

Lab #7 Assessing Flexibility

Purpose

The purpose of this laboratory is to provide you with practical experience in administering flexibility tests using direct (universal goniometer) and indirect (field tests) methods to determine range of motion. You will also be performing 2 tests to assess lower back range of motion (ROM) and strength.

Equipment

Universal goniometer
Anthropometric Tape
Rulers meter sticks
Masking tape
Exercise mats
Sit and reach box
Marking pens

Testing procedures:

1. Work in groups of 3 people. One person serves as the client, the second the technician and the third the recorder. Feel free to rotate positions after each measurement is completed until everyone has a chance to participate.
2. Follow the standard testing procedures for measuring range of motion using the goniometer. Administer 2 trials for each test item listed on the data collection form and use the best score for the final interpretation.
3. Follow the standard procedure for the sit and reach test. Administer 2 trials and use the best score as the final.
4. Follow the standard procedure for the skin distraction test. Administer 2 trials and use the best score as the final.
5. Follow the standard procedure for the low back ROM and strength test. Administer 2 trials and use the best score as the final

NOTE: If you have been diagnosed with any lower back problems or have back pain on a regular basis, it is advisable that you do not participate in this laboratory.

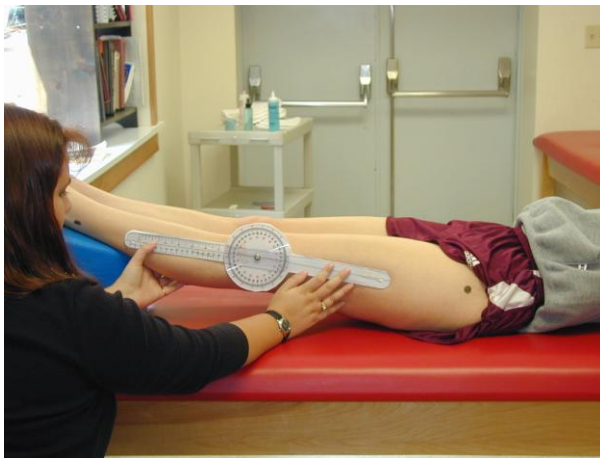
Goniometer Test:

1. KNEE EXTENSION



Patient Instructions:

The patient should simply be lying prone with a towel placed underneath the thigh or foot off the end of the table, to gain full knee extension.



Starting and Ending Position:

- The patient should be lying prone with both legs flat on the table
 - The goniometer positioning for knee extension is the same as it is for knee flexion.
- Normal ROM for knee extension is between 0 and -10 degrees.
The patient has -3 degrees of knee extension.

KNEE FLEXION

Starting Position:

- Patient should be supine with both legs flat on the table.
- The fulcrum is aligned with the lateral epicondyle of the femur.

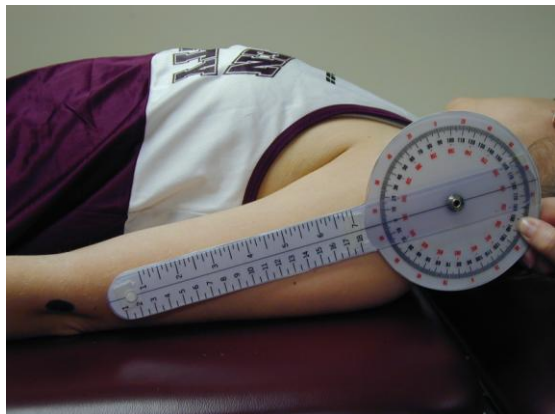


- The stationary arm is in line with the greater trochanter and midline of the femur, the moving arm with the lateral malleolus and midline of the fibula.

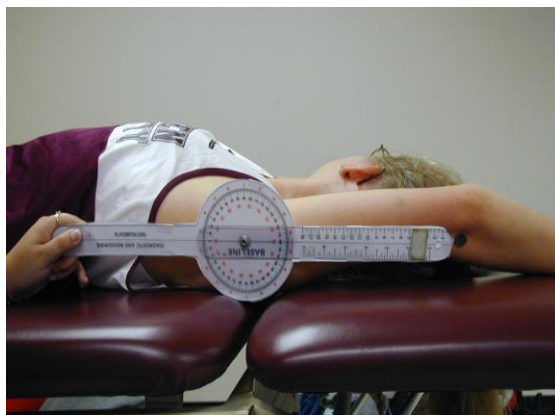
Ending Position:

Normal ROM is 135-150 degrees, the patient in the picture is in 146 degrees of knee flexion.

SHOULDER FLEXION



The fulcrum of the goniometer is placed over the acromion process.



Once the goniometer is aligned properly ask the patient to lift the arm up just as if they were raising their hand to ask a question. Be sure that the patient keeps the palm of their hand facing in toward their body.

Starting Position:

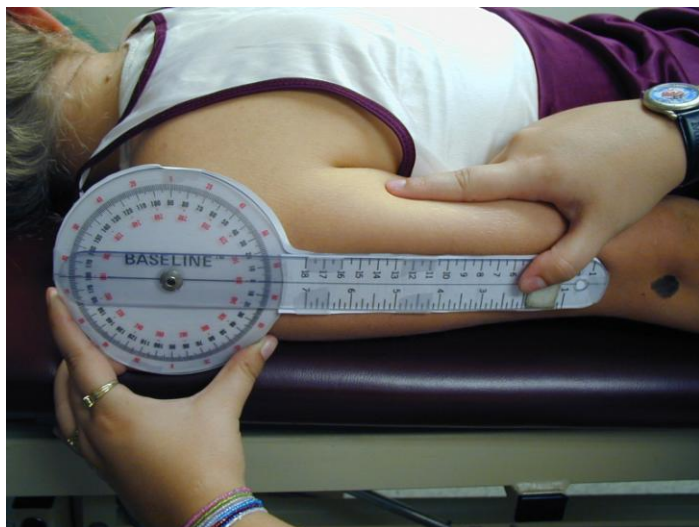
- Patient is supine with arm at side and the palm of the hand facing the body

Ending Position:

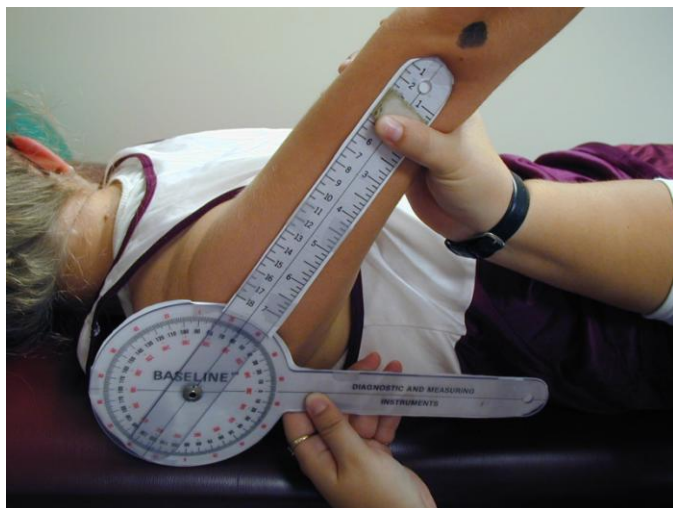
- The moving arm remains in line with the lateral epicondyle and midline of the humerus. The examiner should be supporting the patient's extremity.
- The stationary arm should remain in its starting position, only now it should be in line with the lateral midline of the thorax.

Normal ROM for glenohumeral flexion is 160 to 180 degrees; in the picture the patient is in 180 degrees of flexion.

SHOULDER EXTENSION



Ask the patient to simply lift their arm off the table as far as they can.



Starting Position:

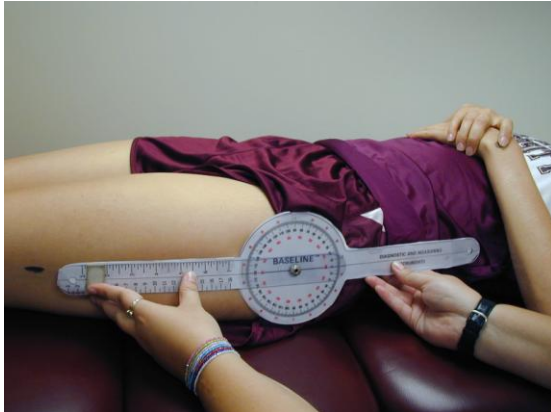
- Patient is prone with arm at side; make sure the head is facing away from the shoulder being tested. Elbow should be bent slightly and the palm facing in toward the body.
- The fulcrum is placed over the acromion process.
- The stationary and moving arms are aligned with the lateral midline of the humerus and the lateral epicondyle.

Ending Position:

- The moving arm remains in line with the lateral epicondyle and the stationary arm should be in line with the midline of the thorax.

Normal ROM for glenohumeral extension is 40 to 60 degrees; in the picture the patient is in 61 degrees of extension.

HIP FLEXION



Patient Instructions:

Ask the patient to bend their knee and bend their leg and bring it as close to their chest as is comfortable for them.

Starting and Ending Position:

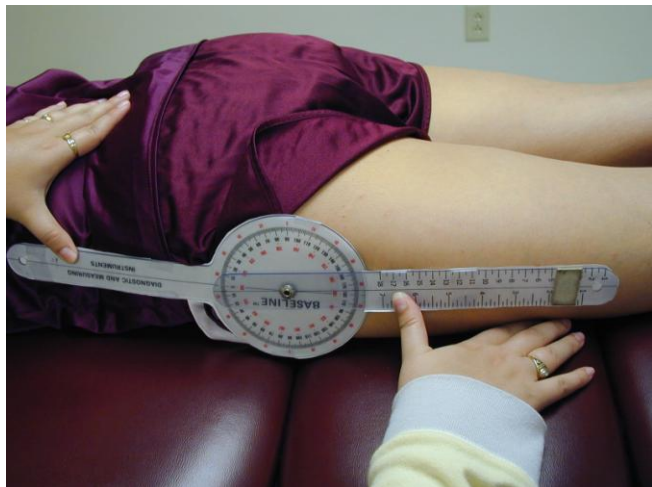
- The patient should be lying supine in the anatomical position.
- The fulcrum is aligned with the greater trochanter of the femur.



- The stationary arm is positioned along the lateral midline of the abdomen, using the pelvis for reference, the moving arm along the lateral midline of the femur.

Normal ROM is between 115 and 125 degrees. The patient is in 115 degrees of knee flexion.

HIP EXTENSION



Patient Instructions:

Have the patient lift their leg off the table as far as they can.

Starting and Ending Position:

- Patient is lying prone with legs together and arms at sides.



- Goniometer positioning is the same as for hip flexion.

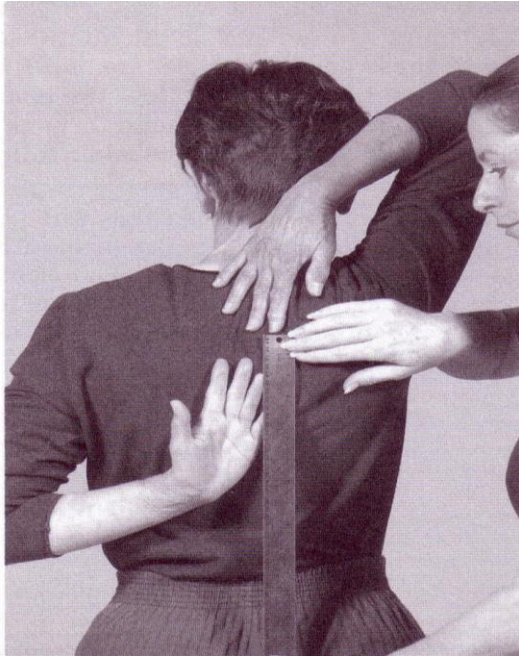
Normal ROM for hip extension is 10 to 30 degrees, patient has 25 degrees of hip extension.

Table 10.3 Average Range-of-Motion (ROM) Values for Healthy Adults

Joint	ROM (degrees)	Joint	ROM
Shoulder		Thoracic-lumbar spine	
Flexion	150-180	Flexion	60-80
Extension	50-60	Extension	20-30
Abduction	180	Abduction	25-35
Medial rotation	70-90	Rotation	30-45
Lateral rotation	90		
Elbow		Hip	
Flexion	140-150	Flexion	100-120
Extension	0	Extension	30
		Abduction	40-45
Radioulnar		Adduction	20-30
Pronation	80	Medial rotation	40-45
Supination	80	Lateral rotation	45-50
Wrist		Knee	
Flexion	60-80	Flexion	135-150
Extension	60-70	Extension	0-10
Radial deviation	20		
Ulnar deviation	30	Ankle	
		Dorsiflexion	20
Cervical spine		Plantar flexion	40-45
Flexion	45-60		
Extension	45-75	Subtalar	
Lateral flexion	45	Inversion	30-35
Rotation	60-80	Eversion	15-20

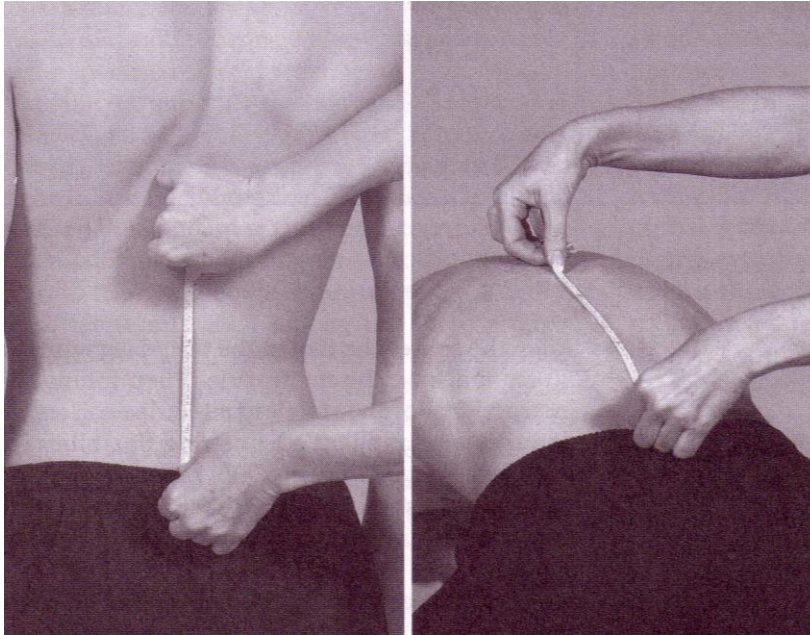
Data from the American Academy of Orthopaedic Surgeons (Greene and Heckman 1994) and the American Medical Association 1988.

BACK SCRATCHER TEST



1. Have the participant perform a 5 minute warm-up that includes dynamic activities such as arm swings and shoulder rotations
2. After the warm-up have the subject raise his or her right arm, bent at the elbow and reach across his or her back as far as possible. At the same time have the subject place the left arm down and behind the back. The subject should attempt to cross the fingers of the left hand and right hands behind the back.
3. Measure the distance of the finger overlap to the nearest 0.5 inches. An overlap is considered a positive score, whereas a gap between the hands is considered a negative score. If the fingers merely touch, the score is considered zero.
4. Perform steps 2 and 3 twice more.
5. Calculate the average for the raised right arm and raised left arm tests and record the results on your data sheet. Compare your results to the normative data below

GENDER	MALE		FEMALE		
	CLASSIFICATION	INCHES	CM	INCHES	CM
Excellent		≥ 5	≥ 12.7	≥ 5	≥ 12.7
Above Average		2.0-4.8	5.1-12.2	2.0-4.75	5.1-12.1
Average		0.0-1.8	0.0-4.6	0.0-1.75	0.0-4.6
Below Average		-1.0-0.25	- 2.5to -0.6	- 1.0 to -0.25	- 2.5 to - 0.6
Poor		Less than -1	Less than - 2.5	Less than -1	Less than - 2.5

SKIN DISTRACTION TEST (measures lumbosacral flexion)

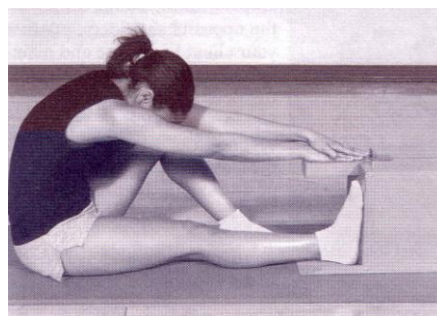
- 1. Place a 0-cm mark on the midline of the lumbar spine at the intersection of a horizontal line connecting the left and right posterior superior iliac spines while the client is standing.**
- 2. Place a second mark 15 cm (5.9inches) superior to the 0-cm mark.**
- 3. As the client flexes the lumbar spine these marks will move away from each other**
- 4. Use the anthropometric tape to measure the new distance between the two marks.**
- 5. Lumbar flexion score = the difference between the measurement and the initial length between the skin markings (15cm)**
- 6. In a group of 15-18yr old subjects, distraction scores average 6.7 ± 1.0 cm in males and 5.8 ± 0.9 cm in females.**
- 7. Normal values for other age groups have not yet been established.**

SIT AND REACH TEST (Variety of tests)

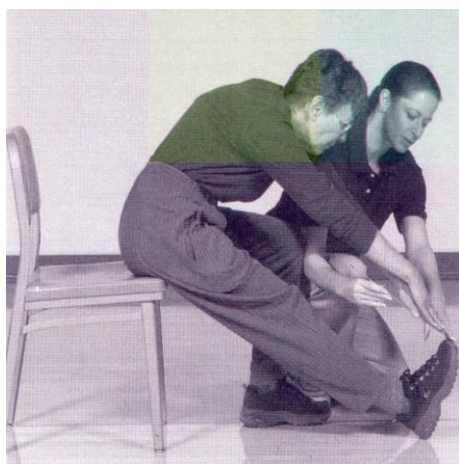


Traditional sit and reach using a mat or a special box (see below)

ACSM sit and reach



Modified Version: Back saver sit and reach test



Modified Version for Elderly Clients

Procedures for Sit and Reach:

Preparation: If you are not using a special sit and reach box follow the instructions for the ACSM sit and reach.

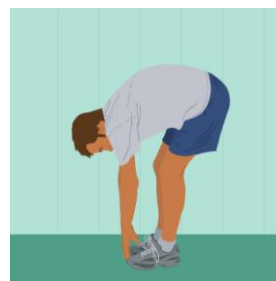
Warm-up: Perform some general warm-ups and some basic stretches (see below)

Table 3.1 Warm-Up for Sit-and-Reach Testing

Warm-up	Activity	Total time
General*	Cycling	5 minutes
Specific	Walking lunges Walking lunges with dynamic rotation High-knee walk Leg swings Trunk rotations Squats	5 minutes

*The general warm-up activity can be selected based upon the equipment available.

Specific Warm-ups



Procedures: (YMCA sit and reach)

1. Place a yardstick on the floor so the zero end faces the subject. Place a piece of tape so that it intersects with the stick at 15 inches.
2. Instruct the subject to remove shoes, then measure his or her height and weight. Record these numbers. Record the subjects gender, age temperature of the room and barometric pressure.
3. Have subject remove shoes and sit on the floor with the stick between the legs. The legs should be separated by 10-12 inches and extended at right angles to the taped line. Heels should touch the taped line (see below)
4. Place hands across the subjects knees to ensure he or she maintains full leg extension
5. Instruct subject to extend arms with one hand on top of the other and with palms facing down (see figure).
6. Instruct the subject to bend forward and move his or her hands along the stick while keeping them parallel to one another. This position should be held for 1-2 seconds. Measure the distance reached and record it on the data sheet. If knees are bent or fingertips become uneven, the test does not count and it should be repeated.
7. Perform the test 2 times
8. Record the best result from the trials on the data sheet and compared with the percentile ratings on the following page.

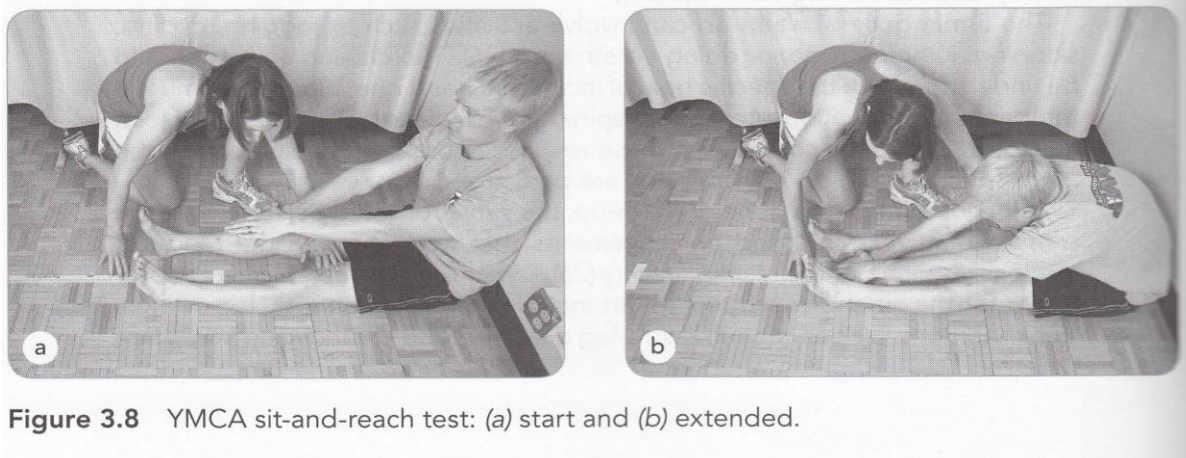


Figure 3.8 YMCA sit-and-reach test: (a) start and (b) extended.

See page to follow for results

Table 3.4 Percentile Ranks and Normative Data for the YMCA Sit-and-Reach Test (cm)

Age (y)			18-25		26-35		36-45		46-55		56-65		>65			
Sex			M	F	M	F	M	F	M	F	M	F	M	F		
Percentile Rank	Classification	Percentile														
	Well above average	90	56	61	53	58	53	56	48	53	43	51	43	51		
		80	51	56	48	53	48	53	43	51	38	48	38	46		
	Above average	70	48	53	43	51	43	48	38	46	33	43	33	43		
		60	46	51	43	51	41	46	36	43	33	41	30	43		
	Average	50	43	48	38	48	38	43	33	41	28	38	25	38		
		40	38	46	36	43	33	41	28	36	23	36	23	36		
	Below average	30	36	43	33	41	33	38	25	36	23	33	20	33		
		20	33	41	28	38	28	36	23	30	18	28	18	28		
Well below average	10	28	36	23	33	18	30	15	25	13	23	10	23			

Note: The index or heel line for the YMCA sit-and-reach test is 38 cm (15 in.). If values fall between the percentile ranks presented, interpolate the data.

Reprinted from YMCA, 2000, *YMCA fitness and testing and assessment manual*, 4th ed., edited by L.A. Golding (Champaign, IL: Human Kinetics).

Traditional Sit and Reach Test

1. This test uses a 12 inch sit-and-reach box. Have subject perform a 10 minute warm-up.
2. Sit on the floor with heels and soles of the feet against the heel line 23cm mark, with legs fully extended and medial sides of the feet about 8 inches apart.
3. Establish a zero point by keeping the head and shoulders erect and reaching forward with one hand on top of the other.
4. Place hands on the subjects knees to ensure he or she maintains full leg extension.
5. When ready, reach forward slowly, sliding the fingers along the top of the box position is held 1-2 seconds. If knees bend or fingertips become uneven, repeat the test. Perform two trials and record the best score
6. The score is recorded as the most distant point on the contacted by the fingertips in inches

Note: Those with proportionally longer arms than legs have significantly better scores on the standard sit and reach test.

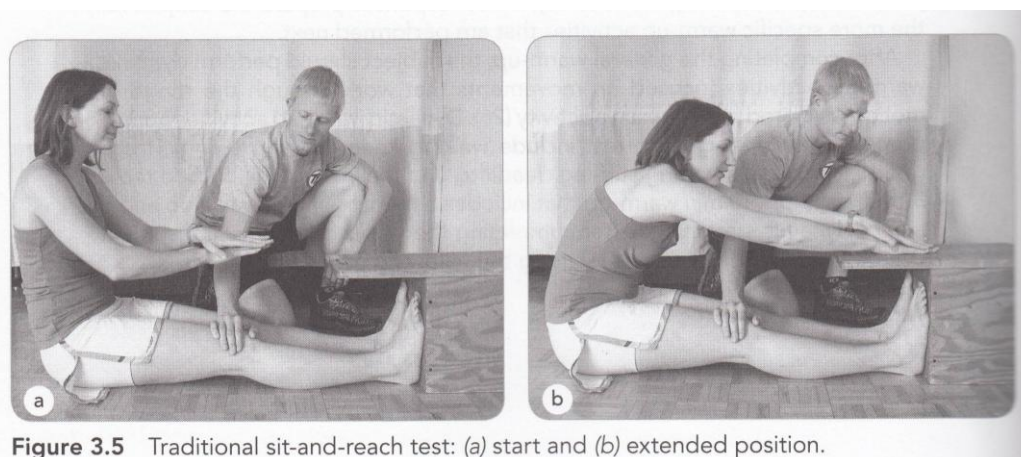


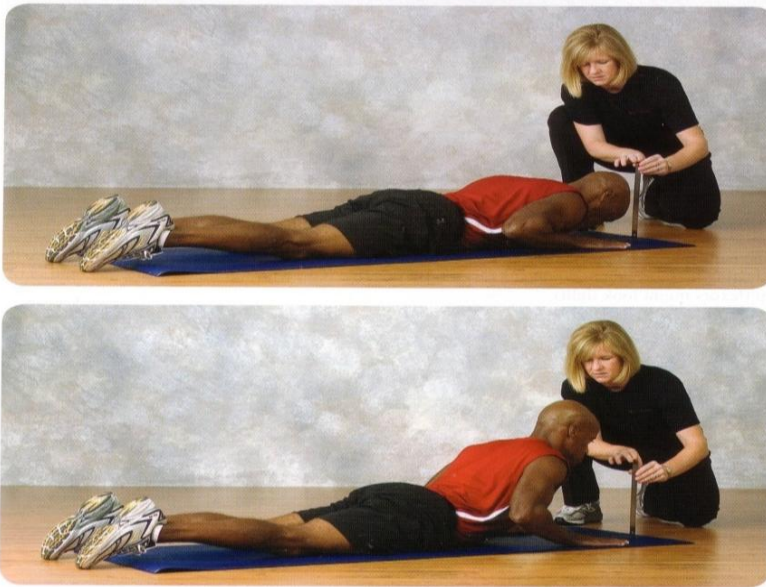
Figure 3.5 Traditional sit-and-reach test: (a) start and (b) extended position.

Table 10.4 Age–Gender Norms for Standard Sit-and-Reach Test^a

	AGE (YR)					
	15-19	20-29	30-39	40-49	50-59	60-69
Men						
Excellent	≥39	≥40	≥38	≥35	≥35	≥33
Very good	34-38	34-39	33-37	29-34	28-34	25-32
Good	29-33	30-33	28-32	24-28	24-27	20-24
Fair	24-28	25-29	23-27	18-23	16-23	15-19
Needs improvement	≤23	≤24	≤22	≤17	≤15	≤14
Women						
Excellent	≥43	≥41	≥41	≥38	≥39	≥35
Very good	38-42	37-40	36-40	34-37	33-38	31-34
Good	34-37	33-36	32-35	30-33	30-32	27-30
Fair	29-33	28-32	27-31	25-29	25-29	23-26
Needs improvement	≤28	≤27	≤26	≤24	≤24	≤22

^aDistance measured in centimeters using a sit-and-reach box with the zero point at 26 cm. If using a box with the zero point at 23 cm, subtract 3 cm from each value in this table.

The Canadian Physical Activity, Fitness & Lifestyle Approach: CSEP-Health & Fitness Program's Health-Related Appraisal and Counselling Strategy, 3rd Edition © 2003. Reprinted with permission of the Canadian Society for Exercise Physiology.

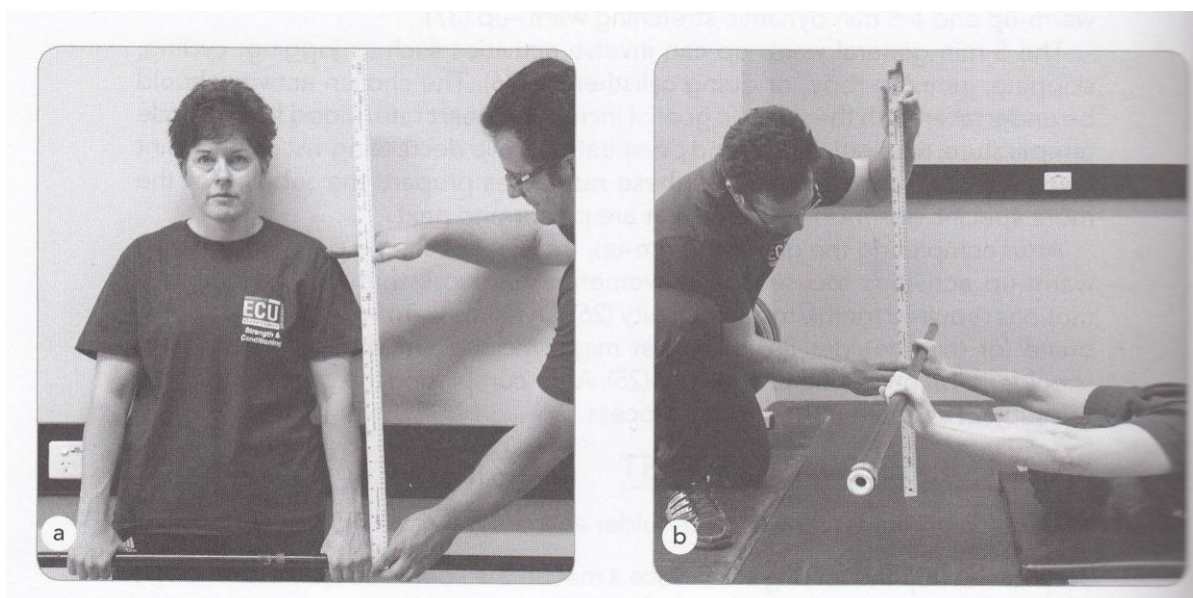
ROM: LOWER BACK FLEXIBILITY TEST

- 1. Keeping the anterior part of the pelvis in contact with the floor, the client elevates the torso with arm and shoulder muscles; the muscles of the back are not used in this movement.**
- 2. The score is the perpendicular distance from the suprasternal notch to the floor. From a geometric perspective, it should be easy for individuals with long trunks to have better scores.**
- 3. Scoring: Excellent 12 inches (30cm) or more is excellent**
 - Good: 8 inches (20cm) – 12 inches (30cm)**
 - Fair: 4 inches (10cm) – 8 inches (30cm)**
 - Poor: < 4 inches (10cm)**

Shoulder Elevation Test (to test shoulder and chest flexibility)

1. Place a mat or towel on the floor in the area with enough room to test.
2. Instruct the participant to perform a 10 minute warm-up to include 5 minutes of dynamic exercise (treadmill, cycling, jogging in place, calisthenics) and 5 minutes of dynamic related warm-up to include exercise through through the range of motion for the shoulder like arm swings, arm circles, shoulder rotations etc.
3. Have the subject grasp the meterstick in front of the body with both hands using a pronated grip (knuckles facing forward). Ensure that the subject keeps his or her arms relaxed in this position.
4. Determine the arm length by measuring the distance from the acromion process to the top of the meter stick being held by the subject. Measure to the nearest inch. Record the value.
5. Have the subject assume a prone position (lying face down) on the mat so that his or her chin touches the floor and his or her arms are extended overhead while holding the meter stick with the same grip used in step 3.
6. Have the subject slowly raise the meterstick as high as possible while maintaining chin contact with the floor and keeping the elbows extended. Once the subject reaches the highest portion possible record this measure in inches (see illustration below).
7. Perform step 4 two more times and three trials of the lift
8. After completing three trials, calculate the shoulder elevation using the following formula:

$$\text{Shoulder elevation score} = \text{shoulder elevation (inches)} \times 100/\text{arm length (inches)}$$



Compare the results with the normative data on the next page.

GENDER	MALE			FEMALE	
	Classification	Percentile	Inches	Cm	Inches
Well above average	90	106-123	269-312	105-123	267-312
Above average	70	88-105	224-267	86-104	218-264
Average	50	70-87	178-221	68-85	173-216
Below average	30	53-69	135-175	50-67	127-170
Well below average	10	35-52	89-132	31-49	79-124

ISOMETRIC LUMBAR STABILIZATION TEST
(measures isometric endurance of the lateral flexors)



To measure isometric endurance of the trunk flexors, use a side bridge.

1. Assume a side-lying position on the mat with the legs extended
2. Place the top foot in front of the lower foot for support
3. Instruct the client to lift the hips off the mat while supporting the body in a straight line on one elbow and the feet for as long as possible. Start a timer.
4. End the timer when the hips return to the mat. Record in SECONDS the elapsed time. Administer this for the right and left side.
5. Refer to the chart below to obtain the score.

	Males	Females
	Endurance Time (sec)	Endurance Time (sec)
Side Bridge (right)	94	72
Side Bridge (left)	97	77

DATA COLLECTION FOR for FLEXIBILITY TESTS

Client's Demographics

Name _____ Age _____yr Gender_____

	Trial 1	Trial 2	Best Score	Rating (above average, average or below average)
Universal goniometer test items				
Knee Flexion				
Knee Extension				
Shoulder Flexion				
Shoulder Extension				
Hip Flexion				
Hip Extension				
Back Scratch (Apley)				
Sit and Reach				
Skin Distraction				
Back ROM				
Shoulder Elevation				
Lumbar Stabilization				

Comments:

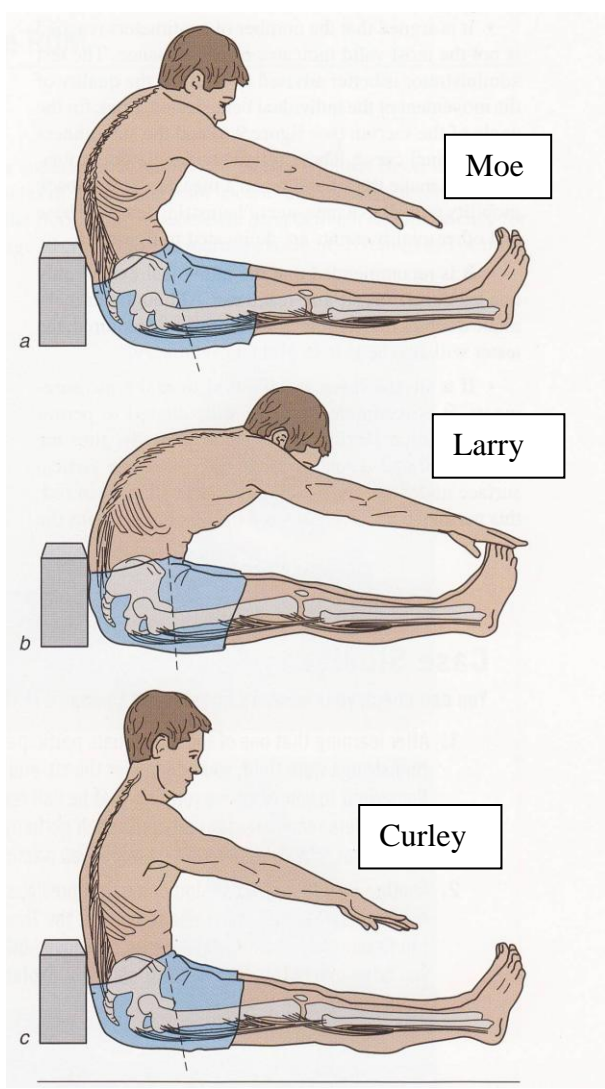
Questions

1. What are 3 major factors which can affect flexibility?
2. What do the sit and reach test tell us about back and hamstring flexibility?
3. What are 5 factors which can affect the accuracy of the flexibility tests?
4. Compare your values for the shoulder elevation test with the back scratcher test. What do these results indicate?
5. How do gender and physical activity affect flexibility results?
6. How is flexibility related to low back pain?
7. What can you do to improve flexibility of your clients (i.e. what specific exercises can you recommend)?

THIS LAB WILL BE DUE ON Tuesday NOV. 27TH

2 Point Bonus Question: (optional) You must get this question 100% correct in order to gain the points. **If correct, you will receive 2 points toward the final exam.**

These are three clients Moe, Larry and Curley (Oh! My! They all look alike!! Must be triplets!). You are administering a sit and reach test to these individuals. Identify 3 quality points that you would look for in evaluating the sit and reach. Which client scores are normal? What are some problem areas that you notice with the other 2 clients which would cause a low score on the sit and reach test (i.e. hamstring, low back, pelvic tilt)



1: Normal or Low Score? _____
2. Problem area (s) _____

1. Normal or low score? _____
2. Problem areas? _____

1. Normal or low score? _____
2. Problem areas? _____

