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## Comparison of max $VO_2$ levels of elite and deaf footballers

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### Abstract

The aim of this study is to determine the endurance performance of the players of the hearing handicapped football team and compare it with those professional players in the same age group playing in Turkish 1<sup>st</sup> and 3<sup>rd</sup> leagues. For this purpose the players of teams in the Turkish first and the third divisions and the Turkish national hearing handicapped football team who won the world championship in 2012 were subjected to shuttle run and their maximum speeds, heart rates, and maximum oxygen consumption rates (max  $VO_2$ ) were determined. At the end of the study all these three parameters of the hearing handicapped team were found to be lower with a statistically significant extent than the values obtained from the two professional teams ( $p < 0.01$ ). This can be attributed to selection of the players of the handicapped team from a much smaller group of players, the lack of training and competitions and they were forced to work in different jobs due to the fact that the economic income they obtained from the sport was not sufficient enough.

**Key words:** Hearing handicapped, sports, performance, Max $VO_2$

### Introduction

Football or soccer as known by the Americans is a very popular among the hearing handicapped people as it is all over the world. Football is a 90 -minute high intensity intermittent sporting activity which requires strength and stamina throughout the period. An elite male player runs about 10 kms throughout the match. Nearly 75-80% of this activity are low intensity anaerobic affords. Endurance is very important to maintain an optimum performance through the competition. The maximum oxygen consumption (max $VO_2$ ) is the highest amount of oxygen taken, transported and utilized by the human body. It is an important criterion in the performance of the people in the endurance exercises. In other words it is the most important indicator of the functional limits of the respiratory system. Max $VO_2$  is dependent on age, anatomical structure, race and environmental factors and it is has a high correlation with the condition level of the person (Foss et al., 1980; McArdle et al., 1999).

The studies carried out on the professional football players have shown that they had a very high aerobic capacity. The level of this aerobic capacity is indicated by Max $VO_2$  (Helgerud et al., 2001; Reilly et al., 2003). It was reported that a player covers an average distance of 10 kms throughout the match and there was an important relation between this distance and the max $VO_2$  (Helgerud et al., 2001; Bunc et al., 2001). It was also reported that the anaerobic threshold level is highly dependent on max $VO_2$  (Hoff et al., 2001).

The number of the hearing handicapped people in Turkey is nearly 3 million. According to the 2012 data there were 114 sport clubs affiliated to the Hearing Handicapped Sports Federation and there were total of 1137 women and 6745 men total of 7782 licensed athletes in all branches. However the number of the licensed players in the football federation is 544,572 according to 2012 data.

In Turkey the number of the handicapped people oriented towards sports is highly limited and the determination of the difference between the sportive performance values of the hearing handicapped people and the professional players has become very important in order to find the reasons behind this ratio. This study aims at the elucidation of the difference between the normal and the hearing handicapped players.

## Material and Method

### Research group:

This study was carried out on 59 football players playing in the Turkish first and third division and the players playing the Hearing Handicapped National football teams who voluntarily participated in the study. The physical features of the players included in the study were tabulated in Table 1. The written consents of the players were taken after giving detailed information about the study to them, their parents and their coaches.

### Test protocol:

The body weights and the heights of the participants were measured by Tanita HD 358 body composition analyzer in kilograms and stadiometer with an accuracy of 0.001 cms in centimeters. The endurance performances of the players were determined by shuttle runs in a closed sport hall. The participants were asked to run a 20-m court with increasing pace until they yielded to the exhaustion or they missed two signals in a row. The data obtained were used to calculate the estimated VO<sub>2</sub> max value in ml.kg/min by the help of the evolution tables. The pace and the corresponding pulse rates when the participants stopped the shuttle run were monitored with a portable telemetric hearth pulse rate monitor (Polar RS 400 multi, Finland).

### Statistical Analyzes:

The descriptive statistical analyzes of the data recorded were performed by computing the mean and standard deviation values ( $\bar{x}$  and SD) by the use of SPSS 15.0 statistical software and evaluation of the differences between these values by ANOVA and Bonferroni test as the Post Hoc tests at the significance level of  $p < 0.01$ .

## Results

**Table 1: The physical features of the participants**

	Age (year)	Body weight (kg)	Height (m)	BMI (kg/boy <sup>2</sup> )
3. Division players (n=18)	23.2 ± 3.6	71.67 ± 3.96	1.79 ± 0.06	22.36 ± 1.20
1.Division players (n=18)	24.6 ± 2.1	74.72 ± 5.08	1.76 ± 0.06	23.87 ± 1.26
Hearing handicapped players (n=23)	26.99±4.88	72.59 ± 6.04	1.77 ± 0.03	23.19 ± 1.68

There were no statistically significant differences between the players participated the study regarding to the physical features ( $p > 0.01$ ).

**Table 2: The endurance performances of the participants**

	Running pace (km/s)	Hearth beat rate (beat/min)	maxVO <sub>2</sub> (mL/min)
3.Division players (n=18)	15.50 ± 1.04	193.83 ± 8.26 <sup>c</sup>	54.99 ± 5.17
1.Division players (n=18)	16.33 ± 0.59 <sup>a</sup>	184.77 ± 6.91 <sup>d</sup>	59.48 ± 3.75 <sup>f</sup>
Hearing handicapped players (n=23)	14.89 ± 1.55 <sup>b</sup>	187.13 ± 7.74 <sup>e</sup>	52.56 ± 7.04 <sup>g</sup>
Z	7.59	6.83	7.64
p	0.00	0.00	0.00

(a-b), (c-d), (c-e), (f-g) p<0.01

When we look at the table above there were statistically significant differences between maximum running pace and maxVO<sub>2</sub> values of the first division and the hearing handicapped players (p<0.01). The hearth beat rates of the third division players at the exhaustion were found to be higher than the other two groups at a statistically significant extend (p<0.01).

### Discussions and Conclusion

In this study which was carried to evaluate and compare the endurance performance of the hearing handicapped national football team players with those of the first and third division players revealed that the performance of the hearing handicapped football team was lower than the their counterparts playing in the first and third divisions by a statistically significant extend .

Football is very popular among the hearing handicapped people in Turkey. There are 32 teams in the first and 40 teams in the second hearing handicapped league. The Turkish national team is very successful in global dimensions. They were the champions of the 18<sup>th</sup> Hearing Handicapped Olympiads organized in Copenhagen in Denmark in 1997. They lost in the final of the 2008 world cup held in Parts in Greece by penalties and won the cup held Ankara Turkey held in 2012. In spite of all these the endurance performance of the hearing handicapped football team were found to be statistically lower compared to the players in the Turkish 1<sup>st</sup> and 3<sup>rd</sup> division .

The success in team sports largely depends upon the aerobic endurance and strength (Kemi et al., 2003; Reilly, 1997). The intermittent pace of the team sports makes the alactic and lactic energy dependency very important. The system is dependent on aerobic system in order to replenish the metabolism after the application of such power pulses to the organism and get it ready to the next purge (Astrand et al., 1986).

An upper level player must be able to continue the high intensity activities of the game (sprint, dribbling, passing the players etc.) Throughout the match (Helgerud et al., 2001; Polman et al., 2004). This requires a very high VO<sub>2</sub>max capacity which depends on the age, gender, anatomical structure and conditioning level of the person. This capacity may also be affected by some racial, environmental and pathological factors. There is a quite a long training time allocated to increase the aerobic capacities of the players in football. One of the methods specific to football to increase the endurance is 3 to 8 minutes of 90-95 % maximum hearth beat rate intensity exercises (Wisløff et al., 1998).

The maxVO<sub>2</sub> levels of the international male players were measured to be 55-68 ml.kg/min while this value may go above 70 ml.kg/min for individual levels (Wisløff et al., 1998). The players with the high maxVO<sub>2</sub> 'capacities were found to make highest number of sprints through the game and have a decisive role in the outcome (Smaros,1980). The values of the third division and handicapped players were found to be below these international levels .

The suitability of the tests to evaluate the sportsman to that sport is very important for the practical importance of the results. The reliability of the site tests is lower than the lab results. However the validity of the site tests is higher than the lab tests since they simulate the actual game condition much better than the lab tests (MacDougall et al., 1991). The shuttle run test to measure the maxVO<sub>2</sub> levels of the football players is highly popular since it includes the movement patterns which have a high correlation with the actual game (Nicholas et al., 2000; Ramsbottom, 1988).

There were statistically significant differences between the maximum running speeds and maxVO<sub>2</sub> levels the handicapped players and the professional players, (p<0.01). This difference can be attributed various reasons such as the much shorter period of the handicapped league (14

matches in a season), the lack of training (twice a week) and the fact that the handicapped players have to work in other jobs since the financial opportunities playing football is not satisfactory.

The loss hearing has a very destructive effect upon the linguistic, cognitive, academic development in other words the life standard of the handicapped people. Early diagnosis is very helpful for them to be much more productive and successful in their school and social lives. The sporting activity started at early ages and sustained throughout the life is a very important social rehabilitation for the hearing handicapped people. No matter how low their endurance is the fact that they are actually doing a sporting activity has very important contribution to their socio-cultural levels and life standards.

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