# UK Biobank

# Grip Strength Measurement

Version 1.0

**http://www.ukbiobank.ac.uk/**

**15th April 2011**

This manual details the procedure for Grip Strength measurement at an Assessment Centre of the UK Biobank.

# Contents



## 1. Introduction

**1.1:** This manual details the procedure for Grip-strength measurement at an Assessment Centre of the UK Biobank. This takes place at the 5th "station" of the Assessment Centre visit, as listed in Table 1.

**Table 1:** Sequence of assessment visit

| | **Visit station** | **Assessments undertaken** |
|---|---|---|
| 1 | Reception | • **Welcome & registration**<br>• Generating a USB key for Participants |
| 2 | Touch screen Section | • **Consent**<br>• **Touch screen questionnaire**<br>• **Hearing Test**<br>• Cognitive function tests (**Shape, Pairs, Fluid Intelligence, Snap**) |
| 3 | Interview & blood pressure | • **Interviewer questionnaire**<br>• **Blood pressure measurement**<br>• **Measurement of arterial stiffness (Pulse Wave Velocity)** |
| 4 | Eye measurements | • **Visual acuity**<br>• **Auto-refraction**<br>• **Intraocular pressure**<br>• **Retinal image (OCT Scan)** |
| 5 | Physical measurements | • **Height (Standing and Sitting)**<br>• **Hip & waist measurement**<br>• **Weight and Bio-impedance (Body Composition) measurement**<br>• **Hand-grip strength**<br>• **Heel-bone ultrasound**<br>• **Spirometry (Lung function Test)** |
| 6 | Cardio (Physical fitness) | • **Exercise ECG (Cycling)** |
| 7 | Sample collection & exit | • **Blood samples collected**<br>• **Urine sample sought**<br>• **Saliva sample sought**<br>• Consent & result summary printed<br>• Travel expense claim provided |

| | | |
|---|---|---|
| 8 | Web-based diet questionnaire | • **Dietary assessment** |

**1.2:** Throughout this document, the term “Participant” signifies a study participant who is taking part in the Assessment Centre process, regardless of whether they eventually give or withhold consent to take part in the UK Biobank study.

**1.3:** The collection of data from assessment visits uses the direct data entry system of the Assessment Centre Environment (ACE). This has five components (**Assessment Centre Environment**), of which Vox operates the Physical Measurement test station of the assessment visit.

**1.4:** At the start of their visit, each participant is issued with a USB Key at the Reception station. This USB Key acts as a participant identifier (it contains Participant ID, name, date of birth and gender) and as a temporary storage device for the recorded data. As the participant progresses between stations, the USB key acts as an identifying token and also as a data transfer mechanism. At the Reception & Exit module, all data on the USB key is removed, after it has been backed up to the Assessment Centre head PC.

## 2. Staff

Healthcare technicians or nurses certified to conduct assessments undertaken at this station are responsible for carrying out this procedure. The Assessment Centre Manager oversees that all Assessment Centre staff work in accordance with the protocol.

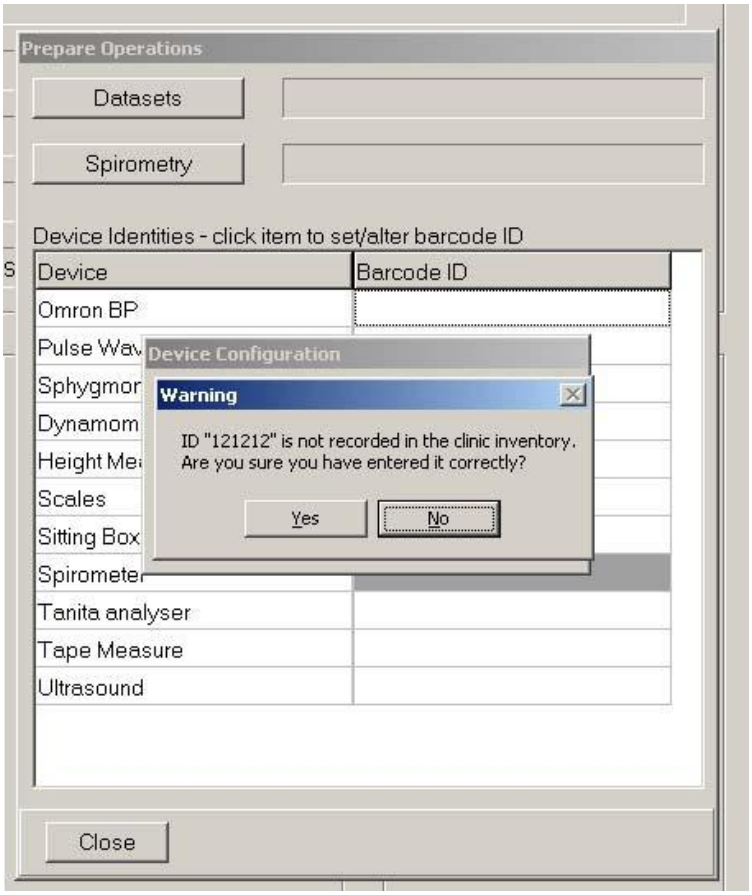
## 3. Order of physical measurements

After completing the **Interview** and **Blood Pressure** procedures, or after the **Eye Measurements** in later versions of UK Biobank, the participant arrives at the Physical Measurements station, which follows the order:

1. Measurement of grip strength
2. Measurement of waist and hip circumference
3. Measurement of standing height
4. Measurement of sitting height
5. Measurement of weight & bioimpedance
6. Left and Right Heel ultrasound measurement
7. Spirometry

## 4. Preparations at the start of the day

**4. 1:** The staff member opens the Vox component of the Assessment centre environment, entering their username and password. From the Vox start-up screen ‘Prepare’ is selected to display the following screen:




**4. 2:** The barcode scanner is used to enter the unique identifier for each device listed. If the equipment ID number is not recognised by the Assessment Centre inventory the coordinating centre is notified of the equipment identifier discrepancy.

## 5. Calibration of hand dynamometer

**5.1:** Grip strength is measured using a Jamar J00105 hydraulic hand dynamometer (figure 1; Appendix 1: Equipment list). This measures grip force isometrically (without movement), and can be adjusted for hand size in five half-inch increments. The dual-scale readout displays isometric grip force from 0 to 200 pounds (90 kg), with a ‘peak-hold’ needle that remains in place once grip is released.

**Figure 1**: Jamar J00105 hydraulic hand dynamometer

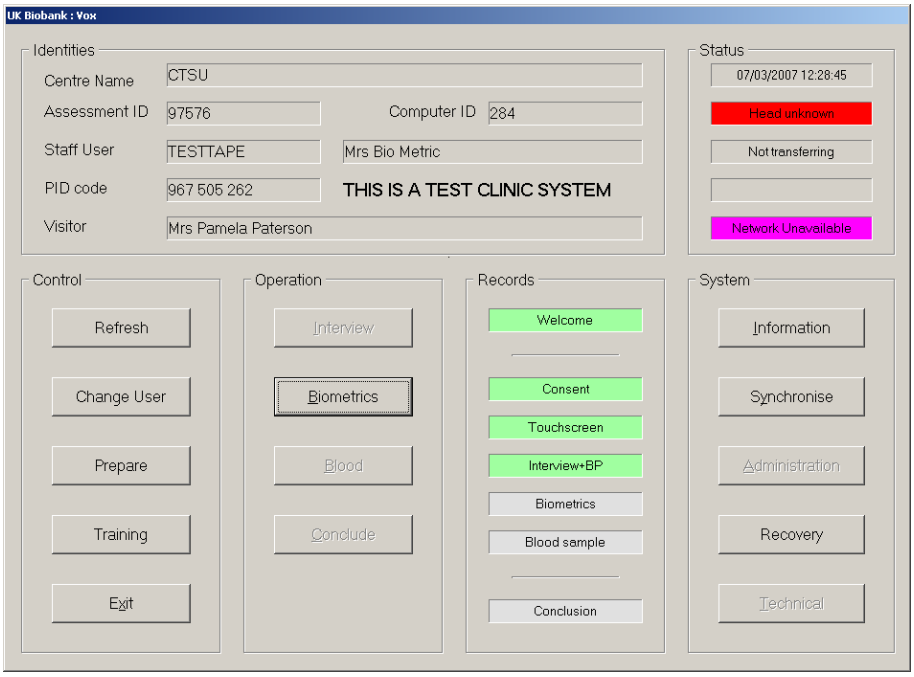
**5.2:** The staff member calibrates the Jamar hand dynamometer at the start of each day by measuring their own grip strength, observing that the needles rise round the dial together and that the red peak-hold needle remains stable and can be read when grip is released. A calibration record is maintained.

## 6. Participant assessment

**6.1:** The participant is seated in a curtained assessment area and told that they will undergo a number of measurements lasting a total of about 10-15 minutes.

**6.2:** The participant is asked to remove any outer garments, take a seat, and remove their shoes socks/tights, with the explanation that this is for measuring their height, weight, body fat and heel bone density. The participant is also asked to empty their pockets and to place any valuables into the tray provided.

**6.3:** The participant's USB key is inserted into the computer, the staff member logs on to Vox and ensures that the 'Records' column are all coloured green up to Biometrics. The 'Biometrics' button is then selected and the identities of the staff member and participant confirmed.




## 7. Measurement of grip strength

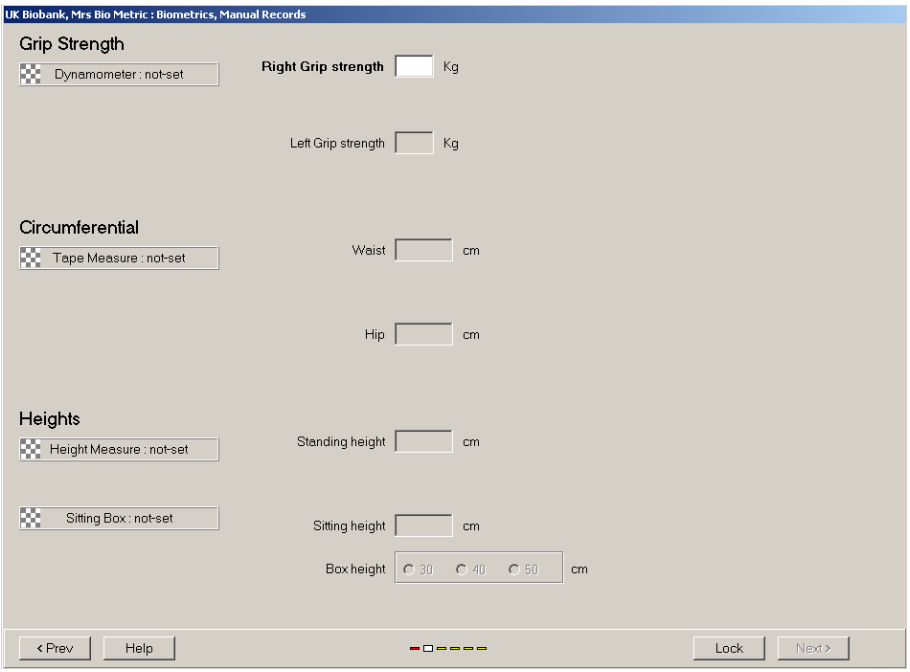
**7.1:** The staff member explains that the first measure will be of grip strength (indicating the Jamar dynamometer device to be used) and that strength in both hands will be measured in turn.

**7.2:** The participant is asked to sit upright in a chair and place their forearms on armrests. With dynamometer handle set to the second incremental slot the participant is asked to hold it first in their right hand. For participants with very large hands the handle is moved to the third slot.

**7.3:** The participant's elbow of the arm holding the dynamometer is against their side and bent to a 90° angle so that their forearm is pointing forwards with their thumb uppermost. Their wrist is straight so that their hand is either pointing forwards or bent slightly outwards

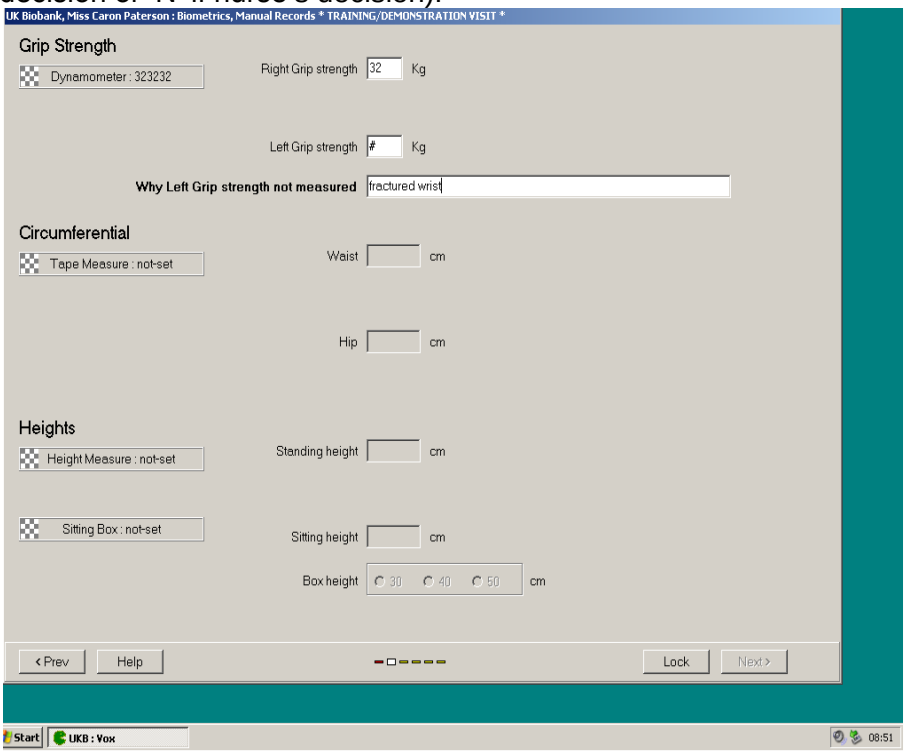
**7.4:** The staff member supports the dynamometer lightly with one hand and rotates the red peak-hold needle anti-clockwise to zero. They explain to the participant that the adjustable handle of the dynamometer does not move while they are gripping it, but it will measure the strength of their grip. The participant is asked to squeeze the handle of the dynamometer as strongly as they can for about 3 seconds. They are given encouragement while doing so.

**7.5:** After 3 seconds the participant is asked to stop, the dynamometer is taken from them and the maximum hand grip strength is read in whole kilogram force units as indicated on the outer aspect of the dial by the red peak-hold needle. This value is entered into the computer (see below).




**7.6:** The grip strength measurement is repeated using the left hand, and this value is also entered.

**7.7:** If the participant cannot, or does not wish to undergo a particular measurement, "**#**" is entered in the relevant field and the reason why is recorded (along with 'P' if participant's decision or 'N' if nurse's decision).




**7.8:** The hand dynamometer is cleaned with Azowipes after each participant. Following grip measurement, the participant remains in the assessment area for the **Waist and Hip Measurement.**

# 8. Appendices

## 8.2 Appendix 1: Equipment list

| **Equipment in Physical Measurements station** | |
|---|---|
| 2 chairs (1participant chair with armrests –no wheels on participant chairs.) | Modular partition dividers with curtains across entrance |
| 1 desktop personal computer | 1 monitor<br>Other Equipment<br>1 Jamar J00105 hydraulic hand dynamometer (Lafayette Instrument USA)<br>1 Seca 200 measuring tape (Seca GMBH, Germany)<br>1 Seca Height measure (Seca GMBH, Germany)<br>1 Wooden sitting height box<br>1 Tanita BC418ma (Tanita Europe, NL)<br>1 Sahara Heel Ultrasound device (Hologic, USA)<br>1 Vitalograph spirometer (Vitalograph Ltd, UK) |
| 1 Barcode scanner | Tray to hold valuables (during body composition measurement)<br>Consumables<br>Sahara Ultrasound Coupling Gel<br>Sahara printer paper |