APPENDIX
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Techniques followed in taking physical and other measurements.

WEIGHT

Weight was measured using a weighing machine (manufacturer: Krups, Germany) graduated in Kilograms.

STATURE

Standing height (height vertex) is taken with the subject standing erect against a vertical wall on a horizontal platform with her heels put together and stretching upwards to the fullest extent, aided by gentle traction on the head behind the ears. Head is held in Frankfort horizontal plane and the back is kept straight. Anthropometer rod is held vertical on the left side of the subject and then horizontal cross bar is brought in contact with the vertex point (highest point on the head) and the measurement is recorded.

SITTING HEIGHT-VERTEX

Sitting height is measured with the subject sitting on a table top with her feet hanging down unsupported over the edge of the table the back of her knees directly above the edge and her back stretched up straight. Gentle traction is applied under the chin and she is not allowed to contract the muscles of her thighs and buttocks. The head is held in F.H. plane and the anthropometer is held vertically in contact.
with the back at the sacral and interscapular regions, measurement is recorded when the horizontal rod touches the point vertex.

**HEAD LENGTH**

The maximum length in the sagittal plane from glabella to the most salient point on the occiput is taken with the help of a spreading caliper. Moderate pressure is exerted to compress the tissues.

**HEAD BREADTH**

The maximum breadth of the head in the transverse plane, across the two parietals is recorded using a spreading caliper.

**BIACROMIAL DIAMETER**

The maximum shoulder width is taken with the subject standing erect with her shoulders relaxed. The outside edge of the acromial process of the shoulder joint is felt by the observer. The measurement is then recorded by placing one arm of the anthropometer along the external border of one acromial process and the other horizontal arm is then brought inwards until its edges rest on the opposite acromial external border.

**BICRISTAL DIAMETER**

While taking this measurement the subject stands erect with her heels put together and the horizontal arms of anthropometer are brought into contact with the iliac crests
HIP WIDTH

The subject is made to stand erect with both heels touching each other and equal weight on the two feet. The anthropometer compass is put across the thighs and maximum distance is recorded.

UPPER EXTREMITY (TOTAL ARM LENGTH)

The subject stands erect as she did in the case of stature measurement, her arms and hands fully extended by her side. The tip of one arm of the anthropometer is placed at the inferior border of the acromial process, the distance to the tip of the longest finger (dactylion point) is measured.

UPPER ARM LENGTH

The subject is directed to stand in the same position as in the case of previous measurement. The straight distance between point acromion and radial is measured. The external superior border of the head of the radius is marked and then the length from this mark to the inferior border of the acromion process is taken.

FORE ARM LENGTH

Straight distance from the marked head of the radius (radiale point) to the tip of the lateral styloid (Stylion point) is measured.
HAND LENGTH

The subject is asked to stand erect, the hand being pendant along the body, fingers are kept fully extended, the distance between Interstylion and dactylion using sliding caliper is measured.

LOWER EXTREMITY (TOTAL LEG LENGTH)

This measurement is obtained, by subtracting sitting height-vertex from stature.

THIGH LENGTH

This was measured with the subject standing in the same posture as for stature measurement, the horizontal arm of the vertically held anthropometer is then brought in contact with the left trochanterion point to obtain height trochanter. Next the horizontal arm of the anthropometer is brought to touch the point tibiale in order to get height tibiale. The desired measurement is then obtained by subtracting height tibiale from height trochanter.

LEG LENGTH

The measurement is taken with the subject standing erect with equal pressure on two feet vertical distance between radiale and sphyriion point is recorded.

FOOT LENGTH

The subject is directed to sit and rest her left foot lightly along the horizontal arm of the anthropometer with the centre of the heel against the arm of the anthropometer;
the second horizontal arm is then brought to touch the end of the longest toe. No pressure is exerted. Care is taken in not taking the measurement with the protuding toe nails.

**FOOT BREADTH**

The subject is asked to sit on a chair and to rest her left foot on the ground. Distance between the points metatarsal tibiale and metatarsal fibulare is recorded using a sliding caliper.

**BICONDYLAR HUMERUS BREADTH**

The subject is asked to bend her elbow to a right angle and the width across the outermost parts of the lower end of the humerus (the bony prominences of distal epicondyles of humers) is recorded using a sliding caliper. Pressure is applied to compress the tissues.

**BICONDYLAR FEMUR BREADTH**

The subject is directed to sit on a table with her knees bent to a right angle. Width across the bony prominences of the femur is then measured with a sliding caliper exerting heavy pressure on the arms of the sliding caliper to compress the tissues.

**ANKLE BREADTH (BIMALLEOLAR BREADTH)**

The measurement is taken with the subject sitting on a table. The breadth of the ankle is measured across the malleoli, with pressure to compress the tissues.
Wrist breadth (Bistyloid breadth)

Wrist breadth is taken across the styloid process using a sliding caliper.

Circumferences

A narrow and flexible steel tape calibrated in centimeters is used in taking the following circumferential measurements.

Head circumference

With the subject seated, the maximum circumference of the head is measured with the tape passing above the brow ridge anteriorly and at the level of occiput posteriorly.

Upper arm circumference

The subject’s arm hanging relaxed and just away from her side. The measurement is taken at the maximum circumference approximately halfway between the acromion process and ulnar olecranon. The tape is placed round the arm so that it is in light contact with the skin all round, but not pressing the skin inwards.

Fore arm circumference

Fore arm circumference is taken immediately distal to the elbow joint at the maximum circumference, with the whole extremity relaxed.
CHEST CIRCUMFERENCE

Chest circumference is measured at the level of the 6th rib, the tape is passed round the chest in a plane at right angles to the axis of the body. The reading is recorded at the median value of a normal respiration.

HIP CIRCUMFERENCE

The subject is asked to stand erect with both heels touching each other and equal weight on the two feet. The tape is held tightly round the hips at a level in the middle of the two buttocks and at right angles to the axis of the body.

THIGH CIRCUMFERENCE

The measurements were taken with the subject standing with her heels slightly apart and her weight evenly distributed on both feet. The tape was placed round the thigh horizontally with its top edge just under the gluteal fold.

CALF CIRCUMFERENCE

The subject was directed to sit on a table with her leg hanging freely (in this position the calf muscle is quite relaxed). The measurement was taken with the steel tape at the maximum circumference of the calf in a plane at right angle to the long axis of the leg.

SUBCUTANEOUS TISSUE MEASUREMENTS

The skinfold thicknesses have been measured at various sites by pinching up the skin and subcutaneous tissue
between the thumb and the fore finger. The skin is lifted by grasping the fold firmly and pulling it away from the underlying muscle. A standard spring loaded skinfold caliper which exerts a constant pressure of 10 gm/mm² of the jaw surfaces at all openings has been used for taking the measurements.

**BICEPS SKINFOLD**

The skinfold is picked up on the front of the upper arm over the biceps muscle at a level midway between the acromion process and the radiale.

**TRICEPS SKINFOLD**

The skinfold is picked up at the back of the upper arm over triceps muscle at the same level as biceps skinfold.

**FORE ARM SKINFOLD**

The skinfold is picked up on the fore arm on the planter side and at the level of maximum breadth.

**MIX-AXILLARY SKINFOLD**

This skinfold is measured along the mid axillary line, at the level of xiphoid process.

**THORASIC FRONT**

The fold is picked up in the thorax region, on costal margin, halfway between mammæ and the umbilicus.

**ABDOMINAL SKINFOLD**

Abdominal skinfold is picked up at a level halfway
between the navel and the anterior superior iliac spine.

**SUPRA-ILIAC SKINFOLD**

The fold is lifted just above and medial to the anterior superior iliac spine.

**SUBSCAPULAR SKINFOLD**

The fold is lifted immediately below and just lateral to the inferior angle of the left scapula pointing slightly downwards and outwards approximately at 45° to the axis of the body.

**THIGH SKINFOLD**

Above quadriceps muscle, halfway between inguinal fold and the knee.

**CALF SKINFOLD**

The skinfold is picked up at the level of the maximum circumference of the calf, on the medial border of the leg.

**PHYSIOLOGICAL VARIABLES**

**VITAL CAPACITY**

The vital capacity was measured as the maximum volume of air which can be expelled from the lungs after a maximum inspiration. A dry spirometer is used to record the measurement. Each subject is given three chances and the best performance out of these three is recorded.
HAND GRIP STRENGTH

It measures the maximum grip strength of the hand without taking any support. A collin's type hand dynamometer is used to record the measurement. The best performance, out of the three allowed to each subject is recorded finally. Only the performance of the right hand has been taken into consideration here in the present study.

BLOOD PRESSURE

Blood pressure (systolic) was taken using a German Sphygmomanometer (Erkameter) graduated upto 300 mm Hg.