

Chart 5 ► Bicycle Test Rating Scale (mL/O₂/kg/min.)

Age	Women				
	17-26	27-39	40-49	50-59	60-69
High-performance zone	46+	40+	38+	35+	32+
Good fitness zone	36-45	33-39	30-37	28-34	24-31
Marginal zone	30-35	28-32	24-29	21-27	18-23
Low zone	<30	<28	<24	<21	<18

Age	Men				
	17-26	27-39	40-49	50-59	60-69
High-performance zone	50+	46+	42+	39+	35+
Good fitness zone	43-49	35-45	32-41	29-38	26-34
Marginal zone	35-42	30-34	27-31	25-28	22-25
Low zone	<35	<30	<27	<25	<22

Source: Charts 4, 5, and 6 based on data from Astrand, P. O., and Rodahl, K.

The 12-Minute Run Test

- Locate an area where a specific distance is already marked, such as a school track or football field, or measure a specific distance using a bicycle or automobile odometer.
- Use a stopwatch or wristwatch to accurately time a 12-minute period.
- For best results, warm up prior to the test; then run at a steady pace for the entire 12 minutes (cool down after the tests).
- Determine the distance you can run in 12 minutes in fractions of a mile. Depending upon your age, locate your score and rating in Chart 6.

Chart 6 ► Twelve-Minute Run Test Rating Chart (Score in Miles)

Classification	Men (Age)			
	17-26	27-39	40-49	50+
High-performance zone	1.80+	1.60+	1.50+	1.40+
Good fitness zone	1.55-1.79	1.45-1.59	1.40-1.49	1.25-1.39
Marginal zone	1.35-1.54	1.30-1.44	1.25-1.39	1.10-1.24
Low zone	<1.35	<1.30	<1.25	<1.10

Classification	Women (Age)			
	17-26	27-39	40-49	50+
High-performance zone	1.45+	1.35+	1.25+	1.15+
Good fitness zone	1.25-1.44	1.20-1.34	1.15-1.24	1.05-1.14
Marginal zone	1.15-1.24	1.05-1.19	1.00-1.14	.95-1.04
Low zone	<1.15	<1.05	<1.00	<.94

For a metric version of this chart, see Appendix B.
Based on data from Cooper, K. H.

The 12-Minute Swim Test

- Locate a swimming area with premeasured distances, preferably 20 yards or longer.
- After a warm-up, swim as far as possible in 12 minutes using the stroke of your choice.
- For best results, have a partner keep track of your time and distance. A degree of swimming competence is a prerequisite for this test.
- Determine your score and rating using Chart 7.

Chart 7 ▶ Twelve-Minute Swim Rating Chart (Score in Yards)

Classification	Men (Age)			
	17–26	27–39	40–49	50+
High-performance zone	700+	650+	600+	550+
Good fitness zone	600–699	550–649	500–599	450–549
Marginal fitness zone	500–599	450–459	400–499	350–449
Low fitness zone	below 500	below 450	below 400	below 350

Classification	Women (Age)			
	17–26	27–39	40–49	50+
High-performance zone	600+	550+	500+	450+
Good fitness zone	500–599	450–549	400–499	450–549
Marginal fitness zone	400–499	350–359	300–399	250–349
Low fitness zone	below 400	below 350	below 300	below 250

For a metric version of this chart, see Appendix B.

Based on data from Cooper, K. H.

Directions:

To determine your threshold of training and target heart rates, locate your resting heart rate on the left and your age across the top. The values at the point where the lines intersect are your threshold and target heart rates.

Chart 8 ▶ Determining Threshold of Training* and Target Zone Heart Rates Using Resting Heart Rate and Age

Resting Heart Rate		Less Than 25	Age								
			25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	Over 65
Below 50	Threshold	107	105	103	102	101	99	98	97	96	95
	target zone	107–170	105–167	103–164	102–161	101–159	99–155	98–151	97–148	96–146	95–139
50–54	Threshold	110	108	106	104	102	101	102	100	99	98
	target zone	110–170	108–167	106–164	104–162	102–160	101–156	102–153	100–150	99–147	98–140
55–59	Threshold	113	111	109	107	106	105	104	103	102	101
	target zone	113–171	111–168	109–163	107–162	106–160	105–157	104–154	103–150	102–146	101–140
60–64	Threshold	116	113	111	109	108	107	106	105	104	104
	target zone	116–171	113–169	111–166	109–163	108–161	107–159	106–155	105–151	104–147	104–141
65–69	Threshold	118	117	115	112	111	110	109	108	107	108
	target zone	118–172	117–170	115–166	112–163	111–161	110–159	109–155	108–152	107–148	108–142
70–74	Threshold	121	120	118	119	116	114	113	112	111	110
	target zone	121–173	120–171	118–167	119–164	116–162	114–160	113–156	112–153	111–149	110–143
75–79	Threshold	124	123	122	121	119	117	116	114	113	112
	target zone	124–173	123–172	122–168	121–164	119–163	117–160	116–157	114–155	113–151	112–143
80–85	Threshold	127	124	123	122	121	119	118	117	116	114
	target zone	127–174	124–172	123–169	122–165	121–164	119–161	118–158	117–156	116–152	114–144
86 and over	Threshold	130	125	126	125	124	123	121	119	117	117
	target zone	130–175	125–173	126–169	125–166	124–164	123–162	121–159	119–157	117–154	117–145

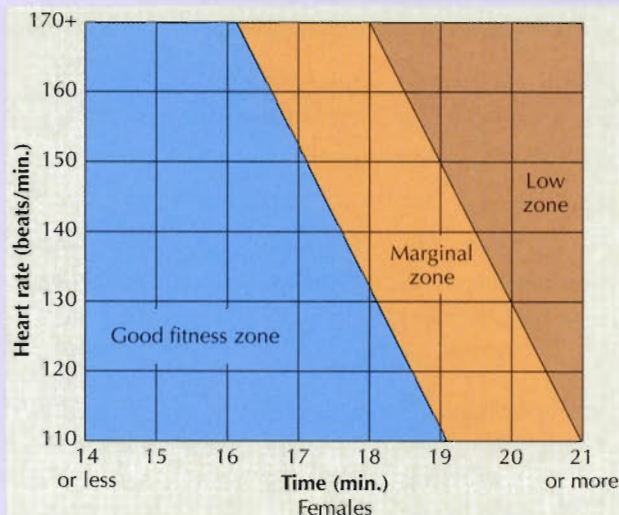
*Threshold for beginners. Mid target or above recommended after becoming a regular exerciser.

Lab Resource Materials: Evaluating Cardiovascular Fitness

The Walking Test

- Warm up; then walk 1 mile as fast as you can without straining. Record your time to the nearest second.
- Immediately after the walk, count your heart rate for 15 seconds; then multiply by 4 to get a 1-minute heart rate. Record your heart rate.
- Use your walking time and your postexercise heart rate to determine your rating using Chart 1.

Chart 1 ▶ Walking Ratings for Males and Females



The ratings in Chart 1 are for ages twenty to twenty-nine. They provide reasonable ratings for people of all ages.

Note: The walking test is not a good indicator of high performance; the running and bicycle tests are recommended.

Source: James M. Rippe, M.D.

The Step Test

- Step up and down on a 12-inch bench for 3 minutes at a rate of twenty-four steps per minute. One step consists of four beats—that is, “up with the left foot, up with the right foot, down with the left foot, down with the right foot.”
- Immediately after the exercise, sit down on the bench and relax. Don’t talk.
- Locate your pulse or have someone locate it for you.
- Five seconds after the exercise ends, begin counting your pulse. Count the pulse for 60 seconds.
- Your score is your 60-second heart rate. Locate your score and your rating on Chart 2.

Chart 2 ▶ Step Test Rating Chart

Classification	60-Second Heart Rate
High-performance zone	84 or less
Good fitness zone	85–95
Marginal zone	96–119
Low zone	120 and above

As you grow older, you will want to continue to score well on this rating chart. Because your maximal heart rate decreases as you age, you should be able to score well if you exercise regularly.

Source: F. W. Kasch and J. L. Boyer.

The Astrand-Ryhming Bicycle Test

- Ride a stationary bicycle ergometer for 6 minutes at a rate of fifty pedal cycles per minute (one push with each foot per cycle). Cool down after the test.
- Set the bicycle at a workload between 300 and 1,200 kpm. For less fit or smaller people, a setting in the range of 300 to 600 is appropriate. Larger or fitter people will need to use a setting of 750 to 1,200. The workload should be enough to elevate the heart rate to at least 125 bpm but no more than 170 bpm during the ride. The ideal range is 140–150 bpm.
- During the sixth minute of the ride (if the heart rate is in the correct range—see previous step), count the heart rate for the entire sixth minute. The carotid or radial pulse may be used.
- Use Chart 3 (males) or 4 (females) to determine your predicted oxygen uptake score in liters per minute. Locate your heart rate for the sixth minute of the ride in the left column and the work rate in kp-m/min. across the top. The number in the chart where the heart rate and work rate intersect represents your predicted O_2 uptake in liters per minute. The bicycle you use must allow you to easily and accurately determine the work rate in kp-m/min.

Lab Resource Materials: Muscle Fitness Tests

Evaluating Isotonic Strength: 1 RM

1. Use a weight machine for the leg press and seated arm press (or bench press) for the evaluation.
2. Estimate how much weight you can lift two or three times. Be conservative; it is better to start with too little weight than too much. If you lift the weight more than ten times, the procedure should be done again on another day when you are rested.
3. Using correct form, perform a leg press with the weight you have chosen. Perform as many times as you can up to ten.
4. Use Chart 1 to determine your 1 RM for the leg press. Find the weight used in the left-hand column and then find the number of repetitions you performed across the top of the chart.
5. Your 1 RM score is the value where the weight row and the repetitions column intersect.
6. Repeat this procedure for the seated arm press.
7. Record your 1 RM scores for the leg press and seated arm press in the Results section.
8. Next, divide your 1 RM scores by your body weight in pounds to get a "strength per pound of body weight" (str/lb./body wt.) score for each of the two exercises.
9. Finally, determine your strength rating for your upper body strength (arm press) and lower body (leg press) using Chart 2.

Chart 1 ► Predicted 1 RM Based on Reps-to-Fatigue

Wt.	Repetitions										Wt.	Repetitions									
	1	2	3	4	5	6	7	8	9	10		1	2	3	4	5	6	7	8	9	10
30	30	31	32	33	34	35	36	37	38	39	170	170	175	180	185	191	197	204	211	219	227
35	35	37	38	39	40	41	42	43	44	45	175	175	180	185	191	197	203	210	217	225	233
40	40	41	42	44	46	47	49	50	51	53	180	180	185	191	196	202	209	216	223	231	240
45	45	46	48	49	51	52	54	56	58	60	185	185	190	196	202	208	215	222	230	238	247
50	50	51	53	55	56	58	60	62	64	67	190	190	195	201	207	214	221	228	236	244	253
55	55	57	58	60	62	64	66	68	71	73	195	195	201	206	213	219	226	234	242	251	260
60	60	62	64	65	67	70	72	74	77	80	200	200	206	212	218	225	232	240	248	257	267
65	65	67	69	71	73	75	78	81	84	87	205	205	211	217	224	231	238	246	254	264	273
70	70	72	74	76	79	81	84	87	90	93	210	210	216	222	229	236	244	252	261	270	280
75	75	77	79	82	84	87	90	93	96	100	215	215	221	228	235	242	250	258	267	276	287
80	80	82	85	87	90	93	96	99	103	107	220	220	226	233	240	247	255	264	273	283	293
85	85	87	90	93	96	99	102	106	109	113	225	225	231	238	245	253	261	270	279	289	300
90	90	93	95	98	101	105	108	112	116	120	230	230	237	244	251	259	267	276	286	296	307
95	95	98	101	104	107	110	114	118	122	127	235	235	242	249	256	264	273	282	292	302	313
100	100	103	106	109	112	116	120	124	129	133	240	240	247	254	262	270	279	288	298	309	320
105	105	108	111	115	118	122	126	130	135	140	245	245	252	259	267	276	285	294	304	315	327
110	110	113	116	120	124	128	132	137	141	147	250	250	257	265	273	281	290	300	310	321	333
115	115	118	122	125	129	134	138	143	148	153	255	255	262	270	278	287	296	306	317	328	340
120	120	123	127	131	135	139	144	149	154	160	260	260	267	275	284	292	302	312	323	334	347
125	125	129	132	136	141	145	150	155	161	167	265	265	273	281	289	298	308	318	329	341	353
130	130	134	138	142	146	151	156	161	167	173	270	270	278	286	295	304	314	324	335	347	360
135	135	139	143	147	152	157	162	168	174	180	275	275	283	291	300	309	319	330	341	354	367
140	140	144	148	153	157	163	168	174	180	187	280	280	288	296	305	315	325	336	348	360	373
145	145	149	154	158	163	168	174	180	186	193	285	285	293	302	311	321	331	342	354	366	380
150	150	154	159	164	169	174	180	186	193	200	290	290	298	307	316	326	337	348	360	373	387
155	155	159	164	169	174	180	186	192	199	207	295	295	303	312	322	332	343	354	366	379	393
160	160	165	169	175	180	186	192	199	206	213	300	300	309	318	327	337	348	360	372	386	400
165	165	170	175	180	186	192	198	205	212	220	305	305	314	323	333	343	354	366	379	392	407

Source: JOPERD.

Evaluating Isometric Strength

Test: Grip Strength

Adjust a hand dynamometer to fit your hand size. Squeeze it as hard as possible. You may bend or straighten the arm, but do not touch the body with your hand, elbow, or arm. Perform with both right and left hands. *Note:* When not being tested, perform the Basic 8 isometric strength exercises, or squeeze and indent a new tennis ball (*after* completing the dynamometer test).

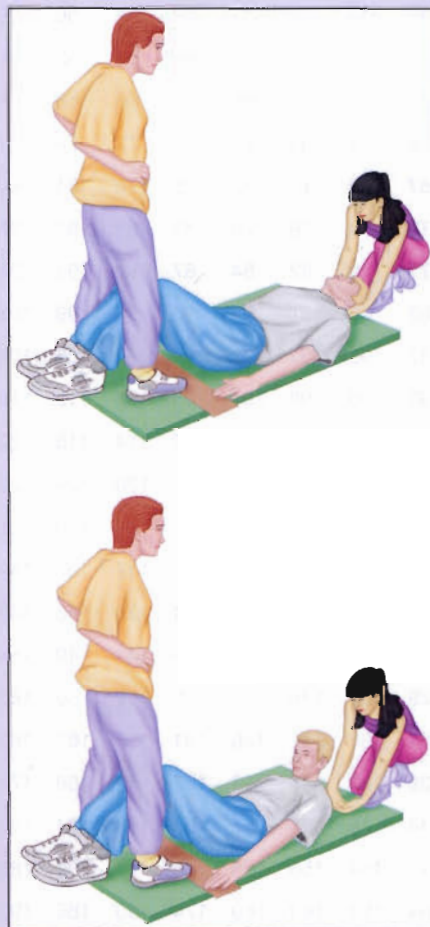


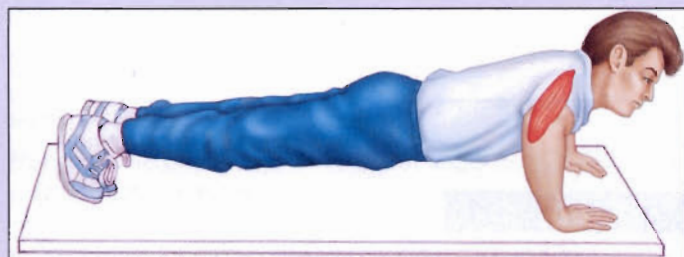
Evaluating Muscular Endurance

1. Curl-Up (Dynamic)

Sit on a mat or carpet with your legs bent more than 90 degrees so your feet remain flat on the floor (about halfway between 90 degrees and straight). Make two tape marks $4\frac{1}{2}$ inches apart or lay a $4\frac{1}{2}$ -inch strip of paper or cardboard on the floor. Lie with your arms extended at your sides, palms down and the fingers extended so that your fingertips touch one tape mark (or one side of the paper or cardboard strip). Keeping your heels in contact with the floor, curl the head and shoulders forward until your fingers reach $4\frac{1}{2}$ inches (second piece of tape or other side of strip). Lower slowly to beginning position. Repeat one curl-up every 3 seconds. Continue until you are unable to keep the pace of one curl-up every 3 seconds.

Two partners may be helpful. One stands on the cardboard strip (to prevent movement) if one is used. The second assures that the head returns to the floor after each repetition.





2. Ninety-Degree Push-Up (Dynamic)

Support the body in a push-up position from the toes. The hands should be just outside the shoulders, the back and legs straight, and the toes tucked under. Lower the body until the upper arm is parallel to the floor or the elbow is bent at 90 degrees. The rhythm should be approximately one push-up every 3 seconds. Repeat as many times as possible up to 35.

3. Flexed-Arm Support (Static)

Women: Support the body in a push-up position from the knees. The hands should be outside the shoulders, and the back and legs straight. Lower the body until the upper arm is parallel to the floor or the elbow is flexed at 90 degrees.

Men: Use the same procedure as for women except support the push-up position from the toes instead of the knees. (Same position as for 90-degree push-up.) Hold the 90-degree position as long as possible, up to 35 seconds.

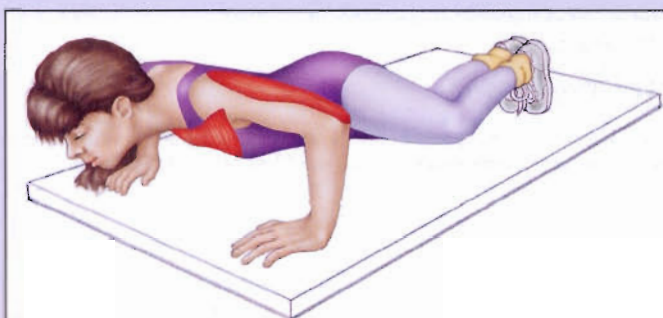


Chart 2 ► Strength per Pound of Body Weight Ratings

Rating: Age: Men	30 or Less	Leg Press 31-50	51+	30 or Less	Arm Press 31-50	51+
High-performance zone	2.06+	1.81+	1.61+	1.26+	1.01+	.86+
Good fitness	1.96-2.05	1.66-1.80	1.51-1.60	1.11-1.25	.91-1.00	.76-0.85
Marginal	1.76-1.95	1.51-1.65	1.41-1.50	.96-1.10	.86-0.90	.66-0.75
Low fitness	1.75 or less	1.50 or less	1.40 or less	.96 or less	.80 or less	.65 or less
Women						
High-performance zone	1.61+	1.36+	1.16+	.75+	.61+	.51+
Good fitness	1.46-1.60	1.21-1.35	1.06-1.15	.65-0.75	.56-0.60	.46-0.50
Marginal	1.31-1.45	1.11-1.20	.96-1.05	.56-0.65	.51-0.55	.41-0.45
Low fitness	1.30 or less	1.10 or less	.95 or less	.55 or less	.50 or less	.40 or less

Chart 3 ► Isometric Strength Rating Scale (Pounds)

Classification	Left Grip	Right Grip	Total Score
Men			
High-performance zone	125+	135+	260+
Good fitness zone	100–124	110–134	210–259
Marginal zone	90–99	95–109	185–209
Low zone	less than 90	less than 95	less than 185
Women			
High-performance zone	75+	85+	160+
Good fitness zone	60–74	70–84	130–159
Marginal zone	45–59	50–69	95–129
Low zone	less than 45	less than 50	less than 95

Suitable for use by young adults between 18 and 30 years of age. After 30, an adjustment of 0.5 of 1 percent per year is appropriate because some loss of muscle tissue typically occurs as you grow older.

Chart 4 ► Rating Scale for Dynamic Muscular Endurance

Age:	17–26		27–39		40–49		50–59		60+	
	Curl-Ups	Push-Ups	Curl-Ups	Push-Ups	Curl-Ups	Push-Ups	Curl-Ups	Push-Ups	Curl-Ups	Push-Ups
Men										
High-performance zone	35+	29+	34+	27+	33+	26+	32+	24+	31+	22+
Good fitness zone	24–34	20–28	23–33	18–26	22–32	17–25	21–31	15–23	20–30	13–21
Marginal zone	15–23	16–19	14–22	15–17	13–21	14–16	12–20	12–14	11–19	10–12
Low zone	<15	<16	<14	<15	<13	<14	<12	<12	<11	<10
Women										
High-performance zone	25+	17+	24+	16+	23+	15+	22+	14+	21+	13+
Good fitness zone	18–24	12–16	17–23	11–15	16–22	10–14	15–21	9–13	14–20	8–12
Marginal zone	10–17	8–11	9–16	7–10	8–15	6–9	7–14	5–8	6–13	4–7
Low zone	<10	<8	<9	<7	<8	<6	<7	<5	<6	<4

Chart 5 ► Rating Scale for Static Endurance (Flexed-Arm Support)

Classification	Score in Seconds
High-performance zone	30+
Good fitness zone	20–29
Marginal zone	10–19
Low zone	10

Lab Resource Materials: Flexibility Tests

Directions: To test the flexibility of all joints is impractical. These tests are for joints used frequently. Follow the instructions carefully. Determine your flexibility using Chart 1.

Test

1. *Modified Sit-and-Reach* (Flexibility Test of Hamstrings)

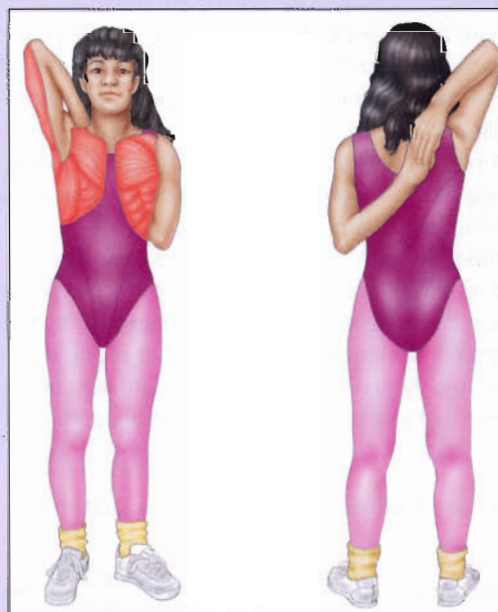
- Remove shoes and sit on the floor. Place the sole of the foot of the extended leg flat against a box or bench, and place the head, back, and hips against a wall with a 90-degree angle at the hips.
- Place one hand over the other and slowly reach forward as far as you can with arms fully extended. Keep head and back in contact with the wall. A partner will slide the measuring stick on the bench until it touches the fingertips.
- With the measuring stick fixed in the new position, reach forward as far as possible, three times, holding the position on the third reach for at least 2 seconds while the partner reads the distance on the ruler. Keep the knee of the extended leg straight (see illustration).
- Repeat the test a second time and average the scores of the two trials.



Test

2. *Shoulder Flexibility* ("Zipper" Test)

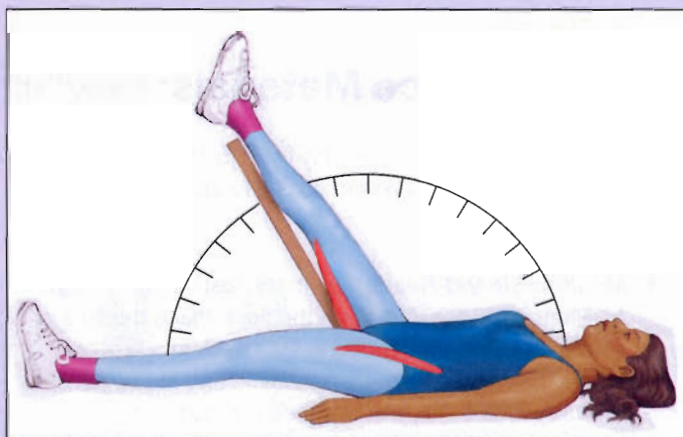
- Raise your arm, bend your elbow, and reach down across your back as far as possible.
- At the same time, extend your left arm down and behind your back, bend your elbow up across your back, and try to cross your fingers over those of your right hand as shown in the accompanying illustration.
- Measure the distance to the nearest half-inch. If your fingers overlap, score as a plus. If they fail to meet, score as a minus; use a zero if your fingertips just touch.
- Repeat with your arms crossed in the opposite direction (left arm up). Most people will find that they are more flexible on one side than the other.



Test

3. Hamstring and Hip Flexor Flexibility

- a. Lie on your back on the floor beside a wall.
- b. Slowly lift one leg off the floor. Keep the other leg flat on the floor.
- c. Keep both legs straight.
- d. Continue to lift the leg until either leg begins to bend or the lower leg begins to lift off the floor.
- e. Place a yardstick against the wall and underneath the lifted leg.
- f. Hold the yardstick against the wall after the leg is lowered.
- g. Using a protractor, measure the angle created by the floor and the yardstick. The greater the angle, the better your score.
- h. Repeat with the other leg.*



*Note: For ease of testing, you may want to draw angles on a piece of posterboard as illustrated. If you have goniometers, you may be taught to use them instead.

Test

4. Trunk Rotation

- a. Tape two yardsticks to the wall at shoulder height, one right side up and the other upside down.
- b. Stand with your left shoulder an arm's length (fist closed) from the wall. Toes should be on the line, which is perpendicular to the wall and even with the 15-inch mark on the yardstick.
- c. Drop the left arm and raise the right arm to the side, palm down, fist closed.
- d. Without moving your feet, rotate the trunk to the right as far as possible, reaching along the yardstick, and hold it 2 seconds. Do not move the feet or bend the trunk. Your knees may bend slightly.
- e. A partner will read the distance reached to the nearest half-inch. Record your score. Repeat two times and average your two scores.
- f. Next, perform the test facing the opposite direction. Rotate to the left. For this test you will use the second yardstick (upside down) so that the greater the rotation, the higher the score. If you have only one yardstick, turn it right side up for the first test and upside down for the second test.

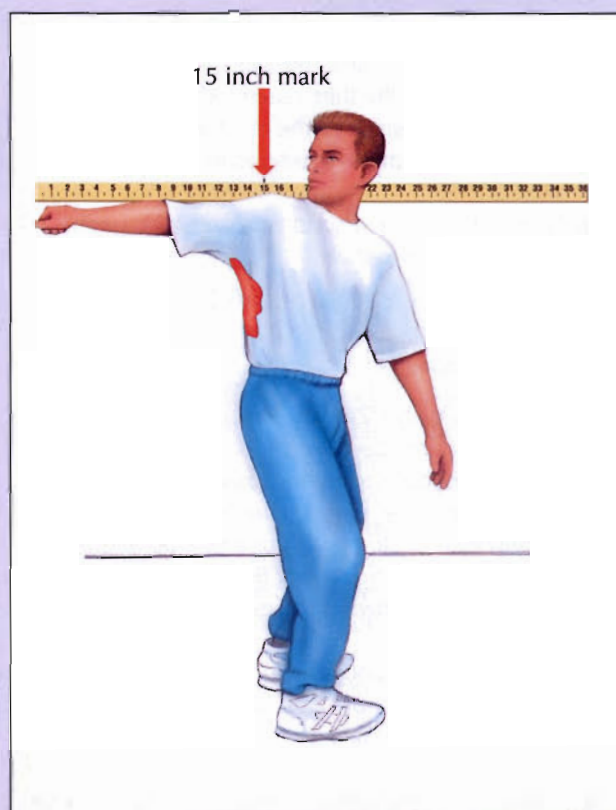


Chart 1 ► Flexibility Rating Scale for Tests 1–4

Classification	Men					Women				
	Test 1	Test 2 Right Up Left Up	Test 3	Test 4	Test 5	Test 1	Test 2 Right Up Left Up	Test 3	Test 4	Test 5
High performance*	16+	5+	4+	111+	20+	17+	6+	5+	111+	20.5 or >
Good fitness zone	13–15	1–4	1–3	80–110	16–19.5	14–16	2–5	2–4	80–110	17–20
Marginal zone	10–12	0	0	60–79	13.5–15.5	11–13	1	1	60–79	14.5–16.5
Low zone	<9	<0	<0	<60	<13.5	<10	<1	<1	<60	<14.5

*Though performers need good flexibility, hypermobility may increase injury risk.

Chart 3 ▶ Percent Fat Estimates for Sum of Triceps, Abdominal, and Calf Skinfolts

Sum of Skinfolts	Men		Women	
	Sum of Skinfolts	Percent Fat	Sum of Skinfolts	Percent Fat
8-10	3.2	23-25	16.8	
11-13	4.1	26-28	17.7	
14-16	5.0	29-31	18.5	
17-19	6.0	32-34	19.4	
20-22	6.0	35-37	20.2	
23-25	7.8	38-40	21.0	
26-28	8.7	41-43	21.9	
29-31	9.7	44-46	22.7	
32-34	10.6	47-49	23.5	
35-37	11.5	50-52	24.4	
38-40	12.5	53-55	25.2	
41-43	13.4	56-58	26.1	
44-46	14.3	59-61	26.9	
47-49	15.2	62-64	27.7	
50-52	16.2	65-67	28.6	
53-55	17.1	68-70	29.4	
56-58	18.0	71-73	30.2	
59-61	18.9	74-76	31.1	
62-64	19.9	77-79	31.9	
65-67	20.8	80-82	32.7	
68-70	21.7	83-85	33.6	
71-73	22.6	86-88	34.4	
74-76	23.6	89-91	35.5	
77-79	24.5	92-94	36.1	
80-82	25.4	95-97	36.9	
83-85	26.4	98-100	37.8	
86-88	27.3	101-103	38.6	
89-91	28.2	104-106	39.4	
92-94	29.1	107-109	40.3	
95-97	30.1	110-112	41.1	
98-100	31.0	113-115	42.0	
101-103	31.9	116-118	42.8	
104-106	32.8	119-121	43.6	
107-109	33.8	122-124	44.5	
110-112	34.7	125-127	45.3	
113-115	35.6	128-130	46.1	
116-118	36.6	131-133	47.0	
119-121	37.5	134-136	47.8	
122-124	38.4	137-139	48.7	
125-127	39.3	140-142	49.5	

Calculating Fatness from Skinfolts (Fitnessgram Method)

1. Sum the three skinfolts (triceps, abdominal, and calf) for men and women. Use horizontal abdominal measure. (See page 289.)
2. Use the skinfold sum and your age to determine your percent fat using Chart 3. Locate your sum of skinfold in the left column at the top of the chart. Your estimated body fat percentage is located where the values intersect.
3. Use the Standards for Body Fatness (Chart 4) to determine your fatness rating.

Calculating Fatness from Self-Measured Skinfolts

1. Use either the Jackson-Pollock or Fitnessgram method but make the measures on yourself rather than have a partner do the measures. When doing the tricep measure, use the self-measurement technique for men and women. (See page 290.)
2. Calculate fatness using the methods described previously.
3. Use Chart 4 to determine ratings.

Chart 4 ▶ Standards for Body Fatness (Percent Body Fat)

	Too Low	Borderline	Good Fitness (Healthy)	Marginal	Overfat
	Below Essential Fat Levels	Unhealthy for Many People	Optimal for Good Health	Associated with Some Health Problems	Unhealthy
Males	No less than 5%	6-9%	10-20%	21-25%	>25%
Females	No less than 10%	11-16%	17-28%	29-35%	>35%

Chart 7 ▶ Body Mass Index (BMI)

Height	5'0"	20	21	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
	5'1"	19	20	21	22	23	24	25	26	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	43	44	45	46	47
	5'2"	18	19	20	21	22	23	24	25	26	27	27	28	29	30	31	32	33	34	35	36	37	37	38	39	40	41	42	43	44	45	46
	5'3"	18	19	19	20	21	22	23	24	25	26	27	27	28	29	30	31	32	33	34	35	35	36	37	38	39	40	41	42	43	43	44
	5'4"	17	18	19	20	21	21	22	23	24	25	26	27	27	28	29	30	31	32	33	33	34	35	36	37	38	39	40	41	42	43	43
	5'5"	17	17	18	19	20	21	22	22	23	24	25	26	27	27	28	29	30	31	32	32	33	34	35	36	37	37	38	39	40	41	42
	5'6"	16	17	18	19	19	20	21	22	23	23	24	25	26	27	27	28	29	30	31	31	32	33	34	35	36	36	37	38	39	40	40
	5'7"	16	16	17	18	19	20	20	21	22	23	23	24	25	26	27	27	28	29	30	31	31	32	33	34	34	35	36	37	38	38	39
	5'8"	15	16	17	17	18	19	20	21	21	22	23	24	24	25	26	27	27	28	29	30	30	31	32	33	33	34	35	36	36	37	38
	5'9"	15	16	16	17	18	18	19	20	21	21	22	23	24	24	25	26	27	27	28	29	30	30	31	32	32	33	34	35	35	36	37
	5'10"	14	15	16	17	17	18	19	19	20	21	22	22	23	24	24	25	26	27	27	28	29	29	30	31	32	32	33	34	34	35	36
	5'11"	14	15	15	16	17	17	18	19	20	20	21	22	22	23	24	24	25	26	26	27	28	29	29	30	31	31	32	33	33	34	35
	6'0"	14	14	15	16	16	17	18	18	19	20	21	22	22	23	24	24	25	26	26	27	28	28	29	30	31	31	32	33	33	34	35
	6'1"	13	14	15	15	16	16	17	18	18	19	20	20	21	22	22	23	24	24	25	26	26	27	28	28	29	30	30	31	32	32	33
	6'2"	13	13	14	15	15	16	17	17	18	19	19	20	21	21	22	22	23	24	24	25	26	26	27	28	28	29	30	30	31	31	32
	6'3"	12	13	14	14	15	16	16	17	17	18	19	19	20	21	21	22	22	23	24	24	25	26	26	27	27	28	29	29	30	31	31
	6'4"	12	13	13	14	15	15	16	16	17	18	18	19	19	20	21	21	22	23	23	24	24	25	26	26	27	27	28	29	29	30	30
		100	105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240	245	250

Low
 Good fitness zone
 Marginal
 Obese

Body Mass Index (BMI)

Use the steps listed below or use Chart 7 to calculate your BMI.

1. Divide your weight in pounds by 2.2 to determine your weight in kilograms.
2. Multiply your height in inches by 0.0254 to determine your height in meters.
3. Square your height in meters (multiply your height in meters by your height in meters).
4. Divide your weight in kilograms from step 1 by your height in meters squared from step 3.
5. If you use these steps to determine your BMI, use the Rating Scale for Body Mass Index (Chart 8) to obtain a rating for your BMI.

Formula

$$BMI = \frac{\text{weight in kilograms}}{(\text{height in meters})^2}$$

Chart 8 ▶ Rating Scale for Body Mass Index (BMI)

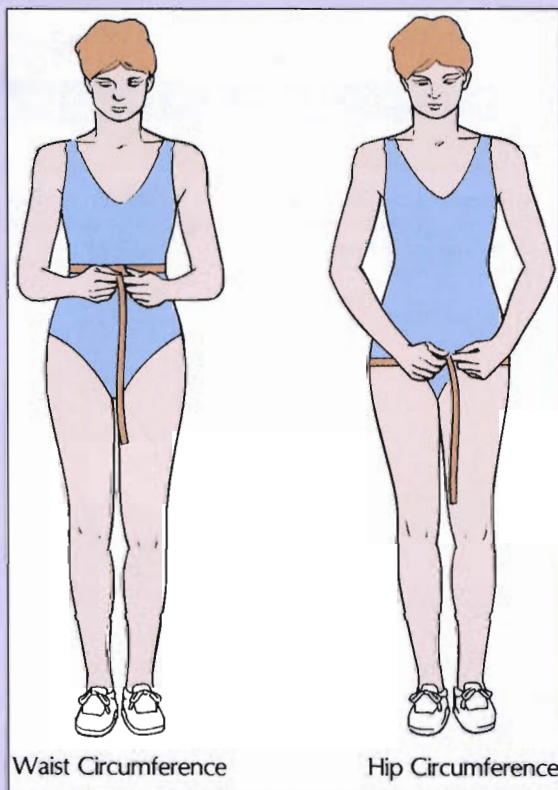
Classification	BMI
Obese (high risk)	Over 30
Marginal	25–30
Good fitness zone	17–24.9
Low	Less than 17

Note: An excessively low BMI is not desirable. Low BMI values can be indicative of eating disorders and other health problems. The government rating for marginal is overweight.

Determining the Waist-to-Hip Circumference Ratio

The waist-to-hip circumference ratio is recommended as the best available index for determining risk and disease associated with fat and weight distribution. Disease and death risk are associated with abdominal and upper body fatness. When a person has high fatness and a high waist-to-hip ratio, additional risks exist. The following steps should be taken in making measurements and calculating the waist-to-hip ratio.

- Both measurements should be done with a nonelastic tape. Make the measurements while standing with the feet together and the arms at the sides, elevated only high enough to allow the measurements. Be sure the tape is horizontal and around the entire circumference. Record scores to the nearest millimeter or 1/16th of an inch. Use the same units of measure for both circumferences (millimeters or 1/16th of an inch). The tape should be pulled snugly but not to the point of causing an indentation in the skin.
- Waist measurement**—Measure at the natural waist (smallest waist circumference). If no natural waist exists, the measurement should be made at the level of the umbilicus. Measure at the end of a normal inspiration.



Note: Using a partner or a mirror will aid you in keeping the tape horizontal.

- Hip measurement**—Measure at the maximum circumference of the buttocks. It is recommended that you wear thin-layered clothing (such as a swimming suit or underwear) that will not add significantly to the measurement.
- Divide the hip measurement into the waist measurement or use the waist-to-hip nomogram (Chart 9) to determine your waist-to-hip ratio.
- Use the Waist-to-Hip Ratio Rating Scale (Chart 10) to determine your rating for the waist-to-hip ratio.

Chart 9 ► Waist-to-Hip Ratio Nomogram

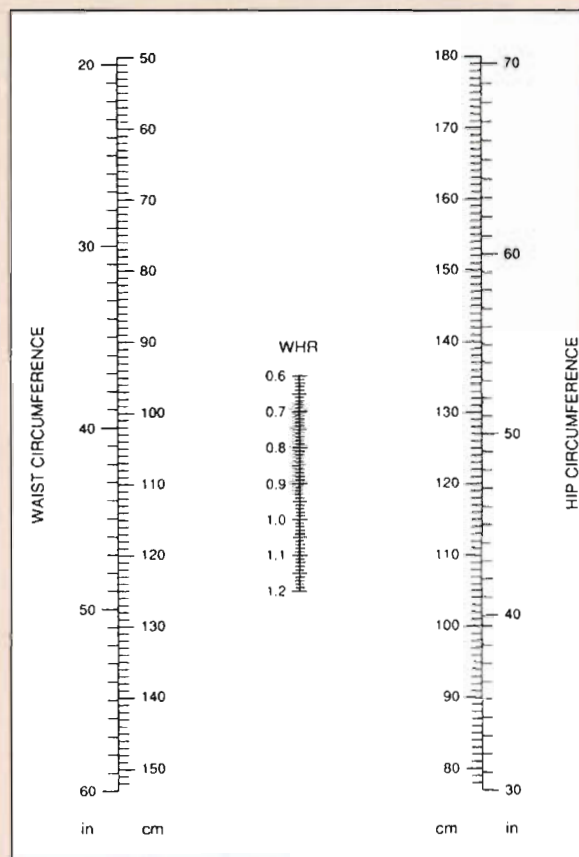


Chart 10 ► Waist-to-Hip Ratio Rating Scale

Classification	Men	Women
High risk	>1.0	>0.85
Moderately high risk	0.90–1.0	0.80–0.85
Lower risk	<0.90	<0.80