

MANUAL MUSCLE TESTING (MMT)

Manual Muscle Testing

16 muscle groups/ motions will be tested (not individual muscles). 14 of these are tested bilaterally. Grading will be based on the isometric “**Break**” test. It is essential that a grade of 3 be established before proceeding to application of resistance for grades above 3 or to alternate gravity minimized tests for grades below 3.

Muscle Group	Abbreviation
Shoulder abductors	SA
Elbow flexors	EF
Wrist extensors	WE
Wrist flexors	WF
Common finger extensors	CFE
Thumb flexors	TF
Hip flexors	HF
Knee extensors	KE
Ankle dorsiflexors	AD
Hip abductors	HAB
Hip adductors	HAD
Elbow extensors	EE
Shoulder external rotators	SER
Hip extensors	HE
Knee flexors	KF
Ankle plantar flexors	AP
Neck flexion	NF
Neck extension	NE

The criteria for assigning specific grades are as follows:

Grade	Criteria
5	Normal strength
5-	Uncertain muscle weakness
4+	Ability to move through full range of motion and hold against strong pressure
4	Ability to move through full range of motion and hold against moderate pressure
4-	Ability to move through full range of motion and hold against slight pressure; or breaks abruptly with pressure
3	Ability to move through full range of motion against gravity
3-	Ability to move through partial range of motion against gravity
2	Ability to move through any range of motion only with gravity eliminated
1	A flicker of movement is seen or felt in the muscle
0	No contraction palpable

For each test:

- Explain or demonstrate the movement that is required of the patient.
- Ask the patient to perform the movement through the full range against gravity.
- If the patient does not perform or is unable to perform the complete movement, check for these limiting factors:
 - Understanding of the required task
 - Availability of the appropriate range of motion - limitations may be due to soft tissue.
 - Weakness
- Based on the limiting factor(s):
 - instruct and demonstrate again
 - decide if joint restriction is affecting the performance
 - repeat the test using the alternative gravity eliminated position
- If the patient completes the movement through full available range against gravity, place the joint at the appropriate angle and apply resistance gradually. Appropriate feedback and encouragement will generate best effort on the part of the patient.
- Grade according to criteria described.

If the patient experiences pain, cramps, or spasms during the testing, the clinical evaluator must determine whether the patient feels that he/she is able to give his best effort in spite of his discomfort. If yes, continue the testing but note under comments that the patient complained of pain. If the patient feels that discomfort prohibits him from giving a maximal effort, do not test that muscle and code appropriately.

The precise order of testing, in terms of whether the evaluator should test R/L, or complete one side in each position is left to the discretion of the CE. However, it is important that the evaluator always be on the same side as the muscle being tested.

NOTE: It is necessary that the testing room allows for space all around the table and that the table is placed away from a wall.

Certain muscles can be graded from 0-5 in one position only. For other muscles, the first testing position will indicate a grading range of 3- to 5. If the muscle cannot be graded in this range, then it will need to be tested again in an alternate position.

A. POSITION I: SITTING

Seat patient comfortably on the examination table with shoes off and feet unsupported. The edge of the examining table should support the patient's thigh to a level proximal to the knee joint.

The following tests are performed in the sitting position:

Shoulder Abduction (3- thru 5)

1. Ask patient to abduct the shoulder as much as they are able to with the elbow extended. If patient able to abduct greater than 90 degrees, ask the patient to position the shoulder to 90° with the elbow flexed and the forearm pronated.
2. Provide stabilization proximal to the shoulder or on the opposite shoulder to prevent any tendency to lean in the opposite direction.
3. With shoulder in 90° of abduction, apply resistance at the elbow.
4. If AROM against gravity is present, but less than 90 degrees, score 3-/5.
5. If patient is unable to abduct the arm at all, retest in the supine position.

Elbow Flexion (0 thru 5)

1. Ask patient to bend the elbow and touch the shoulder with the forearm supinated.

(Observe for substitution, specifically rotation of forearm to mid position - brachioradialis).

2. Provide stabilization under elbow or anterior to the shoulder at proximal end of the humerus.
3. Position elbow at 120° of flexion and apply resistance at wrist to straighten the elbow.
4. If patient is unable to bend the elbow against gravity, support the patient's upper arm in abduction and elbow in extension with forearm supinated. Ask patient to bend the elbow – bringing hand to mouth with forearm in supination.

Wrist Extension (0 thru 5)

1. Place patient's arm by his side, elbow flexed to 90° forearm pronated.
2. Ask patient to extend his wrist from flexed position keeping fingers relaxed.
3. Support forearm proximal to the wrist to maintain 90°. Apply resistance on dorsum of hand.
4. If patient cannot extend the wrist against gravity, place forearm in neutral position, provide support proximal to the wrist and ask patient to extend wrist from flexed position.

Wrist Flexion (0 thru 5)

1. Position patient's arm by his side, elbow flexed to 90°, forearm supinated.
2. Ask patient to flex wrist with fingers relaxed.
3. Support forearm proximal to wrist to maintain 90° and give resistance on the palm of the hand.
4. If patient cannot flex the wrist against gravity, place forearm in neutral position, provide support proximal to wrist and ask patient to flex wrist from full extension keeping fingers flexed.

Common Finger Extensors

1. Place patient's arm by his side, elbow flexed to 90° forearm pronated.
2. Ask patient to extend all digits with fingers adducted.
3. Support wrist
4. Apply resistance just distal to the PIP joints

Long Finger Flexors Thumb (Flexor Pollicis Longus)

1. Patient in sitting with elbow flexed and forearm supinated as much as possible.

2. Stabilize the metacarpal bone and proximal phalanx of the thumb in extension.
3. Ask the patient to flex the interphalangeal joint of the thumb. Using index finger
4. Apply pressure at the palmar surface of the distal phalanx of the thumb in the direction of extension.

Hip Flexion (3- thru 5)

1. Ask patient to sit up straight and support trunk with arms supporting trunk with no greater than 20 degree of trunk extension. 2. Ask patient to bring his knee towards his chest. Patient should be able to flex to 30°. During this test, the patient should be discouraged from leaning sideways and the thigh should remain in neutral rotation. Do not allow patient to maintain hip flexion by pressing the belly of the calf muscle on the edge of the exam table.

3. Provide stabilization or counter pressure against the shoulder.
4. Apply resistance on distal surface of the thigh in the direction of hip extension.
5. To achieve a grade of 3-, the patient should be able to flex the hip enough that the examiner can slide the hand clearly under the distal thigh. If the patient can lift the thigh, but cannot maintain neutral rotation, grade as 3-. If the patient cannot lift the thigh, test in the alternate position.

Knee Extension (3-thru 5)

1. Ask patient to sit up straight and support trunk with arms propped with no greater than 20 degree of trunk extension. 2. The examiner may put his hand or a rolled towel under the distal end of the thigh to cushion it.

3. Patient is then asked to extend the knee.
4. Place the knee in 20° of flexion from full extension to avoid mechanical locking of the joint.
5. Apply resistance just proximal to the ankle.
6. For a grade of 3- patient should be able to actively extend the knee from 90° of flexion without a swinging motion secondary to flexing the knee and creating momentum. If the patient cannot move his leg against gravity, do not grade in this position. Retest in the side-lying position.

7. For a grade of 3, the patient must extend the knee to full extension. If a 'lag' is noted, grade a 3-.

Ankle Dorsiflexion (3- thru 5)

1. Ask patient to bend the foot up from plantar flexed position. (It is helpful to watch posterior ankle joint for movement; ankle inversion or great toe extension may appear with attempts at substitution.)
2. Stabilize leg proximal to ankle.
3. If AROM is full within available ROM, apply resistance on dorsum of the foot at maximum available ROM.
4. If patient is unable to dorsiflex the foot, retest in the side-lying position.

B. POSITION 2: SIDE-LYING

Hip Abduction (3- thru 5)

1. Ask patient to lie on his side, bottom leg slightly flexed to increase the base of support. Patient may hold on to table to provide more stability.
2. Stand behind the patient, place the top leg in extension and stabilize the pelvis with one hand to prevent forward or backward rotation.
3. Ask patient to lift leg as high as possible without bringing it forward or back or rotating it.
4. Apply resistance at knee.
5. If patient cannot lift leg against gravity, retest in supine position.

Hip Adduction (3- thru 5)

1. Ask patient to lie on his side.
2. Stand behind patient, support the top leg in abduction (cradled in arm), and ask patient to lift his bottom leg.
3. If patient is able to lift leg approximately 75% off of the table, apply resistance at the knee. If less than 75% of antigravity ROM noted, score 3-/5.
4. If patient cannot lift leg against gravity, retest in supine position.

POSITION 3: PRONE

Neck Extension (3- thru 5)

To ensure patient safety make sure patient does not have pain or stiffness related to neck movements. Use clinical judgement to determine whether to perform the test.

1. Patient lying prone with arms at their side. Examiner holds the shoulders stable.
2. Patient is asked to lift his head up as high as he can. Patient should be able to get his face perpendicular to the table.
3. Place one hand over the occiput. As a safety measure, keep the other hand below the patient's chin and apply pressure in the direction of neck flexion.
4. If the patient cannot lift his head against gravity, retest in the side-lying position.

* to differentiate between 3 and 3-, drop the table to assess full ROM.

Shoulder External Rotation

1. Patient is lying prone with head in neutral (if possible). Arm is placed in 90 degrees of shoulder abduction, elbow flexed, and forearm pronated.
2. Examiner stabilizes under the distal humerus.
3. Ask the patient to rotate his shoulder, assess for full ROM
4. If full ROM antigavity, apply resistance proximal to the wrist and in the direction of internal rotation.
5. If patient cannot externally rotate against gravity, retest in the sitting position.

Hip Extension (3- thru 5)

1. Check the available range of hip extension and demonstrate the required motion.
2. Ask patient to bend his knee to 90° and then extend the hip.
3. Stabilize the lower trunk with one hand.
4. Apply resistance on the thigh with the other hand.
5. If the patient has limited range of motion or is unable to lift the hip against gravity, or barely lifts it, retest with the patient in the side lying position and finally in standing position to minimize changes of position.

Knee Flexion (3- thru 5)

1. Place patient prone on the table with a pillow under his head and head turned to either side.
2. Ask patient to bend the knee to 90°. Observe ankle to make sure that ankle dorsiflexion is not used to initiate movement.
3. Then place the knee in 70° of flexion.
4. Stabilize the thigh proximal to the knee.
5. Apply resistance just proximal to ankle.
6. For a grade of 3- patient must be able to lift the foot and ankle off the table and not just plantar flex the foot. If the patient cannot lift the leg, retest in side lying position

Ankle Plantar Flexion (3- thru 4+)

1. Maintain Knee flexion at 90° passively.
2. Ask patient to bend foot towards the ceiling.
3. Stabilize the ankle by holding the leg around the malleoli.
4. With the other hand give downwards pressure on the foot.
5. In order to score a 5, patient must be able to perform a single limb heel raise through full ROM*. If unable to perform full ROM in standing, score 5-/5.

*this test may be used for grade 5 if patient is unable to perform single limb stand secondary to proximal weakness.

Alternate tests

Hip Flexion (2 thru 0)

Support the patient's leg under the thigh and lower leg (with knee flexed) and place hip in extension and knee in flexion.

Ask patient to bring his knee towards the chest- flexing the hip.

Hip Extension (2 thru 0)

Support the patient's leg under the thigh and lower leg (with knee flexed) and place hip in flexion.

Ask patient to push the leg back - extending the hip.

Knee Flexion (2 thru 0)

Support the patient's leg under the thigh and lower leg and place knee in extension.

Ask patient to bend/flex the knee.

Knee Extension (2 thru 0)

Support the patient's leg under the thigh and lower leg and place knee in flexion.

Ask patient to straighten/extend the knee.

Ankle Dorsiflexion (2 thru 0)

Support the patient's leg proximal to the ankle and under the foot.

Ask patient to bend the foot towards his face.

Ankle Plantar Flexion (2 thru 0)

Support the patient's leg proximal to the ankle and under the foot.

Ask patient to move the foot down and back towards you.

D. POSITION 4: SUPINE

Neck Flexion (3- thru 5)

1. Passively perform the motion, thus checking for range and any discomfort
2. Ask patient to flex the head and neck until the chin touches the chest.
3. Apply pressure with one hand on the patient's forehead. For safety, hold the other hand just under the patient's head.
4. If unsure between 3/5 and 3-/5 drop the end of the table and check anti-gravity ROM. Pt must be able to move through full anti-gravity ROM for 3/5 strength.
4. If the patient cannot flex the cervical spine so that the chin moves toward the sternum, do not grade. Re-test in the side lying position.

Elbow Extension (3- thru 5)

1. Support the patient's upper arm in 90° of shoulder flexion so that the elbow is pointing toward the ceiling. The forearm is in neutral position and lies across the patient's chest.
2. Ask patient to straighten/extend the elbow.
3. Place the elbow in 20° of flexion and apply resistance just proximal to the wrist.
4. If the patient is unable to move the forearm against gravity, re-test in the sitting position.

Alternate test

Hip Abduction (2 thru 0)

Support the patient's leg under the knee and ankle.

Ask patient to abduct/ move the leg sideways towards you.

Hip Adduction (2 thru 0)

Support the patient's leg under the knee and ankle, bring it out into abduction.

Ask patient to abduct/ move the leg sideways towards midline.

NOTE: Do not allow external rotation, hip flexion, or knee flexion.

E. POSITION 5: REPEAT SIDE-LYING

Neck Flexion (2 thru 0)

Support the weight of the patient's head if necessary.

Ask patient to bend his neck forward bringing chin to chest.

Repeat alternate tests for hip flexion/ extension, knee flexion/extension and ankle dorsiflexion/ plantar flexion as necessary

F. POSITION 6: SITTING

Alternate test

Elbow Extension (2 thru 0)

Place patient's arm in 90° of shoulder flexion, elbow in full flexion and forearm in neutral position. Stabilize the arm proximal to elbow.

Ask patient to straighten the elbow.

Elbow Flexion (2 thru 0)

If patient is unable to bend the elbow against gravity, support the patient's upper arm in abduction and elbow in extension with forearm supinated. Ask patient to bend the elbow – bringing hand to mouth with forearm in supination.

Shoulder External Rotation

Patient is positioned with arm at his side with the elbow flexed to 90 degrees and forearm in neutral. The patient is then asked to rotate the shoulder externally. If the patient has weak biceps, you may support the forearm.

G. POSITION 7: STANDING

Ankle Plantar flexion (5)

Have patient stand next to a table; single limb stand by bending one knee. Once the patient is steady (can steady themselves using table), ask them to go up onto their toes. Assess for complete plantar flexion of the foot.

Assign (5-) if unable to fully plantar flex.

Alternate tests

Hip Extension (3)

Ask patient to stand leaning over the table so that his entire trunk is supported and his feet are just touching the floor, let him hold on to the table for added stability.

Ask him to shift his weight onto one leg. Support the leg being tested in 90° of knee flexion, and ask the patient to lift the thigh away from the table. Grade as 3- if the patient lifts the thigh. If the patient cannot lift the thigh from the resting vertical position (with the examiner supporting the knee in flexion), go ahead and assign grade 2.

NOTE: To avoid having the patient change position more than necessary, assessing for a 3- grade can be done as the last muscle tested, as the patient gets on or off from the exam table.