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Original article

COMPARISON OF SOME PULMONARY FUNCTION OF DIFFERENT NATIONAL WRESTLERS

ULVİYE BİLGİN[1], MERGÜL ÇOLAK[2], ÖZLEM ORHAN[3]

Abstract

Purpose. This study was conducted with the aim of determining and evaluating respiratory functions of National Seniors Wrestling teams of Turkey, Kyrgyzstan and Senegal.

Methods. Respiratory function tests were taken from voluntary wrestlers entering in the preparation camp before the International Yasar Dogu Seniors' Freestyle Wrestling Tournament. A total of 36 athletes participated in the study, including 12 from Turkey (T) (25,67±5, 32 years, 169, 17±8,93 cm, 73, 58±11,30 kg), 12 from Kyrgyzstan (K) (23,17±2,92 years, 167,33±6,41cm, 62,67±7,43 kg) and 12 from Senegal (S) (27,00±4,52 years, 176, 50±8,55 cm, 72, 33±10, 07 kg).

Results were carried out with SPSS 11.0 package software. While international differences were looked at using One-way ANOVA, the Tukey test was applied on the values yielding significant results, significance at the $p<0.05$ level was investigated..While significant differences at the $p<0.05$ level were detected in FVC and VC values and at the $p<0.01$ level in %FVC, %FEV1 and %VC values; no significant differences were observed among teams in PEF and MVV values ($p<0.05$) with regard to pulmonary functions among these countries.

Conclusion. As a result, it is considered that the differences detected in respiratory functions of athletes of the three different countries can stem from external-individual and racial factors/ethnic factors.

Key Words. Wrestling, Spirometer, Respiratory functions, National Athletes

Introductions

Researching the physical and physiological features of elite-level athletes holds a gradually increasing importance for researchers in terms of performance control and performance increase. When evaluated physiologically, pulmonary function tests as well as other physiological tests are also crucial in order to measure the performance conditions of individuals (Astrand, 1986). While it was reported in some studies that there is a positive correlation among physical activity, physical fitness and pulmonary capacities (MacAuley, 1999;Mehrotra and Twisk, 1998) it is expressed in some other studies that there is no such correlation (Biersteker, 1985). Specific pulmonary function tests also assist in determining the problems in the respiratory system as well (Sheety, 2005). Respiratory function levels are used as a reliable risk indicator particularly for COPD (Chronic Obstructive Pulmonary Disease) (Senior, 1998). In addition, high respiratory function levels facilitate the maintenance of a healthy life in the upcoming periods (Wang, 2004). It was stated in a study on health conducted by Buffalo that respiratory functions are a long-term determinant of the general survival rate for both genders as well and they can be used as an instrument in the general evaluation of health (Holger, 2000). Respiratory tests are also used in wrestlers as an indicator for their general health conditions, performance and give important information to trainers and athletes about respiratory system (William, 2004).

Wrestling is a branch of sport that entails the co-existence of various functional features, the anaerobic energy system is predominantly employed and factors such as quickness, strength, agility, flexibility, balance, muscular and cardiovascular endurance, coordination and a high aerobic capacity affect performance (William, 2004). Examining the research performed on wrestlers, it is seen that determining physical and physiological features of wrestlers as well as the effects of different training programs on these features and changes that occur in these features with weight loss have been investigated (Brown, 2006; Vardar, 2007). Research conducted on the respiratory functions of wrestlers is considerably limited (Ghosh, 1985). The need for conducting such a study was put forward with the aim of using pulmonary function tests commonly for the purpose of detecting the fitness conditions of individuals and presenting crucial information to trainers and athletes as an indicator of the health conditions of athletes (Astrand, 1986). Moreover, another reason is the existence of a significant correlation between Wingate test parameters, which are the determinant of anaerobic performance, and respiratory functions (Arslan, 2009) and that being said, anaerobic traits being dominant and in addition, respiratory functions also being affected by quite varied factors such as age, gender, ethnic group, exercise and so on. Due to these reasons, this study was conducted with the aim of determining and evaluating some respiratory functions of athletes of three different seniors' free style wrestling national teams.

[1]Gazi University School of Physical Education and Sports, Ankara/Turkey
CORRESPONDENCE AND REPRINT REQUESTS: Ulviye Bilgin
[2]Erzincan University Faculty of Education Department of Physical Education and Sports, Erzincan/Turkey
Email: ulviye@gazi.edu.tr

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Methods

This study was carried out on athletes who participated in the preparation camp that was held in Ankara before the International Yasar Dogu Seniors' Freestyle Wrestling Tournament between January 23 – February 07, 2008. A total of 36 subjects from the national teams of Turkey (n=12), Kyrgyzstan (n=12) and Senegal (n=12) voluntarily participated in the study.

The heights of the subjects were measured by the Seca brand instrument that measures height and their body weights were measured by a digital bascule with a degree of accuracy of 0.01 kg.

One day before the pulmonary function tests were carried out, the athletes were warned about not using any drugs, smoking cigarettes within the last 24 hours, doing vigorous exercise at least 30 minutes before the test and eating heavy meals 2 hours before the test. The individuals having had upper or lower respiratory infection for the last 4 weeks were excluded from undergoing the test. In addition, individuals tested were asked to not wear clothes restricting their chest and abdominal motions. Subjects were informed about the test maneuvers before the test was conducted.

Before the pulmonary function tests, room temperature and barometric pressure were recorded and BTPS was made (Miller, 2005). Pulmonary function tests were carried out by a portable Cosmed Pony FX brand Spirometer (Italy) while subjects were standing.

Statistical analysis was conducted with SPSS 11.0 package software. Levene's test of homogeneity of variance was applied to the data after conducting a Kolmogorov-Smirnov test and normality test. The One-Way ANOVA test was performed on the data that exhibited normal distribution and whose variances were equal. Tukey multiple comparison test was implemented to determine the differences among the countries, significance at the $p<0.05$ level was investigated.

Results

Looking at (Table 1), no significant difference was found statistically among the physical traits of the subjects (age, height and body weight). When the subjects were evaluated in terms of their pulmonary functions (Table 2), it was observed that there were significant differences among the countries in FVC and VC values at the $p<0.05$ level between Turkey and

Senegal and at the $p<0.01$ level between Turkey – Senegal and Kyrgyzstan – Senegal in %FVC, %FEV1 and %VC values.

Table 1: Physical Traits and Comparison of Three National Teams

Parameters	Turkey (n=12)	Min.	Max.	Kyrgyzstan (n=12)	Min.	Max.	Senagal (n=12)	Min.	Max.	ANOVA	P
Age (year)	25,67±5,32	20	32	23,17±2,92	20	27	27,00±4,52	23	33	1,191	0,331
Weight (kg)	73,58±11,30	55	84	62,67±7,43	55	74	72,33±10,07	60	84	2,261	1,139
Height (cm)	169,17±8,93	155	180	167,33±6,41	162	176	176,50±8,55	168	191	2,184	0,147

P>0.05

Table 2: Comparison of Respiratory Values of Three National Teams

	Turkey (n=12)	Min.	Max.	Kyrgyzstan (n=12)	Min.	Max.	Senagal (n=12)	Min.	Max.	ANOVA	
FVC (lt)	5,07±0,71[a]	4,23	6,03	4,92±0,66	4,13	5,69	3,76±0,94[b]	2,38	5,31	5,001	0,022*
FVC%	106±6,99[c]	95	116	104,83±7,85[d]	91,00	113,00	72,50±13,21[e]	50,00	89,00	22,811	0,001**
FEV1 (lt/1.sn)	4,24±0,69	3,42	5,04	4,14±0,60	3,63	5,05	3,43±0,90	1,95	4,77	2,109	0,156
FEV1%	103,67±8,26[f]	94	114	103,83±8,93[g]	92,00	116,00	78,66±16,74[h]	48,00	96,00	8,814	0,003**
FEV/FVC%	83,33±6,25	74	92	84,00±5,32	74,00	88,00	90,33±6,08	82,00	98,00	2,570	0,110
VC (lt)	4,68±0,56[i]	3,94	5,34	4,59±0,54	3,95	5,20	3,68±0,77[j]	2,68	4,74	4,562	0,028*
VC%	94,00±3,69[k]	87	97	95,50±8,24[l]	83,00	108,00	68,00±9,54[m]	54,00	79,00	24,919	0,001**
PEF (lt/sn)	8,55±1,77	5,34	10,18	8,01±2,15	4,47	10,96	7,24±2,81	4,09	11,21	0,498	0,618
MVV (lt/dk)	158,65±38,58	107,60	214,40	148,68±32,82	101,50	193,50	151,45±55,77	69,90	223,10	0,084	0,920

p<0,05 **p<0,01 (a-b)* (i-j)* (c-e)** (d-e)** (f-h)** (g-h)** (k-m)** (l-m)*

FVC: Force Ventilation Capacity, **FEV_1**:Forced Expiratory Volüme in one second, **VC**: Vital Capacity, **MVV**: Maximal Voluntary Ventilation **PEF:** Peak Expiratory Flow

Discussion

In this study conducted with the aim of determining and evaluating some respiratory functions of athletes from three different countries, while there were no significant differences among countries with regard to their physical traits, significant differences were detected in FVC and VC values between Turkey and Senegal, in %FVC, %FEV1 and %VC values between Turkey and Senegal, and Kyrgyzstan and Senegal.It is reported in the literature that respiratory functions are influenced by various factors as internal-individual and external individual factors (Buist and Scanlan, 1995, Higgins, 1993).

It is stated that external-individual factors which affect pulmonary functions are environment, nutrition, alcohol, body heat and saturation of barometric pressure with water vapor, drug use, exercise, infections, air pollution, allergens and cigarettes, while individual factors are age, gender, ethnic group (Buist, 1995; Higgins, 1993; Rong, 2008), anthropometry(Scanlan, 1995), waist circumference (Higgins, 1993), body posture (Haern, 1968) and psychological factors (Buist, 1995).

In cases of the existence of age and height homogeneity, it is stated that the total pulmonary capacities and ventilation capacities differ among ethnic groups.

While it is noted that pulmonary and ventilation capacities of individuals who live in the Indian subcontinent are lower compared to Europeans (Haern, 1968; Miller, 2005), it was reported that the pulmonary function values of Western Africans are also slightly higher than Indians (Miller, 1970). It is considered in this study conducted as well that inter-athlete difference can stem particularly from extra-race/ethnic group and individual factors rather than age and anthropometric factors.

It is stated that as a result of regular sporting activities, increases were observed in individuals' physical and physiological development in addition to their respiratory functions (Callaway, 1988; Chandran, 2000; Nourry, 2005; Shivesh, 2007; Thaman, 2010), accordingly, pulmonary volume and capacities of trained individuals during exercise and rest are higher than of sedentaries (Durning, 1977; Ferraro, 1999; Ghosh, 1985).

Besides, it is also stated that some changes can occur in the respiratory dynamics of untrained individuals during exercise, albeit not at as high a level as top level trained athletes (Brown, 2006). Even though it is not known to what extent these changes depend on physical training, anatomical limitations or gender distinctions, it is logically accepted that the muscles of respiration of physically trained people are stronger and more durable (Brown, 2006).

In a study in which Gupta and Guastellan (Gupta, 2007) evaluated the pulmonary functions of 53 high school students (27 swimmers, 26 wrestlers and a non-athlete control group of 26), they stated that there was no significant difference statistically between FVC and FEV_1 values of athletes (swimmer-wrestler). On the other hand, they detected that there was a significant difference statistically in FVC and FEV1 values at the $p<0.05$ level between athletes (swimmer-wrestler) and non-athletes (Gupta, 2007).

As a result, they reported that training performed in high school students develops pulmonary functions but there isn't any difference between the types of training performed (in terms of training performed by wrestlers and swimmers) in terms of respiratory parameters.

In another study in which Ghosh et al. (Ghosh, 1985) determined the pulmonary capacities of athletes in different branches in India, they reported that VC, MVV and $\%FEV_1$ values of 21 wrestlers between the ages of 23-24 with a height of 169,4±6.1cm and body weight of 65,9±8,0kg are 4.02±0,73lt, 138,8±23,20lt/min and 90,8±6,4lt respectively (Ghosh, 1985).

The VC, MVV and $\%FEV_1$ values obtained in this study, which was carried out on wrestlers, were detected for Turkey as 4,68±0,56lt, 158,65±38,58lt/min, %103,67±8,26, for Kyrgyzstan as 4,59±0,54lt, 148,68±32,82lt/min, %103,83±8,93 and for Senegal as 3,68±0,77lt, 151,45±55,77lt/min, %78,66±16,74.

While the pulmonary function values of Turkish and Kyrgyz wrestlers were found to be higher than the values of Indian wrestlers determined by Gosh et al., the values of Senegalese wrestlers were found to be lower (Ghosh, 1985).

In another study in which Hearn and Edwards (Edwards, 1972; Haern, 1968) determined pulmonary respiratory capacities, it was reported that the respiratory values of individuals who live in the Indian subcontinent are lower than Europeans; in Miller et al. (Miller,1970), pulmonary respiratory values of Western Africans are slightly higher than Indians (Miller,1970). It was reported that due to the fact that Turkey is situated on the European continent, Kyrgyzstan is situated on the Asian continent but over India, Senegal is on the Indian subcontinent (Edwards, 1972; Haern, 1968), the pulmonary function values of Western Africans are also slightly higher compared to Indians (Miller,1970).

The results attained in this study, in which respiratory values are compared among ethnics group or countries, are backed up by the results obtained by Hearn (Haern,1968) and Edwards et al. (Edwards, 1972) in their studies. Finally, it is considered that distinctions detected in the respiratory parameters of athletes who participated in the research could stem from external-individual and racial factors.

Evaluating respiratory functions together with performance is suggested in studies to be carried out hereafter by covering internal and external individual factors as a whole.

Practical Applicaton: The present study reveals data resulting in comparative benchmark concerning

national wrestlers of different ethnicities and from various countries for further researches.

The data collected in our study showed that ethnicity influenced pulmonary functions significantly. It is therefore suggested that non-individual factors could be effective in such studies

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