NAFTA
COURSE
GRIDS & CHARTS

TABLE OF CONTENTS

Body Fat Norms Based On Percentage of Body Weight that is Fat

Classification	Women	Men
Essential Fat	**11.0-14.0**	**3.0-5.0**
Athletes	**12.0-22.0**	**5.0-13.0**
Fitness	**16.0-25.0**	**12.0-18.0**
Potential Risk	**26.0-31.0**	**19.0-243.0**
Obese	**32.0+**	**25.0+**

Metropolitan Life Height & Weight Tables (1959 Version) for Men and Women Between the Ages of 25-59

MALES

Height		Frame		
Feet	**Inches**	**Small**	**Medium**	**Large**
5	**2**	**112-120**	**118-129**	**126-141**
5	**3**	**115-123**	**121-133**	**129-144**
5	**4**	**118-126**	**124-136**	**132-148**
5	**5**	**121-129**	**127-139**	**135-152**
5	**6**	**124-133**	**130-143**	**138-156**
5	**7**	**128-137**	**134-147**	**142-161**
5	**8**	**132-141**	**138-152**	**147-166**
5	**9**	**136-145**	**142-156**	**151-170**
5	**10**	**140-150**	**145-160**	**155-174**
5	**11**	**144-154**	**150-65**	**159-179**
6	**0**	**148-158**	**154-170**	**164-184**
6	**1**	**152-162**	**158-175**	**168-189**
6	**2**	**156-176**	**162-18-**	**173-194**
6	**3**	**160-171**	**167-185**	**178-199**
6	**4**	**164-175**	**172-190**	**182-204**

Note: With shoes with 1 inch heel for men, 2 inch heel for women

Metropolitan Life Height & Weight Tables (1959Version) for Men & Women Between the Ages of 25-59

WOMEN

Height		Frame		
Feet	**Inches**	**Small**	**Medium**	**Large**
4	**10**	**92-98**	**96-107**	**104-119**
4	**11**	**94-101**	**98-110**	**106-122**
5	**0**	**96-104**	**101-113**	**109-125**
5	**1**	**99-107**	**104-116**	**112-128**
5	**2**	**102-110**	**107-119**	**115-131**
5	**3**	**105-113**	**110-112**	**118-134**
5	**4**	**108-116**	**113-126**	**121-138**
5	**5**	**111-119**	**116-130**	**125-142**
5	**6**	**114-123**	**120-135**	**129-146**
5	**7**	**118-127**	**124-139**	**133-150**
5	**8**	**122-131**	**128-143**	**137-154**
5	**9**	**129-135**	**132-147**	**141-158**
5	**10**	**130-140**	**136-151**	**145-163**
5	**11**	**134-144**	**140-155**	**149-168**
6	**0**	**138-148**	**144-159**	**153-173**

Note: With shoes with 1 inch heel for men, 2 inch heel for women

USDA Healthy Weight Ranges for Men and Women

Feet	Inches	Weight
4	10	91-119
4	11	94-124
5	0	97-128
5	1	101-132
5	2	104-137
5	3	107-141
5	4	111-146
5	5	114-150
5	6	118-155
5	7	121-160
5	8	125-164
5	9	129-169
5	10	132-174
5	11	136-179
6	0	140-184
6	1	144-189
6	2	148-195
6	3	152-200
6	4	156-205
6	5	160-211
6	6	164-216

The USDA recommends that individuals who have a larger skeletal frame or more muscle mass be at a higher end of each range; individuals with smaller frames and or less muscle mass should expect their weight to be nearer the low end of the range.

Recommended Frequency of Medical Examinations

Age	Frequency of Medical Examinations
0 to 1	At least 4 times
2,5,8,15,18,25	At least every year listed
35-65	Every 5 years
Over 65	Every 2 years

TESTING OPTIONS

The purposes for testing are to determine the status, clarify the fitness level, provide the initial point fro prescriptions/recommendations and provide motivation.

KEY FACTORS

- **Informed consent**
- **Emergency procedures**
- **Medical screening**
- **Type of population**
- **Personnel**
- **Time**
- **Money**
- **Facilities**
- **Equipment available**
- **Norms**

PHYSICAL FITNESS NORMS

I. Aerobic Power

3 Categories

- **Maximal-Treadmill Exercise test (Time)**
- **Submaximal-85% submax exercise test, bicycle ergometer test, 1 mile walk test**
- **Maximal field test – 1.5 mile/12 minute run, maximal Schwinn Air**

II. Body Fat Norms

3 Categories

1. **Percent body fat**
    - **Based upon Underwater Weighing**
    - **Skinfold (Jackson & Pollock Formulas)**
    - **Girth Circumference measurement**
2. **Height Weight Norms**
    - **Insurance chart**
    - **BMI**
3. **Waist to hip ratio**

III. Flexibility Norms

- **Sit and reach test (inches)**

IV. Dynamic Strength (muscular endurance) Norms

- **1 minute sit-up test (number in a minute)**

- **1 minute push-up test (number in a minute)**
- **Endurance sit-up test**
- **Endurance push-up test**

V. Absolute strength Norms

- **1 Repetition maximum bench press ratio (For both tests the score is weight pushed in pounds divided by body weight in pounds)**

VI. Coding Categories

- **Superior =S =95 percentile or higher**
- **Excellent =E =80-94 percentile**
- **Good =G =60-79 percentile**
- **Fair =F =40-59 percentile**
- **Poor =P =20-39 percentile**
- **Very Poor =VP =<20 percentile**

REVISED ACSM

GUIDELINES

CORONARY ARTERY DISEASE RISK FACTOR

Thresholds for Use With ACSM Risk Stratification

8 PRIMARY RISK FACTORS

RISK FACTORS	DEFINING CRITERIA
Positive	
1. FAMILY HISTORY	**Myocardial infarction, coronary revascularization, or sudden death before 55 years of age in father or other male first-degree relative i.e. brother or son, or before 65 years of age in mother or other female first-degree relative i.e. sister or daughter.**
2. CIGARETTE SMOKING	**Current cigarette smoker or those who quit within the previous six months.**
3. HYPERTENSION	**Systolic blood pressure of ≥ 140 mm Hg or diastolic ≥90 mm Hg, confirmed by measurements on at least 2 separate occasions or on antihypertensive medication.**
4. HYPERCHOLESTEROLEMIA	**Total serum cholesterol of > 200 mg/dL (5.2 mmol/L) or high density lipoprotein cholesterol of <35 mg/dL (0.9 mmol/L) or on lipid-lowering medication. If low density lipoprotein cholesterol is available use >130mg/dL (3.4 mmol/L) rather than total cholesterol of > 200 mg/dL.**
5. IMPAIRED FASTING GLUCOSE	**Fasting blood glucose of ≥110 mg/dL (6.1 mmol/L) confirmed by measurements on at least 2 separate occasions.**
6. OBESITY	**Body Mass Index of ≥ 30 kg/m2 (8) or waist girth of > 100 cm (9).**
7. SEDENTARY LIFESTYLE	**Persons not participating in regular exercise program or meeting the minimal physical activity recommendations from the U.S. Surgeon General's report.**
8. NEGATIVE	
HIGH SERUM HDL CHOLESTEROL	**> 60 mg/dL (1.6 mmol/L).**

2 SECONDARY RISK FACTORS: Stress and High Triglyceride Levels

MAJOR SIGNS/SYMPTOMS SUGGESTIVE OF CARDIOVASCULAR AND PULMONARY DISEASE

- **Pain, discomfort, (or other anginal equivalent) in the chest, neck, jaw, arms, or other areas that may be due to ischemia.**
- **Shortness of breath at rest or with mild exertion**
- **Dizziness or syncope**
- **Orthopnea or paroxysmal nocturnal dyspnea**
- **Ankle edema**
- **Palpitations or tachycardia**
- **Intermittent claudication**
- **Known heart murmur**
- **Unusual fatigue or shortness of breath with usual activities**

INITIAL ACSM RISK STRATIFICATION

Low Risk

Younger individuals (men < 45, women < 55 who are symptomatic and meet no more than one risk factor threshold.

Moderate Risk

Older individuals (men $\geq$ 45, women $\geq$ 55) or those who meet the threshold for two or more risk factors.

High Risk

Individuals with one or more signs/symptoms or known cardiovascular, pulmonary or metabolic disease.

ACSM RECOMMENDATIONS FOR CURRENT MEDICAL EXAMINATION AND EXERCISE TESTING PRIOR TO PARTICIPATIUON AND PHYSICAL SUPERVISION OF EXERCISE TESTS

	LOW RISK	MODERATE RISK	HIGH RISK
A			
Moderate exercise	**Not necessary**	**Not necessary**	**Recommended**
Vigorous exercise	**Not Necessary**	**Recommended**	**Recommended**
B			
Submaximal Test	**Not necessary**	**Not necessary**	**Recommended**
Maximal Test	**Not necessary**	**Recommended**	**Recommended**

PROCEDURES FOR ASSESSMENT OF RESTING BLOOD PRESSURE

- **Patients should be seated for at least 5 min in a chair with their back supported and their arms bared and supported at heart level. Patients should refrain from smoking cigarettes or ingesting caffeine during the 30 min preceding the measurement.**
- **Under special circumstances, measuring supine and standing positions may be indicated.**
- **Wrap cuff firmly around upper arm at heart level; align cuff with the brachial artery.**
- **The appropriate cuff size must be used to ensure accurate measurement. The bladder within the cuff should encircle at least two-thirds of the upper arm. Many adults require a large adult cuff.**
- **Place stethoscope bell below the antecubital space over the brachial artery.**
- **Quickly inflate cuff pressure to 20 mm Hg above estimated systolic BP.**
- **Slowly release pressure at rate equal to 2 to 3 mm Hg's, noting first Korotkoff sound.**
- **Continue releasing pressure, noting when sound becomes muffled (4th phase diastolic BP) and when sound disappears (5th phase diastolic BP). For classification purposes, the latter is used.**

CLASSIFICATION ODF BLOOD PRESSURE (BPFOR ADULTS AGED 18 YEARS AND OLDER

CATEGORY	SYSTOLIC BP(mm Hg)		DIASTOLIC BP (mm Hg)
Optimal	<120	And	<80
Normal	120-129	And	80-84
High Normal	130-139	Or	85-89
Hypertension			
Stage 1	140-159	Or	90-99
Stage 2	160-179	Or	100-109
Stage 3	>180	Or	>110

CLASSIFICATION OF DISEASE RISK BASED ON BODY MASS INDEX (BMI) AND WAIST CIRCUMFERENCE

		Disease risk Relative to Normal Weight and Waist Circumference	
		Men, ≤ 102 cm	Men, >102 cm
	BMI, kg/m2	Women, ≤88 cm	Women, > 88 cm
Underweight	<18.5		
Normal	18.5-24.9		
Over weight	25.0-29.9	Increased	High
Obesity, class			
I	30.0-34.9	High	Very High
II	35.0-39.9	Very High	Very High
III	≥40	Extreme High	Extreme High

STANDARDIZED DESCRIPTION OF SKINFOLD SITES AND PROCEDURES

SKINFOLD SITE	
ABDOMINAL	**Vertical fold; 2 cm to the right of the umbilicus**
TRICEPS	**Vertical fold; on the posterior midline of the upper arm; halfway between the acromion and olecranon process, with the arm held freely to the side of the body.**
BICEPS	**Vertical fold; on the anterior aspect of the arm over the level used to mark the triceps site.**
CHEST/PECTORAL	**Diagonal fold; one-half the distance between the anterior axillary line and the nipple (men) or one-third of the distance between the anterior axillary line and the nipple (women).**
MEDIAL CALF	**Vertical fold; at the maximum circumference of the calf on the midline of its medial border.**
MIDAXILLARY	**Vertical fold; on the midaxillary line at the level of the xiphoid process of the sternum (An alternate method is a horizontal fold taken at the level of the xiphoid/sternal border in the midaxillary line.)**
SUBSCAPULAR	**Diagonal fold; (at a 45 degree angle)1 to 2 cm below the inferior angle of the scapular.**
SUPRAILIAC	**Diagonal fold; inline with the natural angle of the iliac crest taken in the anterior axillary line immediately superior to the iliac crest.**
THIGH	**Vertical fold; on the anterior midline of the thigh, midway between the proximal border of the patella and the inguinal crease (hip).**

PROCEDURES

- **All measurements should be made on the right side of the body.**
- **Caliper should be placed 1 cm away from the thumb and finger, perpendicular to the skinfold, and halfway between the crest and the base of the fold.**
- **Pinch should be maintained while reading the caliper.**
- **Wait 1 to 2 seconds (not longer) before reading the caliper.**
- **Take duplicate measures at each site and retest if duplicate measurements are not within 1 to 2 mm.**
- **Rotate through measurement sites or allow time for skin to regain normal texture and thickness.**

Retesting Protocol: 12-16 weeks

PROTOCOL FOR BODY COMPOSITION

Skinfold Measurements
Is an accurate field method for determining body fat

Level Screening:
Level I

Procedures:

1. **When measuring the opposite sex, have a witness present**
2. **Have skinfold calipers**
3. **Select a private, comfortable area**
4. **Have a witness/data recorder**
5. **Explain to participant the procedure**
6. **Use the right side of the body**
7. **Be sure of each anatomical site**
8. **Pinch from the top and measure from the bottom**
9. **Identify the site, push in, gather the fold, separate the tissue and measure**
10. **Measure each site until you get two readings that agree**
11. **Sum the sites and use the chart to determine the percent of body fat**

Order and Location of Skinfold Measurements
Males:

1. **Chest – diagonal fold on the lateral border of the pectoralis major muscle, halfway between the nipple and the shoulder crease.**
2. **Abdomen – vertical fold adjacent to the umbilicus**
3. **Thigh – vertical fold at the middle and front thigh; halfway between the greater trochanter and patella.**

Females:

1. **Triceps – vertical fold over the belly of the triceps halfway between the acromion and olecranon processes.**
2. **Suprailiac crest – diagonal fold just above the iliac crest; slightly anterior to the middle side.**
3. **Thigh – vertical fold at the middle and front thigh; halfway between the greater trochanter and patella.**

Retesting Protocol: 12-16 Weeks

PERCENT FAT ESTIMATES FOR WOMEN --- AGE TO THE LAST YEAR

Sum of 3 Skinfolds	Under 22	23-27	28-32	33-37	38-42	43-47	48-52	53-57	Over 58
23 - 25	9.7	9.9	10.2	10.4	10.7	10.9	11.2	11.4	11.7
26 - 28	11.0	11.2	11.5	11.7	12.0	12.3	12.5	12.7	13.0
29 - 31	12.3	12.5	12.8	13.0	13.3	13.5	13.8	14.0	14.3
32 - 34	13.6	13.8	14.0	14.3	14.5	14.8	15.0	15.3	15.5
35 - 37	14.8	15.0	15.3	15.5	15.8	16.0	16.3	16.5	16.8
38 - 40	16.0	16.3	16.5	16.7	17.0	17.2	17.5	17.7	18.0
41 - 43	17.2	17.4	17.7	17.9	18.2	18.4	18.7	18.9	19.2
44 - 46	18.3	18.6	18.8	19.1	19.3	19.6	19.8	20.1	20.3
47 - 49	19.5	19.7	20.0	20.2	20.5	20.7	21.0	21.2	21.5
50 - 52	20.6	20.8	21.1	21.3	21.6	21.8	22.1	22.3	22.6
53 - 55	21.7	21.9	22.1	22.4	22.6	22.9	23.1	23.4	23.6
56 - 58	22.7	23.0	23.2	23.4	23.7	23.9	24.2	24.4	24.7
59 - 61	23.7	24.0	24.2	24.5	24.7	25.0	25.2	25.5	25.7
61 - 64	24.7	25.0	25.2	25.5	25.7	26.0	26.2	26.4	26.7
65 - 67	25.7	25.9	26.2	26.4	26.7	26.9	27.2	27.4	27.7
68 - 70	26.6	26.9	27.1	27.4	27.6	27.9	28.1	28.4	28.6
71 - 73	27.5	27.8	28.0	28.3	28.5	28.8	29.0	29.3	29.5
74 - 76	28.4	28.7	28.9	29.2	29.4	29.7	29.9	30.2	30.4
77 - 79	29.3	29.5	29.8	30.0	30.3	30.5	30.8	31.0	31.3
80 - 82	30.1	30.4	30.6	30.9	31.1	31.4	31.6	31.9	32.1
83 - 85	30.9	31.2	31.4	31.7	31.9	32.2	32.4	32.7	32.9
86 - 88	31.7	32.0	32.2	32.5	32.7	32.9	33.2	33.4	33.7
89 - 91	32.5	32.7	33.0	33.2	33.5	33.7	33.9	34.2	34.4
92 - 94	33.2	33.4	33.7	33.9	34.2	34.4	34.7	34.9	35.2
95 - 97	33.9	34.1	34.4	34.6	34.9	35.1	35.4	35.6	35.9
98-100	34.6	34.8	35.1	35.3	35.5	35.8	36.0	36.3	36.5
101-103	35.2	35.4	35.7	35.9	36.2	36.4	36.7	36.9	37.2
104-106	35.8	36.1	36.3	36.6	36.8	37.1	37.3	37.5	37.8
107-109	36.4	36.7	36.9	37.1	37.4	37.6	37.9	38.1	38.4
110-112	37.0	37.2	37.5	37.7	38.0	38.2	38.5	38.7	38.9
113-115	37.5	37.8	38.0	38.2	38.5	38.7	39.0	39.2	39.5
116-118	38.0	38.3	38.5	38.8	39.0	39.3	39.5	39.7	40.0
119-121	38.5	38.7	39.0	39.2	39.5	39.7	40.0	40.2	40.5
122-124	39.0	39.2	39.4	39.7	39.9	40.2	40.4	40.7	40.9
125-127	39.4	39.6	39.9	40.1	40.4	40.6	40.9	41.1	41.4
128-130	39.8	40.0	40.3	40.5	40.8	41.0	41.1	41.5	41.8

BODY COMPOSITION

FEMALES

AGE

%	20-29	30-39	40-49	50-59	60+	
99	5.4	7.3	11.6	11.6	15.4	
95	10.8	13.4	16.1	18.8	16.8	VL
90	14.5	15.5	18.5	21.6	21.1	
85	16.0	16.9	20.3	23.6	23.5	
80	17.1	18.0	21.3	25.0	25.1	E
75	18.2	19.1	22.4	25.8	26.7	
70	19.0	20.0	23.5	26.6	27.5	
65	19.8	20.8	24.3	27.4	28.5	
60	20.6	21.6	24.9	28.5	29.3	G
55	21.3	22.4	25.5	29.2	29.9	
50	22.1	23.1	26.4	30.1	30.9	
45	22.7	24.0	27.3	30.8	31.8	
40	23.7	24.9	28.1	31.6	32.5	F
35	24.4	26.0	29.0	32.6	33.0	
30	25.4	27.0	30.1	33.5	34.3	
25	26.6	28.1	31.1	34.3	35.5	
20	27.7	29.3	32.1	35.6	36.6	P
15	29.8	31.0	33.3	36.6	38.0	
10	32.1	32.8	35.0	37.9	39.3	
5	35.4	35.7	37.8	39.6	40.5	
1	40.5	40.0	45.5	50.8	47.0	VP
n	638	1336	1175	708	250	

TOTAL n = 4107

*Very Lean - No less than 10-13% body fat is recommended for females.

PERCENT FAT ESTIMATES FOR MEN (Under 40) --- AGE TO THE LAST YEAR

Sum of 3 Skinfolds	Under 20	20-22	23-25	26-28	29-31	32-34	35-37	38-40
11 - 13	1.9	2.3	2.6	3.0	3.3	3.7	4.0	4.3
14 - 16	2.9	3.3	3.6	3.9	4.3	4.6	5.0	5.3
17 - 19	3.9	4.2	4.6	4.9	5.3	5.6	6.0	6.3
20 - 22	4.8	5.2	5.5	5.9	6.2	6.6	6.7	7.3
23 - 25	5.8	6.2	6.5	6.8	7.2	7.5	7.9	8.2
26 - 28	6.8	7.1	7.5	7.8	8.1	8.5	8.8	9.2
29 - 31	7.7	8.0	8.4	8.7	9.1	9.4	9.8	10.1
32 - 34	8.6	9.0	9.3	9.7	10.1	10.4	10.7	11.1
35 - 37	9.5	9.9	10.2	10.6	10.9	11.3	11.6	12.0
38 - 40	10.5	10.8	11.2	11.5	11.8	12.2	12.5	12.9
41 - 43	11.4	11.7	12.1	12.4	12.7	13.1	13.4	13.8
44 - 46	12.2	12.6	12.9	13.3	13.6	14.0	14.3	14.7
47 - 49	13.1	13.5	13.8	14.2	14.5	14.9	15.2	15.5
50 - 52	14.0	14.3	14.7	15.0	15.4	15.7	16.1	16.4
53 - 55	14.8	15.2	15.5	15.9	16.2	16.6	16.9	17.3
56 - 58	15.7	16.0	16.4	16.7	17.1	17.4	17.8	18.1
59 - 61	16.5	16.9	17.2	17.6	17.9	18.3	18.6	19.0
62 - 64	17.4	17.7	18.1	18.4	18.8	19.1	19.4	19.8
65 - 67	18.2	18.5	18.9	19.2	19.6	19.9	20.3	20.6
68 - 70	19.0	19.3	19.7	20.0	20.4	20.7	21.1	21.4
71 - 73	19.8	20.1	20.5	20.8	21.2	21.5	21.9	22.2
74 - 76	20.6	20.9	21.3	21.6	22.0	22.3	22.7	23.0
77 - 79	21.4	21.7	22.1	22.4	22.8	32.1	23.4	23.8
80 - 82	22.1	22.5	22.8	23.2	23.5	23.9	24.2	24.6
83 - 85	22.9	23.2	23.6	23.9	24.3	24.6	25.0	25.3
86 - 88	23.6	24.0	24.3	24.7	25.0	25.4	25.7	26.1
89 - 91	24.4	24.7	25.1	25.4	25.8	26.1	26.5	26.8
92 - 94	25.1	25.5	25.8	26.2	26.5	26.9	27.2	27.5
95 - 97	25.8	26.2	26.5	26.9	27.2	27.6	27.9	28.3
98 - 100	26.6	26.9	27.3	27.6	27.9	28.3	28.6	29.0
101 - 103	27.3	27.6	28.0	28.3	28.6	29.0	29.3	29.7
104 - 106	27.9	28.3	28.6	29.0	29.3	29.7	30.0	30.4
107 - 109	28.6	29.0	29.3	29.7	30.0	30.4	30.7	31.1
110 - 112	29.3	29.6	30.0	30.3	30.7	31.0	31.4	31.7

PERCENT FAT ESTIMATES FOR MEN (OVER 40) --- AGE TO THE LAST YEAR

Sum of 3 Skinfold	r 41-43	44-46	47-49	50-52	53-55	56-58	59-61	Over 62
11 - 13	4.7	5.0	5.4	5.7	6.1	6.4	6.8	7.1
14 - 16	5.7	6.0	6.4	6.7	7.1	7.4	7.8	8.1
17 - 19	6.7	7.0	7.4	7.7	8.1	8.4	8.7	9.1
20 - 22	7.6	8.0	8.3	8.7	9.0	9.4	9.7	10.1
23 - 25	8.6	8.9	9.3	9.6	10.0	10.3	10.7	11.0
26 - 28	9.5	9.9	10.2	10.6	10.9	11.3	11.6	12.0
29 - 31	10.5	10.8	11.2	11.5	11.9	12.2	12.6	12.9
32 - 34	11.4	11.8	12.1	12.4	12.8	13.1	13.5	13.8
35 - 37	12.3	12.7	13.0	13.4	13.7	14.1	14.4	14.8
38 - 40	13.2	13.6	13.9	14.3	14.6	15.0	15.3	15.7
41 - 43	14.1	14.5	14.8	15.2	15.5	15.9	16.2	16.6
44 - 46	15.0	15.4	15.7	16.1	16.4	16.8	17.1	17.5
47 - 49	15.9	16.2	16.6	16.9	17.3	17.6	18.0	18.3
50 - 52	16.8	17.1	17.5	17.8	18.2	18.5	18.8	19.2
53 - 55	17.6	18.0	18.3	18.7	19.0	19.4	19.7	20.1
56 - 58	18.5	18.8	19.2	19.5	19.9	20.2	20.6	20.9
59 - 61	19.3	19.7	20.0	20.4	20.7	21.0	21.4	21.7
62 - 64	20.1	20.5	20.8	21.2	21.5	21.9	22.2	22.6
65 - 67	21.0	21.3	21.7	22.0	22.4	22.7	23.0	23.4
68 - 70	21.8	22.1	22.5	22.8	23.2	23.5	23.9	24.2
71 - 73	22.6	22.9	23.3	23.6	24.0	24.3	24.7	25.0
74 - 76	23.4	23.7	24.1	24.4	24.8	25.1	25.4	25.8
77 - 79	24.1	24.5	24.8	25.2	25.5	25.9	26.2	26.6
80 - 82	24.9	25.3	25.6	26.0	26.3	26.6	27.0	27.3
83 - 85	25.7	26.0	26.4	26.7	27.1	27.4	27.8	28.1
86 - 88	26.4	26.8	27.1	27.5	27.8	28.2	28.5	28.9
89 - 91	27.2	27.5	27.9	28.2	28.6	28.9	29.2	29.6
92 - 94	27.9	28.2	28.6	28.9	29.3	29.6	30.0	30.3
95 - 97	28.6	29.0	29.3	29.7	30.0	30.4	30.7	31.1
98 - 100	29.3	29.7	30.0	30.4	30.7	31.1	31.4	31.8
101 - 103	30.0	30.4	30.7	31.1	31.4	31.8	32.1	32.5
104 - 106	30.7	31.1	31.4	31.8	32.1	32.5	32.8	33.2
107 - 109	31.4	31.8	32.1	32.4	32.5	33.1	33.4	33.8
110 - 112	32.1	32.4	32.8	33.1	33.5	33.8	34.2	34.5

BODY COMPOSITION
MALES

AGE

%	20-29	30-39	40-49	50-59	60+	
99	2.4	5.2	6.6	8.8	7.7	
95	5.2	9.1	11.4	12.9	13.1	
90	7.1	11.3	13.6	15.3	15.3	
85	8.3	12.7	15.1	16.9	17.2	
80	9.4	13.9	16.3	17.9	18.4	E
75	10.6	14.9	17.3	19.0	19.3	
70	11.8	15.9	18.1	19.8	20.3	
65	12.9	16.6	18.8	20.6	21.1	
60	14.1	17.5	19.6	21.3	22.0	G
55	15.0	18.2	20.3	22.1	22.6	
50	15.9	19.0	21.1	22.7	23.5	
45	16.8	19.7	21.8	23.4	24.3	
40	17.4	20.5	22.5	24.1	25.0	F
35	18.3	21.4	23.3	24.9	25.9	
30	19.5	22.3	24.1	25.7	26.7	
25	20.7	23.2	25.0	26.6	27.6	
20	22.4	24.2	26.1	27.5	28.5	P
15	23.9	25.5	27.3	28.8	29.7	
10	25.9	27.3	28.9	30.3	31.2	
5	29.1	29.9	31.5	32.4	33.4	
1	36.4	35.6	37.4	38.1	41.3	V P
n	638	1336	1175	708	250	

TOTAL n = 4107

*Very Lean - No less than 3% body fat is recommended for males.

PROTOCOL FOR TAKING BLOOD PRESSURE

Blood pressure needs to be carefully monitored since high blood pressure is a major risk factor for CHD. Remember, only a physician can diagnose hypertension.

Blood pressure is the force that moves blood through the circulatory system.
BP = Systolic Pressure/Diastolic Pressure

Systolic Pressure is the force of the blood against the walls of the arteries during the heart's contraction.

Diastolic Pressure is the force of the blood against the walls of the arteries when the heart is between beats.

- **Blood Pressure is the Level One of the Screening Process**
- **Usual reading for adults is 120/80 mmHg**
- **The mmHg represents millimeters of mercury**
- **Approximately 60 million have hypertension**
- **BP readings as low as 90/60 mmHg are not uncommon**

Key factors for setting up an assessment battery

- **Informed consent**
- **Emergency procedures medical screening**
- **Type of population**
- **Personnel**
- **Time, money, facilities, equipment**
- **Available norms**

Equipment:

- **Stethoscope**
- **Blood Pressure cuff**

Participant:

- **is free of stimuli**
- **sits quietly**
- **feet are flat on the floor, legs not crossed**
- **forearm near heart level**
- **does not talk during testing**
- **does not hold arm**

Examiner:

- **apply an appropriately sized BP cuff snugly, 2.5 cm above the antecubital space and centered on the brachial artery**
- **tighten the screw and the rubber bulb clockwise so that you can pump up the cuff**

- **be aware that some stethoscopes have an on and off position**
- **place the stethoscope over the brachial artery and pump up the cuff to 180mmHg**
- **slowly deflate no faster that 2-3 mmHg per sec. by twisting the screw of the bulb counterclockwise**
- **the first beat you hear is the systolic**
- **continue to deflate**
- **the second and final beat you hear is the diastolic**

Measuring of Resting Heart Rate

Procedures:

- **There are many sites on the body where the heart rate can be found. but the two common areas are the radial artery and carotid artery.**
- **Use the index finger to locate the pulse not the thumb.**
- **To determine resting heart rate, take it in the morning before you get out of bed.**
- **Find the pulse and count each beat for one full minute.**

CLASSIFICATION of BLOOD PRESSURE MEASUREMENTS

SYSTOLIC	DIASTOLIC	CATEGORY
<130	**<85**	**Normal**
130 – 139	**85 – 89**	**High Normal**
140 – 159	**90 –99**	**Mild Hypertension**
160 – 179	**100 –109**	**Moderate Hypertension**
180 – 209	**110 –119**	**Severe Hypertension**
≥210	**≥120**	**Very Severe Hypertension**

PROTOCOL FOR 3 MINUTE STEP TEST

Screening Level:
Level II

Purpose:
Is to measure the heart rate in the recovery period for three minutes of stepping

Equipment:

1. **12 inch bench**
2. **Clock with second hand or a stop watch**
3. **Metronome or an audiotape of the metronome**

Procedure:

1. **Administered before any other test that would elevate the heart rate.**
2. **Participant steps up and down on the 12 inch step with the setting of 96 on the metronome for 3 minutes.**
3. **Participant is to sit down immediately after the 3 minutes of stepping.**
4. **Take a 60 second heart rate within 5 seconds of completion of stepping.**
5. **If participant does not finish the test refer to a doctor and do not proceed to level III.**
6. **The score is the 60 second pulse rate following the 3 minutes of stepping.**

3 Minute Step Test	Males	Females
Excellent	<71	<97
Good	71-102	97-127
Fair	103-117	128-142
Poor	118-147	143-171
Very Poor	148+	172+

Retesting Protocol: 12 weeks

PARTIAL CURL UP TEST

This test is another option for measuring dynamic strength of the abdominal musculature. Curl ups are becoming more popular, as they maximize use of the abdominal muscle, while minimizing use of the hip flexors.

Furthermore, NAFTA does not consider the use of the one minute sit-up test as a safe and valid method of assessing dynamic strength of abdominal musculature. Instead, NAFTA uses the Partial Curl Up Test adapted from Liemohn and Sharpe 1992. Adaptation based on research by Faulkner et.al. 1998.

SCREENING LEVEL

Level III

EQUIPMENT
Clip board, pen, exercise mat, masking tape, ruler

PROCEDURES

1. **Have the subject start in a supine position with the knees flexed at 90 degrees and the fingers resting on the upper leg.**
2. **The tester cradles the participants head.**
3. **The individual curls up slowly and touches the knees.**
4. **The individual returns to the starting position until the head touches the tester's hands.**

PARTIAL CURL UP NORMS

NUMBER COMPLETED

AGE	18-29	30-39	40-49	50-59	60-69
SEX	F M	F M	F M	F M	F M
ADVANCED	>45 >50	>40 >45	>35 >40	>30 >35	>25 >30
INTERMEDIATE	25-45 30-50	20-40 22-45	18-35 21-40	12-30 18-35	11-25 15-30
BEGINNER	<25 <30	<20 <22	<18 <21	<12 <18	<11 <15

Retesting Protocol: 8 weeks

DYNAMIC STRENGTH

1 MINUTE SIT-UP
FEMALES

AGE

%	<20	20-29	30-39	40-49	50-59	60+	
99	>55.0	>51.0	>42.0	>38.0	>30.0	>28.0	
95	55.0	51.0	42.0	38.0	30.0	28.0	S
90	54.0	49.0	40.0	34.0	29.0	26.0	
85	49.0	45.0	38.0	32.0	25.0	20.0	
80	46.0	44.0	35.0	29.0	24.0	17.0	E
75	40.0	42.0	33.0	28.0	22.0	15.0	
70	38.0	41.0	32.0	27.0	22.0	12.0	
65	37.0	39.0	30.0	25.0	21.0	12.0	
60	36.0	38.0	29.0	24.0	20.0	11.0	G
55	35.0	37.0	28.0	23.0	19.0	10.0	
50	34.0	35.0	27.0	22.0	17.0	8.0	
45	34.0	34.0	26.0	21.0	16.0	8.0	
40	32.0	32.0	25.0	20.0	14.0	6.0	F
35	30.0	31.0	24.0	19.0	12.0	5.0	
30	29.0	30.0	22.0	17.0	12.0	4.0	
25	29.0	28.0	21.0	16.0	11.0	4.0	
20	28.0	21.0	20.0	14.0	10.0	3.0	P
15	27.0	24.0	18.0	13.0	7.0	2.0	
10	25.0	23.0	15.0	10.0	6.0	1.0	
5	25.0	18.0	11.0	7.0	5.0	.0	
1	<25.0	<18.0	<11.0	<7.0	<5.0	.0	VP
n	15	144	289	249	137	26	

Total n
= 4471

DYNAMIC STRENGTH
MODIFIED PUSH-UP

FEMALES

AGE

%	20-29	30-39	40-49	50-59	60+	
99	70	56	60	31	20	
95	45	39	33	28	20	S
90	42	36	28	25	17	
85	39	33	26	23	15	
80	36	31	24	21	15	E
75	34	29	21	20	15	
70	32	28	20	19	14	
65	31	26	19	18	13	
60	30	14	18	17	12	G
55	29	23	17	15	12	
50	26	21	15	13	8	
45	25	20	14	13	6	
40	23	19	13	12	5	F
35	22	17	11	10	4	
30	20	15	10	9	3	
25	19	14	9	8	2	
20	17	11	6	6	2	P
15	15	9	4	4	1	
10	12	8	2	1	0	
5	9	4	1	0	0	VP
n	579	411	246	105	12	

Total
n =
1353

DYNAMIC STRENGTH

AGE AND SEX BASED NORMS

FULL BODY PUSH UPS*

FEMALES

%	20-29	30-39	40-49	
99	53.0	48.0	23.0	
95	42.0	39.5	20.0	S
90	37.0	33.0	18.0	
85	33.0	26.0	17.0	
80	28.0	23.0	15.0	E
75	27.0	19.0	15.0	
70	24.0	18.0	14.0	
65	23.0	16.0	13.0	
60	21.0	15.0	13.0	G
55	19.0	14.0	11.0	
50	18.0	14.0	11.0	
45	17.0	13.0	10.0	
40	15.0	11.0	9.0	F
35	14.0	10.0	8.0	
30	13.0	9.0	7.0	
25	11.0	9.0	7.0	
20	10.0	8.0	6.0	P
15	9.0	6.5	5.0	
10	8.0	6.0	4.0	
5	6.0	4.0	1.0	
1	3.0	1.0	0.0	VP

* Full body push ups are generally used by law enforcement and public safety organizations.

DYNAMIC STRENGTH

1 MINUTE SIT-UP
MALES

AGE

%	<20	20-29	30-39	40-49	50-59	60+	
99	>62.0	>55.0	>51.0	>47.0	>43.0	>39.0	
95	62.0	55.0	51.0	47.0	43.0	39.0	S
90	55.0	52.0	48.0	43.0	39.0	35.0	
85	53.0	49.0	45.0	40.0	36.0	31.0	
80	51.0	47.0	43.0	39.0	35.0	30.0	E
75	50.0	46.0	42.0	37.0	33.0	28.0	
70	48.0	45.0	41.0	36.0	31.0	26.0	
65	48.0	44.0	40.0	35.0	30.0	24.0	
60	47.0	42.0	39.0	34.0	28.0	22.0	G
55	46.0	41.0	37.0	32.0	27.0	21.0	
50	45.0	40.0	36.0	31.0	26.0	20.0	
45	42.0	39.0	36.0	30.0	25.0	19.0	
40	41.0	38.0	35.0	29.0	24.0	19.0	F
35	39.0	37.0	33.0	28.0	22.0	18.0	
30	38.0	35.0	32.0	27.0	21.0	17.0	
25	37.0	35.0	31.0	26.0	20.0	16.0	
20	36.0	33.0	30.0	24.0	20.0	15.0	P
15	34.0	32.0	28.0	22.0	19.0	13.0	
10	33.0	30.0	26.0	22.0	17.0	10.0	
5	27.0	27.0	23.0	17.0	15.0	7.0	
1	<27.0	<27.0	<23.0	<17.0	<12.0	<7.0	VP
n	46	312	1431	1558	919	205	

Total n
= 4471

DYNAMIC STRENGTH

PUSH-UP

MALES

AGE

%	20-29	30-39	40-49	50-59	60+	
99	100	86	64	51	39	
95	62	52	40	39	28	S
90	57	46	36	30	26	
85	51	41	34	28	24	
80	47	39	30	25	23	E
75	44	36	29	24	22	
70	41	34	26	21	21	
65	39	31	25	20	20	
60	37	30	24	19	18	G
55	35	29	22	17	16	
50	33	27	21	15	15	
45	31	25	19	14	12	
40	29	24	18	13	10	F
35	27	21	16	11	9	
30	26	20	15	10	8	
25	24	19	13	9.5	7	
20	22	17	11	9	6	P
15	19	15	10	7	5	
10	18	13	9	6	4	
5	13	9	5	3	2	VP
n	1045	790	364	172	26	

Total
n =
2397

STANDARD VALUES FOR PUSH - UP TEST

Rating	Age (yr)				
	20 - 29	**30 - 39**	**40 - 49**	**50 - 59**	**60 +**
Full-Body Push - Up					
Excellent	> 54	> 44	> 39	> 34	> 29
Good	45 - 54	35 - 44	30 - 39	25 - 34	20 - 29
Average	35 - 44	25 - 34	20 - 29	15 - 24	10 - 19
Fair	20 - 34	15 -24	12 - 19	8 - 14	5 - 9
Poor	< 20	< 15	< 12	< 8	< 5
Modified-Body Push - Up					
Excellent	> 48	> 39	> 34	> 29	> 19
Good	34 - 48	25 - 39	20 - 34	15 - 29	5 - 19
Average	17 - 33	12 - 24	8 - 19	6 - 14	3 - 4
Fair	6 - 16	4 - 11	3 - 7	2 - 5	1 - 2
Poor	< 6	< 4	< 3	< 2	< 1

STANDARD VALUES FOR CURL- UP TEST

	NUMBER COMPLETED					
	MEN / AGE			**WOMEN / AGE**		
Rating	**< 35**	**35 - 44**	**> 45**	**< 35**	**35 - 44**	**> 45**
Excellent	60	50	40	50	40	30
Good	45	40	25	40	25	15
Marginal	30	25	15	25	15	10
Needs Work	15	10	5	10	6	4

PROTOCOL FOR ABSOLUTE STRENGTH TESTING

Test:
1 RM Bench Press

Absolute Strength:
Is defined as the amount of tension a muscle can exhibit in one maximal contraction.

Procedures:

1. **Two experienced spotters must be used. One on each side of the bar.**
2. **Starting weight: Males 2/3 of body weight and females is the bar.**
3. **With subject in supine position, spotters lower the bar to level of participant's chest.**
4. **Participant should have a slightly wider grip than shoulder width apart.**
5. **Spotters then release the bar and the participant presses to full extension while exhaling.**
6. **Spotters take the bar and place it back on the rack and increase poundage.**
7. **Repeat 3-5 until 1 RM is reached. This should take approximately 5-6 trials.**
8. **Convert the 1 RM free with bench press score to the estimated 1 RM Universal bench press score by using the following formulas.**
   Males: Estimated 1 RM Universal = (1.016 x free weight 1 RM) + 18.41
   Females: Estimated 1 RM Universal = (.848 x free weight 1 RM) + 21.37
9. **Divided number of pounds pressed by body weight to obtain ratio.**
10. **Use the norms to determine fitness category.**

Retesting Protocols: 8 weeks

ABSOLUTE STRENGTH

1 REPITITION MAXIMUM BENCH PRESS

FEMALES

Bench Press Weight Ration = Weight pushed in Lbs. / Body weight in Lbs.

AGE

%	<20	20-29	30-39	40-49	50-59	60+	
99	>.88	>1.01	>.82	>.77	>.68	>.72	
95	.88	1.01	.82	.77	.68	.72	S
90	.83	.90	.76	.71	.61	.64	
85	.81	.83	.72	.66	.57	.59	
80	.77	.80	.70	.62	.55	.54	E
75	.76	.77	.65	.60	.53	.53	
70	.74	.74	.63	.57	.52	.51	
65	.70	.72	.62	.55	.50	.48	
60	.65	.70	.60	.54	.48	.47	G
55	.64	.68	.58	.53	.47	.45	
50	.63	.65	.57	.52	.46	.45	
45	.60	.63	..55	.51	.45	.44	
40	.58	.59	.53	.50	.44	.43	F
35	.57	.58	.52	.48	.43	.41	
30	.56	.56	.51	.47	.42	.40	
25	.55	.53	.49	.45	.41	.39	
20	.53	.51	.47	.43	.39	.38	P
15	.52	.50	.45	.42	.38	.36	
10	.50	.48	.42	.38	.37	.33	
5	.41	.44	.39	.35	.31	.26	
1	<.41	<.44	<.39	<.35	<.31	<.26	VP
n	20	191	379	333	189	42	

TOTAL
n =
1154

ABSOLUTE STRENGTH

1 REPITITION MAXIMUM LEG PRESS

FEMALES

Leg Press Weight Ration = Weight pushed in Lbs. / Body weight in Lbs.

	AGE						
%	<20	20-29	30-39	40-49	50-59	60+	
99	>1.88	>1.98	>1.68	>1.57	>1.43	>1.43	
95	1.88	1.98	1.68	1.57	1.43	1.43	S
90	1.85	1.82	1.61	1.48	1.37	1.32	
85	1.81	1.76	1.52	1.40	1.31	1.32	
80	1.71	1.68	1.47	1.37	1.25	1.18	E
75	1.69	1.65	1.42	1.33	1.20	1.16	
70	1.65	1.58	1.39	1.29	1.17	1.13	
65	1.62	1.53	1.36	1.27	1.12	1.08	
60	1.59	1.50	1.33	1.23	1.10	1.04	G
55	1.51	1.47	1.31	1.20	1.08	1.01	
50	1.45	1.44	1.27	1.18	1.05	.99	
45	1.42	1.40	1.24	1.15	1.02	.97	
40	1.38	1.37	1.21	1.13	.99	.93	F
35	1.33	1.32	1.18	1.11	.97	.90	
30	1.29	1.27	1.15	1.08	.95	.88	
25	1.25	1.26	1.12	1.06	.92	.86	
20	1.22	1.22	1.09	1.02	.88	.85	P
15	1.19	1.18	1.05	.97	.84	.80	
10	1.09	1.14	1.00	.94	.78	.72	
5	1.06	.99	.96	.85	.72	.63	
1	<1.06	<.99	<.96	<.85	<.72	<.63	VP
n	20	192	281	337	192	44	

TOTAL n = 1066

ABSOLUTE STRENGTH

1 REPITITION MAXIMUM BENCH PRESS

MALES

Bench Press Weight Ration = $\frac{\text{Weight pushed in Lbs.}}{\text{Body weight in Lbs.}}$

AGE

%	<20	20-29	30-39	40-49	50-59	60+	
99	>1.76	>1.63	>1.35	>1.20	>1.05	>.94	
95	1.76	1.63	1.35	1.20	1.05	.94	S
90	1.46	1.48	1.24	1.10	.97	.89	
85	1.38	1.37	1.17	1.04	.93	.84	
80	1.34	1.32	1.12	1.00	.90	.82	E
75	1.29	1.26	1.08	.96	.87	.79	
70	1.24	1.22	1.04	.93	.84	.77	
65	1.23	1.18	1.01	.90	.81	.74	
60	1.19	1.14	.98	.88	.79	.72	G
55	1.16	1.10	.96	.86	.77	.70	
50	1.13	1.06	.93	.84	.75	.68	
45	1.10	1.03	.90	.82	.73	.67	
40	1.06	.99	.88	.80	.71	.66	F
35	1.01	.96	.86	.78	.70	.65	
30	.96	.93	.83	.76	.68	.63	
25	.93	.90	.81	.74	.66	.60	
20	.89	.88	.78	.72	.63	.57	P
15	.86	.84	.75	.69	.60	.56	
10	.81	.80	.71	.65	.57	.53	
5	.76	.72	.65	.59	.53	.49	
1	<.76	<.72	<.65	<.59	<.53	<.49	VP
n	60	425	1909	2090	1279	343	

ABSOLUTE STRENGTH

1 REPITITION MAXIMUM LEG PRESS

MALES

Bench Press Weight Ration = Weight pushed in Lbs.
Body weight in Lbs.

AGE

%	<20	20-29	30-39	40-49	50-59	60+	
99	>2.82	>2.40	>2.20	>2.02	>1.90	>1.80	
95	2.82	2.40	2.20	2.02	1.90	1.80	S
90	2.53	2.27	2.07	1.92	1.80	1.73	
85	2.40	2.18	1.99	1.86	1.75	1.68	
80	2.28	2.13	1.93	1.82	1.71	1.62	E
75	2.18	2.09	1.89	1.78	1.68	1.58	
70	2.15	2.05	1.85	1.74	1.64	1.56	
65	2.10	2.01	1.81	1.71	1.61	1.52	
60	2.04	1.97	1.77	1.68	1.58	1.49	G
55	2.01	1.94	1.74	1.65	1.55	1.46	
50	1.95	1.91	1.71	1.62	1.52	1.43	
45	1.93	1.87	1.68	1.59	1.50	1.40	
40	1.90	1.83	1.65	1.57	1.46	1.38	F
35	1.89	1.78	1.62	1.54	1.42	1.34	
30	1.82	1.74	1.59	1.51	1.39	1.30	
25	1.80	1.68	1.56	1.48	1.36	1.27	
20	1.70	1.63	1.52	1.44	1.32	1.25	P
15	1.61	1.58	1.48	1.40	1.28	1.21	
10	1.57	1.51	1.43	1.35	1.22	1.16	
5	1.46	1.42	1.34	1.27	1.15	1.08	
1	<1.46	<1.42	<1.34	<1.27	<1.15	>1.08	VP
n	60	424	1909	2089	1286	347	

Total n
= 6115

PROTOCOL FOR AEROBIC MAXIMAL TESTING

Both the 1.5 Run and the 12 minute test are measures of cardiovascular endurance.

Screening Level:
Level III

Objectives:
1.5 Mile Run – to cover the distance as fast as possible.
12 Minute Test – to cover as much distance as possible in 12 minutes.

Equipment;

1. **Stopwatch**
2. **Indoor or outdoor track**
3. **Testing forms to record data**

Procedures for 1.5 Mile Run Test:

1. **Participants should not eat a heavy meal at least 2-3 hours prior to test.**
2. **Participants should not smoke for at least 2-3 hours prior to test.**
3. **Participants should warm up thoroughly prior to test.**
4. **The participants run as fast as possible.**
5. **Upon finishing the test, finish times should be called out and recorded.**
6. **Participants should have a mandatory cool down period. Walk slowly for 5 minutes and stretch.**

Procedures for 12 Minute Test

1. **Participants should not eat a heavy meal at least 2-3 hours prior to test.**
2. **Participants should not smoke for at least 2-3 hours prior to test.**
3. **Participants should warm up thoroughly prior to test.**
4. **Using a 440 track, traffic cones are placed every 88 yards on the inside edge of lane 1. The first traffic cone is placed at the starting line.**
5. **If using a 400 meter track, traffic cones are placed every 80 meters on the inside edge of lane 1. The first cone is placed at the starting line.**
6. **Either case, there should be 5 cones on the track.**
7. **The participant covers as much distance as possible in the 12 minutes.**
8. **The number of traffic cones passed during the 12 minutes is recorded.**
9. **440 track multiply the number of cones passed by .05 to obtain distance in miles.**
10. **400 meter track multiply the number of cones passed by .0497 to obtain the distance in miles.**

Retesting Protocol: 12 weeks

PROTOCOL FOR SUBMAXIMAL ERGOMETER TEST

Purpose:
To provide an estimate of cardiovascular fitness

Equipment:

1. **Monark cycle ergometer**
2. **Stopwatch**
3. **Data sheets**
4. **Sphygmomaneter**
5. **Stethoscope**
6. **Heart Rate Monitor**

Procedure:

1. **Medical screening**
2. **Do not administer the test to individuals with contraindications.**
3. **The test is invalid for diabetics and for individuals taking medications which affect heart rate.**
4. **Participants should refrain from caffeine and nicotine for at least 3 hours prior to testing.**
5. **Calculate the heart rate at which the test will be terminated.**
6. **Generally 70-85% of age predicted maximal heart rate.**
7. **To calculate maximal heart rate, take 220 minus the participant's age.**
8. **Choose bike test protocol A, B, or C depending upon sex, age, body weight and activity level of the subject.**
9. **The goal is to choose a protocol which will elicit the target heart rate in the 4^{th} stage.**

Predicted maximal heart rate = 220-age

Protocol	Stage 1	Stage 2	Stage 3	Stage 4
A	150 kpm	300 kpm	450 kpm	600
B	150	300	600	900
C	300	600	900	1200

10. **Adjust the seat height on the cycle so that the knee is near full extension on the downstroke of the pedaling motion.**
11. **Explain the purpose of the test to the participant.**
12. **Using either a metronome (100 clicks per minute) or a cycling speed of 50 rpm, have the subject begin pedaling at zero workload.**
13. **50 rpm will be held constant during testing.**
14. **Set the workload Stage 1**
15. **Stage 1 should last about 2-3 minutes.**

16. **Monitor the heart rate each minute and obtain blood pressure near the end of each stage.**
17. **Record steady state heart rate.**
18. **If heart rate is more than 5 beats below target heart rate, continue to Stage 2.**
19. **Set the record workload Stage 2.**
20. **Monitor the heart rate each minute and obtain blood pressure near end of each stage.**
21. **Record steady heart rate.**
22. **If heart rate is more than 5 beats below target heart rate, continue to Stage 3.**
23. **Set the second workload Stage 3.**
24. **Monitor the heart rate each minute and obtain blood pressure near the end of each stage.**
25. **Record steady state heart rate.**
26. **If heart rate is more than 5 beats below target heart rate, continue to Stage 4.**
27. **Set the second workload Stage 2.**
28. **Monitor the heart rate each minute and obtain blood pressure near the end of each stage.**
29. **Record steady state heart rate.**
30. **At the end of Stage 4, decrease the workload to approximately 150 kpm and have participant cool down for at least three minutes.**
31. **Please note that not everyone will complete all four stages of the test.**
32. **Some individuals will reach their target heart rate at the end of Stage 2 or 3.**
33. **Remember to choose the protocol that will increase the likelihood that the participant will be able to complete all four stages.**
34. **Plot heart rate vs workload on the graph in order to determine the estimate VO max. Heart rates of less than 110 beats/minute should not be plotted.**

Example:
John is a 40 year old male. He is physically active and weighs 155 lbs.
220-40=180 predicted maximal heart rate.
180 x 85% = 153 bpm target heart rate
We will select protocol B for John

Stage	Workload	Heart Rate
Stage 1	150 kpm (25 watts)	110
Stage 2	300 kpm (50 watts)	120
Stage 3	600 kpm (100 watts)	138
Stage 4	900 kpm (150 watts)	150

AEROBIC POWER TESTS

MALES

	AGE 20-29				AGE 30-39				
%	Balke Tread-mill (Time)	Max VO_2 (ml/ kg/ min.)	12 Min. Run (Distance) (Miles)	1.5 Mile Run (Time)	Balke Tread-mill (Time)	Max VO_2 (ml/ kg/ min.)	12 Min. Run (Dis-tance) (Miles)	1.5 Mil Run (Miles)	
99	30:20	58.79	1.94	7:29	29:00	58.86	1.89	7:11	
95	27:00	53.97	1.81	8:13	26:00	52.53	1.77	8:44	S
90	25:11	51.35	1.74	9:09	24:30	50.36	1.71	9:30	
85	24:00	49.64	1.69	9:45	23:00	48.20	1.65	10:16	
80	23:00	48.20	1.65	10:16	22:00	46.75	1.61	10:47	E
75	22:10	46.99	1.62	10:42	21:00	45.31	1.57	11:18	
70	22:00	46.75	1.61	10:47	20:30	44.59	1.55	11:34	
65	21:00	45.31	1.57	11:18	20:00	43.87	1.53	11:49	
60	20:15	44.23	1.54	11:41	19.:00	42.42	1.49	12:20	G
55	20:00	43.87	1.53	11:49	18:25	41.58	1.47	12:38	
50	19:03	42.49	1.50	12:18	18:00	40.98	1.45	12:51	
45	19:00	42.42	1.49	12:20	17:00	39.53	1.41	13:22	
40	18:00	40.98	1.45	12:51	16:32	38.86	1.39	13:36	F
35	17:30	40.26	1.43	13:06	16:00	38.09	1.37	13:53	
30	17:00	39.53	1.41	13:22	15:30	37.37	1.35	14:08	
25	16:00	38.09	1.37	13:53	15:00	36.65	1.33	14:24	
20	15:20	37.13	1.34	14:13	14:06	35.35	1.29	14:52	P
15	15:00	36.65	1.33	14:24	13:10	34.00	1.25	15:20	
10	13:30	34.48	1.27	15:10	12:09	32.53	121	15:52	
5	11:30	31.57	1.19	16:12	11:00	30.87	1.17	16:27	
1	8:23	27.09	1.06	17:48	8:00	26:54	1.13	18:00	VP

n = 1675

Total ‘n’ = 8769

AEROBIC POWER TESTS

MALES

%	AGE 40-49 Balke Treadmill (Time)	Max VO_2 (ml/kg/min.)	12 Min. Run (Distance) (Miles)	1.5 Mile Run (Time)	AGE 50-59 Balke Treadmill (Time)	Max VO_2 (ml/kg/min.)	12 Min. Run (Distance) (Miles)	1.5 Mile Run (Miles)	
99	28:00	55.42	1.85	7:42	26:00	52.53	1.77	8:44	
95	24:30	50.36	1.71	9:30	22:15	47.11	1.62	10:40	S
90	23:00	48.20	1.65	10:16	21:00	45.31	1.57	11:18	
85	21:00	45.31	1.57	11:18	19:00	42.42	1.49	12:20	
80	20:10	44.11	1.54	11:44	18:00	40.98	1.45	12:51	E
75	20:10	43.89	1.53	11:49	17:00	39.53	1.41	13:22	
70	18:32	41.75	1.47	12:34	16:15	38:45	1.38	13:45	
65	18:00	40.98	1.45	12:51	15:40	37.61	1.35	14:03	
60	17:15	39.89	1.42	13:14	15:00	36.65	1.33	14:24	G
55	17:00	39.53	1.41	13:22	14:30	36.10	1.31	14:40	
50	16:00	38.09	1.37	13:53	14:00	35.20	1.29	14:55	
45	15:30	37.37	1.35	14:08	13:15	34.12	1.26	15:08	
40	15:00	36.65	1.33	14:29	13:00	33.76	1.25	15:26	F
35	14:15	35.56	1.30	14:47	12:07	32.48	1.22	15:53	
30	13:57	35.13	1.29	14:56	12:00	32.31	1.21	15:57	
25	13:00	33.76	1.25	15:26	11:08	31.06	1.17	16:23	
20	12:30	33.04	1.23	15:41	13:30	30.15	1.15	16:43	P
15	12:00	32.31	1.21	15:57	10:00	29.43	1.13	16:58	
10	10:59	30.85	1.17	16:28	9:00	27.98	1.09	17:29	
5	6:21	28.29	1.10	17:23	7:00	25.09	1.01	18:31	
1	6:21	24.15	.98	18:51	4:54	22.06	.92	19:36	VP

n = 1675

Total ‘n’ = 8769

AEROBIC POWER TESTS

MALES

AGE 60+

%	Balke Tread-mill (Time)	Max VO2 (mg/ kg/ min)	12 Min. Run Dis-tance (Miles)	1.5 Mile Run (Time)	
99	24:29	50.39	1.71	9:30	
95	20:56	45.21	1.57	11:20	S
90	31:00	42.46	1.49	12:20	
85	17:00	39.53	1.41	13:22	
80	16:00	38.09	1.37	13:53	E
75	15:00	36.65	1.30	14:24	
70	14:04	35.30	1.29	14:53	
65	13:22	39.29	1.26	15:19	
60	12:53	33.59	1.24	15:29	G
55	12:03	32.39	1.21	15:55	
50	11:40	31.83	1.19	16:07	
45	11:00	30.87	1.17	16:27	
40	10:30	30.15	1.15	16:43	F
35	10:00	29.43	1.13	16:58	
30	9:30	28.70	1.11	17:14	
25	8:54	27.89	1.08	17:32	
20	8:00	26.54	1.05	18:00	P
15	7:00	25.09	1.01	18:31	
10	5:35	23.05	.95	19:15	
5	4:00	20.76	.89	20:04	
1	2:17	18.28	.82	20:57	VP

n = 1005

AEROBIC POWER TESTS

FEMALES

	AGE 20-29				AGE 30-39				
%	Balke Tread-mill (Time)	Max VO_2 (ml/ kg/ min.)	12 Min. Run (Dis-tance) (Miles)	1.5 Mile Run (Time)	Balke Tread-mill (Time)	Max VO_2 (ml/ kg/ min.)	12 Min. Run (Dis-tance) (Miles)	1.5 Mile Run (Miles)	
99	26:21	53.03	1.78	8:33	23:22	48.73	1.66	10:05	
95	22:00	46.75	1.61	10:47	20:00	43.87	1.53	11:49	S
90	20:12	44.15	1.54	11:43	18:00	40.98	1.45	12:51	
85	19:00	42.42	1.49	12:20	17:30	40.26	1.43	13:06	
80	18:00	40.98	1.45	12:51	16:20	38.57	1.38	13:43	E
75	17:00	39.53	1.41	13:22	15:30	37.37	1.35	14:08	
70	16:00	38.09	1.17	13:53	15:00	36.65	1.33	14:24	
65	15:30	37.37	1.35	14:08	14:10	35.44	1.29	14:50	
60	15:00	36.65	1.33	14:24	13:35	34.60	1.27	15:08	G
55	14:39	36.14	1.31	14:35	13:10	33.85	1.26	15:20	
50	14:00	35.20	1.29	14:55	13:00	33.76	1.25	15:26	
45	13:30	34.48	1.27	15:10	12:10	32.41	1.22	15:47	
40	13:00	33.76	1.25	15:26	12:00	32.31	1.21	15:57	F
35	12:17	32.72	1.22	15:48	11:09	31.09	1.17	16:23	
30	12:00	32.31	1.21	15:57	10:45	30.51	1.16	16:35	
25	11:03	30.94	1.17	16:26	10:00	29.29	1.13	16:58	
20	10:50	30.63	1.16	16:33	9:30	28.70	1.11	17:14	P
15	10:00	9.43	1.13	16:58	9:00	27.98	1.09	17:29	
10	9:17	28.39	1.10	17:21	8:00	26.54	1.05	18:00	
5	7:33	25.89	1.03	18:14	7:00	25.09	1.01	18:31	
1	5:15	22.57	.94	19:25	5:12	22.49	.93	19:27	VP
n = 764					n = 2049				

Total n = 2813

AEROBIC POWER TESTS

FEMALES

	AGE 40-49				AGE 50-59				
%	Balke Tread-mill (Time)	Max VO_2 (ml/kg/min.)	12 Min. Run (Distance) (Miles)	1.5 Mile Run (Time)	Balke Tread-mill (Time)	Max VO_2 (ml/kg/min.)	12 Min. Run (Distance) (Miles)	1.5 Mile Run (Miles)	
99	22:00	46.75	1.61	10.47	18:44	42.04	1.48	12.28	
95	18:00	40.98	1.45	12.51	15:07	36.81	1.33	14.20	S
90	17:00	39.53	1.41	13.22	14:00	35.20	1.29	14.55	
85	15:35	37.49	1.35	14.06	12:53	33.59	1.24	15.29	
80	14:45	36.28	1.32	14.31	12:00	32.31	1.21	15.57	E
75	13:56	35.11	1.29	14.57	11:43	31.90	1.20	16.05	
70	13:00	33.76	1.25	15.16	11:00	30.87	1.17	16.27	
65	12:30	33.04	1.23	15.41	10:14	29.76	1.14	16.51	
60	12:00	32.31	1.21	15.57	10:00	29.43	1.13	16.58	G
55	11:30	31.59	1.19	16.12	9:30	28.70	1.11	17.24	
45	10:48	30.58	1.16	16.34	9:00	27.98	1.09	17.29	
40	10:01	29.45	1.13	16.58	8:13	26.85	1.06	17.55	F
35	10:00	29.43	1.12	16.59	7:43	26.13	1.04	18.09	
30	9:11	28.25	1.10	17.24	7:16	25.48	1.02	18.23	
25	9:00	27.98	1.09	17.29	7:00	25.09	1.01	18.31	
20	8:00	26.54	1.05	18.00	6:25	24.25	.98	18.49	P
15	7:20	25.57	1.02	18.21	6:00	23.65	.97	19.02	
10	7:00	25.09	1.01	18.31	5:05	22.33	.93	19.30	
5	5:55	23.53	.96	19.05	4:14	21.10	.90	19.57	
1	4:00	20.76	.89	20.04	2:36	18.74	.83	20.47	

n = 1630 n = 878

Total ‘n’ = 2508

AEROBIC POWER TESTS

FEMALES

AGE
60+

%	Balke Tread-mill (Time)	Max VO2 (mg/ kg/ min)	12 Min. Run Dis-tance (Miles)	1.5 Mile Run (Time)	
99	20:25	44.47	1.55	11:36	
95	15:34	37.46	1.35	14:06	S
90	14:00	35.20	1.29	14:55	
85	12:00	32.31	1.21	15:57	
80	11:15	31.23	1.18	16:20	E
75	11:00	30.87	1.17	18:27	
70	10:00	29.43	1.13	16:58	
65	9:00	27.98	1.09	17:29	
60	8:28	27.21	1.07	17:46	G
55	8:00	26.54	1.05	18:00	
50	7:30	25.82	1.03	18:16	
45	7:30	25.09	1.01	18:31	
40	7:00	24.49	.99	18:44	F
35	6:16	24.03	.98	18:54	
30	6:08	23.80	.97	18:59	
25	6:00	23.65	.97	19:02	
20	5:24	22.78	.94	19:21	P
15	5:00	22.21	.93	19:33	
10	4:00	20.76	.89	20:04	
5	3:15	19.68	.86	20:23	
1	2:00	17.87	.81	21:06	VP

n = 202

PROTOCOL FOR FLEXIBILITY TESTING

Equipment:

1. **12 inch box (12 inch bench/step can be substituted)**
2. **Yardstick on box with the 15 inch mark at the edge.**

Procedure:

1. **The participant should warm up.**
2. **No shoes.**
3. **Feet against the box with the feet no wider than eight inches apart. Toes are pointed directly up to the ceiling.**
4. **The knees remain extended throughout the test.**
5. **Hands are placed one top of the other fingertips even.**
6. **Yardstick is placed at the edge of the box.**
7. **The participant leans forward without lunging or bobbing and reaches as far down the yardstick as possible.**
8. **The neck remains neutral.**
9. **Record the reach nearest the ¼ inch.**
10. **Three trials are allowed; the best of the three trials is recorded.**
11. **Exhaling on the reach is recommended.**

FLEXIBILITY

SIT AND REACH

FEMALES

AGE

%	<20	20-29	30-39	40-49	50-59	60+	
99	>24.3	>24.5	>24.0	>22.8	>23.0	>23.0	
95	24.3	24.5	24.0	22.8	23.0	23.0	S
90	24.3	23.8	22.5	21.5	21.5	21.8	
85	22.5	23.0	22.0	21.3	21.0	19.5	
80	22.5	22.5	21.5	20.5	20.3	19.0	E
75	22.3	22.0	21.0	20.0	20.0	18.0	
70	22.0	21.5	20.5	19.8	19.3	17.5	
65	21.8	21.0	20.3	19.1	19.0	17.5	
60	21.5	20.5	20.0	19.0	18.5	17.0	G
55	21.3	20.3	19.5	18.5	18.0	17.0	
50	21.0	20.0	19.0	18.0	17.9	16.4	
45	20.5	19.5	18.5	18.0	17.0	16.1	
40	20.5	19.3	18.3	17.3	16.8	15.5	F
35	20.0	19.0	17.8	17.0	16.0	15.2	
30	19.5	18.3	17.3	16.5	15.5	14.4	
25	19.0	17.8	16.8	16.0	15.3	13.6	
20	18.5	17.0	16.5	15.0	14.8	13.0	P
15	17.8	16.4	15.5	14.0	14.0	11.5	
10	14.5	15.4	14.4	13.0	13.0	11.5	
5	14.5	14.1	12.0	10.5	12.3	9.2	
1	<14.5	<14.1	<12.0	<10.5	<12.3	< 9.2	VP
n	19	183	376	332	192	44	

Total n
= 1146

FLEXIBILITY

SIT AND REACH

MALES

AGE

%	<20	20-29	30-39	40-49	50-59	60+	
99	>23.4	>23.0	>22.0	>21.3	>20.5	>20.0	
95	23.4	23.0	22.0	21.3	20.5	20.0	S
90	22.6	21.8	21.5	20.0	19.0	19.0	
85	22.4	21.0	20.0	19.3	18.3	18.0	
80	21.7	20.5	19.5	18.5	17.5	17.3	E
75	21.4	20.0	19.0	18.0	17.0	16.5	
70	20.7	19.5	18.5	17.5	16.5	15.5	
65	19.8	19.0	18.0	17.0	16.0	15.0	
60	19.0	18.5	17.5	16.3	15.5	14.5	G
55	18.7	18.0	17.0	16.0	15.0	14.0	
50	18.0	17.5	16.5	15.3	14.5	13.5	
45	17.3	17.0	16.0	15.0	14.0	13.0	
40	16.5	16.5	15.5	14.3	13.3	12.5	F
35	16.0	16.0	15.0	14.0	12.5	12.0	
30	15.5	15.5	14.5	13.3	12.0	11.3	
25	14.1	15.0	13.8	12.5	11.2	10.5	
20	13.2	14.4	13.0	12.0	10.5	10.0	P
15	11.9	13.5	12.0	11.0	9.7	9.0	
10	10.5	12.3	11.0	10.0	8.5	8.0	
5	9.4	10.5	9.3	8.3	7.0	9.25.8	
1	<9.4	<10.5	<9.3	<8.3	<7.0	< 5.8	VP
n	56	422	1906	209	1278	344	

Total n
= 6096

Who's Overweight Who's Obese?

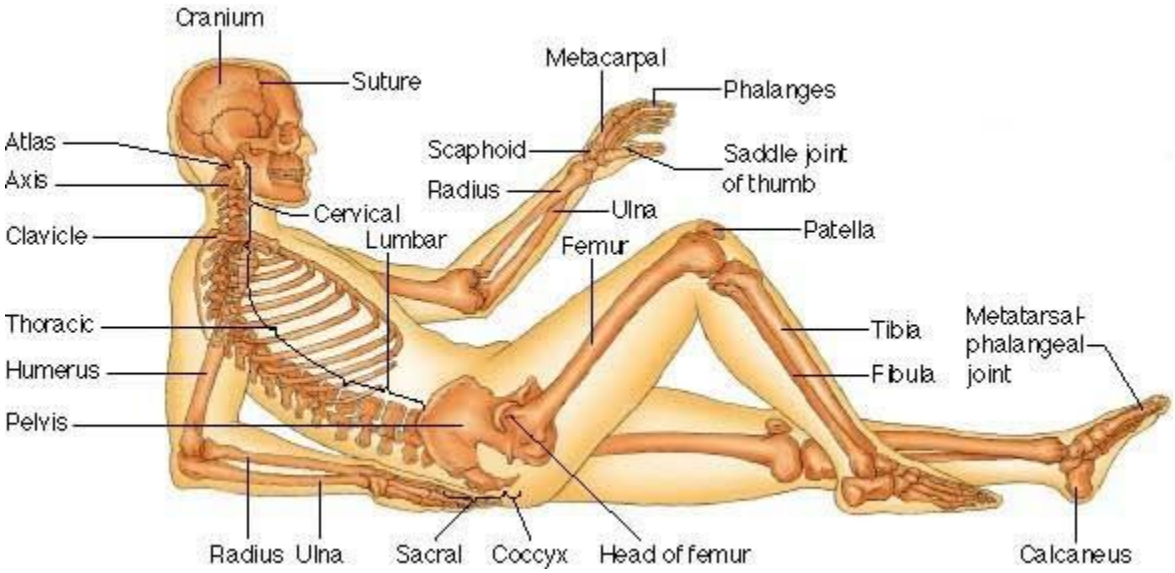
How to calculate your BMI (Body Mass Index)

1. **Divide your weight in pounds by your height in inches.**
2. **Divide that number by your height in inches again.**
3. **Multiply that number by 704.5 to get your BMI.**

Where Do You Fall?

Below 18.5	**Underweight**
18.5 to 24.9	**Normal**
25 to 29.9	**Overweight**
30 to 34.5	**Mildly Obese**
35 to 39.9	**Moderately Obese**
40 and Above	**Extremely Obese**

BONES OF THE HUMAN BODY



There are four terms a person needs to know when studying anatomical kinesiology. These terms are: Anatomy, Physiology, Kinesiology, and Biomechanics.

Anatomy is the study of structure.

Physiology is the study of function.

Kinesiology is the study of structure and function of the musculo-skeletal system.

Biomechanics literally meaning “life movements”.

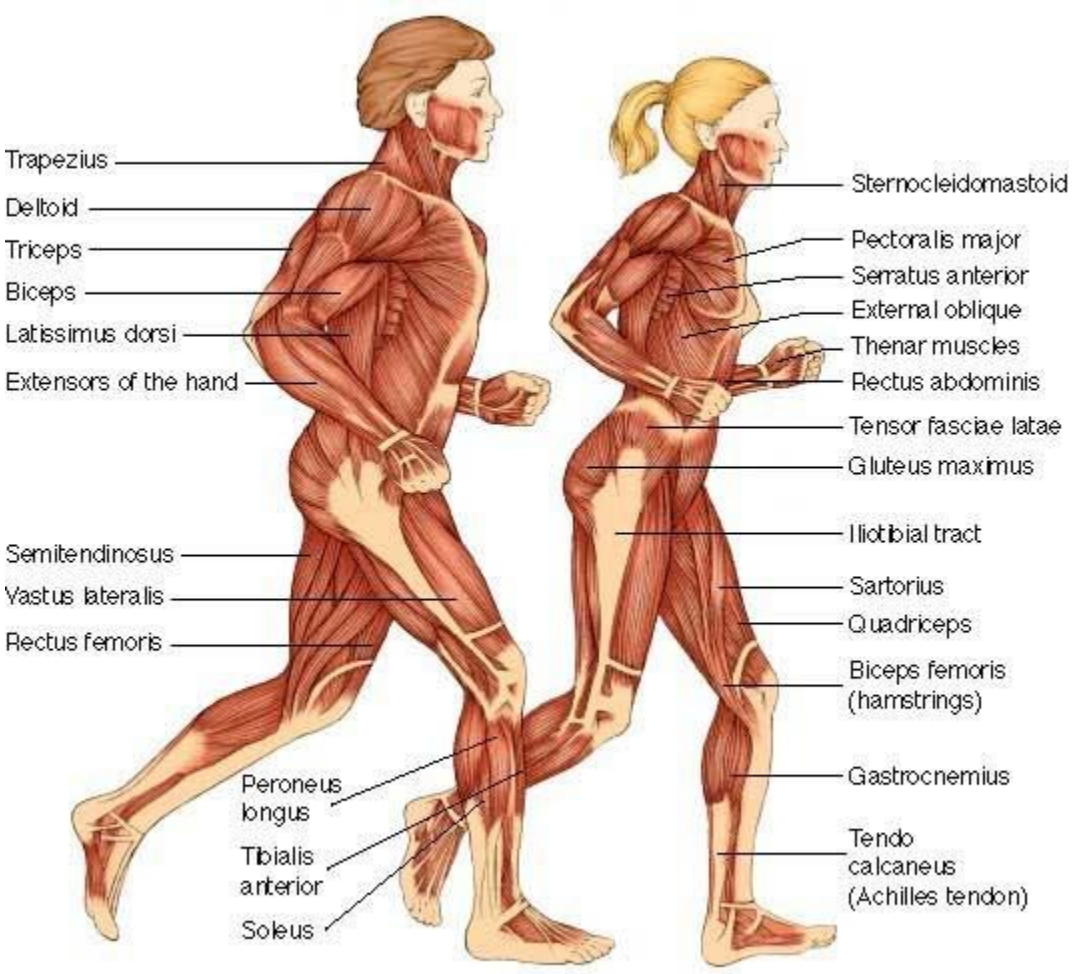
These terms and their definitions will help one to better understand anatomical kinesiology.

Other Related Terms to know:

Musculoskeletal system consists of the muscles, bones, and joints

Axial Skeleton consists of the head, neck, and trunk.

MUSCLES OF THE HUMAN BODY



Other Anatomy Related Terms:

Origin: superior attachment site where the muscle attaches.
Insertion: inferior attachment site where the muscle attaches.

Waist-to- Hip Ratio

		Risk			
	Age	**Low**	**Moderate**	**High**	**Very High**
MEN	**20-29**	**<0.83**	**0.83-0.88**	**0.89-0.94**	**>0.94**
	30-39	**<0.84**	**0.82-0.91**	**0.92-0.96**	**>0.96**
	40-49	**<0.88**	**0.88-0.95**	**0.99-1.00**	**>1.00**
	50-59	**<0.90**	**0.90-0.96**	**0.97-1.02**	**>1.02**
	60-69	**<0.91**	**0.91-0.98**	**0.99-1.03**	**>1.03**
WOMEN	**20-29**	**<0.71**	**0.71-0.77**	**0.78-0.82**	**>0.82**
	30-39	**<0.72**	**0.72-0.78**	**0.79-0.84**	**>0.84**
	40-49	**<0.73**	**0.73-0.79**	**0.80-0.87**	**>0.87**
	50-59	**<0.74**	**0.74-0.81**	**0.82-0.88**	**>0.88**
	60-69	**<0.76**	**0.76-0.83**	**0.84-0.90**	**>0.90**

PLANK TEST

The plank test is a simple fitness test of core muscle strength, and can also be used as a fitness exercise for improving core strength.

- **purpose:** The plank test measures the control and endurance of the back/core stabilizing muscles.
- **equipment required:** flat and clean surface, stopwatch, recording sheets, pen.
- **pre-test:** Explain the test procedures to the subject. Perform screening of health risks and obtain informed consent. Prepare forms and record basic information such as age, height, body weight, gender and test conditions. Perform a standard warm-up.
- **procedure:** The aim of this test is to hold an elevated position for as long as possible. Start with the upper body supported off the ground by the elbows and forearms, and the legs straight with the weight taken by the toes. The hip is lifted off the floor creating a straight line from head to toe. As soon as the subject is in the correct position, the stopwatch is started. The test is over when the subject is unable to hold the back straight and the hip is lowered.
- **scoring:** The score is the total time completed. The table below is just a rough guide to scores for both males and females which I made up. The world record is over 30 minutes!

Rating	Time
Excellent	> 6 minutes
Very Good	4-6 minutes
above average	2-4 minutes
Average	1-2 minutes
below average	30-60 seconds
poor	15-30 seconds
very poor	< 15 seconds

WALL SQUAT TEST

Single-Leg Wall Sit Test

This is a simple test of lower body muscular strength and endurance, requiring the subject to hold a sitting position while leaning against a wall, on one leg, for as long as possible. There is the similar wall squat test performed with both legs on the ground.

- **purpose:** to measure the strength endurance of the lower body, particularly the quadriceps muscle group.
- **equipment required:** flat non-slip floor, smooth wall and a stopwatch.
- **pre-test:** Explain the test procedures to the subject. Perform screening of health risks and obtain informed consent. Prepare forms and record basic information such as age, height, body weight, gender, test conditions. Perform an appropriate warm-up. See more details of pre-test procedures.
- **procedure:** Stand comfortably with feet approximately shoulder width apart, with your back against a smooth vertical wall. Slowly slide your back down the wall to assume a position with both your knees and hips at a 90° angle. Move the feet position if required. The timing starts when one foot is lifted off the ground and is stopped when the subject cannot maintain the position and the foot is returned to the ground. After a period of rest, the other leg is tested.
- **scoring:** the total time in seconds that the position was held for each leg is recorded. The table below gives a general guideline to expected scores for a single leg for adults, based on my personal experiences. Comparing the scores for each leg may indicate muscle weakness on one side.

Ratings for Single Leg Wall Sit Test

rating	males (seconds)	females (seconds)
excellent	>100	> 60
good	75-100	45-60
average	50-75	35-45
below average	25-50	20-35
very poor	< 25	< 20

Wall Squat Test

The wall squat test is a simple test of lower body muscular strength and endurance. The test requires the subject to hold a sitting position while leaning back against a wall. There is also a similar single-leg wall sit test.

- **purpose:** to measure the strength endurance of the lower body, particularly the strength of your quads, hamstrings and glutes.
- **equipment required:** flat non-slip floor, smooth wall and a stopwatch.
- **pre-test:** Explain the test procedures to the subject. Perform screening of health risks and obtain informed consent. Prepare forms and record basic information such as age, height, body weight, gender, test conditions. Perform an appropriate warm-up (leg stretches, squats).
- **procedure:** Stand comfortably with feet shoulder width apart and about 2 feet from the wall, with your back against a smooth vertical wall. Slowly slide your back down the wall to assume a position with both your knees and hips at a 90° angle. Move the feet distance from the wall if required. Ensure that the feet are flat on the ground, the back flat against the wall, and the knees and hips are at right angles. The knees should be directly above your ankles (rather than over your toes), and the thighs to the ground. The timing starts when the correct position is assumed, and is stopped when the subject cannot maintain that position.
- **scoring:** record the total time in seconds that the position was held.
- **comments:** the arm should be left in a comfortable position across the chest, resting on the thighs or hanging by the side. You may want to use a method to measure the correct knee angle.
- **contraindications:** this test is not suitable for obese people, or those with knee pain or lower leg injury.
- **variations / alternatives**: there is the similar single leg wall sit test performed with one leg raised.
- **advantages:** This test requires minimal equipment and can be conducted with large groups all at once.

rating	males (seconds)	females (seconds)
excellent	>100	> 60
good	75-100	45-60
average	50-75	35-45
below average	25-50	20-35
very poor	< 25	< 20