

\*

One-way ) (60) (84) .( )  
 (0.05=  $\alpha$ ) (T-test) (Anova)  
 ( ) ( ) ( )  
 (4-3-2) (4-3-2)  
 ( 60 ) ( 50 )  
 ) ( 60 )  
 .( 80 ) ( 80 )  
 (60)

(EMG)  
 (2000 ) (2000 ) (2004 )  
 (1994 ) (1999 )  
 " :

(WHO)

(1995 )

.(WHO)

(1993 )

(2001)

.2008/9/3

2008/2/28

\*

(pH)

(pH)

(H<sup>+</sup>)

:

) (1998 ) (2003 )  
.(1999 ) (1993

(Quain, 2004)

(EMG)

(Walker, 2002)

(72)

%50

.(2003 )  
" : (1998)

0.22-

(Fowles, 2002)

(Na<sup>+</sup>\_K<sup>+</sup>\_ATPase)

: (2003)

"

100•50•20•10)

(%30-%55) (  
(Na<sup>+</sup>\_K<sup>+</sup>\_ATPase)

"

(Stackhouse, 2001)

(C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>)

(ATP-PC)

(pH)

(pH)

(H<sup>+</sup>)

(Strojnik, 2001)

(Ca<sup>++</sup>, K<sup>+</sup>, Na<sup>+</sup>)

:

. - (60) (MVC)  
 / / / -2  
 / / / -  
 . (60) (MVC)  
 (Danion, 2000)  
 / / / -1  
 / / / (60)  
 / / / -  
 / / / -2 (MVC)  
 / / / (MVC)  
 / / / -  
 / / / -3 (Alwin, 1998)  
 / / / ( )  
 / / / -  
 / / / -4 (EMG)  
 / / / -  
 / / / -5  
 / / / -  
 : -1  
 .(2005/4/11 10) : -2  
 : -3  
 . ( )  
 (60) (MVC)  
 )  
 -1 ( )  
 )  
 .(  
 -2 :  
 / / -1  
 / /

-3

:

- 1
- 2
- 3
- 4

(75) (75)

(1)

(41) (44)

(1)

(%)			
48.2	41		
51.8	44		
31	27		
68.2	58		
32.9	28		
25.9	22		
25.9	22		
15.3	13		
5.9	5	50	
24.7	21	60>50	
17.6	15	60	
27.1	23	60	
16.5	14	70> 60	
8.2	7	70	

(Matlab)

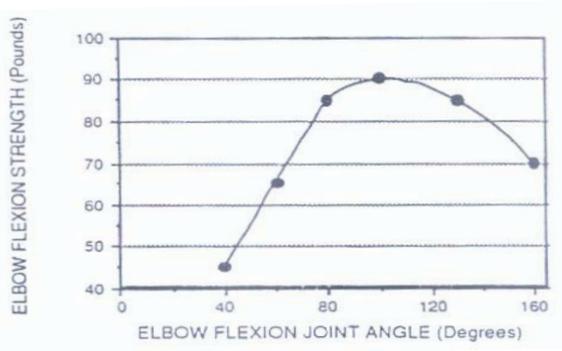
-1

-  
-

90

-2

) (2) ( )



-3

:(2)

(60)

-6

(10)

-4

.(Isometric Strength Testing)

(60)

- " -1

." -2

(60)

90

:-3

(1)

.(Rise Time) -

.( )

.(Full Time) -

Total ) -

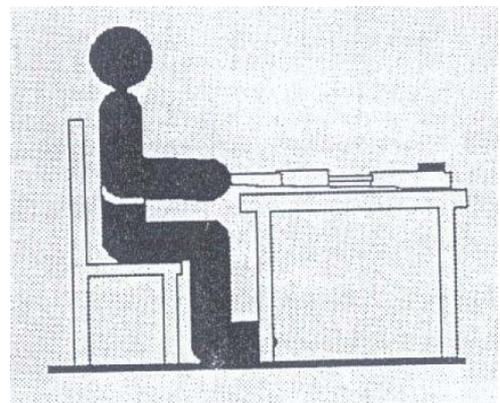
.(Aera

.(Peak Value)

-

.(Peak Time)

-



:(Peak Value) -1

.(Total Aera) -2

.(Peak Time) -3

:(1)

/ " : / / / 90 -5

-3

.(6) (5) (4) (3) (2)

-4

-1

-2

(2)

71.94	234.13	41		/	1
75.61	374.86	44			
3328.61	7798.08	41		/	2
3845.44	13886.23	44			
3.54	5.18	41		/	3
4.76	6.15	44			

(3)

91.15	230.93	27		/	1
86.69	342.38	58			
3932.85	7606.15	27		/	2
4232.77	12506.02	58			
4.11	5.29	27		/	3
4.29	5.87	58			

(4)

69.99	324.24	28		( )
112.32	296.84	22		
81.09	265.58	22		
146.34	357.04	13		
4008.01	11701.20	28		( )
4847.91	10824.31	22		
2994.98	8389.47	22		
6314.18	13875.29	13		

(5)

54.73	362.73	23	70	/
85.24	360.13	14	80-70	
87.01	444.20	7	80	
3597.90	13786.79	23	70	/
3549.11	12396.19	14	80-70	
3639.26	17193.04	7	80	

(6)

92.79	183.95	5	50	/
63.61	224.73	21	60-50	
67.49	264.02	15	60	
3817.09	6848.49	5	50	/
3129.70	7197.77	21	60-50	
3347.18	8955.04	15	60	

" " ( ) " : / / /  
 (Walker, 2002) - " /  
 (2)

( )  
 .(7)  
 (7)  
 (0.05 =  $\alpha$ )

:" / / T-) (test  
 - / /  
 "

(3) (Al- Kurdi, 1995)  
 (2000 )

( )  
 .(8)  
 (8)  
 (0.05 =  $\alpha$ )

(1979 )  
 (Strojink, 2001)

.(T-test) (Desrosiers, 1997)

(David, 2003)

(7)

( )

*0.00	8.777	83	71.94	234.13		/
			75.61	374.86		
*0.00	7.779	83	3328.61	7798.08		/
			3845.44	13886.23		
0.296	1.052	83	3.54	5.18		/
			4.76	6.15		

(8)

( )

*0.00	5.429	83	91.15	230.93		/
			86.69	342.38		
*0.00	5.079	83	3932.85	7606.15		/
			7262.02	15206.02		
0.560	0.585	83	4.11	5.29		/
			4.29	5.87		

-1

-2

： (2001 ) (2000 )  
 .(The Weight Trainer, 2001) (1979)  
 " : / / :  
 - / / :

...

(9) " (4)  
 (0.05 =  $\alpha$ )

(Scheffe) .(10) .(9)

(9)

*0.048	2.757	2964.310	3	80892.929		/
		8782.028	81	792344.27		
			84	87323720		
*0.005	4.601	90544154.02	3	27163232462.064		/
		19679968.55	81	1594077452.404		
			84	1865709914.469		

(10)

(Scheffe)

357.04	265.85	296.84	324.24			/
*32.8	58.39	27.4		324.24		
5.4	30.99			296.84		
25.59				265.85		
				357.04		
13875.29	8389.47	10524.31	1170.20			/
*12705.09	*7219.27	*9354.11		1170.20		
3351.79	2134.84			10524.31		
1216.95				8389.47		
				13875.29		

(10)

( ) ( )  
 ( ) ( )  
 ( ) ( )

" :  
 / /  
 - " / One-way )  
 (6) (5) : (Anova  
 (Scheffe)  
 :  
 .(13) (11) ( ) ( )  
 (11) .( )  
 (0.05 =  $\alpha$ )  
 .(12) (Scheffe)  
 (12)  
 (80 )  
 70 )  
 ) (80-70  
 (80  
 (13)  
 (0.05 =  $\alpha$ )  
 :  
 ) ( )  
 .(One-way Anova)  
 .(Scheffe) .( )  
 (12) ( )  
 ( 60 )  
 50 )  
 ) ( 70-60 ) ( )  
 ( 60  
 )  
 (1995 ) ( ) ( ) (1997  
 (1995 )  
 :

(11)

*0.026	3.992	20038.631	2	40077.263		/
		5219.248	41	205789.168		
			43	245866.430		
*0.022	4.188	53927633.190	2	107855266		/
		12878160.238	41	528004570		
			43	63859836		

(12)

(Scheffe)

<b>80</b>	<b>80-70</b>	<b>70</b>			
444.20	360.13	362.73			
*81.47	2.60		362.73	70	/
*78.87			360.13	80-70	
			444.20	80	
<b>80</b>	<b>80-70</b>	<b>70</b>			
17193.04	12396.19	13786.79			
*3406.25	1390.60		13786.79	70	/
*2015.75			12396.19	80-70	
			17193.04	80	

(13)

0.064*	2.954	13925.388	2	27850.776		/
		4714.873	38	179165.187		
			40	207015.963		
0.239*	1.486	16077262.546	2	32154525.093		/
		10816666.671	38	411033333.05		
			40	443187858.60		

(2000 )

(1997

-1

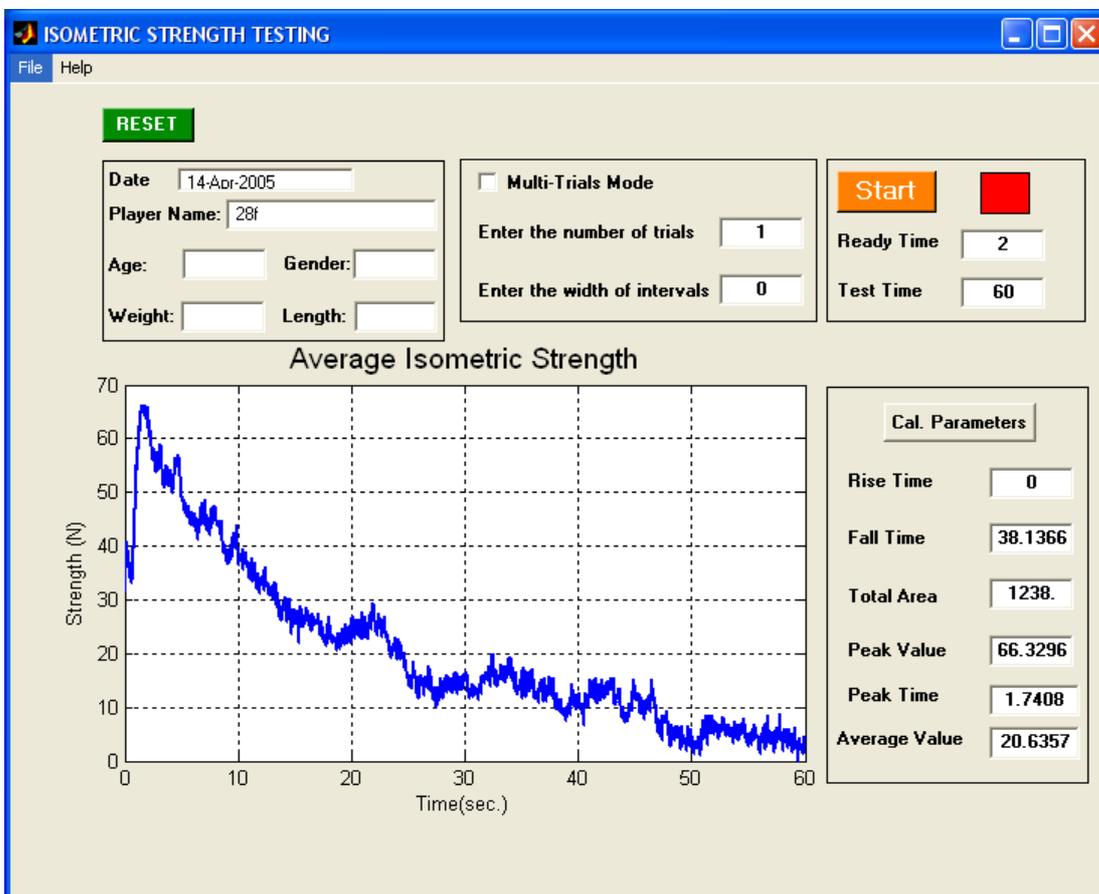
-2

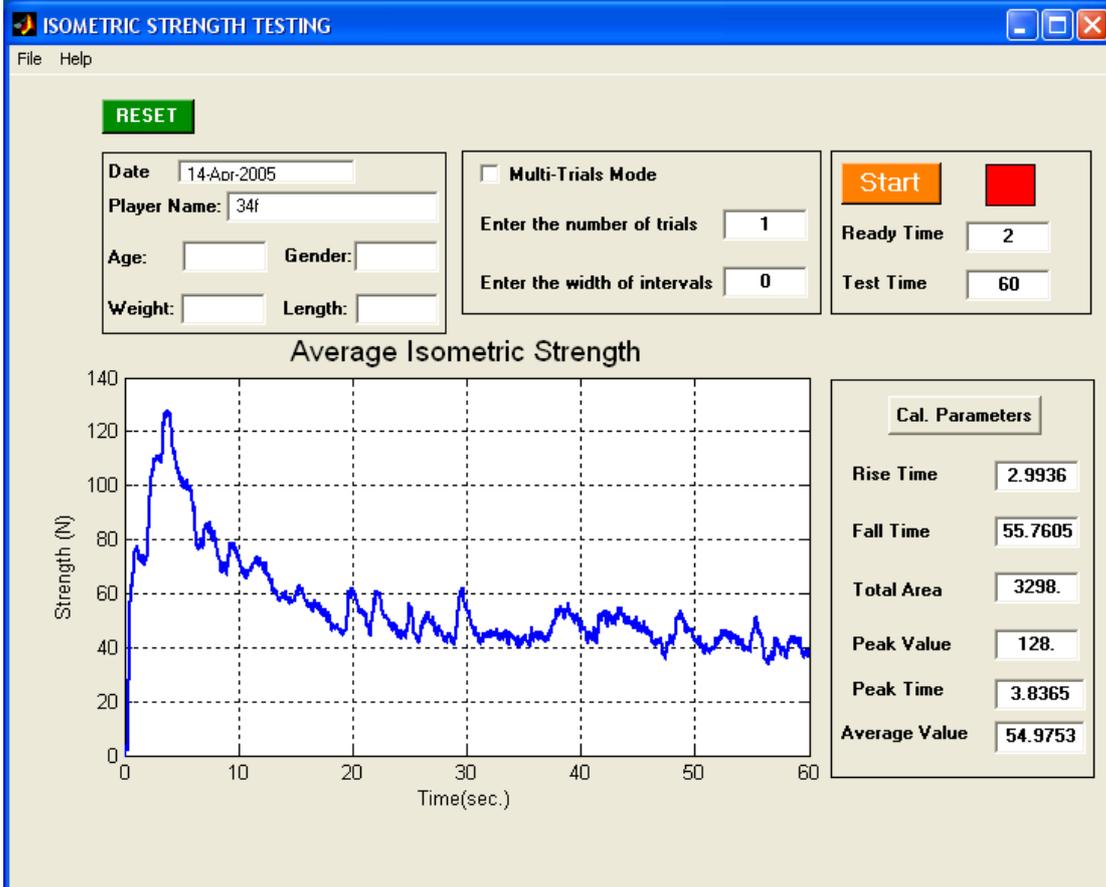
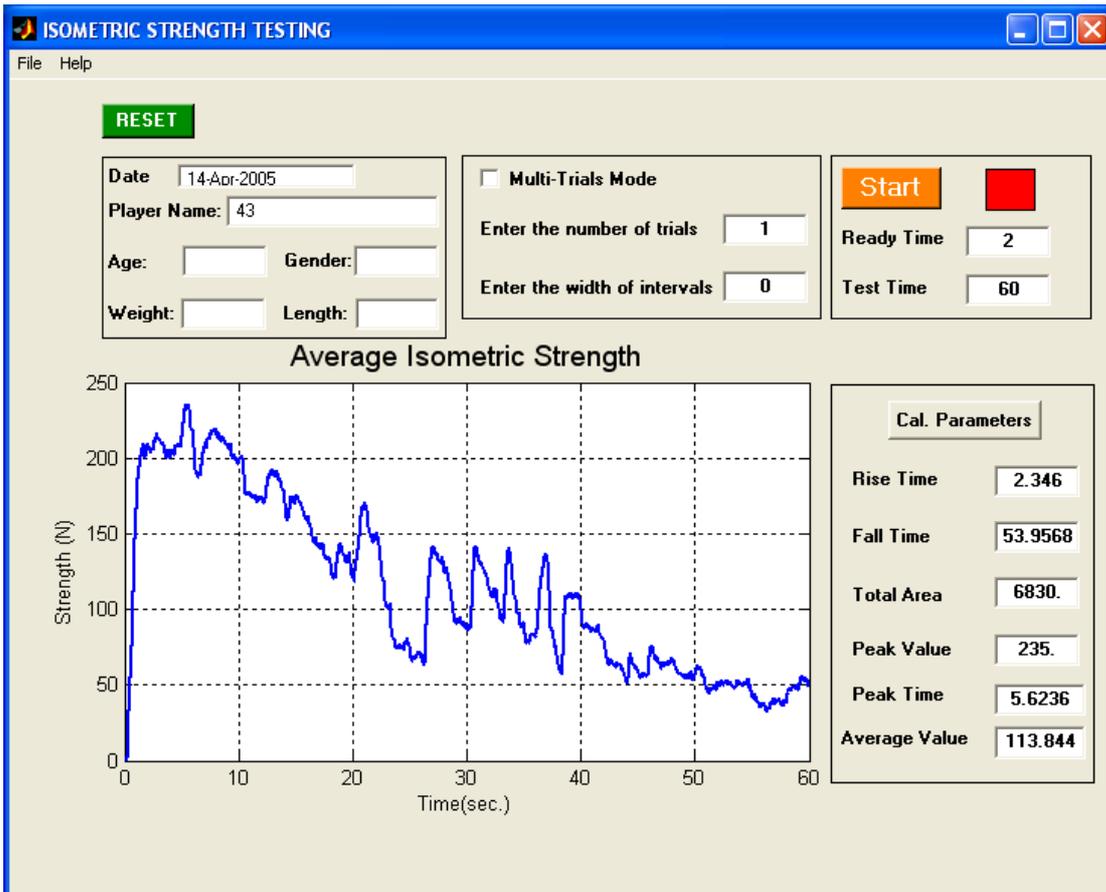
-3

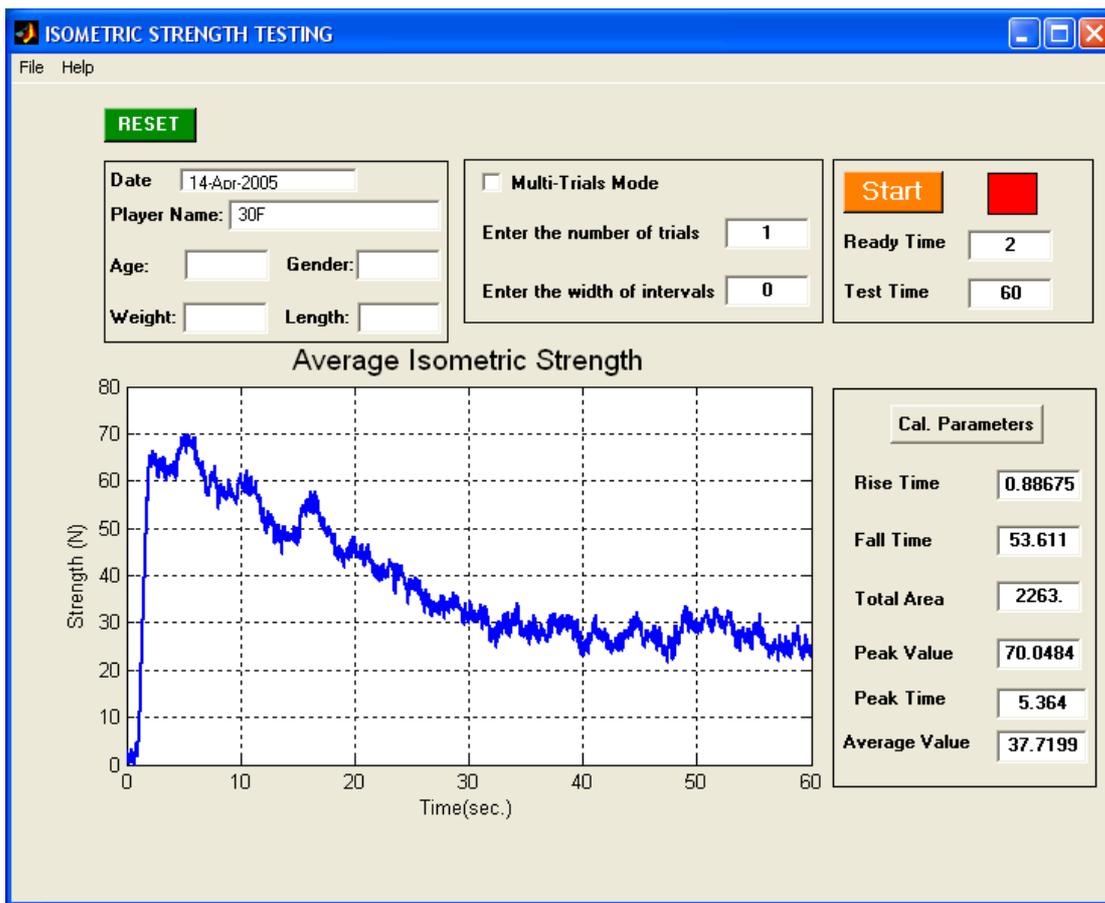
-4

(EMG)

(Isometric Strength Testing)







1993

2 5

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1997

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## Peak Force, Amount of Work and Muscle Fatigue by Hand Grip Testing upon Physical Education Students at Al- Yarmouk University

*Sumaya M.H. Khwaileh and Zeyad D. Al-Kurdi \**

### ABSTRACT

The purpose of this research was to identify the differences between hand grip muscular force and fatigue for some students of physical education at Al-yarmouk university (males and females) according to the variables of “gender, practitioner or non-practitioner of sport activities, study year and weight”. Eighty four (84) students (males and females) were chosen randomly to perform the adjusted hand grip test for 60 sec. using the modified Jackson device measurement system which was modified to be used by a computer programme designed to serve the purpose of the study. This measurement system provides readings about the peak force value “Newton”, the amount of work “Jule” and peak force time “sec.”, that are considered as the domains of this study.

T- test and One-way ANOVA were used to process the data. The results showed that there were differences with statistical significance at the significance level ( $\alpha= 0.005$ ). At the domains of peak force value and the amount of work due to the variable of gender, the significance was in favor of males rather than females.

Due to practitioners and non-practitioners of sport activities, the differences were in favor of practitioner students. There were differences with statistical significance between the mean of measurements of first year students and fourth year students in favor of fourth year students in the domain of peak force value. The means of measurements of first year students and students from “ second, third and fourth “years in the domain of the amount of work were in favor of “second, third and fourth “ year students in the domain of the amount of work. There were also differences with statistical significance between the means of measurements of weight “less than 50 kg” and “more than 60kg” in favor of “more than 60kg” for female students in the domains of peak force value and the amount of work. The finding for male students was the same between “less than 60 kg” and “more than 80 kg” in favor of “more than 80 kg”.

It was concluded that the time of the hand grip test of “60 sec.” is not adequate to achieve high levels of fatigue. Therefore, the researchers recommend increasing the time of the test to two or three minutes. The researchers also recommend conducting more studies and research in the field of muscle fatigue and on different kinds of samples; e.g. players of different ages, players of high and low performance levels.

**Keywords:** Muscle fatigue, Peak force, Amount of work.

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