

Profiles of Subcutaneous Fat in Baseball Players

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Abstract

This study was conducted to describe the profiles of elite baseball players by examining subcutaneous fat and provide the information which may be useful as a point of reference for training. Eight thicknesses of subcutaneous fat determined via ultrasonic method of the groups of pitchers (n=15), fielders (n=14), and non-athletic students (n=14) revealed that the highest values were observed in the pitchers for all sites measured, while almost the same thicknesses were observed between the fielders and the non-athletic students. With regard to the anatomical distribution of subcutaneous fat, the pattern of the pitchers tended to indicate the possibility of more fat stores in upper extremity and abdominal sites than those in lower extremity sites compared to the other two groups. From the fact that abdominal site had the greatest variability among eight sites measured, the relationship between body weight and the thickness on abdominal site was investigated. In the elite baseball players, the increase in body weight was accompanied by the increase in the subcutaneous fat on abdominal site. As a reference point for training, two points were recommended; 1) the increase in lean body mass should be planned in the training program for baseball pitchers, setting body fat aside, 2) body weight should be examined to understand the degree of aerobic training on baseball players.

Key Word: baseball, subcutaneous fat, ultrasonic method

Introduction

Recent advances in sports science have led to a great deal of interest in investigating the profiles of elite athletes in their respective sports. Of physiological profiles, body composition of elite athletes has been well documented^{4,8,10}, because this profile provides insights in developing the training program that should be emphasized for high performances. With respect to body composition of elite baseball players, Coleman¹⁾ and Gurry et al.⁵⁾ measured the skinfold thicknesses on major league baseball players. From these studies, it seems to be concluded that elite baseball players indicate almost the same relative body fat as non-athletic population. The game of baseball is, however, considered to require each player to possess not only fine motor skills involved in the game but also certain physiological profiles in conjunction with these skills. Furthermore, the effect of physical training on physique is reported to be more remarkable in the change of body fat than that of body weight⁹⁾. Therefore, it appears appropriate to describe the profiles of elite baseball players by examining subcutaneous fat and provide the information which may be useful as a point of reference for training.

Procedures

Twenty nine elite baseball players and 14 non-athletic male college students volunteered as subjects for this study. Baseball players, who were all engaged in a Japanese professional baseball team, were grouped as pitchers (n=15) and fielders (n=14). Mean values of age, body height, and body weight for each subject group are given in Table 1. Measurements for baseball players were taken immediately after the competitive season.

Eight subcutaneous fats were measured on each subject as follows: 1) forearm anterior, on the front of forearm at the 30% distal point from the olecranon; 2) upper arm anterior, on the front of upper arm at the 60% distal point from the acromion; 3) upper arm posterior, on the back of upper arm at the corresponding point with upper arm anterior; 4) subscapular, just beneath the inferior angle of the scapular; 5) abdominal, in horizontal line with the umbilicus 1 cm to the right; 6) thigh anterior, on the front of thigh at the 50% distal point from the greater trochanter; 7) thigh posterior, on the back of thigh at the corresponding point with thigh anterior; 8) leg posterior, on the back of leg at the 30% distal point from the articulation of the knee. All subcutaneous fats were measured on the right side of each standing subject by using an ultrasonic apparatus (ECHO CAMERA 210 D-11, ALOKA Co.). The thickness of subcutaneous fat was defined as the length from cutis to the boundary line between subcutaneous fat and musculo-fascia on the ultrasonic image pictured by B mode method.

Ordinary statistical values, including means, standard errors, and coefficients of correlation, were calculated. Difference between values in any two of the three groups were tested for significance by the paired t test. The level of significance was accepted as below 0.05.

Table 1. Physical Characteristics and the Thickness of Subcutaneous Fat

		Age (yr)	Height (cm)	Weight (kg)
Pitchers	(n=15)	21.3 ± 0.6	181.4 ± 1.0	80.3 ± 1.8
Fielders	(n=14)	22.6 ± 0.8	177.3 ± 0.8	76.4 ± 1.6
Non-Athletes	(n=14)	20.3 ± 0.3	171.3 ± 1.8	62.8 ± 1.9
		forearm a.*	upper arm a.	upper arm p.*
				subscap.
				(mm)
P	4.5 ± 0.3	3.7 ± 0.1	6.1 ± 0.5	7.9 ± 0.5
F	3.7 ± 0.2	3.2 ± 0.1	4.5 ± 0.3	7.0 ± 0.7
N	3.6 ± 0.2	3.3 ± 0.1	4.8 ± 0.3	7.7 ± 0.4
		abdominal	thigh a.	thigh p.
				leg p.
				(mm)
P	13.8 ± 2.1	5.9 ± 0.4	5.9 ± 0.5	4.7 ± 0.4
F	8.6 ± 1.3	5.6 ± 0.3	5.3 ± 0.3	4.6 ± 0.3
N	10.4 ± 1.6	4.9 ± 0.2	4.6 ± 0.1	4.5 ± 0.3

mean ± S.E.

* ; Symbols of a. and p. indicate anterior and posterior, respectively.

] ; significant difference between two groups

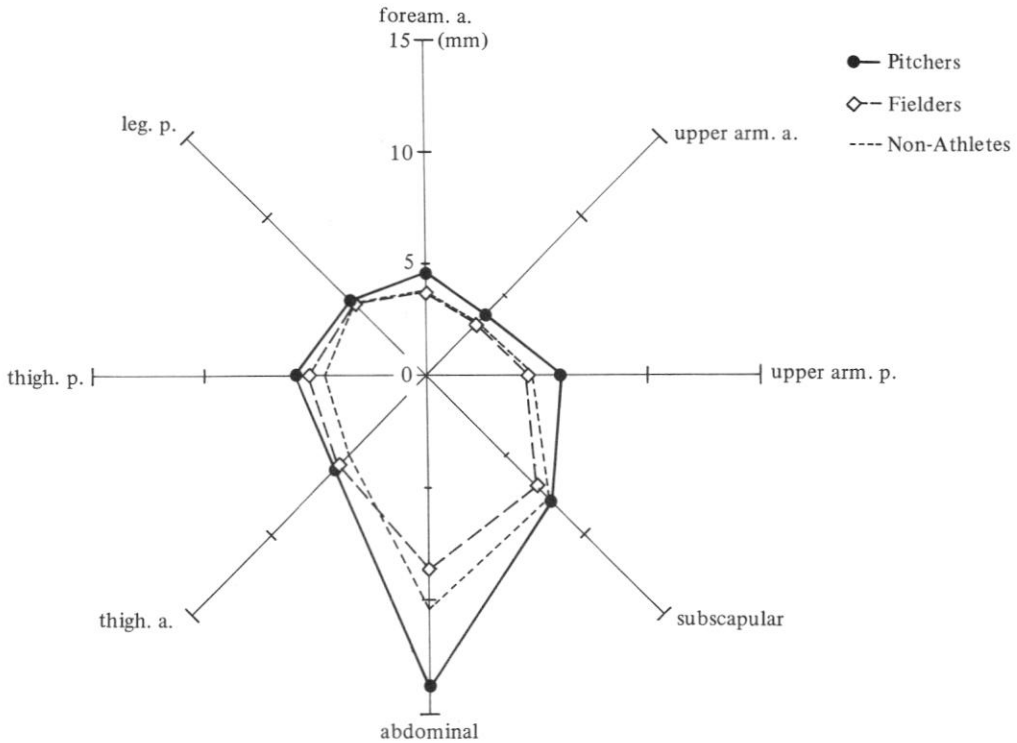


Fig. 1. Anatomical distribution of subcutaneous fat. Each point indicates the mean value for the measures.

Results

Eight thicknesses of subcutaneous fat determined via ultrasonic method of the groups of pitchers, fielders, and non-athletic students are presented in Table 1. In order to understand the anatomical distribution of subcutaneous fat better, the mean values for the measures on each group are illustrated in Figure 1.

Comparison of the thicknesses of subcutaneous fat among the three groups revealed that the highest values were observed in the pitchers for all sites measured. The pitchers indicated significant higher values than the fielders in 4 out of 8 sites (forearm anterior, upper arm anterior, upper arm posterior, and abdominal) and the non-athletic students in 5 sites (forearm anterior, upper arm anterior, upper arm posterior, thigh anterior, and thigh posterior), respectively. Except for thigh posterior, there were no significant differences in the thicknesses of subcutaneous fat between the fielders and the non-athletic students. With regard to the anatomical distribution of subcutaneous fat, the pattern of pitchers tended to indicate the possibility of more fat stores in upper extremity and abdominal sites than those in lower extremity sites compared to the other two groups, although considerably similar pattern was observed in all groups.

Whereas, among eight sites of subcutaneous fat measured, abdominal site had the greatest

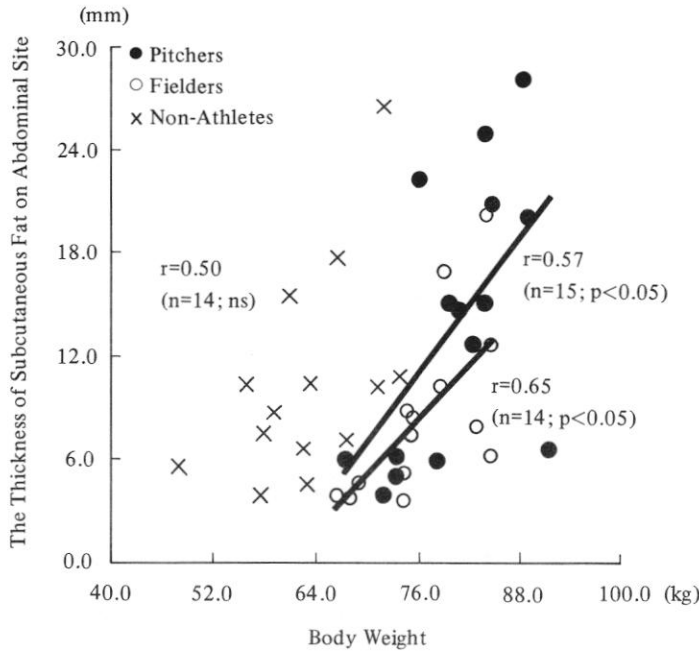


Fig. 2. Relationship between body weight and the thickness of subcutaneous fat on abdominal site.

variability in all groups. Especially, it was remarkable in the pitchers. The relationship between body weight and the thickness of subcutaneous fat on abdominal site is shown in Figure 2. In the pitchers and the fielders, significant correlations between these two variables were obtained. That is, in the baseball players participated in this study, the increase in body weight was accompanied by the increase in the thickness of subcutaneous fat on abdominal site.

Discussion

The results on the thicknesses of subcutaneous fat in this study suggested that the pitchers indicated higher relative body fat than the fielders. A similar finding was noted by Coleman¹⁾ in the study of major league baseball players by position, who found higher relative body fat in the pitchers and considered about the reason of his finding that fat weight, while not desirable in any position, was less detrimental to performance in pitching than in other positions. According to Fahey et al.³⁾, in the athletes such as shot-putter, discus thrower, and foot ball linemen, relative body fat was observed to be somewhat higher than the average individual. They argued that because a large lean body mass was of considerable advantage in these sports, body fat was not a serious matter for success in performance so far as speed in the movement of the body could be maintained. The same characteristics in performance between these athletes and baseball pitchers is considered that anaerobic power exerted by muscles contributes greatly to elite performances. However, body weight is not of primary importance for baseball pitchers because of no contact with the opponent. Therefore, it may be recommended that while there is an acceptable range of body fat for good health status, the increase

in lean body mass should be planned in the training program, setting body fat aside.

On the other hand, except for thigh posterior, there were no significant differences in the thicknesses of subcutaneous fat between the fielders and the non-athletic students. As the mean body weight in the fielders was observed higher than that in the non-athletic students, it was predicted that the fielders indicated lower relative body fat than the non-athletic students. It has been generally believed that there is a negative correlation between relative body fat and the velocity in sprint running^{2,11}). Considering that the fielders had more opportunities of running such as fielding and base running than the pitchers, the lower relative body fat was considered to be desirable for the fielders.

Although considerably similar pattern was observed in the anatomical distribution of subcutaneous fat in all groups, the pattern of pitchers tended to indicate the possibility of more fat stores in upper extremity and abdominal sites than those in lower extremity sites compared to the other two groups. This result appeared to be contrary to the study of Malina et al.⁷) who asserted that the anatomical distribution of fat might be more dependent on biological or environmental factors unrelated to sport and training than fatness, i.e., the sum of suitable loaded skinfolds. This disagreement is considered to be due to the difference in definition of anatomical distribution of fat. As the pitchers indicated higher values in the thickness of subcutaneous fat on both upper extremity and abdominal sites, similar result may be obtained if the definition of them in which anatomical distribution of fat was determined as an extremity/trunk ratio was adopted. Ishida et al.⁶), measuring the subcutaneous fat on female distance runners, suggested that effect of physical training on the decrease in subcutaneous fat was observed more noticeable in the trunk than in the extremities. The thickness of subcutaneous fat on abdominal site may be one index to understand the degree of aerobic training on the athletes. If so, the game and/or training of baseball may not have the aerobic stress on the pitchers adequately to decrease in body fat.

As seen in Figure 2, there was a positive correlation between body weight and the thickness of subcutaneous fat on abdominal site in the baseball players. The baseball players with relatively low range of body weight, even pitchers with lower weight, appeared to indicate lower value of the thickness of subcutaneous fat on abdominal site than the non-athletic students in the same range of body weight. The body weight, however, should be taken into account as an easy item for the measure which reflects the thickness of subcutaneous fat on the abdominal site for baseball players.

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