UK Biobank

Anthropometry

Version 1.0

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biobank uk

Improving the health of future generations

Contents

1 Introduction

1.1. This document provides an overview of the anthropometry data held by UK Biobank, including the procedures for data collection.

1.2. Anthropometric measurements were collected from UK Biobank participants during the Physical Measures section of the assessment centre visit. Full details of the assessment centre visit can be found here.

1.3. Anthropometry data are presented in Data Showcase within Category 100008.

2 Anthropometric Measurements

2.1 Hip and Waist Circumference measurement

2.1.1 Intra-abdominal fat mass can be reasonably inferred by waist measurement. A high waist : hip ratio (waist circumference / hip circumference) implies a high degree of central obesity and is a risk factor for cardiovascular and cardiometabolic disease[1].

2.1.2 Hip and waist circumference measurements were collected from participants using a Seca 200cm tape measure (Figure 2.1.1). Tape measures were tagged with a barcode and replaced periodically, when the maximum number of measurements had been reached.

2.1.3 Participants were required to stand with feet facing directly forward and shoulder-width apart and with arms folded across their chest. Ensuring no obstruction of clothing items, the Seca tape was first passed around the smallest part of the trunk (i.e. the natural indent) and secured in place using the plastic fastener. If a natural indent could not be found, the umbilicus ('belly button') was identified and the circumference measured at this level.

2.1.4 Participants were asked to breathe normally while the tape was adjusted to a comfortable position (neither too loose nor too tight). On the outbreath, the waist circumference was recorded in centimetres and entered into the assessment centre software manually (Figure 2.1.2).

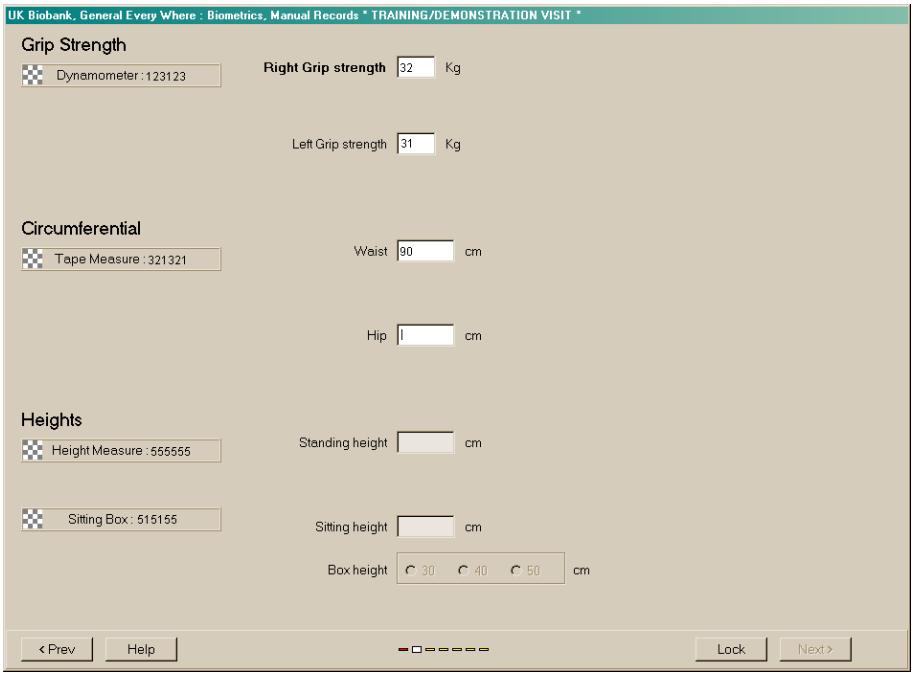
2.1.5 With the participant remaining in the same position the Seca measuring tape was lowered to the widest part of the hips for the hip circumference measurement. This was recorded in centimetres and entered into the assessment centre software manually.

2.1.6 Participants were unable to undergo waist and hip measurements if they were:

- Pregnant
- Wheelchair-bound
- Wearing a colostomy bag
- Not willing to be measured

Figure 2.1.1: Seca 200 tape measure

Figure 2.1.2: Manual entry of measurements into assessment centre software



2.2 Standing and Sitting Height measurement

2.2.1 Both standing and sitting height were measured during the assessment. Standing height gives an overall assessment of growth, whereas sitting height measures the length of the trunk. There is less variation between people in truncal height compared to total height so it provides additional information about the general health and nutrition of populations and ethnic, social and economic groups.

2.2.2 Standing and sitting height measurements were collected from participants using a Seca 240cm height measure (Figure 2.2.1). For seated height a 30 x 40 x 50 cm box was used for seating the participant so that their feet were flat on the floor. The height measure and sitting height box were calibrated every 2 weeks using a wooden metre rule, and withdrawn from use if found to be inadequate.

2.2.3 For the standing height measurement, participants were required to stand barefoot with their back against the vertical scale, feet parallel to each other, toes pointing forward and soles flat on the floor. The participant's posture was checked to ensure they were standing unsupported, with legs straight and with buttocks and shoulder blades touching the vertical scale. Participants were asked to relax their shoulders, with arms by their sides, and to ensure they were not slouching or leaning to one side.

2.2.4 With permission, the participant's head was gently positioned in the 'Frankfort plane' (Figure 2.2.2). This is a standard craniometric reference passing through the right and left ear holes and the lower margin of the left orbit and is used to minimise measurement error.

2.2.5 Participants were asked to stand as tall as possible, and breathe deeply. On the in breath the horizontal measure was lowered down on top of the participants head and the measurement on the vertical scale (as indicated by the red or black arrows / line) was recorded in centimetres and entered into the assessment centre software manually (Figure 2.2.3).

2.2.6 For the sitting height measurement, the wooden box was positioned directly in front of the height device, at 30cm, 40 cm or 50cm height, whichever allowed the participant to place both feet flat on the floor. The participant was required to sit on the box with their back straight, shoulders relaxed and without slouching or leaning to one side.

2.2.7 With their head positioned in the Frankfort plane, participants were asked to sit as tall as possible, and breathe deeply. On the in breath the horizontal measure was lowered down on top of the participants head and the

measurement on the vertical scale was recorded in centimetres and entered into the assessment centre software manually.

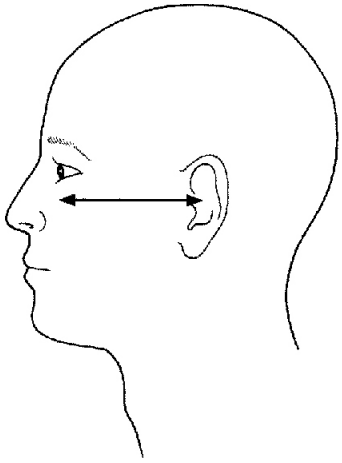
2.2.8 Participants were unable to undergo standing and sitting height measurements if they were:

- Unable to bear weight
- Wheelchair-bound
- Suffering from a neck complaint
- Suffering from scoliosis
- Wearing a turban

2.2.9 The standing height measurement collected during this assessment was later used in the calculation of Body Mass Index (BMI = weight in kilograms/ height in metres^2), Arterial Stiffness Index (ASI), and in the Spirometry tests (since lung capacity varies with height).

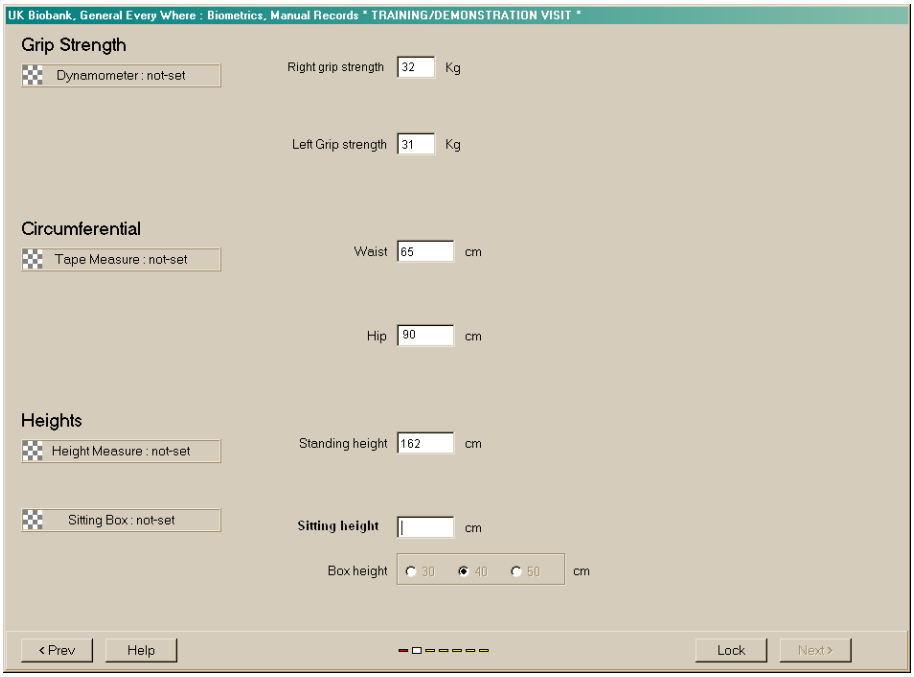
Figure 2.2.1: Seca 240cm height measure

Figure 2.2.2: Head positioned in the Frankfort plane



Source: http://www.answers.com/topic/frankfort-plane

Figure 2.2.3: Manual entry of measurements into assessment centre software



2.3 Weight and Bioimpedance measurement

2.3.1 Bioimpedance involves passing a safe, low amperage electrical current through the body (via the hands and feet) and is used to estimate body fat. It works because fat contains very little water, whereas muscle contains 70% water and this conducts electricity. From the impedance of the current a bioimpedance analyser can calculate total body water, fat-free mass and body fat. This method can be accurate but is influenced by hydration status, food intake and skin temperature.

2.3.2 Weight and bioimpedance data was collected from participants using a Tanita BC418MA body composition analyser (Figure 2.3.1). This device produces segmental readings of fat percentage, fat mass, fat-free mass and predicted muscle mass for the right arm, right leg, left arm, left leg and trunk.

2.3.3 Participants were required to place their bare feet on the analyser platform's feet markings, (ensuring no obstruction by trousers and that feet were kept still and in contact with the platform), and to grip the two metal handles firmly allowing arms to hang loosely by their sides.

2.3.4 The Tanita analyser recorded a weight measurement first, and then emitted a 'beep' each time it measured body impedance. A double 'beep' indicated that it had finished the analysis.

2.3.5 Data captured by the Tanita analyser was transmitted directly into the assessment centre software (i.e. without the need for manual data entry, figure 2.3.2).

2.3.6 Participants were unable to undergo bioimpedance analysis if they were:

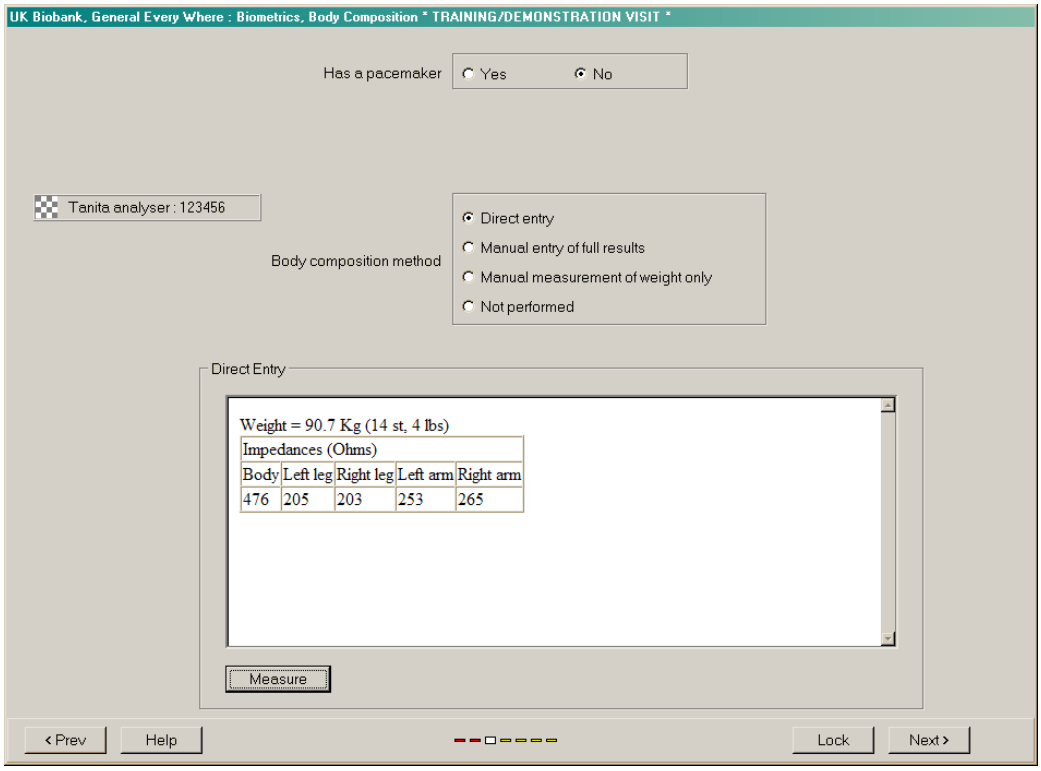
- Pregnant
- Using a pacemaker
- Wheelchair-bound
- An amputee
- Unable to grip the handles of the Tanita analyser
- Unable to stand
- Wearing a plaster cast
- Unwilling to remove their shoes

Reasons for not completing the bioimpedance measurement were recorded.

2.3.7 Participants who did not undergo bioimpedance analysis were asked if their weight could be measured using standard scales. This value was entered into the assessment centre software manually, or a reason for not completing the weight measurement was recorded, where applicable.

Figure 2.3.1: Tanita BC418MA body composition analyser

Figure 2.3.2: Direct entry of bioimpedance measures into assessment centre software



3 Presentation of data in Showcase

Anthropometry data are presented in Data Showcase within Category 100008, of which there are two sub-categories:

- Category 100009: Impedance measures for data that was captured directly from the Tanita body composition analyser. Data-fields that are available include:

    - Impedance (both legs, both arms, whole body)
    - Weight
    - BMI
    - Basal metabolic rate
    - Fat % (both legs, both arms, trunk)
    - Fat mass (both legs, both arms, whole body)
    - Water mass (both legs, both arms, trunk, whole body)
    - Fat-free mass (both legs, both arms, trunk, whole body)
    - Predicted mass (both legs, both arms, trunk)
    - Impedance device ID

- Category 100010: Body size measures for the anthropometric measurements which were collected using standard measuring devices and entered into the assessment centre software manually. Data-fields that are available include:

    - Weight
    - Standing Height
    - Sitting Height
    - Sitting box height
    - BMI
    - Waist circumference
    - Hip circumference
    - Device IDs
    - Reason for skipping each measure

4 References

1. Yusuf S, Hawken S, Ounpuu S, et al., Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. Lancet. 2004 Sep 11-17;364(9438):937-52.