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Impact of Somatotype on Anthropometric Measurements of Body Fat distribution in Young Adult Population

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Introduction

Kinanthropometry is defined as the study of human size, shape, proportion, composition, maturation, and gross function, in order to understand growth, exercise, performance, and nutrition [1]. It is a scientific discipline that is concerned with the measurement of the subjects in a different of morphological views, its application to components of body build like body measurements, proportions, composition, shape and maturation; motor abilities and cardiorespiratory capacities; physical activity as well as sports performance [2]. Anthropometry uses non-invasive, affordable and portable devices to calculate skinfolds, weight, height and body circumferences and diameters. These devices are simple, easy to use, allowing quick measurements that can be performed in large sample size. This measurement requires well trained personnel, standardization of the measurement, as well as, the appropriate calibration of the instruments.

Screening and Assessment

Before enrolling any patient in a weight-loss therapy, the physician should have a concise idea of that individual's expectations. They should guide the obese patient who seeks weight loss therapy to develop the goals that fit the mnemonic SMART: Specific, Measurable, Attainable, Realistic, and Timely. Motivation regarding the changes in diet, exercise, and behavior required to maintain weight loss.

Methods

I.S.A.K.-International Society for the Advancement of Kinanthropometry [3] using prediction equations that is widely used and cross-validated.

Standardized Techniques should be

- Valid
- Calibration
- Reliable
- Measurement error
- Objectivity

The following parameters should be recorded

- Sitting height/standing height
- Shoulder width/hip width
- Thigh length/leg length
- Neck length/neck circumference

Procedure

The following skinfolds were measured: Triceps (T), Subscapular (Sb), Suprailiac (Sp), Abdominal (A), Thigh Calf (TC) and Medial Calf (MC). Anthropometric measurements were performed according to ISAK standards. The qualified person should be performed independently each measurement twice, considering valid values when standard deviation of each measurement was lower than 7%. The following sums were considered for fat content calculations: six skinfolds (SSS=T+Sb+Sp+A+TC+MC), upper body skinfolds (SUBS=T+Sb), trunk skinfolds (STS=Sp+A) and lower body skinfolds (SLBS=TC+MC) [4] (Figures 1 and 2).

Figure 1: OMRON scale and body composition analyzer.

Figure 2: Harpenden skinfold caliper.

Clinical Importance of Heath-Carter Anthropometric Somatotype

The somatotype describes a particular category of body build, determined on the basis of certain physical characteristics (Bailey et al.). Endomorph is an individual having the type of body build in which tissues derived from the endoderm predominate. Endomorphy in which measurements of three skinfold thicknesses (triceps, subscapular, suprailiac) are combined to indicate the amount of fat in

the body. It is corrected for height because the surface area-volume relationship changes with height. Ectomorph is an individual having a type of body build in which tissues derived with large surface area, thin muscles and subcutaneous tissue, and slightly developed digestive viscera, as contrasted with endomorph. Ectomorph in which measurements of height and mass are combined to provide an indication of "linearity". A cubic relationship (Ponderal Index) is used for the Heath-Carter Anthropometric Somatotype.

Mesomorph is an individual having a type of body build in which tissues derived from the mesoderm predominate. There is relative preponderance of muscle, bone, and connective tissue, usually with heavy, hard physique of rectangular outline. This somatotype is classified between the ectomorph and the endomorph. Mesomorphy in which measurements of bone diameters and muscle circumferences (corrected for skinfold thickness) are compared with the person's height to provide an indication of general musculoskeletal development. The three components of the Heath-Carter Anthropometric Somatotype are plotted in two dimensions on a cam-shaped "graph", called a somatochart. Plotting of the three somatotype components on a somatochart, and the normal adult variation is shown below (Figure 3).

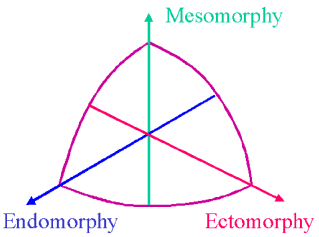

Figure 3: Graph showing three components of the heath-carter anthropometric somatotype.

The centre of the somatochart is "444" or"333" and represents the "unisex phantom", while the bottom left, endomorphy, corner, is "711", the top, mesomorphy, corner is "171", and the bottom right, ectomorphy, corner is "117". The typical adult male is "353" while the typical adult female is "543 (Bailey et al.) showed the following differences in somatotype.

Conclusion and Recommendation

Newer technology, like Dual-Energy X-Ray Absorptiometry (DXA), Magnetic Resonance (MR) and Computerized Tomography (CT) are more reliable than anthropometry. In addition to that, they are very expensive and only available to a few research centers. On the other hand, anthropometry has a strong tool in estimating body fat, in the field of sport researchers, medical staff, nutritionists and trainers.

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