



**Table 10.9** Raw score norms (number of repetitions) for the pull-ups test for boys.

Percentile	Age				
	13	14	15	16	17+
95	10	12	15	14	15
75	5	7	9	10	10
50	3	4	6	7	7
25	1	2	3	4	4
5	0	0	0	1	0

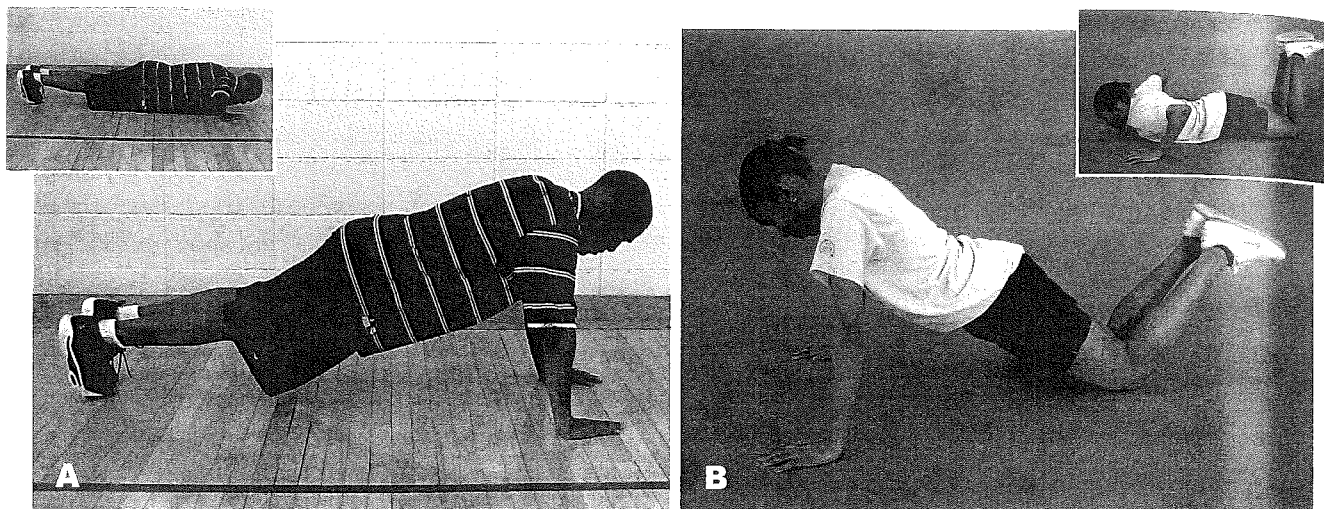
and the number of seconds (to the nearest second) the subject maintains this position is the score that is recorded. Evaluative norms are presented in Table 10.10.

### Push-ups Test

It doesn't get any easier for assessing upper body endurance – all you need is a mat. The goal of the test is to perform push-ups to exhaustion. The basic push-up position with hands under the shoulders and toes on the ground must be maintained throughout the test (no sagging or piking of the body) (Figure 10.12 A). The chest

**Table 10.10** Norms (seconds) for the flexed arm hang, boys and girls 14-17 years old.

Percentile	Boys				Girls			
	14	15	16	17	14	15	16	17
95	80.8	84.0	92.0	80.8	58.0	53.0	52.0	55.0
90	72.5	72.5	80.5	73.1	46.5	45.3	46.1	47.5
85	66.9	67.3	74.3	69.5	41.8	40.5	41.4	43.0
80	63.1	64.2	68.8	66.7	36.3	36.0	39.2	40.1
75	61.1	62.4	65.8	65.2	31.9	31.3	35.8	37.1
70	59.6	60.9	63.0	63.9	29.4	28.8	32.8	34.1
65	56.8	59.7	61.8	62.5	26.5	25.1	30.2	32.5
60	54.0	57.1	60.8	60.9	24.2	23.4	27.1	30.8
55	51.6	53.8	59.8	58.3	22.6	21.5	24.6	28.7
50	48.7	51.6	57.0	56.0	20.3	20.0	21.4	25.4
45	45.8	50.1	53.7	52.3	18.5	18.5	19.2	24.0
40	42.7	47.4	51.0	49.8	16.6	15.8	16.7	21.3
35	39.9	44.8	48.7	46.7	14.1	14.2	15.1	19.1
30	36.3	42.3	45.3	43.7	12.0	12.4	12.8	16.9
25	33.8	38.3	42.0	41.5	10.2	10.6	10.6	14.8
20	31.0	34.5	39.8	38.9	8.8	8.6	9.0	12.0
15	26.8	29.1	35.1	34.8	6.9	7.1	7.8	9.1
10	21.8	24.1	29.8	30.7	5.2	5.8	5.8	6.2
5	12.5	15.5	18.3	24.5	3.5	3.3	3.9	4.5



**Figure 10.12** The push-ups test. A. Standard push-up. B. Modified push-up.

must touch the mat on each repetition to count in the score. Women may perform modified push-ups with the knees bent and touching the mat rather than the toes (Figure 10.12 B). The score is simply the number of push-ups successfully completed. Evaluative norms are presented in Table 10.11.

### **Continuous Burpee Test**

This test measures the participant's general muscular endurance. Appropriate for both males and females, all that is required for this test is a

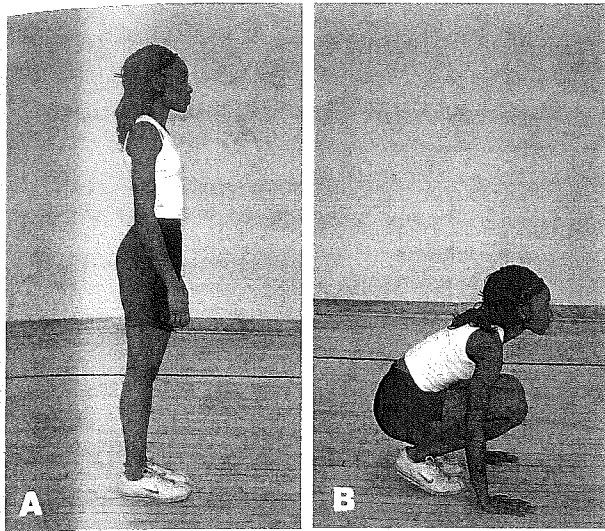
stopwatch, wrist watch, or clock with a second hand. A burpee is performed in the following sequence: from standing, (1) the subject squats and places the hands on the floor in front of the feet; (2) propels the legs backwards to a front-leaning rest position; (3) returns to the squat-rest position; and (4) rises back to a standing position (Figure 10.13). The test involves repeating this sequence as many times as possible after a "Go!" signal has been given. The subject's score is the total number of repetitions. Evaluative norms are presented in Table 10.12.

**Table 10.11** Norms (number of repetitions) for the push-ups test (modified push-ups for females).

Performance Level	No. of Push-ups	
	Males (15 – 19)	Females (15 – 19)
Excellent	39+	33+
Above Average	29 – 38	25 – 32
Average	23 – 28	18 – 24
Below Average	18 – 22	12 – 17
Needs Improvement	≤ 17	≤ 11

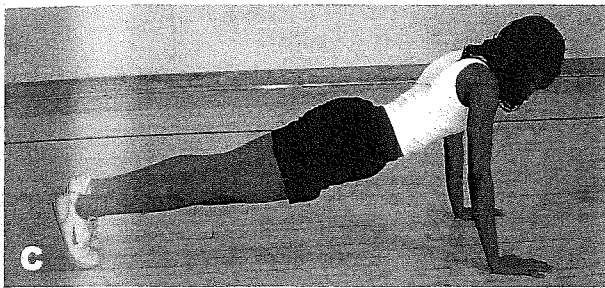
**Table 10.12** Norms (total number of burpees) for the continuous burpee test.

Performance Level	No. of Burpees	
	Males	Females
Excellent	94+	46+
Above Average	70 – 93	38 – 45
Average	39 – 69	20 – 37
Below Average	22 – 38	12 – 19
Needs Improvement	≤ 21	≤ 11

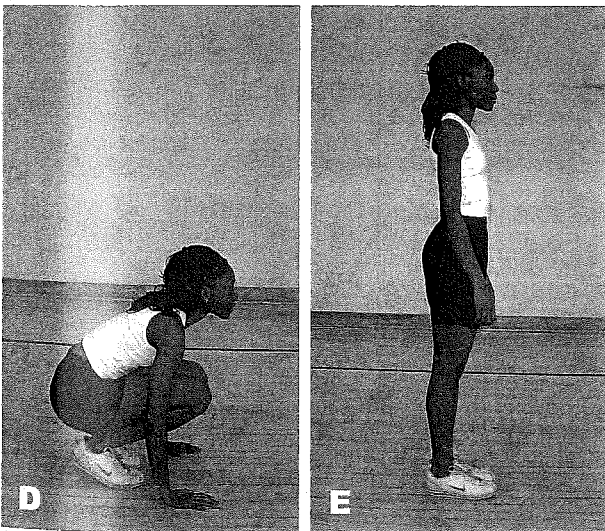


A Starting position

B Squat or crouch position



C Front-leaning rest position



D Return to squat position E Return to standing

## Measuring Flexibility

Measuring flexibility or joint range of motion is an important measurement goal. Not only is flexibility important for performing physical skills, but it is also vital for performing daily tasks with comfort and ease. However, flexibility tends to be joint specific; therefore, a general test of flexibility really doesn't exist. Having flexible shoulders does not mean you will have flexible hamstrings. This creates a problem in measuring flexibility, unless the flexibility of a specific joint is being tested. Various laboratory methods exist that measure joint range of motion, including goniometry (manual, electric, and pendulum goniometers), radiography, photography, trigonometry, and linear measurements. While these methods are reliable and valid, many are not feasible for schools or average individuals. Other simple field tests exist that effectively measure flexibility.

### Sit-and-Reach Test

This test assessing trunk and hamstring flexibility is satisfactory for both males and females from age five and above. Prior to testing, participants should warm up properly to stretch. These tests involve reaching as far forward as possible with the legs held straight. Some tests use a specially constructed box of specific dimensions with a measurement scale (Figure 10.14). However, the

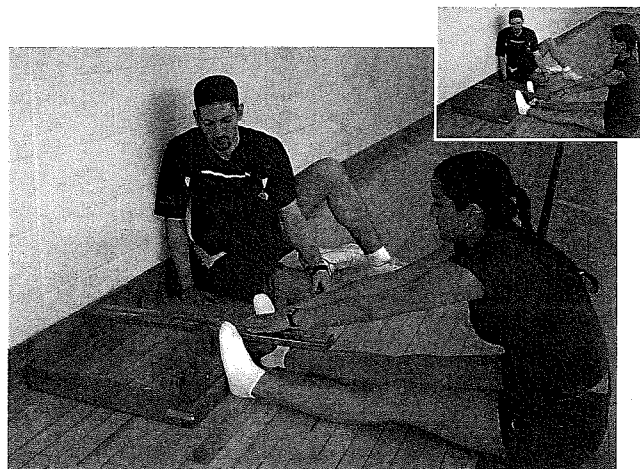


Figure 10.14 The sit-and-reach test.

Figure 10.13 The sequence of a properly performed burpee.

**Table 10.13** Norms (cm) for the modified sit-and-reach test.

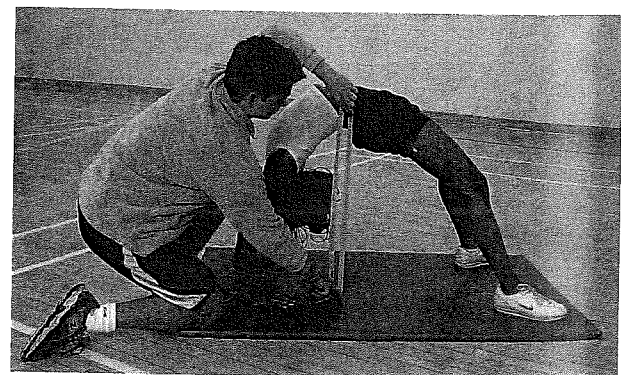
Percentile Rank	Males		Percentile Rank	Females	
	Age Category			Age Category	
	Under 18	19 – 35		Under 18	19 – 35
99	53	51	99	57	53
95	50	48	95	50	49
90	46	44	90	47	45
80	45	43	80	45	42
70	41	40	70	42	41
60	39	38	60	41	40
50	37	37	50	39	38
40	36	34	40	37	37
30	34	33	30	35	35
20	30	29	20	32	32
10	24	23	10	29	26
05	21	20	05	24	23
01	18	18	01	20	19

test may also be completed with a metre stick or measuring tape. For this modified test, the participant sits with one leg on either side of the metre stick or tape measure with the feet and arms outstretched and the hips, back, and head against the wall (see background image in Table 10.13). The tape measure on the floor should be lined up with the edge of the participant's outstretched fingers. The participant's head and back can now come off the wall and gradually reach forward along the metre stick three times. On the third attempt, the participant stretches forward as far as possible, and holds the final position for at least two seconds. The back of the participant's knees must remain flat on the floor. Each trial is scored to the nearest centimetre. Two trials are allowed and the final test score is calculated as the average of the two scores. Evaluative norms are presented in Table 10.13.

### **Bridge-up Test**

Although little testing has been conducted on

trunk extension, here is one test that is useful. It measures trunk extension, and is particularly useful for assessing flexibility for sports such as the butterfly (swimming), high jump, modern dance and ballet, and the balance beam and floor exercise events in gymnastics. It is appropriate for both males and females, and all that is needed is a mat and a yardstick. Subjects begin in a supine position (on their backs) with their feet against a wall. Each

**Figure 10.15** The bridge-up test.



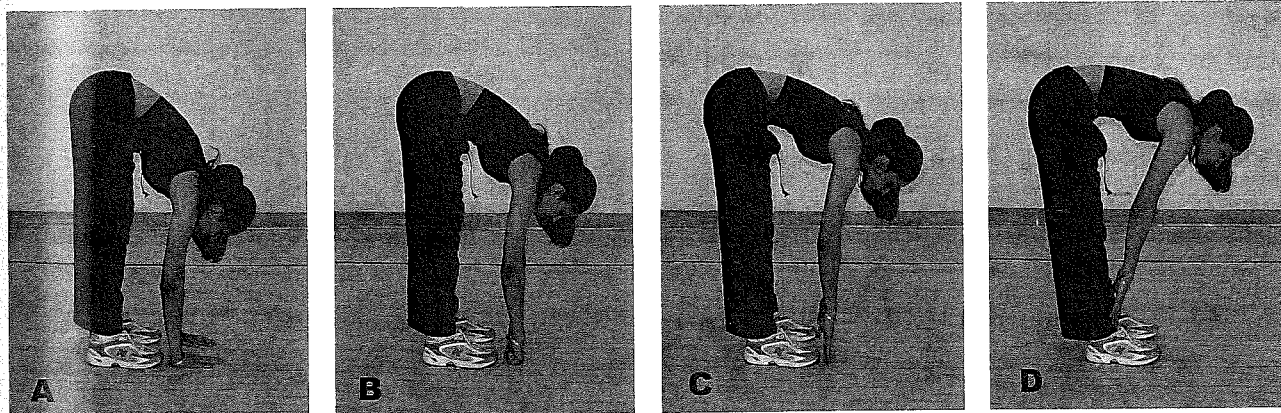
subject should tilt the head back, pushing upwards and arching the back. The subjects then walk their hands and feet as close together as possible. A partner then measures the highest point of the arched back from the floor (Figure 10.15). Record the best score of three trials; this score is then subtracted from the subject's standing height (floor to navel). The smaller the difference, the better the performance.

### Hamstring Looseness Test

This test is designed to assess hamstring looseness. Prior to testing, participants should be properly warmed up to stretch. The participant stands with the feet approximately hip-width apart. Keeping the knees straight, the participant bends over at the waist and lets the arms drop towards the ground, pushing the hands as far towards the floor as the hamstrings will allow. Refer to Figure 10.16 A-D and Table 10.14 to determine your performance level.

**Table 10.14** Performance levels for the hamstring looseness test.

Performance Level	Position Reached
Excellent	Palms touch the floor (Figure 10.16 A)
Above Average	Knuckles touch the floor (Figure 10.16 B)
Average	Fingertips touch the floor (Figure 10.16 C)
Below Average	Fingertips touch the feet
Needs Improvement	Fingertips touch the ankles or higher (Figure 10.16 D)



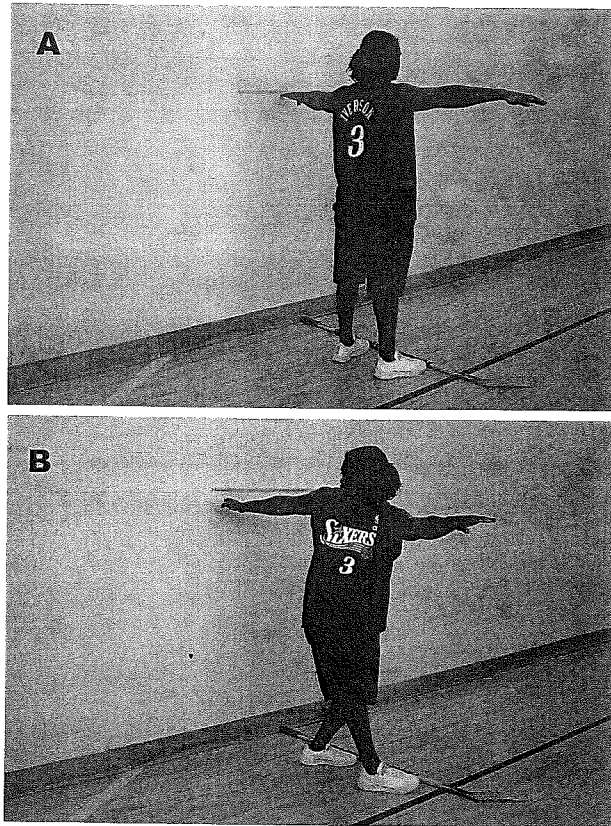
**Figure 10.16** The hamstring looseness test. **A.** Palms touch the floor. **B.** Knuckles touch the floor. **C.** Fingertips touch the floor. **D.** Fingertips touch the ankles or higher.

### Total Body Rotation Test

This simple test is designed to measure trunk flexibility. Begin by fastening a measuring tape on the wall at approximately shoulder height of the participant. At the 40-cm mark, draw a line with masking tape or chalk on the floor. Adjust the height of the measuring tape to each participant

to ensure it is at shoulder height. Two stations are needed for testing both sides.

The participant should be properly warmed up to stretch. The participant stands sideways, an arm's length away from the wall. The toes must be lined up with the line on the floor with the feet parallel and shoulder-width apart, and the knees slightly bent. With the inside arm extended to the



**Figure 10.17** The total body rotation test. **A.** Starting position. **B.** Right rotation.

**Table 10.15** Percentile norms (cm) for the total body rotation test.

Percentile Rank	Left Rotation				Right Rotation			
	Under Age 18		Age 19 – 35		Under Age 18		Age 19 – 35	
	Male	Female	Male	Female	Male	Female	Male	Female
99	74	74	71	73	72	75	71	75
95	68	68	63	63	65	70	65	64
90	64	65	60	58	62	66	61	58
80	56	60	56	55	58	60	57	53
70	53	55	52	52	54	56	53	49
60	51	52	49	49	50	53	48	46
50	47	50	46	46	48	50	44	44
40	43	47	43	44	44	46	41	41
30	38	43	38	40	38	41	38	39
20	35	41	34	39	33	37	34	36
10	27	33	27	35	27	31	29	28
05	22	28	23	19	21	26	21	22

wall and the outside arm stretched out parallel to the floor, the knuckles must face the ceiling (Figure 10.17 A). Now rotate the trunk, the outside arm stretching backwards until it touches the wall. Gradually slide the fist alongside the tape measure as far as possible. The final position must be held for a minimum of two seconds. The body must be kept as straight as possible and the feet should always be pointing straight forward (Figure 10.17 B).

The test is conducted on either the right or left side of the body. Each participant is allowed two trials on the selected side. Each trial is scored to the nearest centimetre at the knuckles, and held for at least two seconds. The average of two trials is used as the final test score. Evaluative norms are presented in Table 10.15.

## Measuring Agility

**Agility**, the physical ability that enables rapid and precise change of body position and direction, is important for many activities and sports. Athletes who participate in sports such as judo, wrestling, or badminton, which require quick maneuverability and agile reactions, undoubtedly possess a high



**Table 10.16** Raw score norms (number of parts completed) for the burpee test.

Performance Level	College Men	High School and College Females	High School Boys
Excellent	≥ 34	≥ 30	≥ 32
Above Average	29 – 33	26 – 29	28 – 31
Average	17 – 28	14 – 25	16 – 27
Below Average	12 – 16	10 – 13	12 – 15
Needs Improvement	≤ 11	≤ 9	≤ 11

degree of agility. Testing for agility may be accomplished in many ways, but only a few simple tests will be presented here.

### Burpee Test

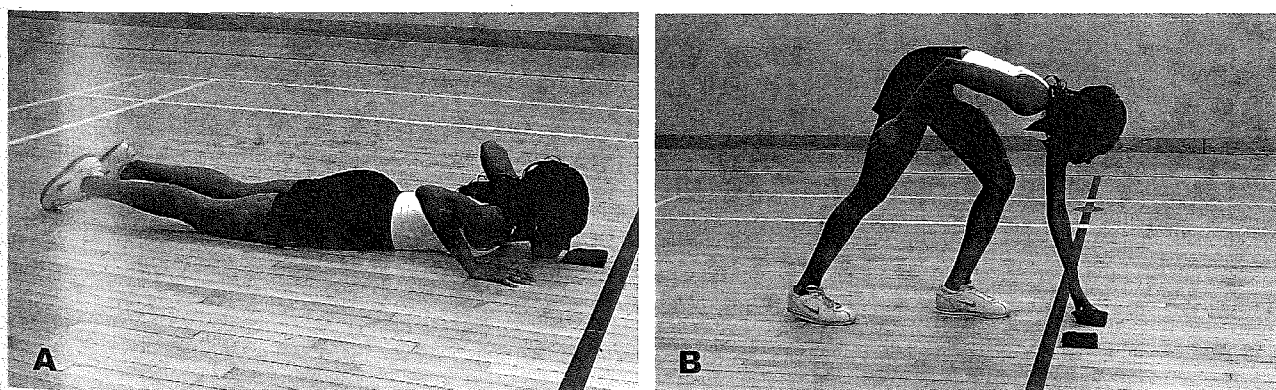
This test, as described previously, can also be used for evaluating agility. It effectively measures how quickly participants can change their body position. The score represents simply the parts of the exercise sequence completed in 10 seconds. Squatting and placing the hands on the floor represents the first part (Figure 10.13 B); propelling the legs backwards is the second (Figure 10.13 C); returning to the squat position is the third (Figure 10.13 D); and rising back to standing is the fourth (Figure 10.13 E). Scores are only valid if all parts of the exercise are performed

properly as shown in Figure 10.13. Evaluative norms are presented in Table 10.16.

### CAHPER Shuttle Run

Shuttle runs are often used to measure the agility of individuals in running and changing direction. Both males and females age nine and up can complete this test. Marking tape, a stopwatch, and three bean bags (or three of any small object, e.g., blocks of wood) are all the equipment needed for the test.

One bean bag is placed beside the participant on the starting line and two bean bags are placed on a line 10 metres away. The participant lies face down, hands at the sides of the chest and forehead behind the starting line (Figure 10.18 A). On the signal, the participant (1) jumps to his or her feet



**Figure 10.18** The shuttle run. **A.** Start face down at the starting line. **B.** Pick up a bean bag before returning to the start line.

**Table 10.17** Norms (sec) for the CAHPER shuttle run, boys and girls 14-17 years old.

Percentile	Boys				Girls			
	14	15	16	17	14	15	16	17
95	10.6	10.4	10.1	10.0	11.1	11.3	11.2	11.2
90	10.7	10.6	10.3	10.2	11.4	11.6	11.4	11.2
85	10.9	10.8	10.5	10.4	11.6	11.8	11.7	11.6
80	11.0	10.9	10.6	10.5	11.8	11.9	11.8	11.8
75	11.2	11.0	10.7	10.6	12.0	12.2	12.0	11.9
70	11.3	11.1	10.8	10.7	12.1	12.3	12.1	12.0
65	11.4	11.2	10.9	10.8	12.3	12.4	12.2	12.1
60	11.5	11.3	11.0	10.9	12.4	12.5	12.3	12.3
55	11.6	11.4	11.0	11.0	12.6	12.8	12.5	12.5
50	11.7	11.4	11.1	11.1	12.7	12.9	12.6	12.6
45	11.8	11.5	11.3	11.2	12.8	13.0	12.7	12.7
40	11.9	11.6	11.4	11.3	13.0	13.1	12.9	12.8
35	12.0	11.7	11.5	11.4	13.2	13.2	13.0	13.0
30	12.1	11.8	11.6	11.5	13.3	13.4	13.1	13.2
25	12.3	12.0	11.8	11.6	13.5	13.5	13.4	13.4
20	12.5	12.2	11.9	11.8	13.7	13.8	13.5	13.5
15	12.7	12.4	12.1	11.9	14.0	14.0	13.8	13.7
10	13.0	12.6	12.4	12.3	14.2	14.3	14.0	14.1
5	13.5	13.1	13.1	13.1	14.6	14.9	14.6	14.7

and runs 10 metres to the line; (2) picks up one bean bag (Figure 10.18 B); (3) returns to the start line; (4) sets the bean bag down across the line; (5) picks up another bean bag; (6) returns to the line 10 metres away; (7) exchanges the bean bag he or she is carrying for another; and (8) runs back across the finish line.

A "ready" warning signal should be given prior to the starting signal. Administer two trials with sufficient rest between them and record the better of the two to the nearest tenth of a second. Evaluative norms are shown in Table 10.17.

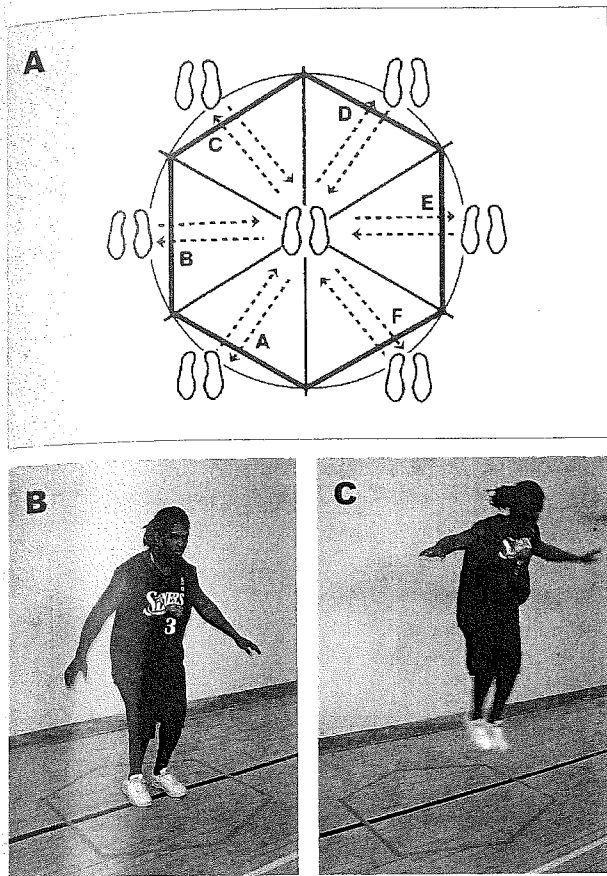
### Hexagonal Obstacle Test

This test is designed to assess agility, coordination, and balance. Begin by drawing or taping a

hexagon on the floor (66 cm per side). To simplify the task, first draw a large circle with a radius of approximately 66 cm; then insert the lines of the hexagon. Label the lines A to F (Figure 10.19 A).

Standing in the middle of the hexagon (Figure 10.19 B), the participant begins on signal to jump with both feet over side A and immediately back into the starting position within the hexagon. Then, without ever turning the body, the participant jumps over all sides to complete one round (Figure 10.19 C). The test continues until three full revolutions are completed. Time is recorded to the nearest tenth of a second. Time is stopped and recorded when the participant's feet enter the hexagon after jumping side F for the third time. The best time out of two trials is recorded (Table 10.18).





**Figure 10.19** The hexagonal obstacle test. **A.** Schematic. **B.** Ready. **C.** Jump.

## Summary

Physical fitness testing serves several important purposes, including diagnosis, placement, prediction, motivation, achievement, and program evaluation. When assessing physical fitness, it is important that reliable and valid fitness tests are selected. Reliability refers to the consistency of test scores, data, or observations, whereas validity refers to the extent to which a test measures what it proposes to measure. In addition, well-developed norms for all age categories help you compare and evaluate your personal test achievements relative to your peers.

Measures of physical fitness that are com-

**Table 10.18** Norms (sec) for the hexagonal obstacle test.

Performance Level	Males	Females
Excellent	≤ 10.0	≤ 10.5
Above Average	10.1 – 12.5	10.6 – 14.5
Average	12.6 – 15.5	14.6 – 18.5
Below Average	15.6 – 18.5	18.6 – 21.5
Needs Improvement	≥ 18.6	≥ 21.6

monly assessed include aerobic capacity, body composition, muscular strength, muscular power, muscular endurance, flexibility, and agility. While more accurate test results can be obtained by using sophisticated laboratory equipment, many reliable and valid field tests (e.g., step tests, skinfold measurements, shuttle runs, and the sit-and-reach test) have proven to be useful in assessing the major components of fitness. However, you must realize that any assessment requires thorough preparation, practice trials, and attention to detail for sound measurement and evaluation of performance. Effective measurement and evaluation of your physical fitness should help you develop into a healthy and physically educated individual.