

**KNEE RANGE OF MOTION****TABLE OF CONTENTS**

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## 1. Background and rationale

In MOST, we will assess active knee range of motion to better understand how knee extension and flexion relates to knee osteoarthritis, pre- and post-knee replacement function and pain. We have the opportunity to assess knee range of motion in a large cohort with or at high-risk for the development of knee osteoarthritis.

We will assess knee range of motion using a long-arm goniometer.

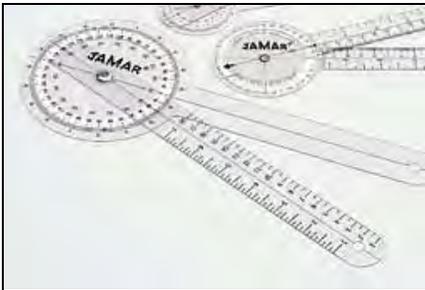
## 2. Equipment and supplies

- Jamar 12½ inch plastic long-arm goniometer
- Bolster (4" flat bottom)

### 2.1 Service and maintenance

#### 2.1.1 Jamar long-arm goniometer

Replace the goniometer if the markings on the plastic device become worn and are unreadable. It is recommended that you clean the goniometer as needed with clean cloth, soap and water.



#### 2.1.2 Bolster

Clean the vinyl covered, rigid bolster with a clean cloth, soap and water or antibacterial product before each use. Replace the bolster if the vinyl covering is worn or torn.



## 2.2 Software

None.

## 2.3 Calibration

None.

## 3. Safety issues and exclusions

### 3.1 Safety issues

There are no safety issues. The participant performs active range of motion and the examiner only measures the joint range that the participant is able to comfortably perform.

### 3.2 Exclusions

The only exclusion for this exam is leg amputation. All knees, including those that have had a knee replacement, will be eligible for the knee range of motion measurement. If the participant has had a knee replacement or other acute knee surgery less than three months ago, the examiner should assess whether or not the participant should complete the exam on a case by case basis.

## 4. Participant preparation

Measurement will be taken when the participant is lying on the examination table just prior to or after the Pain Sensitivity examination.

### 4.1 Detailed measurement procedures

#### 4.1.1 Assessment of range of motion

Knee joint range of motion for knee extension and flexion will be assessed in both knees in a standardized evaluation. The participant will actively extend or flex their knee and the examiner will measure the joint range with the goniometer. Place the axis of a goniometer at the intersection of the thigh and shank at the knee joint center of rotation, i.e., the lateral femoral condyle. The stationary arm is placed along the lateral aspect of the thigh, following the line from the knee joint to the greater trochanter at the hip. The moveable arm is placed along the lateral aspect of the fibula (from knee center of rotation to the lateral malleolus at the ankle). You will measure knee range of motion with the participant supine on an exam table long enough to support the legs. This measurement will be taken for both knees in all study participants.

*General instructions*

Equipment: Have the long-arm goniometer and rigid bolster available near the exam table.

Participant positioning: The participant should wear shorts. Have the participant lie in a supine position on an examining table with the head of the table elevated to about 25 to 30 degrees. The leg measured should be extended, with a fairly rigid bolster as support under the ankle. It should be high enough that the participant's knee is raised slightly from the table (provides space for participant to fully extend their knee actively). The participant should tighten their quadriceps muscles to actively extend their knee (push their knee into the table) three times. After the knee extension measurement is taken (on the third trial) the bolster is removed and the participant is asked to place their foot as close as possible to their buttocks (foot on the table). The participant will be given three trials to flex their knee as far as possible without using their hands to assist them. After the knee flexion measurement is taken (on the third trial), the participant is told that they can extend their leg and relax.

The nature and the purpose of the tests should first be explained to the participant:

Introduction (please read to the participant)

Script: "This exam is to measure the range of motion in your knee. This measurement will help us get a better understanding of your knee mobility. I'm going to ask you to first straighten your leg as much as possible three times, that is to push your knee as straight as you can into the table. I will put this bolster under your ankle to make sure that you are straightening your leg completely and then measure the angle on your third try by simply holding this device (show them the goniometer) against the side of your leg. Then I'll remove the bolster and ask you to bend your knee as far as possible three times by putting your foot on the exam table and bringing (or sliding) your heel as close as you comfortably can toward your buttocks without using your hands to help. Again I will measure the angle on your third try by simply holding this device (show them the goniometer) against the side of your leg"

*Equipment*

Exam table

Jamar long-arm goniometer

Bolster

Extension measurement:

1. Ankle is placed on a fairly rigid bolster (if excessive adipose tissue is present and the knee is resting on the table, add additional height under the ankle).
2. Participant is asked to actively straighten the leg three times. Check to see that the participant is contracting their quadriceps muscles to extend their knee down towards the table (not just co-contracting both hamstrings and quadriceps).
3. Examiner measures the angle in degrees using the goniometer. Use reference of  $180^\circ$  as full extension (e.g. angles greater than  $180^\circ$  indicates hyper-extension).



Flexion measurement:

1. Participant is asked to bring the foot as close as possible to the buttocks without using their hands to pull.
2. Foot is flat on the table
3. Examiner measures the angle in degrees using the goniometer, being careful to use angles that are referenced as follows:  $180^\circ$  equals full extension and normal flexion will likely not exceed  $40^\circ$ .



## 5. Alert values/Follow-up/Reporting to participants

This exam has no alert values reported to the participant or physician. The participant can be told their knee range of motion measurements if they are interested in knowing them. Note, however that there may be confusion if they are in physical therapy, since the opposite reference is typically used for angles (e.g. full extension =  $0^\circ$  and full flexion approaches  $140^\circ$ ). If this occurs, simply indicate that differences in reference angles may result in numbers that are foreign to them (or do the math for them to switch the angles:  $180$  minus the documented angle).

## 6. Quality assurance

### 6.1 Training and certification

Clinic staff require no special qualifications or experience to perform this testing. Staff will be initially certified following the below certification requirements. Training should include:

- Read and study manual
- Attend MOST training session on techniques (or observe administration by experienced examiner)

- Practice on other staff or volunteers
- Discuss problems and questions with local expert or QC officer

## 6.2 Certification requirements

- Complete training requirements
- Conduct exam on two volunteers:
  - According to protocol, as demonstrated by completed QC checklist

## 6.3 Quality assurance checklist

- Participant positioned properly on examination table
- Correct script used to introduce exam
- Goniometer measurement for knee extension taken and read correctly
- Goniometer measurement for knee flexion taken and read correctly
- Goniometer measurements recorded correctly on data collection form
- Correctly completes form
- Reviews form for completeness

7. Data collection form



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## Knee Range of Motion



Visit	MOST ID #	Acrostic	Date of Exam	Staff ID#
<input checked="" type="radio"/> 84-month <input type="radio"/> M	M		/ / 20 <small>Month Day Year</small>	

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*(Examiner note: The exam is performed with the participant supine on the exam table. A bolster is placed under the ankle for the knee extension measurement.)*

**1. Right knee range of motion**

Exam Completed (full warm-up) →

Exam Completed (partial warm-up) →

Participant refused

Not done/Not applicable

1a. Extension:  degrees  
 1b. Flexion:  degrees

Comments (optional): \_\_\_\_\_

**2. Left knee range of motion**

Exam Completed (full warm-up) →

Exam Completed (partial warm-up) →

Participant refused

Not done/Not applicable

2a. Extension:  degrees  
 2b. Flexion:  degrees

Comments (optional): \_\_\_\_\_

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*(Examiner Note: Pages 39 through 54 have been removed from the Follow-up Visit Workbook.)*

★ Page 54a ★

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