AN IMPORTANT BIOMECHANICAL PARAMETER IN ELITE WRESTLERS: PRE AND POST TRAINNING HAND GRIP STRENGTH

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Abstract

Hand grip strength (a biomechanical parameter) plays an important role in daily life and especially during the sportive activities to get the maximum efficiency. Therefore, hand grip strength is an important indicator in wrestling in terms of performance.

This study was carried out on 22 elite wrestlers who wrestle for professional Turkish wrestling clubs in Ankara. Hand grip strength of wrestlers in 66 kilogram category was only measured in this study for standardization. Maximum and minimum right and left hand grip strengths of the wrestlers were measured when the arms positioned in 90 ˚ and 180 ˚ degree angles. Each measurement was repeated three times.

The results of the study were compared by using paired samples t test. MedCalc statistical program were used for the statistics. Although pre training hand grip strengths were found higher than post training hand grip strength the results were not found to be statistically significant($p>0.05$).

In conclusion, no significant difference was observed in hand grip stress of the elite wrestlers before and after training.

Clinical article (J Int Dent Med Res 2011; 4: (3), pp. 155-159)

Keywords: Wrestling, muscles, force, hand grip strength, biomechanical parameters.

Received date: 05 June 2011 **Accept date: 07 October 2011**

Introduction

Wrestling is a martial art that uses grappling type techniques such as clinch fighting, throws and takedowns, joint locks, pins and other grappling holds. A wrestling bout is a physical competition, between two (occasionally more) competitors or sparring partners, who attempt to gain and maintain a superior position. There are a wide range of styles with varying rules with both traditional historic and modern styles. Wrestling techniques have been incorporated into other martial arts as well as military hand-to-hand combat systems[1]. It is also reported that Wrestling is one of the oldest forms of combat with references to it as early as the Iliad, in which Homer recounts the Trojan War in the 13th or 12th century BC[1]. Wrestling has been a popular sport throughout recorded history. The origins of wrestling can be traced back 15,000 years through depictions in cave drawings in France. Early Egyptian and Babylonian reliefs depict wrestlers using most of the holds known to the present-day sport[2].

Usage of oil in wrestling dates back to 2650 BC in Egypt and Assyria. Techniques and rules of Turkish style wrestling began taking form in Central Asia in early Middle Ages; this style of wrestling is still widely practiced among Central Asian Turkic people under names of Köraş, Khuresh, Kurash etc. Turkish wrestlers had started covering themselves according to the Islamic law (between the navel and the knees) after the 10th century. After Oghuz branch of Turks migrated to Western Asia and Anatolia, they brought their Central Asian Kurash wrestling style with them. After conquest of Anatolia by Seljuk Turks, they brought their traditional freestyle wrestling called "karakucak" (literally

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means black hug) and the special leather clothing and initiated usage of olive oil, to make it harder to grap the opponent, from the ancient Western Asian wrestling; and created what is today known as the Yagli Gures or Turkish Oil Wrestling. In the Ottoman Empire, wrestlers learned the art in special schools called tekke, which were not merely athletic centers, but also spiritual centers, similar to those attended by the Japanese Sumo wrestlers, where it was taught that man is not just matter, but also spirit[3]. However, all the types of the modern wrestling have been performed in Turkish wrestling.

Strength is main biomechanical parameters in all sports. Strength also plays an important role in performance and sporting success. However, hand grip strength is also very important factor in the most of the sports especially in the wrestling[4]. Wrestling is a very important type of sport that activates all the body during match and training[5]. Therefore, it is important to know parameters of body biomechanics such as strength. Hand grip strength is very important biomechanical parameters for the wrestlers during wrestling.

Hand grip strength is a technical feature that affects the course of wrestling and it is therefore play an important role in the solving the tactical problems. Strong hand grip strength help to neutralize the opponent's wrist and prevent the opponent from making the games. However, powerful hand grip strength help to grasp the wrist of opponent tightly and provides superiority for the wrestler, which has powerful hand grip strength during attacks[6]. Therefore, developing hand grip strength main target of the wrestlers. Because of importance of hand grip strength in the wrestling, the purpose of this study is to measure hand grip strength of elite wrestler.

Materials and methods

The study was carried out on 22 elite wrestlers (18-22 years old) who are wrestling in the famous wrestling clubs in Turkey. Hand grip strength, which is important biomechanical parameter in the wrestling of the elite wrestler were measured by a hand dynamometer **(**MED-DYN100, Turkey). This study performed on the wrestlers who are wrestling in 66 kilograms. All the wrestlers in this study were informed about the research before the study. Duration of training was one and a half hours. Maximum and minimum hand grip strengths of right and left arms of the wrestlers before and after training were measured while the arms positioned 90^{o} and 180^{o} (figure 1 and 2).

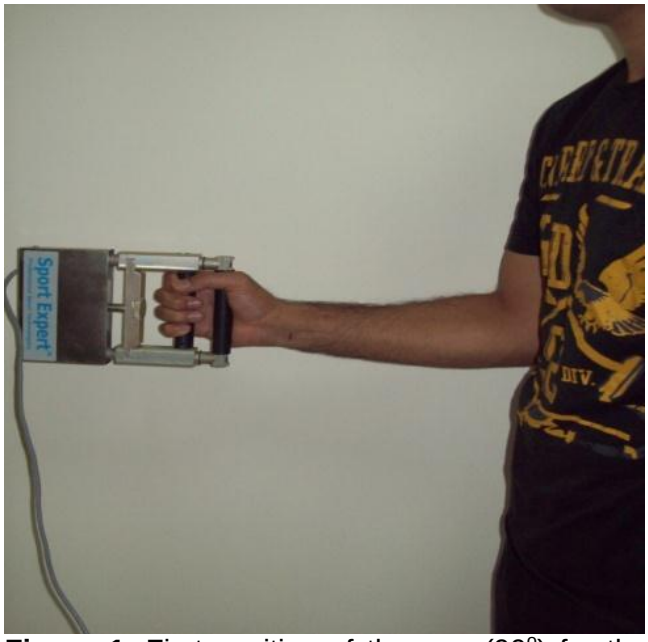

Figure 1. First position of the arm (90^{o}) for the hand grip strength measurement.

Figure 2. Second position (180^{o}) for the hand grip strength measurement.

Each handgrip strength measurement was performed during 20 seconds. Each measurement was repeated three times in different periods to avoid from any mistake and average hand grip strength were determined.

Measurements were performed for two arms of the wrestlers. Hand-grip strength was measured in kilograms force (kgf), using a dynamometer with the handle adjusted dynamometer. Measurement positions of right and left arms in the study have been summarized follow;

- Pre training hand grip strength was measured while right and left arm positioned in 90°.
- Post training hand grip strength was measured while right and left arm positioned in 90°.
- Pre training hand grip strength was measured while right and left arm positioned in 180°.
- Post training hand grip strength was measured while right and left arm positioned in 180°.

The results of the measurements were measured by MedCalc statistical program. Paired Student-t test were used to analyze the results of the study. Measurement system of the study is seen figure 3.

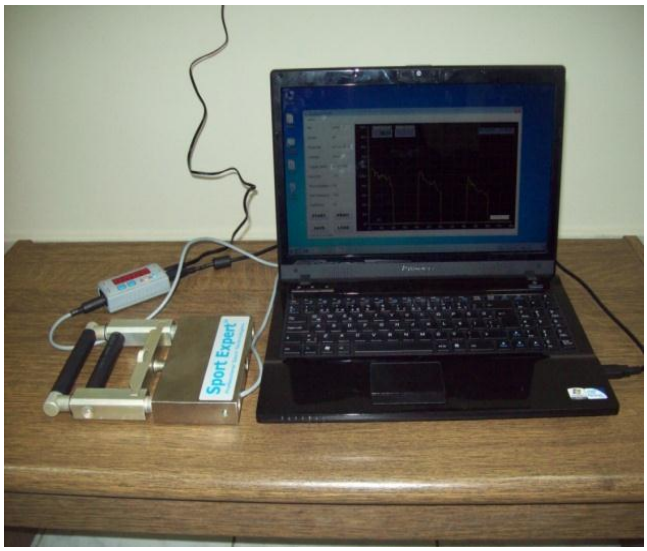

Figure 3. Hand grip strength measurement system of the study.

Results

According to the results of the study, right and left maximum hand grip strength were not found to be significant while right and left arms positioned 90° and 180° ($p > 0.05$). However, right and left minimum hand grip strength were not found to be significant while right and left arms positioned 90° and 180° ($p > 0.05$).

Pre and post training right and left hand grip strength values of the wrestlers while the arms positioned 90° and 180° was given in table 1. However, statistical results are given in the table 2 and 3.

Arm position	Pre Training Maximum value		Post Training Maximum value		Pre Training Minimum value		Post Training Minimum value	
	Mean	±SD	Mean	±SD	Mean	±SD	Mean	±SD
Right arm 90°	44,68	7,33	41,77	7,62	26,86	8,77	24,22	8,43
Right arm 180°	44,72	7,89	42,59	6,37	27,45	7,65	26,18	6,47
Left arm 90°	42,36	8,94	40,81	7,93	25,59	8,49	22,54	8,74
Left arm 180°	44,18	9,33	42,72	9,45	24,45	7,71	22,81	7,53

Table 1. Pre and post training right and left hand grip strength values in kgf (Mean, ±SD).

Groups	n	t	P
Pre – Post training maximum value.(Arm positioned 90°)	22	-1,753	> 0.05
Pre – Post training minimum value. (Arm positioned 90°)	22	-1,234	> 0.05
Pre – Post training maximum value.(Arm positioned 180°)	22	-1,296	> 0.05
Pre – Post training minimum value.(Arm positioned 180°)	22	- 0,731	> 0.05

Table 2. Statistical results of Pre and post training right hand grip strength.

Groups	n	t	P
Pre – Post training maximum value.(Arm positioned 90°)	22	-1,030	> 0.05
Pre – Post training minimum value. (Arm positioned 90°)	22	-2,105	> 0.05
Pre – Post training maximum value.(Arm positioned 180°)	22	-0,961	> 0.05
Pre – Post training minimum value.(Arm positioned 180°)	22	-0,765	> 0.05

Table 3. Statistical results of Pre and post training left hand grip strength.

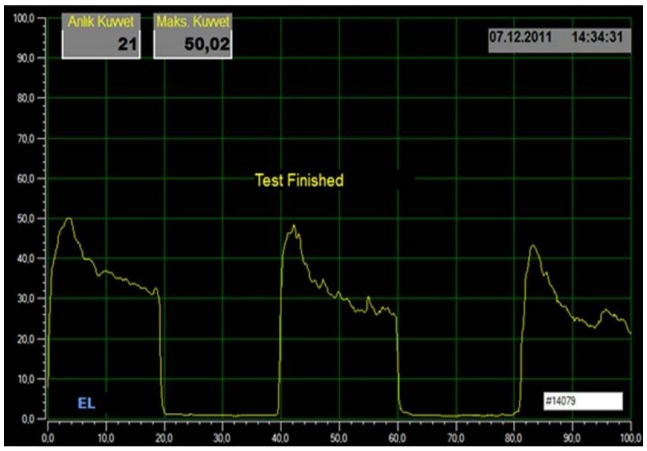

Figure 4. An Example of graphic that shown maximum and minimum hand grip strength.

In conclusion, the values of maximum and minimum hand grip strength decreased after training. However, difference between the values of pre and post training was not found to be significant ($p > 0.05$).

Discussion

Wrestling is oldest sport of the world. The fighting is man's birth instinct thus it is not related with particular country or period yet it is very essential to know the origin and development of this popular sport. Most of European writers admit this idea that the origin place of the wrestling is India, whereas world renown Greece, Rome, Egypt and China[7].

Muscle endurance is the capacity of a muscle or a group of muscles to perform repeated contractions against a given load for a long period. It is an important parameter of physical fitness. Muscular strength and function are essential during sports activities, as well as in daily life. Stability and movement are provided through coordination of all muscles that surround the lumbar spine[8-11].

It is reported that hand grip strength correlated strongly with strength in upper body and neck muscle groups[12]. Similarly, Fink et al stated that Measures of hand grip strength correlate strongly with strength in other muscle groups[13]. Hand grip strength is the most important parameter for the wrestler for making games during the wrestling. Therefore, it can be said that the wrestler has more powerful handgrip strength may probably be favorite of the match. Hand grip strength has been changing depend on age, weight and job[14,15]. For instance Housh et al showed that hand grip strength change depend on age[16]. Because of this, to compare hand grip strength of people in different weight is wrong and the comparison should be between same weight wrestlers. Thus, we measured hand grip strength of the wrestlers in 66 kg only.

Cicioglu et al measured right and left hand grip strength of wrestler between 15 – 17 years old before and after sport camp and they did not found significant differences between pre and post camp ($p > 0.05$). There is a similarity between the results of the study performed by Cicioglu et al and our study[17]. Ziyagil et al measured hand grip strength of the wrestler between 16 – 17 years old before and after one year training camp. They observed that hand grip strength of the wrestlers increased. There is not any similarity between our results and them. We believe that difference between two studies may have originated from the exercise program and age of the wrestler. Because, age range of the wrestler in our study was 21.75 ± 5.04 and they probably completed they are development while the wrestlers in the study of Ziyagil et al. not completed the body development. On the other hand, the results of Zorba et al. support the results of our study[18]. Hazar et al measured left and right hand grip strength of the wrestler before and after weight loss. They interestingly found that right and left hand grip strength of the wrestler increased after weight loss[19]. Song and Garvie measured right and left hand grip strength of Canadian and Japanese wrestlers. They found that right hand strength higher than left hand[20]. In our study we did not found differences between right and left hand grip strength in the wrestler. We believe that it is indicator of quality of the wrestlers in this study.

Conclusions

In conclusion, maximum and minimum right and left hand grip strength of the wrestlers decreased after training. However, differences between pre and post hand grip strength of the wrestlers was not found to be statistically significant ($p > 0.05$). Similarly, any significant difference was not observed between maximum right and left hand grip strength. Finally, we believe that hand grip strength measurement would be a good biomechanical parameter to show growing process of the wrestler to reach maximum strength.

Acknowledgements

This study supported by Scientific Research Project Coordination Center of Dicle University. However, the authors thank to Professor M. Zulkuf Akdag from Biophysics Dept. of Medical School of Dicle University for his contributions.

Declaration of Interest

The authors report no conflict of interest and the article is not funded or supported by any research grant.

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