest, he resumed exercise. Approximately 1 hour later, he stopped exercising to weigh himself and demonstrated fatigue. A few minutes later, his legs became unsteady, he became incommunicative, and he had difficulty breathing. Attempts to administer fluid orally were unsuccessful, and he developed cardiorespiratory arrest. Resuscitation was unsuccessful. Chemistry findings in vitreous humor obtained 4 hours after death were sodium, 159 mmol/L (normal: 136-146 mmol/L); urea nitrogen, 31 mg/dL (normal: 8-20 mg/dL); and creatinine, 0.7 mg/dL (normal: 0.9-1.3 mg/dL). Urine myoglobin was 4280 ng/mL (normal: 0-45 ng/mL). **The autopsy report cited the cause of death as rhabdomyolysis.**

- Determining a healthy body weight is critical.

- A healthy weight is one that can be realistically maintained, allows for positive increases in athletic performance and minimizes risk of injury.

- Pressure to achieve unrealistic body weights can lead to chronic dieting and eating disorders in severe cases.

- In addition, pressure to loss weight can encourage athletes to follow unhealthy weight loss methods.

Extreme calorie restrictions can result in a decreased in both body fat and muscle which can hinder athletic performance.

- Excessive weight loss can especially be a problem for female athletes.

- In females, low calorie intakes in combination with high energy expenditures can lead to amenorrhea and loss of or failure to gain bone mass.

Very Low Fat Diets

Not Recommended

Too little dietary fat affects

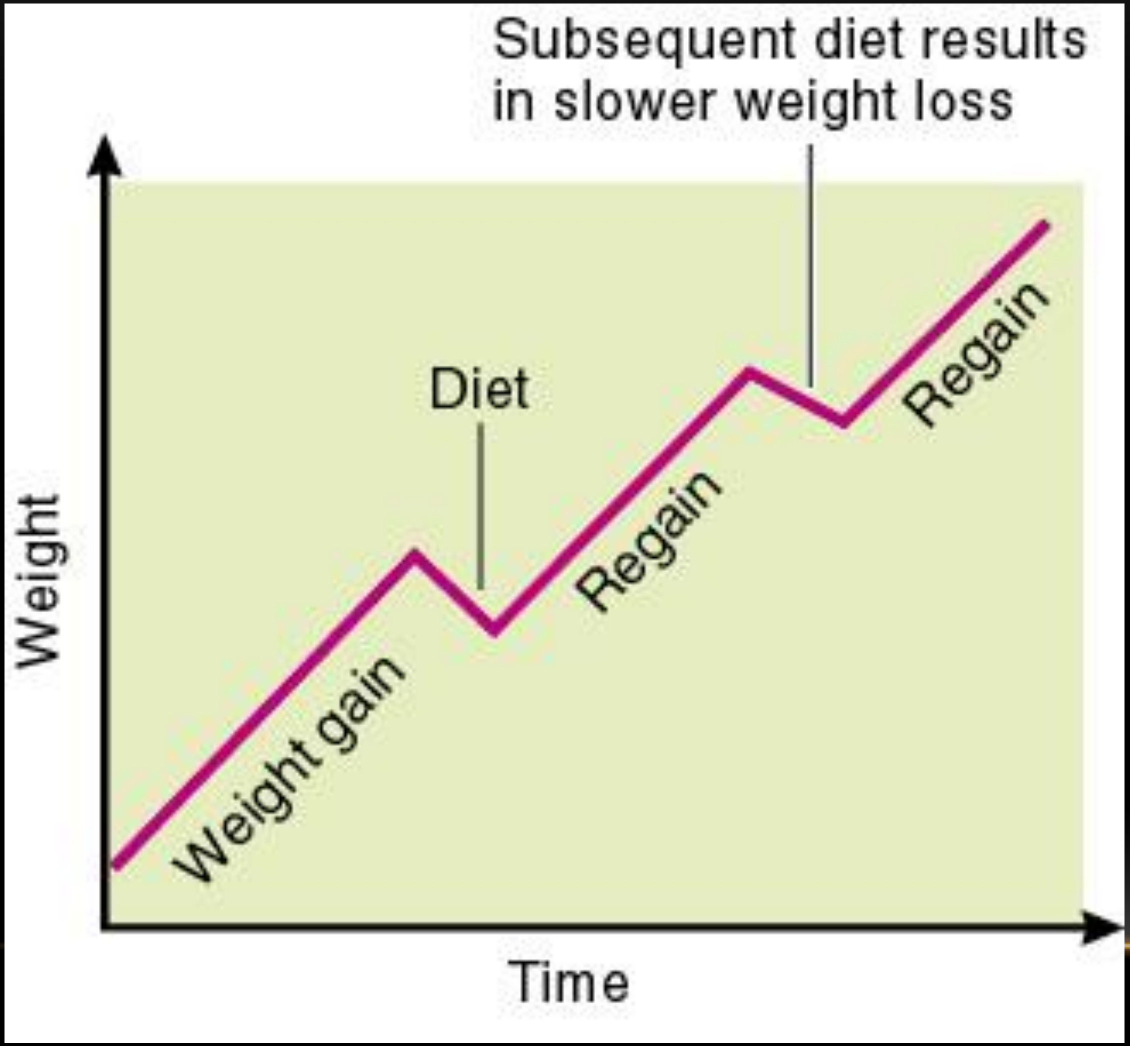
mental function,

immune function,

hormone function,

absorption of some vitamins, and energy levels

The Weight-Cycling Effect of Repeated Dieting



Each period of dieting results in a resetting of your “homeostatic set point”.

Therefore, each loss is followed by a gain even larger than the loss

راهکارهای افزایش وزن

مقدمه

کم وزنی و لاغری یکی از مشکلات تغذیه ای در بین تعدادی از ورزشکاران بخصوص نوجوانان و جوانان ورزشکار می باشد.

در بسیاری از رشته های ورزشی از جمله در ورزش هایی که در آنها برخورد بدنی زیاد بوده و قدرت بدنی نقش تعیین کننده در موفقیت ورزشکار دارد، کم وزنی و لاغری یک نقطه ضعف بوده و حتی می تواند با کاهش توانایی سیستم دفاعی بدن زمینه را برای ابتلا به بیماری ها فراهم ساخته و بدین ترتیب سلامتی ورزشکار را به مخاطره بیندازد.

کم وزنی و لاغری همچنین خطر آسیب های جسمانی در ورزش را نیز افزایش می دهد.

–تمرینات ورزشی بیش از حد به همراه عدم تامین نیازهای انرژی(تغذیه نامناسب بدلیل مسافرت های ورزشی ،حذف وعده های غذایی و......)،موجب کاهش وزن بدن ورزشکار(توده چربی و بافت عضلانی) می گردد.

برای افزایش وزن مطلوب افراد لاغر می توان از رژیم های غذایی افزایش وزن (رژیم پرکالری)، ورزش های مقاومتی و مکمل های غذایی مناسب بطور همزمان استفاده کرد.

راه کارهای افزایش وزن و توده بدنی

- رژیم غذایی افزایش وزن(پرکالری)

- ورزش های مقاومتی

- مصرف مکمل های افزایش وزن

ملاحطات تغذیه ای در افزایش وزن

۱.تعیین **وزن فعلی**(current weight)(مثال ۷۰ کیلوگرم) و **وزن هدف**(target weight)(مثال ۷۵ کیلوگرم)

۲.محاسبه میزان افزایش وزن مورد نظر(۵ کیلوگرم)

۳. تعیین مدت زمان مورد نظر (هفته ای ۰/۵ کیلوگرم)(مثال ۱۰ هفته(۲/۵ ماه)

۵.افزایش ۵۰۰ کیلوکالری به محتوای انرژی برنامه غذایی روزانه

راهکارهای عملی افزایش محتوای کالری رژیم:

۱.افزایش تعداد وعده ها(۳ وعده اصلی و ۳ تا ۴ میان وعده)

۲.افزایش محتوای کالری هر وعده با استفاده از غذاهای با ارزش غذایی زیاد

۳.استفاده از نوشیدنی های حاوی انرژی

۴.مصرف آجیل و خشکبار

ضروریات افزایش وزن(توده عضلانی)

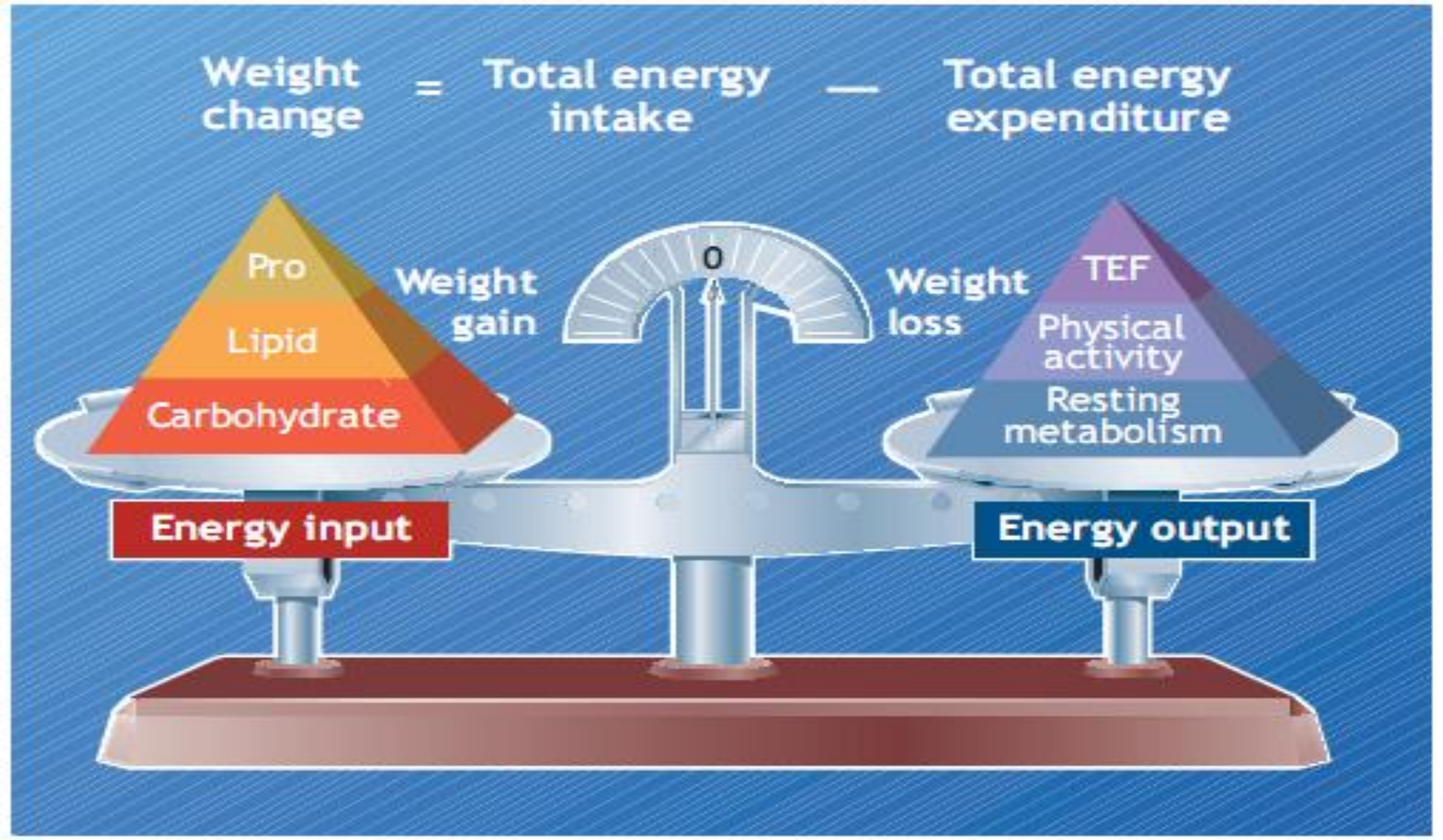
(تعادل مثبت انرژی) positive energy balance

(تعادل مثبت ازت) positive nitrogen ballance (NB)

تعادل مثبت پروتئین عضله positive muscle protein balance (MPB)

تعادل مثبت انرژی

Positive energy balance


Weight change
=
Total energy intake
—
Total energy expenditure
Pro
Lipid
Carbohydrate
Weight gain
0
Weight loss
TEF
Physical activity
Resting metabolism
Energy input
Energy output

سنتز ۱ گرم بافت جدید در بدن حدوداً بـــه ۵ کیلوکـــالری انـــرژی نیـــاز دارد.

(Institute of Medicine, 2002)

بنابراین برای افزایش ۰/۵ کیلوگرم وزن بدن(توده عضلانی) ۲۵۰۰ کیلوکـــالری انرژی اضافه نیاز است.که برای یک هفته حدوداًروزانه ۴۰۰ کیلوکالری در نظـــر گرفته می شود.

تعادل مثبت پروتئین

positive nitrogen ballance (NB)

برای سنتز ۰/۵ کیلوگرم توده عضلانی، ۱۰۰ گرم پروتئین اضافه نیاز است

می توان با افزایش مصرف روزانه ۱۴ گرم، افزایش ۰/۵ کیلوگرم توده عضلانی در هفته را نایل شد.

تعادل مثبت پروتئین عضلانی
positive muscle protein balance (MPB)

–ورزش مقاومتی

تعادل مثبت انرژی

تعادل مثبت پروتئین(غذا و مکمل های پروتئینی)

(Gropper, Smith, and Groff, 2005; Phillips, Hartman, and Wilkinson, 2005;

Phillips, 2004; Tipton and Wolfe, 2001)

However, when resistance training is performed alone, in the absence of nutritional and supplemental interventions, net protein balance still does not increase to the point of becoming anabolic.

Specific nutrients and supplements are needed in conjunction with the resistance training for the net protein balance to become positive.

مکمل های پروتئینی
PROTEIN SUPPLEMENTS

WHEY PROTEIN

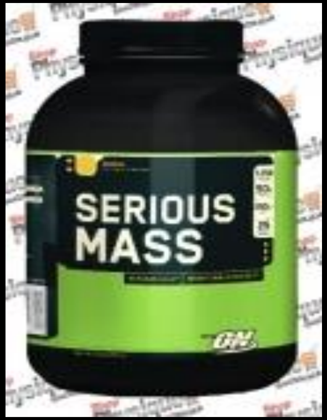
CASEIN PROTEIN

Soy protein

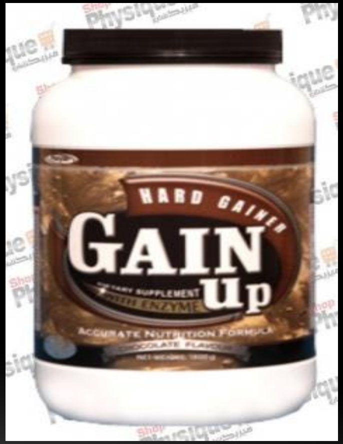
مکمل های افزایش وزن

carbohydrate–protein supplements

Gain up supplements


SERIOUS MASS
ON

DOOBIS
SUPER GAIN BIS
Loaded with BCAA
COFFEE


HARD GAINER
GAIN Up
ACCURATE NUTRITION FORMULA

Thanks for your attention….