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# The Effect of Training and Sport Type on Pulmonary Function Parameters among Iraqi Soccer and Futsal Players

Zeyad Tareq Abdul Razzaq[1], Zaid Al-Madfai[2], Ghassan Thabet Saeed[3]
[1]*M.B.Ch.B, MSc.*
[2]*M.B.Ch.B, M.Sc. Ph.D*
[3]*M.B.Ch.B, MSc., Ph.D.*

***Back ground:*** *The characters of sport and the training and regular exercises, make athletes tend to have an increase in pulmonary capacity to compensate the forceful respiratory movements and large air volumes used. Intensity and severity of sports performed by the athletes usually determines the extent of strengthening of the inspiratory muscles and may be the alveolar size with a resultant increase in the pulmonary functions.*
***Aim of the study****: this study has been carried out to establish a relationship between the character of sports and pulmonary functions in Iraqi athletes.*
***Methods:*** *35 soccer and 35 futsal male athletes which are members of six Iraqi clubs were included in this study. In sitting position, the spirometry was done in sitting based on American Thoracic Society (ATS) recommendations. Pulmonary function was assessed based on Forced Expiratory Volume in first second (FEV1), Forced Vital Capacity (FVC), Tiffeneau index (FEV1/FVC) and Peak Expiratory Flow Rate (PEFR). These values are calipered according to the predicted for the age, sex, height, weight and race.*
***Results:*** *Pulmonary Function Profile was analysed and compared between the study groups. In our study the soccer athletes group were having a significant higher mean of percentage value of FVC, FEV1, PEFR and FEV1/ FVC ratio as compared to futsal athletes group.*
***Conclusions****: Regular strong and long-time exercise in addition to the character of training and competition produces a positive effect on the lung by increasing pulmonary capacity and thereby improving the lung functioning.*
***Keyword:*** *spirometry, athletes, training, FVC, FEV1*.

## I. Introduction

In general, the futsal and soccer seem to be very similar in the movement structures but rules of the two sports are significantly different. In soccer; 11 players approximately run 8-12 km throughout the 90 minutes duration of the game that is composed of 2 halves of 45 minutes and permits 3 substitutions maximally. While in futsal; 5 players and 2 halves of 20minutes, unlimited substitutions are the properties of the game. As a result, soccer players to spend more time in improving their self-performance and spend a longer time playing and long distance than the futsal players (1-3). It is now well accepted that pulmonary function is a long-term predictor for overall survival rates in both genders and could be used as a tool in general health assessment (4).

Pulmonary functions are generally determined by respiratory muscle strength, compliance of the thoracic cavity, airway resistance and elastic recoil of the lungs (5). The spirometry tests are mostly used in the respiratory status evaluation, and they have become a basic part of the routine health checks in occupational medicine, sports medicine, public health status monitoring and clinical practice (6). Although lung function is genetically regulated, and its function is among other influenced by the environmental and alimentary factors, previous research show that it can be improved by bodily exercise (7-8) , as well as the fact that it is influenced by the type of the sport (9). Besides sedentary lifestyles, respiratory performance is affected by various factors like air pollution (10) and smoking (11). Ethnic variations as well as the variation in age and body size (12) and also level of physical fitness (13).

Training improves physical working capacity and trained sportsman has a resting bradycardia and a greater maximum O2 consumption ability (VO2max) (14). Soccer is the most popular game in Iraq but in last few years, futsal start as an alternate and began to be known and popular. Routine investigations including pulmonary functions of Iraqi players in most Olympic Games are poor and insufficiently documented although spirometer represents an important part in fitness evaluation of all athletes.

## II. Methods

This study included 35 athletes of soccer and 35 futsal that are professionals in the games from six Iraqi League clubs. All the athletes must be trained and played for at least seven years in the game. The players were healthy and had normal blood pressure with no history of chronic diseases or smoking. Any player with history of tonic steroids using was excluded from this study.

The height and weights were measured and body mass index (BMI) was measured by the equation:
BMI = weight (kg) / height (m2).

The spirometry examination was done at rest and with no exercise to be done for the last 3hours in agreement with the recommendations of American Thoracic Society – ATS (1994) (6). In sitting position, the examinees performed three forced expiratory maneuvers with their nose plugged and the best of three was used in data analysis.

Pulmonary measures included:

Forced vital capacity (FVC) this is the largest amount of air that can be maximally expired after a maximum inspiration;

Forced expiratory volume within the first second (FEV1) that is volume of air expired by a maximum expiration after a maximum inspiration during the first second (FEV1),

Tiffeneau index (FEV1/FVC);

Peak Expiratory Flow (PEF) that is the maximum amount of flow at peak expiration measured in liters per second.

Statistical comparisons between soccer and futsal players were accomplished using an independent t-test. Criterion alpha level of $P \leq 0.05$ was used to determined statical significances

## III. Results

The anthropometric comparison was showed in Table1

The soccer players were taller while futsal are heavier.

BMI was 23.5 in soccer player while it was around 25.2 in futsal players.

The mean age of futsal players was 26.5years which was higher than that of soccer players which was 24.4years.

Comparisons of pulmonary function tests were shown in Table 2. It showed that soccer players had statistically significant higher values of the FVC, FEV1, and PER while the difference in FEV1/FVC percentages was not significant between the studied groups.

**Table 1:** Physical characteristics of soccer and futsal players

| | **Soccer players** | | **Futsal players** | |
|---|---|---|---|---|
| | **Mean** | **SD** | **Mean** | **SD** |
| **Height (cm)** | 180.8 | 5.55 | 176.33 | 7.2 |
| **Weight (kg)** | 76.8 | 5.6 | 78.88 | 6.9* |
| **Body mass index** | 23.5 | 2.2 | 25.2 | 2.7* |
| **Age(years)** | 24.4 | 2.5 | 26.5 | 5.33* |

Statistically significant difference (t-test for independent samples) * $p<0.05$

**Table 2:** Comparison of pulmonary function test of soccer and futsal players

| Soccer players (mean ± SD) | | Futsal Players (mean ± SD) | |
|---|---|---|---|
| FVC | 90.2± 8.8 | FVC | 85.5±6.9* |
| FEV1 | 92.6± 4.6 | FEV1 | 86.6± 6.9* |
| FEV1/FVC | 100.23± 2.2 | FEV1/FVC | 101.5± 3.5 |
| PEF | 98.6± 4.8 | PEF | 88.9± 6.0* |

Statistically significant difference (t-test for independent samples) * $p<0.05$

## IV. Discussion

The quality of the game and its rules needs special body characters that make the athletes able to practice and give a good performance. In this study 2 types of football game players were studied. The games are similar in the outline but the roles are different. As the body character of the players was compared with the international standard; Iraqi soccer players were heavier than the international standard (Brazilian (15), German (16), and Croatian (17)) but taller than the Brazilian (15) and shorter than the German (16) and Norwegian (18). Their BMI was approximately similar to the international that is about 23 (15)

The futsal players were shorter and heavier than the international including Spanish (19), English (20), and Brazilian (21). Their BMI was also higher than the international (17, 20).

As the futsal players were shorter and heavier than soccer players, BMI of futsal players was higher than soccer players. This can be explained by the fact that in Iraq, the futsal schools that prepare the young players are not well organized. In addition, most futsal players had previous experience in soccer training and leave the game and/or the regular training and started futsal non-programed or pre-match short period training.

In the world, futsal is not that popular and retired soccer players converted from soccer to futsal but in Iraq and because of the political unstable events or commercial causes, futsal league increased but still depend on soccer players. Futsal players are usually older in age and heavier as they are irregularly trained and might have extra jobs that are non-related to sports.

The respiratory function analysis among Iraqi futsal and soccer players showed that soccer players had significant higher values of the FVC, FEV1 and PEF variables in relation to futsal players. These findings were in agreement with some previously published studies (17, 20).

Regular long duration forceful training and sport practicing cause regular forceful inspiration and expiration for long period during training that leads to increase the power and strengthening of the respiratory muscles (2). The maximal lungs inflate and deflate is an important physiological stimulus for the release of surfactant (22). Swimming and water sports and also weight lifting had better pulmonary function compared to other athletes such as sprinters, who have less strenuous muscle exercise (23).

The FEV1/FVC ratio could be used as a predictor of obstructive and restrictive lung disease. In the present study, the mean value of FEV1/FVC for football and futsal were not significantly different and similar to the international (17). Vedala and coworkers (24) showed that sedentary subjects has lower value that is about {81.1} while in marathon runner (2km/day) the value was about {92.1} while in some previous studies (25-27) there were no observed differences in vital capacity in athletes when compared with non-athletes as these capacities might affected by genetic and ethnic factors.

Because Futsal match is shorter and its rules are easier, soccer players spend more time in the game and run far long distance during the match and this might increase the pulmonary capacities as it is generally accepted that regular exercise produces a positive effect on the lung (4). In addition; longer time period in training and playing cause significant improvement in oxygen transport and usage system (28).

Thus, people with higher levels of physical activity are expected to have higher levels of fitness because physical activity will improve cardiorespiratory fitness (6).

From these findings, one can assumed that although both soccer and futsal are categories of football games, player's trainings are different and as lung function improved due to an exercise, Iraqi soccer players showed the higher levels of lung function with better body characters than futsal players.

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