

\*

(84)

$$80.88 - 24.35 : ( \quad )$$

$$: ( \quad ) : ( \quad )$$

(Jackson and Pollock, 1978)

(38.71 59.85 81.64 18.60 30.42 38.4) :

$$^2 / 23.66 / 1.06 64.52 \%13.5) :$$

(0.79)  $(R^2)$  (Stepwise Regression) (0.77)  $(R^2)$  2.04

$$: \times (1.590-) + [( \quad ) \times (0.584)] + [( \quad ) \times (0.490)] + (34.949-) =$$

$$.[( \quad ) \times (0.294)] + [( \quad )$$

(0.755 =  $(R^2)$ )

$$+ [( \quad ) \times (0.606-)] + [( \quad ) \times (0.851)] + (25.754) = (LBM)$$

$$.[( \quad ) \times (1.942)] + [( \quad ) \times (0.686-)]$$

(0.786 =  $(R^2)$ )

(Anthropometric

-1

Parameters)

(Anthropometry)

(Heimer et al., 1988)

(Harre, 1982: 26, 29)

(Beyer, 1986:59)

:

.(1996 )

(Ravussin and Swinburn, 1992)

(MCW, 2003)

(Klark and Klark, 1987)

.2004/9/23

2003/10/22

(De Lorenzo et al., 2000)

\*

(Fox and Bowers, 1992) (VO<sub>2</sub>max)  
 (Buskirk, 1986)  
 (Heyward, 1991) (Body Composition)

) :

) (2003 ) (1999 ) (1998 )  
 (Puhl et al., 1982) (Bosco et al., 1982) (2004 )  
 (Sandra and Victor, 1988) (Tamayo et al., 1984) (Harre, 1982: 29)  
 (Smith et (McGown et al., 1990) (Heimer et al., 1988 )  
 (Melhim et al., 1993) al., 1992)

(BMI)

$^2 / (24.08-21.82)$   
 (Ravussin and Swinburn, 1992)

(19.61)  
 (24.08) (Sandra and Victor, 1988)  $2 /$   
 (Smith et al.,  $^2 /$   
 .1992)

(Body Surface (BSA)

Area) .(1998 ) (1.97) 1996  
 (1994 )

:

(Collins)

(Hey, 1978)

(1919)

(BSA) (Dibos and Dibos) (Fox et al., 1989)  
 :

$\times 0.425( ) \times (0.007184) =^2$  (BSA) (88.58) 1996  
 (DeLorenzo et al., 1999)  $0.725( )$  .(1998 )  
 (Body Mass (BMI) (Body Composition) Index)

:

$^2 / (25-20)$   
 $(^2 / 30)$   
 (Ravussin snd Swinburn, 1992)

(Behnke) ( )

(Lean Body Mass (LBM) (Fat) (%50-40)  
 (Wilmore and Costill, 1994:382) (1984)  
 (LBM) (Brooks and Fahey, 1984: 539) (%40)  
 (%10-5)

(1)

$( ) \times (1.48) + 4.88 = \%$ $(($	49-20	(Eston et al.,1995)	(Eston et al.,1995)
$) \times (0.0008267) - (1.10938) =$ $\times (0.0000016) + ((( )$ $-((( )$ $(( ) \times (0.0002574))$		(Jackson and Pollock,1978)	(Ted and Jaskson, 1987: 249)
$) \times (1.0817) + (44.636) = ( )$ LBM $(( ( ) \times (0.7396)) - ((( ( )$		Kirkendall et al.,1987)	(Kirkendall et al.,1987: 185)
$) \times (0.001327) - (1.1043) =$ $) \times (0.00131) - ((( ( )$ $(( ( )$	26-18	(Sloan,1967)	(Heyward,1991:155)
$) \times (0.00162) - (1.10647) =$ $) \times (0.00144) - ((( ( )$ $) \times (0.00077) - ((( ( )$ $\times (0.00071) + ((( ( )$ $(( ( )$		(Forsyth and Sinning,1973)	(Heyward,1991:156)
$) \times (0.00068) + (1.15114) =$ $+((( ( ) \times (0.00146)) + ((( ( )$ $-((( ( ) \times (0.00057)) + ((($ $\times (0.00124) - ((( ( ) \times (0.00192))$ $(( ( )$		(Behnke and Wilmore,1974)	(Heyward,1991: 168)
$) \times (0.00133) - (1.1043) =$ $) \times (0.00131) - ((( ( )$ $(( ( )$		(Sloan and Weir,1970)	(Fox et al.,1989:568)
$) \times (0.793) + (10.26) = ( )$ LBM $(( ( ) \times (0.368)) - ((( ( )$	35-17	(Wimore and Behnke,1970)	(Fox et al.,1989: 569)
$-((( ( ) \times (0.84)) + (6.14) = ( )$ LBM $(( ( ) \times (0.63))$	67-36	(Lewis et al., 1975)	(Fox et al.,1989: 569)
$\frac{( )}{2(( ) )} = 2 / ($ BMI)		-	(Ravussin and Swinburn, 1992)

(Body : Composition) ( )  
(Body Build) ( )  
( ) (Wilmore and Costill, 1994: 382)

(Sandra and (Tamayo et al., 1984) (Puhl et al., 1982) . (Body Size)  
 (McGown et al., (Heimer et al., 1988) Victor, 1988)  
 (Melhim et al., 1993) (Smith et al., 1992) 1990) (Behnke)

(%12-6.3)

(Smith et al., 1992) (%6.3)

(%12)

(Hydrostatic Weighing)

(LBM)

(Puhl et al., 1982)

(Bio-

(Fox et al., 1989:565)

(76.5-63.9)

(Wilmore and Costill, Electrical Impedance Analysis)

(Melhim et al., (63.9)

1994:387)

1982)

.(Heyward, 1991:153)

(Puhl et al., 1982) (76.5)

(Puhl et al., 1982)

. / (1.07)

(Huygens et al.,

(Kanehisa et al., 1998) (Lilia et al., 2001) 2002)

(De Lorenzo et al., (Eston et al., 1995) (Anders, 1998)

1998)

- - .1

(Eston et al., 1995)

) :

(47)

:

(34.9)

(

)

(

)

(

.(0.32\*0.13 0.53 0.31) :

.2

(Body Density) (BD)

: (Siri)

(100) x(4.50- /4.95)=(%)

.(Fox et al., 1989: 566)

(LBM)

(Volleyball)

.(McArdle, Katch and Katch, 1981:493)

(

)

(170)

(Ferretti,

(150)

1990: 132)

(1)

(Bosco et al., 1982) :

(2)

(84 = )

3.52	24.35		
0.066	1.84		
8.62	80.88		

(Huygens et al., 2002) :

:

(Lilia et al., 2001) (Kanehisa et al.,1998)

.1 (De Lorenzo et al., (Eston et al., 1995) (Anders,1998) 1998)

.2

:(Anthropometry) -

.(Beyer,1986: 59)

(Buskirk, 1986)

:(Body Composition) : -

:

(Fat)

(Lean Body Mass) (LBM)

.(Jackson and Pollock,1978)

:(BMI) Body Mass Index : -

.(Ravussin and Swinburn, 1992)

:(Body Surface Area) (BSA) -

.(1994 )

:

.1 :

.1

2003/7/18

.2

( 1) ( 500) (14)

2003/7/18 .2

: -3 .3

1 -2

(Body Composition) -5

(Lafayette Company, Indiana) (1978)

: (SPSS)

)x(0.0008267)]-(1.10938) = 2003/7/18

) x (0.0000016)]+[( )

x (0.0002574)]-[( ) (14)

.(Ted and Jaskson, 1987: 249)[( ) (168)

(Siri)

:

(100) x(4.50- /4.95)=(%) (84)

.(Fox et al., 1989: 566) (6)

(LBM) (Gay, 1982: 96) (Systematic Sample)

(11 9 7 5 3 1)

( ) (LBM) (2) (%50)

(Compute)

.(SPSS)

.<sup>2</sup> (BSA) -6

:

-1

: (Dibos and Dibos) ) :

x <sup>0.425</sup> ( ) x (0.007184)=2 (BSA)

.(DeLorenzo et al., 1999) <sup>0.725</sup>( )

(Compute)

.(SPSS) (Seca) ( -2

(3)

(84 = )

3.52	24.35		
0.066	1.84		
8.62	80.88		
5.05	11.25		
6.07	15.57		
7.83	15.46		
6.45	13.50	%	
6.77	16.35		
8.02	64.52		
0.014	1.06	/	
1.72	23.66	2 /	
0.13	2.04	2	
2.50	38.14		
4.58	30.42		
1.29	18.60		
8.11	81.64		
5.69	59.85		
6.28	38.71		

( :2 / (BMI) -7

:

( ) = <sup>2</sup> / (BMI)  
 -10 (Ravussin and Swinburn, <sup>2</sup>(( ) ) .1992)

-11 -8  
 (Ratio Scale)

(Compute) (SPSS) (Kirkendall et al., 1987)

-9

(SPSS)

:

) :

(4)

( )	(%)	
**0.49-	**0.41	
**0.57	0.18	
**0.77	**0.63	
**0.55	**0.59	
*0.44	**0.44	
**0.52	**0.35	
*0.23	**0.79	
**0.45	**0.57	
**0.50	**0.45	
*0.21	**0.74	
**0.75	**0.50	

.(82) (0.25) ( ) (0.01 =  $\alpha$ ) \*\*

.(82) (0.22) ( ) (0.05 =  $\alpha$ ) \*

(5)

*	( )				
*0.0001	60.73	652.43 10.74	4 79 83	2609.75 848.63 3458.38	
				<b>0.755</b>	(R <sup>2</sup> )

.(0.0001 =  $\alpha$ ) \*

(t-test) ( ) .4 .1

-3 (Pearson Correlation Coefficient) .2

: (R<sup>2</sup>) (Stepwise Regression) .3

(R<sup>2</sup>) (5) (0.755) (3)

(5) (3)

(R<sup>2</sup>) (0.755) ( 80.88 1.84 24.35)

(6) ( ) 81.64 18.60 30.42 38.14) :

(6) (38.71 59.85

( ) 64.52 %13.5) :

(0.0001 = α) (2 2.04 2 / 23.66 / 1.06

:

+ [( )×(0.490)]+(34.949-)= :

( ) × (1.590-) + [( ) ×(0.584)]

.[( )× (0.294)] +[(

:

(Pearson Correlation Coefficient)

)

:

(Stepwise Regression)

(4)

(

(7) (0.786) (R<sup>2</sup>) (0.79) (LBM)

(7)

(0.77)

(R<sup>2</sup>) (0.786) (Stepwise Regression)

(8) ( )

(8) :

( ) (0.0001 = α) ) -

:

+ (25.754) = (LBM)

( ) × (0.606-) +[( )×(0.851)] (

× (1.942)]+[( ) × (0.686-)]+[(

.[( )

(6)

( )

	( )	Beta			
*0.0001	6.18-		5.64	34.949-	(Intercept)
*0.0001	5.98	0.616	0.082	0.490	
*0.0001	5.06	0.31	0.115	0.584	
*0.0001	4.09-	0.32	0.389	1.590-	
*0.0001	3.75	0.39	0.076	0.294	

.(0.0001 =  $\alpha$ )

\*

(7)

	( )				
*0.0001	72.34	71050.287	4	4201.150	
		14.517	79	1146.850	
			83	5348	
				<b>0.786</b>	(R <sup>2</sup> )

.(0.0001 =  $\alpha$ )

\*

(8)

( )

	( )	Beta			
*0.0001	3.92		6.56	25.754	(Intercept)
*0.0001	9.34	0.91	0.091	0.851	
*0.0001	6.37	0.61-	0.95	0.606-	
*0.0001	5.11	0.301-	0.13	0.686-	
*0.0001	4.29	0.314	0.45	1.942	

.(0.0001 =  $\alpha$ )

\*

-15) (%13-5) (%5) -4  
 (%25  
 .(%25)

(Melhim et al., :  
 (McGown et al., 1990) (Smith et al., 1992) 1993) (84)  
 (Toriola et al., (Tamayo et al., 1984) (Puhl et al., 1982) (24.35)  
 (Ongley, 1981) (Sandra and Victor, 1988) 1987) (80.88) (1.84)  
 -6.3)  
 .(%12 (SPSS)  
 (LBM)  
 (64.52) :  
 (63.9) (Melhim, et al., 1993)

(Puhl :  
 (Ongley, 1981) (Toriola et al., 1987) et al., 1982) : (3)  
 . (76.5-65.4)  
 ) (1.84)  
 ( (1999 ) (1.81)

.(Smith et al., 1992) :  
 (1.06) ) (2004 ) (2003 )  
 (Puhl et al., / (Ayed et al., (Heimer et al., 1988) (1998  
 . / (1.07) 1982) (McGown et al., 1990) (Smith et al., 1992) 1993)  
 (<sup>2</sup> / ) (BMI) (Sandra and (Tamayo et al., 1984) (Puhl et al., 1982)  
<sup>2</sup> / (23.66) (Bosco et al., 1982) Victor, 1988)  
 (Ravussin . (1.97-1.85)  
 and Swinburn, 1992) (80.88)

(25-20) :  
 .<sup>2</sup> / (30) <sup>2</sup> / (Melhim (1999 ) (2004 )  
 (2004 ) : et al., 1993)  
 ) (Melhim et al., 1993) (1998 ) (78-76)

(Heimer et al., (1998 ) (2003 ) (2003 ) :  
 (McGown et al., 1990) (Smith et al., 1992) 1988) (Smith et al., (Heimer et al., 1988) (1998  
 (Sandra and (Tamayo et al., 1984) (Puhl et al., 1982) (Puhl et al., 1982) (McGown et al., 1990) 1992)  
 (Bosco et al., 1982) Victor, 1988) (Sandra and Victor, 1988) (Tamayo et al., 1984)  
<sup>2</sup> / (BMI) (Bosco et al., 1982)  
<sup>2</sup> / (24.08-21.82) . (89.6-81.89)

(%13.50)

( ) (Wilmore, 1986:144)  
 (Ravussin and Swinburn, 1992)

(%75.5) (

:

(%2.8) (%5.8) (%62.5)

.(%4.4) (BSA) <sup>2</sup> (2.02)

) (0.786) (2003)

(%78.6) ( <sup>2</sup> (2.33)

)

(%21.6) (%45.1) : (38.71 59.85 81.64

. (% 5.1) (%6.8) (Eston et al., 1995)

:

. (36.5 52.4 76.9 27.6)

(Ted (Eston et al., 1995) :

(Heyward, (Kirkendall et al., 1987) and Jaskson, 1987) :

(Huygens et al., 2002) (Fox et al., 1989) 1991)

(Kanehisa et al., 1998)

.

(4)

(%62.5) (0.79)

(Williams, 1995) (LBM)

.

.(0.77)

(%45.1) (Stepwise

(%25) (Regression)

(%40)

.(Wilmore and Costill, 1994:406)

:

+[( )×(0.490)]+(34.949-) =

) × (1.590-)]+[( ) × (0.584)]

.[( )× (0.294)] +[(

×(0.851)]+(25.754)= (LBM)

+ [( ) × (0.606-)] + [( )

: )× (1.942)]+[( ) × (0.686-)]

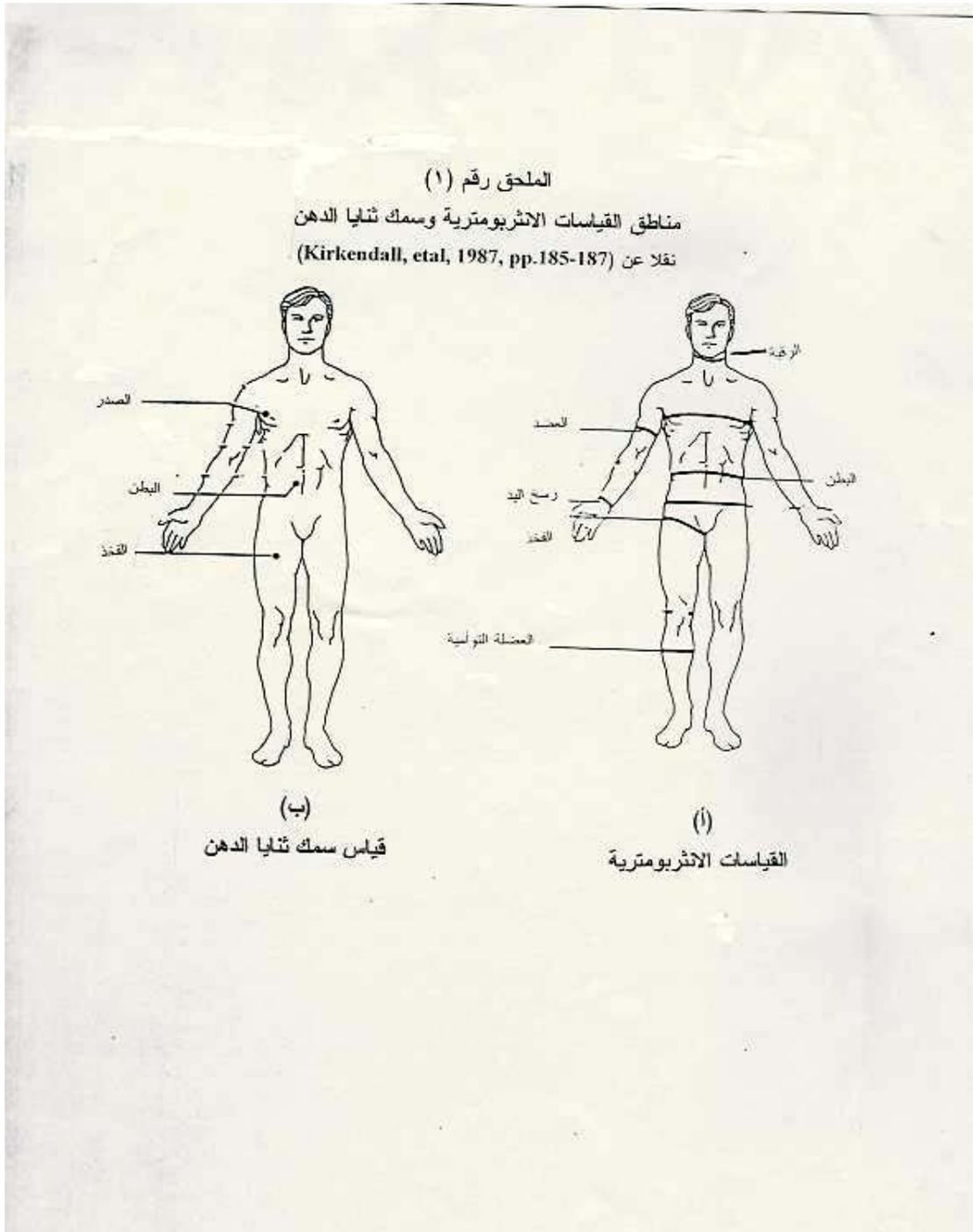
.[(

-1

(%13.5) (0.755)

)

		...	
-)] + [(	) × (0.606-)] + [(		-2
	) × (1.942)] + [(	) × (0.686	(15.57)
		.[(	-3
	.(0.786 = (R <sup>2</sup> ))	(1.84)	
		(23.66)	-4
:			.2 /
	-1		-5
		(0.79)	
		.(0.77)	
			-6
	-2		
		:	
		)×(0.490)]+(34.949-)	=
	-3	× (1.590-)] + [(	× (0.584)] + [(
		) × (0.294)] + [(	)
			.[(
		.(0.755 = (R <sup>2</sup> ))	
		) ×(0.851)]+(25.754 )=	(LBM)



1984

1998

.101

2003

1996

(42)

.137-121

.44-5

1996

1999

1994

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( ) .57-31 (1) (17) 2004 (BMI) (VO<sub>2</sub>max) (RMR)

.233-189 (1) (5)

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## The Relationship Between Selected Anthropometric Measures and Body Composition of Volleyball Players

*Abdul Nasser Al-Qaddoumi\**

### ABSTRACT

The purpose of this study was to investigate the relationship between selected anthropometric measures and Body Composition (BC) of volleyball players. The sample consisted of (84) players, from different divisions of volleyball clubs in Palestine.

The means of age, body mass and height were (24.35 years, 80.88 kg, and 1.84 m), respectively.

The researcher conducted anthropometric measures (age, height, body mass, circumference of neck, biceps, hand wrist, abdomen, thigh and calf ) Body Mass Index (BMI), Body Surface Area (BSA), and three skin folds measures (chest, abdomen, thigh) to determine body density using Jackson and Pollock (1978) equation.

The results indicated that the means of circumferences of neck, biceps, hand wrist, abdomen, thigh and calf, were respectively (38.4, 30.42, 18.60, 81.60, 59.85, 38.71) centimeters, respectively. In addition, the means of percent of body fat, Lean Body Mass (LBM), Body Density (BD), (BMI), and (BSA) were (13.5%, 64.52 kg, 1.06 g/ml, 23.66 kg/m<sup>2</sup>, 2.04 m<sup>2</sup>) respectively. Also, the results revealed that the best correlation between anthropometric measures and (BC) was between fat and abdomen circumference (0.79), and between body mass and (LBM) (0.77).

Furthermore, the results of stepwise regression R<sup>2</sup> revealed the following two equations:

$$\begin{aligned} \%Fat = & (34.949) + (0.490) * (\text{abdomen circumference, cm}) + (0.584) * (\text{age, yr}) \\ & + (-1.590) * (\text{hand wrist circumference, cm}) + (0.294) * (\text{body mass, kg}) \\ (R^2 = & 0.755) \end{aligned}$$

$$\begin{aligned} (\text{LBM}) \text{ kg} = & (25.754) + (0.851) * (\text{body mass, kg}) + (-0.606) * (\text{abdomen circumference, cm}) + (-0.686) * \\ & (\text{age, yr}) + (1.942) * (\text{hand wrist circumference, cm}) \\ (R^2 = & 0.786) \end{aligned}$$

Based on the study findings, the researcher recommended to apply these two equations for predicting (BC), the first one for fat and the other for (LBM).

**Keywords:** Anthropometric Measures, Body Composition, Volleyball.

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