

**KNEE HEIGHT and LEG LENGTH**

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## KNEE HEIGHT AND LEG LENGTH

### 1. Background and rationale

Knee height is the distance from the sole of the foot to the anterior surface of the thigh with the ankle and knee each flexed to a 90° angle. The purpose of the heel-to-knee (knee height) measure is to be able to get an estimate of standing height for those people whose total height has diminished due to spinal curvature. Unlike stature (total height), knee height changes little with increasing age yet is highly correlated with stature. Sex and age-specific formulas have been developed which compute standing height from knee height. The knee height measure is made with a sliding broad-blade caliper. This device consists of an adjustable measuring stick with a blade attached to each end at a 90° angle.

Leg length is the distance from the bottom of the umbilicus (navel) to the highest point in the inner ankle (medial malleolus). We will be measuring leg length to the closest centimeter on both the right and left sides. The purpose of the umbilicus to medial malleolus measurement is to be able to get an estimate of leg length discrepancies. Leg length discrepancy can cause gait problems and other secondary problems. The leg length measurement is made while the participant is supine with a non-stretchable measuring tape.

### 2. Equipment and supplies

- Heel-to-knee caliper calibrated in centimeters
- Small sandbag
- Nylon or plastic measuring tape in centimeters

### 3. Safety issues and exclusions

The measurements of knee height using a standard knee height caliper and leg length using a tape measure pose no safety concerns or reasons for exclusion. Those participants who have had either abdominal surgery that left their umbilicus off the middle of their body, or have had an above-or below-knee amputation will be excluded from the leg length measurement, and of course, from the knee height measurement on that side.

#### 4. Participant and exam room preparation

Shoes and very heavy socks should be removed. It is necessary to perform the knee height measurement on the bare knee. Measure the participant in shorts. For the leg length measurement, the umbilicus must be exposed.

#### 5. Detailed measurement procedures

##### 5.1 Knee height

- 1) Measure the right leg unless the left leg is obviously longer than the right leg or if the right leg cannot be measured for some other reason (e.g., cast, amputation, sores, etc.).
- 2) While sitting in a chair, the person being measured bends the right knee at a 90° angle.

Script: “This device measures the distance from your heel to the top of your knee. I’m putting a sandbag under your foot for support. I’m going to take two measurements.”

- 3) One blade of the sliding broad-blade caliper is placed under the heel of the right foot. The heel rests on the caliper blade. Sandbags are used to raise the front part of the foot to the level of the heel resting on the caliper, and to maintain a 90° angle at the ankle.



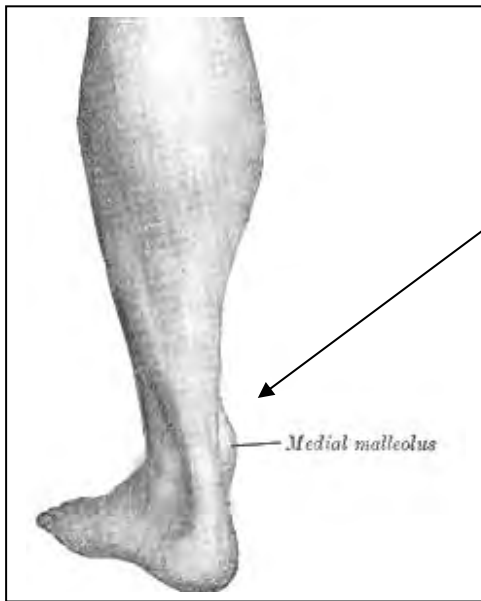
- 4) The other blade is placed over the anterior surface of the right thigh, across the condyles of the femur and just proximal to the kneecap. Pressure is applied to completely compress tissue or to the maximum comfortable pressure.



- 5) Record to the nearest 0.1 cm.
- 6) Remove then reposition the caliper. Repeat the measurements.
- 7) If the two measurements differ by more than 0.4 cm, take two more measurements.

## 5.2 Leg Length

- 1) Place the participant in the supine position with spine flat against the table surface.
- 2) Ask the participant to lift buttocks off the table and set buttocks back down flat. Inspect participant to make sure they are lying flat and straight and not bending to one side.
- 3) Ask the participant to bare their belly button. The leg length is measured from the bottom of the umbilicus to the middle of the inner ankle (medial malleolus) on both sides to the closest 0.5 centimeter.



- 4) Measure right side and then left side.
- 5) Record on the data form accordingly.

## 6. Alert values/reporting to participants

There are no alert values. When the testing is completed, thank the participant.

## 7. Quality assurance

## 7.1 Training requirements

No special qualifications or experience are required to perform these measurements. 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 (Goal: minimize differences between repeat measurements)
- Discuss problems and questions with local expert or QC officer

## 7.2 Certification requirements

### Knee Height

- Complete training requirements
- Conduct exams on two volunteers:
  - According to protocol, as demonstrated by completed QC checklist
  - Differences between repeat measures should be less than .4 cm
  - Differences between trainees and QC officer's measurements should be less than .4 cm

### Leg Length

- Complete training requirements
- Conduct exams on two volunteers:
  - According to protocol, as demonstrated by completed QC checklist
  - Differences between trainees and QC officer's measurements should be less than .5 cm

### 7.3 Quality assurance checklist


#### Knee Height

- Right leg measured. (If one leg is obviously longer than the other, longest leg was measured.)
- Participant sitting in chair with knee bent at 90° angle
- Blade of sliding caliper placed under heel of right foot
- Heel resting on caliper blade
- Sandbags used to raise front part of the foot to level of heel resting on the caliper, and to maintain 90° angle at ankle
- Other blade placed over anterior surface of right thigh, across condyles of femur, just proximal to kneecap
- Pressure applied to maximally compress tissue
- Measurement to nearest 0.1 cm recorded
- Caliper removed and then repositioned
- Two more measurements made if first two differ by greater than .4 cm
- Reviews form for completeness
- Correctly completes form

#### Leg Length


- Both legs are measured
- Participant lying supine on exam table with spine flat against the table surface
- Participant asked to lift bottom off the table and set bottom back down flat Inspect participant to make sure they are lying flat and straight and not bending to one side
- Participant asked to bare their belly button
- Measurement taken from the bottom of the umbilicus to the middle of the inner ankle (medial malleolus)
- Measure right leg and then the left leg
- Measure on both sides to the closest 0.5 centimeter
- Record on the data form accordingly
- Reviews form for completeness
- Correctly completes form

8. Leg length and knee height data collection form



14915

## Leg Length



MOST

| MOST ID #       | Acrostic | Date Form Completed |     |
|-----------------|----------|---------------------|-----|
| Office Use Only |          | Month               | Day |
| 2000            |          | Year                |     |

---

① Has the participant had abdominal surgery that left the belly button off the mid-line of the body?

Yes                       No

↓

Do not measure either leg. Go to next exam.

② Has the participant had an above- or below-the-knee amputation?

Yes                       No

↓

Which leg was amputated?
   
 Right                       Left                       Both
   

Measure left leg.

Measure right leg.

Do not measure either leg.

③ Right leg length:       .  cm

④ Left leg length:       .  cm

Staff ID#

## Knee Height

Right leg is measured unless the left leg is obviously longer than the right leg or if the right leg cannot be measured for some other reason (e.g., cast, sores, etc.).

① Which leg is being measured?                       Right                       Left

② Measurement 1                        .  cm

③ Measurement 2                        .  cm

④ Difference between Measurement 1 & Measurement 2                       cm

⑤ Is the difference between Measurement 1 and Measurement 2 greater than .4 cm?

Yes     No

Complete Measurement 3 and Measurement 4 below.

Go to next exam.

⑥ Measurement 3                        .  cm

⑦ Measurement 4                        .  cm

Staff ID#