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# COMPERATIVE ANALYSIS IN SOME MOTORIC ABILITIES BETWEEN WRESTLERS, BOXERS AND STUDENTS FROM THE REPUBLIC OF KOSOVO

*(Original scientific paper)*

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***Abstract***

*This research was carried out on a sample of 210 male participants of the age 18-33, Composed from 3 sub-samples of participants of similar age. The first sub-sample was consisted of 65 athletes-wrestles in free style, the second sub-sample of 60 athletes-boxers and the third sub-sample of 93 participants- non-athletes (students). For the realization of the aims of this research was used a system of 15 motoric tests. The obtained results were elaborated by multivariate and univariate analysis of the variance. Based on the obtained results it can be concluded that the boxers show better placement accuracy, as well as speed of leg frequency, arm and shoulder girdle strength, repetitive strength and endurance of arm and flat waist and static strength of the spinal extensors, and better agility (speed with direction change) in relation to the wrestlers and the students. The wrestlers show better flexibility of the back lodge and the lower part of the spinal cord, as well as the shoulder girdle, frequency speed of the upper limbs in the frontal plane and explosive strength of the lower limbs. Of course, these differences are conditioned from the specifics of the sports discipline itself where in boxing the explosive and repetitive arm and the shoulder girdle speed for performing punches, the agility of dodging the opponents punches and the strong muscles of the trunk are particularly important. In wrestlers, in a large number of movements it is needed good flexibility, segmental and frequent speed of the legs in order to attack the opponent.*

***Key words:*** *wrestling, box, motoric abilities, comparison*

## Introduction

Scientific knowledge are indispensable in the area of kinesiological activity, because without those knowledge it would be hard to determine the laws of the transformational processes in these activities. That Is especially important because these findings can be the basis for determining and change of the motoric, anthropometrics and other athlete dimensions. Within this, an important place takes the research of anthropometric, motoric (basic and specific), the cognitive and connotative space. The research of these spaces of anthropometric status has a big importance in the programming and the realization of the kinesiological activities in athletes.

According to one of the sports division's, wrestling and boxing belong to the group of polystructural sports with an acrylic character, the basis of which is the direct collision with the opponent and symbolical destruction of the same. The structure of two of the sports differs greatly and the success depends on different levels of certain abilities and characteristics of the anthropometrical status. During the fight these complex activities, it is required from the wrestler and boxer to be versatile, whereas in their technique they must have adequate "wrestling answers". Also, the wrestler and the boxer must be prepared for the fight with different opponents who are characterized by certain specifications (Ćirković, 1978; Kuznjecov, 1980; Savić, 1986ab; Savić, 1996; Chatzilelekas, 1999; Filimonov, 2000).

The training process in boxing and wrestling lasts long enough to cause adaptive changes in individual organs and organ systems which are specific for the sport itself (Zahorjević, 1976; Zulići Milošević, 1987; Popović, 1988; Malacko & Rađa, 2004; Malacko i Popović. 2001). For planning and programming the training process it is very important the abilities and characteristics of the anthropometric status to be evaluated, which determine the effects of the trainings. The determination between the group of participants

who are subjected to different training programs will indicate the certain advantages but also the eventually disadvantages which come as a result of individual training programs.

When it comes to the motoric abilities which characterize these athletes, the boxers and wrestlers have significant differences in the muscular structure, fitness abilities and the way they prepare themselves. The boxers develop high level of the aerobic and anaerobic durability because the box requires intensive and continuative effort during more rounds, with short breaks periods. In this sport, the speed of movement, as well as the precise punches are of critical importance, and because of the fight dynamic, it is expected that the boxers have high cardiovascular and respiratory condition.

In wrestling, the main physical components include strength, blistering and agility. Beside the aerobic and anaerobic condition, the wrestlers focus on developing strength and resistance in the muscles, which are used in short term and intensive explosive manoeuvres. In this sport, of great importance is the ability to maintain static strength, especially in moments where the athlete must keep the opponents on the floor or defeat him.

Many research confirm that boxes and wrestlers show different models of physical fitness and body structure. Based on the newest studies, boxers have high level of aerobic condition and low percentage of muscle mass compared to wrestlers, who have higher percentage of muscle mass and high explosiveness. Research done by Anilkumar (2013) shows that because of the nature of the sport, boxers achieve a significant advantage in the speed and coordination of movements, whereas wrestlers, are characterizes with bigger strength and agility while keeping the opponent on the floor.

Through this analysis, are emphasized the differences in requirements about physical fitness between the boxers and wrestlers and it highlights the importance of the adequate training for each discipline. These findings open the possibilities of further research which could deepen the understanding on how these components and their importance develop in relation to the sport success.

According to our knowledge, in the Republic of Kosovo there aren't much research that compared motoric abilities between boxers and wrestlers.

Based on all of the mentioned above, this research is done with a significant aim to determine the condition and the differences on some motoric abilities in Kosovar athletes who box and wrestle, as well as comparison of athletes motorical abilities with normal population (students).

**Work methods**

*Participants sample*

This research was carried out on a sample of 210 male participants of the age 18-33, Composed from 3 sub-samples of participants of similar age. The first sub-sample was consisted of 65 athletes-wrestles in free style, the second sub-sample of 60 athletes-boxers and the third sub-sample of 93 participants- non-athletes (students). The participant students (boxers and wrestlers) were taken from different boxing and wrestling teams in the Republic of Kosovo. The students were taken from different faculties from the State University in Prishtina.

The sub-samples of participant athletes (boxers and wrestlers) were compiled based on the next criteriums: to actively and constantly box – wrestle for at least 2 years; to have been included in the system of matches; to have had trainings minimum 4-5 times a week; to have been healthy and without body injuries on the day of measurement.

*Variable sample*

For the realization of the research aims the next motoric test are implemented: Figure eights with bending (MOSNAV), Standing on one leg on a beam in length with eyes open (MSGOCD), Standing on one leg on a beam in width with open eyes (MSTGOS), Standing on one leg on a beam in length with closed eyes (MSGZOD), Tapping with the foot (MTAPNO), Tapping with the hand (MATPRS), Shooting at a target with a long stick (MSTMDS), Shooting at a target with a short stick (MSTKST), Deep bend on a bench (MDLPRK) Barbell curl (MISPAL), Deep bend in a seat (MDLPSE), Holding the trunk in a horizontal position lying on a bag (MZTHPM), Vertical curls on a shaft (MZGIVI), Long jump from a place (MSKDAM), Throwing a 1 kg medicine ball from a supine position (MFMPGR) (Metikos et al., 1989).

The measurement was carried out in standard conditions in halls and open fields. It was carried out by experts in the field of kinesiology, who were previously trained to measure specific motoric test. The space where the measurement took place was equipped with all the needed requisites and instruments for the proposed tests. The distance between the individual tests and their order was such so that the measurements

done before cannot affect the results of the next test. The hall temperature and in the open field range from 17-22 ºC. All of the participants were in sports equipment and divided into groups.

The predicted tests were measured based on the methodology recommended from D. Metikos et al. (1989), after the recommended model about assessing the motoric dimensions of the athletes.

*Data processing methods*

For all of the variables were calculated the basic statistic parameters: arithmetic environment (Mean), standard deviation (SD), the coefficient of variability (KV%), the minimal result (MIN), the maximal result (MAX), whereas the normality of the results distribution is checked with the procedure of Kolmogorov and Smirnov (KS). The differences between the wrestlers, boxers and the students were determined by one-factor multivariate and univariate analysis of variance (MANOVA and ANOVA).

The statistical software program SPSS 26 (SPSS, v. 26.0 for Windows; SPSS Inc., Chicago, IL, USA) was used to process the obtained data.

**Results**

Result distribution in most motor tests in the three sub-samples is normal, which made it possible to perform further processing of the basic data in a methodologically correct manner.

To determine whether statistic significant differences in the motor tests between boxers, wrestlers and students exist, multivariate and univariate analysis of variance (MANOVA and ANOVA) were applied.

By implementing the variance multivariate analysis (MANOVA) respectively by testing the significance of the differences in arithmetic means of motoric tests, a statistically significant difference was determined between boxers, wrestlers and students, since Wilks' Lambda .03 and for degrees of freedom df=404/30, gives statistical significance at the Q < .000 level. The size of the partial effect of the determinants (partial $n^2$) shows high values .834.

Chart 1. Differences in motoric tests between boxers, wrestlers and students

| | Value | F | Hypothesis df | df | Sig. | $n^2$ |
|---|---|---|---|---|---|---|
| Wilks' lambda | 0,03 | 67,27 | 30 | 402 | ,000 | ,834 |

| | Boxers | | Wrestlers | | Students | | F | Sig. | $n^2$ |
|---|---|---|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD | | | |
| MOSNAV | 189,82 | 13,84 | 198,77 | 15,36 | 201,29 | 27,78 | 5,50 | 0,005 | 0,05 |
| MSGOCD | 52,12 | 18,85 | 48,72 | 30,62 | 43,18 | 26,66 | 2,28 | 0,105 | 0,02 |
| MSTGOS | 33,65 | 12,09 | 36,87 | 21,22 | 30,43 | 21,22 | 2,18 | 0,115 | 0,02 |
| MSGZOD | 27,05 | 6,37 | 25,99 | 8,32 | 25,87 | 11,14 | 0,33 | 0,720 | 0,00 |
| MTAPNO | 26,22 | 1,63 | 21,62 | 1,65 | 20,54 | 3,29 | 100,19 | 0,000 | 0,48 |
| MATPRS | 34,48 | 3,18 | 36,31 | 5,37 | 33,96 | 5,27 | 4,73 | 0,010 | 0,04 |
| MSTMDS | 79,18 | 4,30 | 63,45 | 2,56 | 58,13 | 6,59 | 323,49 | 0,000 | 0,75 |
| MSTKS | 81,88 | 4,69 | 63,15 | 1,81 | 59,83 | 6,15 | 410,38 | 0,000 | 0,79 |
| MDLPRK | 38,05 | 4,65 | 52,85 | 6,57 | 44,87 | 8,35 | 70,69 | 0,000 | 0,40 |
| MISKPAL | 97,92 | 9,86 | 80,75 | 15,13 | 94,08 | 13,52 | 30,52 | 0,000 | 0,22 |
| MDLPSE | 48,05 | 4,65 | 52,85 | 6,57 | 44,87 | 8,35 | 25,04 | 0,000 | 0,19 |
| MZTHPM | 71,25 | 24,49 | 56,25 | 19,27 | 44,46 | 27,94 | 22,71 | 0,000 | 0,17 |
| MZGIVI | 13,62 | 5,67 | 11,29 | 5,08 | 9,82 | 5,46 | 9,00 | 0,000 | 0,08 |
| MSKDAM | 211,40 | 17,06 | 223,28 | 19,78 | 203,76 | 24,74 | 17,27 | 0,000 | 0,14 |
| MFMPGR | 1221,75 | 172,58 | 1230,08 | 197,49 | 768,66 | 129,01 | 207,40 | 0,000 | 0,66 |

According to the applied multivariate analysis, it is a univariate analysis of the variance (ANOVA), in order to determine the differences between each individual test. The results of the univariate analysis if the variance (Table 1) indicates that between boxers, wrestlers and students there are significant differences in 12 from the 15 motoric tests. Between group differences are determined in motoric tests: figure eights with bending, foot tapping, hand tapping, long stick target shooting, short stick target shooting, deep bench press, pole vault, deep seated bench press, holding the hull torso in a horizontal position while lying on a mat, overhead squats on a shaft, long jump from a standing position and throwing a 1kg medicine ball from a supine position ($p< 0.05$). No intergroup differences were found in the motor tests: standing on one leg on a beam in length with eyes open, standing on one leg on a beam in width with eyes open, and standing on one leg on a beam in length with eyes closed. The partial effect of the determinants partial η2 is ranked

between .02 and .03 and shows a small effect of influence. The largest effect in determining differences is shown by the motor tests: shooting at a target with a long stick (partial - $n^2$ =.75) and shooting at a target with a short stick (partial - $n^2$ =.79).

In order to determine between which group of boxers, wrestlers and students exist statistically significant differences in each individual motoric test, also the post hoc tests (LSD – least significant difference test) were applied. From the values of the anthropometric environments and the level of the statistically importance of the Post Hoc tests, it can be seen that the boxers show better results in motoric tests: figure eights with bending, tapping with a foot, shooting at a target with a long and short stick, keeping the torso in a horizontal position lying on a bellows and bending of the shaft in relation to wrestlers and students. The wrestlers show better results in motoric tests tapping with a hand in the frontal plane, deep bending on a bench, twisting with a stick, deep bending in a sitting position and long jump from a place. The students show weaker results in motoric tests of throwing a 1kg medicine ball from a supine position in relation to wrestlers and boxers. No differences were found between boxers and wrestlers in the motor test throwing a 1kg medicine ball from a supine position.

**Discussion**

Based on the results, it can be concluded that the boxers demonstrate superior abilities in some basic aspects of physical performance, including the placement accuracy, leg frequency speed, arm and shoulder girdle strength, as well as repetitive arm and shoulder girdle strength and endurance. These abilities are of essential importance to succeed in boxing, which not only requires physical strength but also specific motoric skills, the ability to react fast and adaption of the dynamic circumstances in the ring. Additionally, the boxers show significant advantages in the statistic spinal extensor strength, which may be related to the need for stability and control when performing physical manoeuvrers during matches. The results of the research show also improved agility, or the ability to quickly change direction, which is a critical component in boxing, where turning and evading of the opponent are crucial to avoid punches, and for effective attack.

In the comparison context, the wrestlers also show important advantages in certain motor skills, as the flexibility, especially in the back and lower spine, as well as in the shoulder gridle. This flexibility is very important in wrestling, where the range of the movement and the ability to perform complex techniques is crucial for success. Also, wrestlers demonstrate higher frequency speed in the upper extremities in the frontal plane, which is essential for effective dealing with the opponent, and at the same time they also show explosive strength in the lower extremities, which is important for performing fast and explosive movements. Given these differences, it can be concluded that both boxing and wrestling develop unique physical skills and abilities depending on the specificity of their sports requirements.

The research of this topic (García-Pallarés et al., 2011; Mirzaei et al., 2011) show that boxers and wrestlers develop different fitness attributes because of the different sport requirements. The boxers are focused on speed, whereas the wrestlers must own resistance and flexibility for successive handling the continues contact and strength, which are needed for fighting.

The comparison between the top boxers and wrestlers in free style represents interesting topic for research, because both sports require high physical and mental readiness, but at the same time the differ in the dominant fitness components, the anthropometric characteristics and somatotype skills. The free style of box and wrestling fall into contact sports that emphasize force, resistance, speed and explosivity. However, the differences in the technique, the aims and the strategy require specific body growth and readiness in athletes.

Regarding the dominant motoric abilities (fitness components), the free style of box and wrestling show similarities and differences. Even though both sports require high level of strength and resistance, but the way in which they develop these components is different.

Both boxers and wrestlers are exposed in highly, intensive activities with short breaks, which means that in both develops aerobic and anaerobic resistance. However, the free style of wrestling requires on higher degree of anaerobic resistance because the matches include ongoing movements and explosive interventions, where the body uses significant glycogen resources (Smith et al., 2018). On the other hand, boxers lay on the combination of both aerobic and anaerobic resistance, because the matches can last until 12 rounds, which means that higher lever of cardiac resistance for keeping the performances are needed (McArdle et al., 2015).

The strength and explosiveness are crucial motoric skills (fitness components) for both boxers and wrestlers. However, wrestlers show higher level of strength in relation to the boxers, because the

interventions and techniques in free style require control over body mass in the opponent (Peterson & Draper, 2020). Unlike them, boxers show more explosiveness in the upper part of the body because of the fast and strong punches, where specific exercises for explosive strength in arms and shoulders are used (Thomas et al., 2019).

Speed is particularly important for boxers because it allows them to maintain control of the fight through rapid movement and reaction to their opponent's punches (Hickey & Roberts, 2021). In freestyle wrestling, agility and full-body speed are crucial, as these athletes are constantly changing positions and moving with rapid transitions from one hold to another. According to Jones et al. (2021), "agility in wrestlers is crucial for quickly reacting to and avoiding their opponent's counter-holds" (p. 175).

The anthropometric characteristics in top boxers and wrestlers show certain similarities, but also important differences which are the result of different requests of these sports. In general boxers have longer extremities, whereas wrestlers usually have more compact body structure.

Boxers often have priority if they have longer arms and legs, because it enables them having greater reach and possibility for far punches, which is especially important in the defensive strategies (Lee et al., 2021). Unlike them, wrestlers in their free style have compact bodies which enables them with better control upon body mass and faster adaptation in the position changes. According to the Carter and Heath research (2020) "more compact structure in wrestlers enables them better balance and stability, which is crucial for grappling" (page 205).

In both boxers and wrestlers weight plays an important role because of the different wight categories. However, in wrestlers the body mass percentage is lower due to the increased need for mobility and flexibility, which allows them to move more efficiently on the floor (Brooks et al., 2018). In boxers, muscle mass is concentrated in the upper part of the body, which gives them strength and explosivity for fast and powerful punches, while in wrestlers, the musculature is more evenly developed throughout the body.

The lower body mass percentage is important for both boxers and wrestlers, because the lower amount of body fat increases agility and lowers the possibility of tiredness (Norton & Olds, 2019). However, boxers can have a little higher percentage of body mass due to the need of more mass which will help them to absorb the punches. According to the research done by Fernandez I Ramirez (2019), "the lower percentage of body mass in wrestlers is related with their need for fast movements and positions flexibility" (page 93).

Despite the similarities in the physical and mental preparation, the top boxers and wrestlers in their free style differentiate in the motoric abilities, anthropometric characteristics and somatotype components. Boxers emphasize explosiveness and speed, especially in the upper part of the body, whereas wrestlers focus on strength and agility with evenly distributed musculature. The compact body structure in wrestlers allows them better balance and control in their positions, whereas larger extremities in boxers are an advantage for fast strikes. The anthropometric characteristics and somatotype play an important role in these differences, with both sports requiring different physical adaptations for optimal success.

The comparative research of motoric abilities between boxers and wrestlers in free style is of big significance for the sport science, to understand the specific physical requirements in both sports. Boxers and wrestlers share common fitness aims such as strength, explosiveness, speed and resistance, but also exist important differences in their functional application and physical needs that arise from the nature of both sports. These differences emphasize the importance of comparative studies of motoric abilities of boxers and wrestlers, as they can help creating specific training programs that respond to the unique physical need of the athletes. These kinds of studies are crucial for optimizing training and injury preventions, because they enable better understanding of the anatomical and physiological demands of each sport.

## Conclusion

Based on the gained results it can be concluded that compared to wrestlers, boxers show better accuracy of placement, as well as speed of leg frequency, arm and shoulder girdle strength, repetitive strength and endurance of the arms and shoulder girdle and static strength of the extensors of the spinal column as well as better agility (speed with change of direction). Wrestlers show better flexibility of the back and lower part of the spinal column, as well as the shoulder girdle, speed of frequency of the upper extremities in the frontal plane and explosive strength of the lower extremities. Of course that these differences are conditioned by the specifics of the sports discipline itself, where as in boxing the explosive and repetitive strength of the arms and shoulder girdle for performing strikes, agility for dodging the opponent's blows

and strong muscles of the trunk are particularly important. In wrestlers in a greater number of movements it is needed good flexibility, segmental and frequent speed in order to attack the opponent.

Given these differences, the conclusion could be that both box and wrestling develop unique physical skills and abilities depending on the specifics of their sport requirements. Further research might contribute to a better understanding of adaption mechanism in different sport disciplines and also for developing specific training programmes for optimizing physical performance.

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