PERCENTILE SCALES FOR ANALYSIS OF BODY COMPOSITION IN MALE YOUTH

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ABSTRACT

For the purpose of present study five thousand adult males were selected randomly as subjects for the study. The age of subjects were ranging from 18–25 years. On the basis of chronological age, subjects were divided into eight different age groups: 18 years (n=640), 19 years (n=960), 20 years (n=760), 21 years (n=560), 22 years (n=540), 23 years (n=520), 24 years (n=509) and 25 years (n=511). Following variables were selected for the purpose of present study: body fat percentage, fat mass and skinfold thicknesses (*chest*, *triceps*, *subscapular*, and sum of skinfolds). The scores for each variable were gathered for all the subjects separately and then pooled agewise. Percentile scales were constructed to prepare the standards for body composition. Percentile scales were prepared for different age groups for the college youth of Delhi State. The percentile scales provide a basis for interpreting an individual's score in terms of his standing in some specified group. However, percentile scale is not considered a standard scale as the mean and standard deviation are not used in constructing the scale and the scores are not distributed evenly.

Keywords: *body composition, body fat percentage, percentile scales, male youth*

INTRODUCTION

History points that the people who cared for their bodies and engaged in vigorous physical activities, remained strong and prosperous, whereas those neglected them, waned and perished [8]. The importance of good body composition in the achievements and maintenance of good health cannot be underestimated. Obesity has become a health hazard of epidemic proportion in most developed countries around the world. Obesity by itself has been

associated with several serious health problems and account for 15 to 20% of the annual US mortality rate. Obesity has long been recognized as a measure of risk factor for diseases of the cardiovascular system, including coronary heart disease, hypertension, congestive heart failure, elevated blood lipids, athero-sclerosis, strokes, varicose veins and intermittent claudication. The proper way of determining ideal body weight is through body composition, that is by finding out what percent of total body weight is fat and what amount is lean tissue. The importance of good body composition in the achievement and maintenance of good health cannot be underestimated [3].

It is important to assess both weight and percent body fat because they provide two related pieces of information about a person's body composition. Body weight is easy to measure and once someone has an understanding of a desirable body weight for his or her frame, weight can be used to monitor changes in body composition. The shortcoming of using only body weight is that the lean weight component, frame size and muscle development are not accurately considered. Two individuals of the same height, gender and age may weigh the same, but have different levels of lean mass and body fat [1].

In general body fatness negatively influences performances both mechanically and metabolically in most physical tasks that require translocation of body weight. Fat free weight on the other hand, tends to have a positive relation with physical performance. Body size and body composition are important factors determining one's performance ability. In general, body fat negatively influences athletic performances involving agility, speed, endurance, running and jumping. On the other hand, the fat free body mass is positively associated with and may be required for athletic activities in which force must be applied such as lifting, pushing, throwing and blocking [2].

Scientists usually divide the body into four components- water, bone tissue, protein tissue and fat tissue. Body composition may be condensed in two components – body fat and lean body mass. Body fat is the total amount of fat in the body. Lean body mass primarily consists of the muscles and bones and other body organs such as the heart, liver and kidneys. Body composition may be influenced by a number of factors such as age, sex, diet and exercise. Age effects are significant during development years. Diet can affect body composition over a short period such as in the acute water restriction and starvation but its main effects are seen over long periods [7].

Skinfolds are practical values of body composition or relative fatness/leanness, which provide a more accurate estimate of body fatness than simple weight, height and various ratios of these two measurements [4]. Skinfolds measurements are highly correlated with underwater determined body density. Multiple regression models have been used to develop generalized skinfold

equations for men [1]. Abdominal skinfolds in men and thigh skinfolds in women are difficult for some technician to measure [2]. Hence in the present study generalized equation developed by Jackson & Pollock [1] using sum of three skinfolds (*chest*, *triceps* and *subscapular*) was adopted. For any evaluation procedure where the performances can be obtained in terms of numerical scores, it is necessary that a standard scale be available to interpret such scores without which the scores may not convey much meaning [5]. The objective of this study was to establish and compare the body composition standards of college youth of Delhi State on the basis of their age.

MATERIALS AND METHODS

For the purpose of present study five thousand adult males of Delhi State, India were selected randomly as the subjects for the study. The age of the subjects were ranging from 18–25 years. Subjects were from various colleges of Delhi State. On the basis of chronological age, subjects were divided into eight different age groups namely: above 18 years (n=640), 19 years (n=960), 20 years (n=760), 21 years (n=560), 22 years (n=540), 23 years (n=520), 24 years (n=509) and 25 years (n=511). Following variables were selected for the purpose of present study: body density, body fat percentage, lean body mass, fat mass and skinfold thicknesses (*chest, triceps, subscapular*, and sum of skinfolds). The scores for each variable were gathered for all the subjects separately and then pooled age wise. Percentile scales were constructed to prepare the standards for body composition. For the purpose of analysis of data, Microsoft Excel 2000 was used to prepare the percentile scales.

RESULTS

The data was analysed and standards of body composition were prepared and presented in the form of percentile scales. The result shows that the lowest body fat percent was found in 18 years age group while the highest percent of body fat was found in 25 years of age group. Similarly, the fat mass was also found to be lowest in 18 years of age group as compared to 25 years of age group.

　　Table 1 show that lowest value of body fat percentage is at 100th percentile, while the highest value of body fat percentage is at zero percentile for different age groups. Table 2 shows that the lowest value of fat mass is at 100th percentile, while the highest value of fat mass is at zero percentile for different age groups. Table 3 shows that the highest value of lean body mass is at 100th percentile, while the lowest value of lean body mass is at zero percentile for different age

groups. Table 4 shows that lowest value of chest skinfold is at 100th percentile, while the highest value of chest skinfold is at zero percentile for different age groups. Table 5 shows that lowest value of triceps skinfold is at 100th percentile, while the highest value of triceps skinfold is at zero percentile for different age groups. Table 6 shows that lowest value of subscapular skinfold is at 100th percentile, while the highest value of subscapular skinfold is at zero percentile for different age groups. Table 7 shows that lowest value of sum of skinfold is at 100th percentile, while the highest value of sum of skinfold is at zero percentile for different age groups. Table 8 shows range body fat is relation to age.

Table 1. Percentile scale for body fat percentage in relation to age

Per-centile	Body fat percent							
	18 years	19 years	20 years	21 years	22 years	23 years	24 years	25 years
100	2	6	5	7	7	7	8	9
90	7	9	9	9	10	10	11	12
80	9	10	10	11	11	12	12	13
70	10	10	11	12	12	13	13	14
60	10	11	12	12	13	13	14	15
50	11	12	12	13	14	14	14	16
40	12	12	13	14	14	15	15	16
30	13	13	14	15	15	16	16	17
20	14	15	16	16	17	17	18	19
10	17	18	18	19	20	20	20	21
0	23	30	26	26	26	27	27	27

Table 2. Percentile scale for fat mass in relation to age

Per-centile	Body fat percent							
	18 years	19 years	20 years	21 years	22 years	23 years	24 years	25 years
100	1	3	3	3	3	5	4	4
90	4	5	5	6	6	6	6	7
80	5	6	6	6	7	7	7	8
70	6	6	7	7	7	8	8	8
60	6	7	7	8	8	8	8	9
50	7	7	8	8	9	9	9	9
40	7	8	8	9	9	9	10	10
30	8	9	9	10	10	10	10	11
20	9	10	10	11	11	11	11	12
10	11	13	13	13	14	14	14	15
0	18	18	21	21	21	22	23	23

Table 3. Percentile scale for lean body mass in relation to age

Per-centile	Body fat percent							
	18 years	19 years	20 years	21 years	22 years	23 years	24 years	25 years
100	68.2	75	70.1	67.7	66.7	71.7	71.2	70.2
90	60.3	61.6	62.2	61.9	61.1	60.9	61.1	60.3
80	58.7	58.5	60.5	60.3	59.1	59	59.2	58.3
70	57.2	57.5	58.1	57.6	57.1	56.6	56.4	55.8
60	55.4	56.4	57.5	57	56.2	55.7	55.5	55.1
50	54	54.8	56.1	55.9	55.2	54.4	54.2	53.8
40	53.3	54.2	54.1	54.1	53.7	52.8	52.6	51.9
30	52.7	53.4	52.6	52.7	52.4	51.5	51.3	50.7
20	51.3	52.4	50.7	51.3	51.2	49.5	49	48.7
10	49.8	50.1	49.3	49	48.9	46	46	45.5
0	44.4	39.6	42.6	43	35.2	41.6	35.1	34.6

Table 4. Percentile scale for chest skinfold in relation to age

Per-centile	Body fat percent							
	18 years	19 years	20 years	21 years	22 years	23 years	24 years	25 years
100	2.2	4.2	4.8	5.2	5.8	6.2	6.2	6.6
90	5	6.4	6.8	7	7.4	7.4	7.4	8.2
80	6.2	7	7.8	8	8.2	8.4	8.6	9.4
70	6.8	7.4	8.2	8.6	8.6	9	9.2	10
60	7.4	7.8	8.8	9	9.2	9.6	9.8	10.6
50	8	8.4	9.2	9.6	9.8	10	10	11
40	8.6	9	9.6	10	10.6	10.8	11	11.8
30	9.4	9.8	10	11	11.4	11.6	12	12.6
20	10.2	10.8	11	12	12.4	12.4	13	13.4
10	12.6	14	14	14	15.8	15.4	16	16.2
0	23.4	24.4	26	26	25.8	26.8	27	27.4

Table 5. Percentile scale for triceps skinfold in relation to age

Per-centile	Body fat percent							
	18 years	19 years	20 years	21 years	22 years	23 years	24 years	25 years
100	3	3.2	4	4.4	5.6	5.2	5.4	6.2
90	6.8	8	8	8.2	8.6	9	9.2	9.8
80	8	8.6	9	9.2	9.6	10	10	11
70	8.8	9.2	9.8	10	10.4	10.8	11	11.8
60	9.4	10	10.6	11	11.2	11.6	12	12.6
50	10.2	10.8	11.4	12	12.2	12.4	13	13.4
40	11	11.6	12.2	12	12.8	13.2	13	14.2
30	11.8	12.8	13	13	13.8	14	14	15
20	13.2	14.4	14.4	15	15.4	15.6	16	16.6
10	15.4	16.8	17	17	18	18.2	18	19.2
0	22.6	24	24.2	25	24.8	25.4	26	26.4

Table 6. Percentile scale for sub scapular skin fold in relation to age

Per-centile	Body fat percent							
	18 years	19 years	20 years	21 years	22 years	23 years	24 years	25 years
100	1.8	3.4	4	5.6	6	5.8	5.8	7
90	8.8	8.8	8.6	8.8	9.2	9.6	9.6	10.8
80	10	9.6	9.8	10	11	11	11	11.8
70	10.6	10.6	10.8	11	12	12	12	12.8
60	11.4	11.2	11.6	12	13	13	13	13.8
50	12	12	12.4	13	13	14	14	14.6
40	12.8	12.8	13.2	14	14	15	14	15.4
30	13.6	13.6	14.4	15	15	16	16	16.4
20	14.8	15	15.8	16	16	17	17	17.8
10	16.4	17.4	17.8	18	18	19	19	20.2
0	23	24	27	24	24	25	26	26.4

Table 7. Percentile scale for sum of three skin fold in relation to age

Per-centile	Body fat percent							
	18 years	19 years	20 years	21 years	22 years	23 years	24 years	25 years
100	10.4	17.4	16.6	19	20.4	20.4	21	23.4
90	21	24.2	24.8	24.8	25.8	27	27	30
80	24.6	26.2	27.2	28.4	29	30.4	30	33
70	26.6	27.4	29.2	30.8	31.4	32.8	33	35.4
60	28.6	29.2	30.8	32.4	33.2	34.6	35	37.2
50	30.4	31	33	34.2	35.4	36.2	37	39.2
40	32.2	33	35	36.4	37.2	38.4	39	41.2
30	34.2	35.6	37	38.2	39.8	40.6	41	43.6
20	37.8	39.8	40.8	42	44	44.6	45	47.6
10	44.4	47.2	48.4	49.8	51.6	51.8	53	55.6
0	65.2	69.4	77.2	73.4	72.4	76	77	77.6

Table 8. Range of selected body composition components for college youth

Age in years	Body fat Percent	Fat mass
18	7.8–15.5	4.4–10
19	8.7–16	5–11
20	9.4–16.7	5.3–11.7
21	9.9–17.1	5.7–12
22	10.3–18	5.9–12.5
23	11–18.2	6.2–12.6
24	11.2–18.5	6.25–13
25	12.4–19.4	7–13.6

Note: The range for body composition components is ±SD from reported mean value

DISCUSSION

Percentile scales were prepared for different age groups for the college youth of Delhi State. The percentile scales provide a basis for interpreting an individual's score in terms of his standing in some specified group. However, percentile scale is not considered a standard scale as the mean and standard deviation are not used in constructing the scale and the scores are not distributed evenly.

Body composition may be influenced by a number of factors such as age, sex, diet, and exercise [7]. It was evident from the scales that various age groups considered in this study showed significant differences on body composition

components. The difference existed may be due to combination of various factors. Vaccaro et al. [6] in their paper stated that aging is often associated with a gain in weight, an accumulation of body fat, a loss of lean tissue, demineralization of bone and decrement in aerobic power.

Increase in body fat percent showed a positive trend that lowest body fat percent as in 18 years age group, while the highest body fat percent was in 25 years age group. Increase in the body fat percent may be attributed to the improved living conditions of the subjects, which was clearly reflected in the increase in family income of the subject as the age increases. In the beginning of college years, physical activity level is higher but it tends to decrease a little with advancement of the age. Further this positive trend in body fat percent might be due the fact that in the early years of college life youths were generally inclined towards development of good physique but with maturity and in search for employment and career, they find little time for activity. This was also proved by the analysis of few motor fitness components.

Body fatness negatively influences performances both mechanically and metabolically in most physical tasks. Fat free weight on the other hand tends to have positive relation with physical performance. Body fat negatively influences performance involving agility, speed, endurance and jumping [2]. Further decreased lean body mass might be due to the decreased physical activity level and increased fat mass along with decreased performance in two motor fitness variables.

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