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A Comparison of Reaction and Agility Tests of Female Soccer Players in Different Leagues

Cansu ÇOBAN[1], Murat TAŞ[2], Murat AKYÜZ[2], Öznur AKYÜZ[2], Fatih ÇATIKKAŞ[2], Atilla Orkun DİLBER[2]
[1]Ege University, Faculty of Sport Sciences, İzmir, TURKEY
https://orcid.org/0000-0001-5621-0873
[2]Manisa Celal Bayar University, Faculty of Sport Sciences, Manisa, TURKEY
https://orcid.org/0000-0003-2940-903X
https://orcid.org/0000-0002-8424-2765
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https://orcid.org/0000-0001-6047-3406
Email: cansucoban09@gmail.com, murattas25@gmail.com, sporcu006@hotmail.com, oznur.akyüz@cbu.edu.tr, fatihcatikkas@gmail.com, orkunaod@gmail.com

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Abstract

This study aims to see whether there is a difference in the reaction and agility running tests of female soccer players in different leagues. The sample group of this study consisted of 30 participants, 15 of whom were licensed female soccer players in the 1st League (Konak Belediyespor) aged 18-25 and the other 15 were female soccer players in the 2nd League (Manisa Gençlerbirliği), who are actively engaged in soccer. Reaction and agility tests such as reactive agility test, grid drill (reaction test), 30m sprint test, and zig-zag change-of-direction running tests were applied with the Smartspeed (Fusion Sport) branded photocell device. Average age, height, body weight, BMI, and athlete ages in the study are 21.26±2.08 years, 165.53±5.65 cm, 56.60±4.62 kg, 20.64±1.16 kg/m², 7.53±3.41 years. In the 2nd League (Manisa Gençlerbirliği), they are 20.66±2.57 years, 165.20±5.91 cm, 57.13±7.01 kg, 20.92±2.19 kg/m², 3.86±1.88 years, respectively. As a result of the tests, there was no statistically significant difference ($p>0,5$) between the two groups regarding the reaction and reactive agility tests, while a positive significance ($p<0.05$) was found in the 30-meter sprint in favor of the 1st League (Konak Belediyespor) and a statistically significant difference ($p<0.05$) was found in the zig-zag test in favor of the 2nd League (Manisa Gençlerbirliği). As a result, we can say that to be more successful in the agility performance, the players should be more effective in making decisions rather than leaning close to the ground at the moment of changing direction.

Keywords: Reaction, Agility, Soccer, Smartspeed.

Introduction

Soccer has several rules and is the art of defeating the opponent and finding a way to succeed by knowing these rules well and following the rules in practice (Durusoy, 2002). At the same time, it is a sports discipline in which aerobic and anaerobic powers are used consecutively and factors such as speed, strength, balance, agility, reaction, muscle, cardio-circulatory, and respiratory system directly affect it. Being quick and fast on the field in a competition will be advantageous. Thinking and applying it faster than the opponent will have a positive effect on the score. During a soccer match, the player is involved in many activities that require rapid strength development, such as sprinting or changing direction (İmamoğlu et al., 2017). However, although its goal, strategy, and tactics are determined, it is a game that its outcome cannot be predicted because it involves the human factor (Durusoy, 2002).

Many studies have been conducted to define the characteristic structures of athletes from different sports branches (Aslan, 2014). The factors determining the performance, which are among the elements that make up these characteristic structures; are elements such as strength, power, flexibility, endurance, speed, and quickness and it is possible to achieve success by combining these elements with compatible training and individual efforts of the athlete (Sezgin, 2011).

Soccer is undoubtedly the most widespread, most popular, and most-watched sport in the world. It has a unique place among other branches with its features such as the number of players, the size of the playing field, and the required competing skills (Marancı, 2001). As in other sports branches, the sportsman responds voluntarily (reaction) or involuntarily (reflex) to external stimuli in soccer. Çakıroğlu et al. (2012) state that the reaction time, which determines the time between performing the first muscular reaction or movement against external stimuli, should be good and this skill should be improved. The athlete must be able to maintain his/her physical characteristics during the match (Ağaoğlu et al., 2017). For these reasons, high reaction-time performance can affect the speed and agility of the athlete as well as increase the shooting performance (Bulgurcuoğlu et al., 2018).

Due to the characteristic feature of soccer sport, together with the flow of the game, the athlete needs the ability to move fast and change place-direction, that is, agility (Sonchan, 2017). Agility is considered as a locomotor skill that enables the body to change its direction as quickly, fluently, easily and in a controlled manner while moving from one point to another (Ağaoğlu et al,, 2017).

Each sports branch has its own training program, criteria, and tests. In order to reach the top rank in a sports match, we should evaluate the current situation of athletes by performing performance measurement tests as well as doing long and very tiring training.

This study is crucial for women's soccer to become widespread. However, it is thought to be beneficial in terms of contributing to the personal development of female soccer players. When the studies in the literature are examined, it is seen that although there are many studies on male soccer players, there are not many studies enough on female soccer players. From this point of view, emphasis should be put on women's soccer, and studies that will improve their performance should be included in the research. With this study, it is aimed to measure the reaction speed of female soccer players who play soccer in different leagues to reaction and agility tests and to see whether there is a significant difference between them.

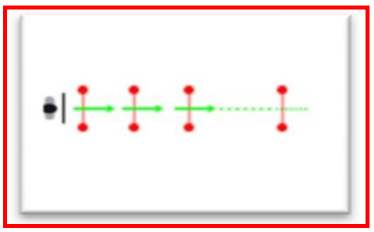
Material and Method

Participants

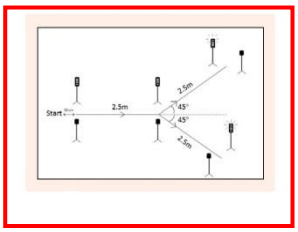
The sample group of this study consisted of 30 participants who are actively engaged in soccer, 15 of whom are licensed female soccer players in the 1st League (Konak Belediyespor) aged 18-25, the other 15 are female soccer players in the 2nd League (Manisa Gençlerbirliği).

Procedure

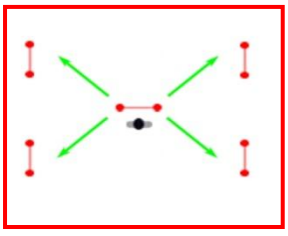
In body composition measurements, body weight (BW) was measured with a digital scale (its sensitivity is 0.1 kg (100g). Following that, reactive agility, grid drill (reaction test), zig-zag running test, and 30m sprint test were applied to all participants using a SmartSpeed (Fusion Sport) branded photocell device after 30 minutes of warm-up on the first day of the study. Measurements were carried out at 19.00 in the evening in the soccer field of Manisa Celal Bayar University, Faculty of Sport Sciences.



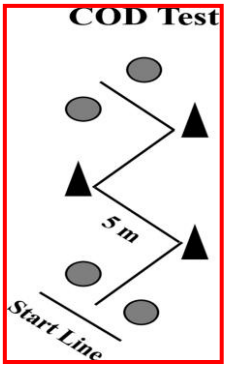
30m Sprint Test



Reactive Agility



Grid Drill Test



Zig-Zag Test

Data Analysis

In order to perform the statistical analysis of the study, the minimum, maximum, average, and standard deviation values of the descriptive, physical, and physiological parameters were calculated with descriptive statistics in the SPSS 16.0 package program running under Windows XP. Mann Whitney U test was used for comparison of the two groups.

Findings

Table 1. Descriptive Parameters of The Participants (M±SD)

Parameters	1st League (n =15)		2nd League (n=15)	
	M±SD	Min. Max	M±SD	Min. Max
Age (years)	21.26±2.08	18-25	20.66±2.57	18-25
Height (cm)	165.53±5.65	155-175	165.20±5.91	156-175
Body Weight (kg)	56.60±4.62	50-66	57.13±7.01	50-76
BMI (kg/m2)	20.64±1.16	18.64-22.89	20.92±2.19	18.97-25.39
Athletic Age (years)	7.53±3.41	4-13	3.86±1.88	2-7

M= mean; SD= standart deviation

When Table 1 is examined, the descriptive parameters of the participants are shown. According to this, the average age of the 1st League Group is 20.66 years, the average height is 165.53 cm, the average BMI is 20.64 ± 1.16 kg/m², the average athletic age is 7.53 years. The average age of the 2nd League Group is 20.26 years, the average height is 165.20 cm, the average BMI is 20.92 ± 2.19 kg/m², the average athletic age is 3.86 years.

Table 2. Mean Scores of Reaction and Agility Tests of Participants (M±SD)

Parameters	1st League Group (n =15)		2nd League Group (n=15)	
	M±SD	Min. Max	M±SD	Min. Max
R.A. Test (1-1-2)(sec)	3.35±0.35	3-4.02	3.60±0.57	2.67-4.46
30m sprint (sec)	4.98±0.21	4.62-5.25	6.36±0.29	6.02-6.79
Zig-zag Test (sec)	6.51±0.37	5.98-7.21	5.17±0.47	4.54-6.13
Reaction Test (Grid Drill) (Tot.sec)	23.91±2.21	16.99-26.60	24.13±1.50	21.38-26.28

M= mean; SD= standard deviation R.A.=Reactive Agility Test

Table 2 shows the average of the reaction and reactive agility tests of the participants. According to this, the average of reactive agility test of the 1st League Group is 3.35±0.35sec, 30m. Sprint test is 4.98±0.21sec, Zig-zag test is 6.51±0.37sec, and the grid drill (reaction

test) is 23.91±2.21sec. The average of reactive agility test of the 2nd League Group is 3.60±0.57sec, 30m. Sprint test is 6.36±0.29sece, the zig-zag test is 5.17±0.47sec, the reaction test is 24.13±1.50sec.

Table 3. The Comparison of Agility and Reaction Parameters of Groups

Parameters	**1st League Group (n =15)**	**2nd League Group (n=15)**	**P**
Reactive Agility Test (1-1-2) (sec)	3.35±0.35	3.60±0.57	.206
30 m. Sprint (sec.)	4.98±0.21	6.36±0.29	.000*
Zig-zag Test (sn.)	6.51±0.37	5.17±0.47	.000*
Reaction Test (Grid Drill) (Total sec)	23.91±2.21	24.13±1.50	.885

*p<0,05

When Table 3 is examined, the comparison of the reactive agility and reaction parameters of the groups is shown.

There was no significant difference (p>0.05) between the reaction and reactive agility tests between the two groups, a statistically significant difference (p<0.05) was found in favor of the 1st League in the 30m sprint test, and a statistically significant difference (p<0,05) was found in favor of the 2nd League in the zigzag test.

Discussion and Conclusion

The main findings of this study were that the reaction and reactive agility ability was not sensitive enough to detect a difference between 1st and 2nd league female soccer players. On the contrary, physical capacities in terms of 30m sprint and zig-zag test results were found to be suitable for detecting significant differences according to the game level.

The sprint distance in the soccer game varies between 5 meters and 40 meters in research (Leger & Lambent 1982). In our study, 30 meters was preferred for the maximal anaerobic sprint test. The reason we decided on this is that it is the maximal sprint distance in soccer.

The ability to slow down quickly, change body orientation, and accelerate are important prerequisites that increase the chances of players to win one-on-one duels or perform effective defensive maneuvers (Trecroci et al., 2018; Reilly 2007; Young et al., 2015). Therefore, both young and adult players with a high level of competitiveness should present a better change of direction speed (COD) profile than their lower-level counterparts. However, the second assumption is the opposite of the current results. One possible explanation might be that,

during a match, the ability of players to change direction depends not only on physical capacity but also on known perceptual and decision-making factors that refer to their reaction skills (Sheppard et al., 2006).

In the study conducted by Haugen et al. (2012), out of 194 Norwegian female soccer players from National Team, 1st League, 2nd League, 3rd League, National Team players were found to be 2% faster (P = .027, d = 0.5) than 1st league players and they were found to be 5% faster than the players of the 2nd division over 0--20 m. Mujika (2009) compared the sprint performances of 34 Spanish Super League and Premier League female players within themselves and 34 Super League and Premier League male soccer players within themselves. Female: the super league player outperformed the premier league player (2.1%, ES (d) = 0.64). In the study conducted by Koç et al. (2011), a 30-meter speed test was applied to male basketball and handball players, and 5.20 ± 0.77sec was reported for basketball players and 4.65 ± 0.48sec was reported for handball players.

In the 30-meter sprint test in our study, the 30m Sprint test of the 1st League Group is 4.98 ± 0.21sec. The 30m Sprint test of the 2nd League Group is 6.36 ± 0.29sec. It was found to be significant in favor of the 1st League (Konak Belediyespor). It can be said that it is a result of Konak Belediyespor being in an upper league.

Sheppard and Young (2006), Farrow et al. (2005) investigated the reactive agility netball players with high and low performances. The test consisted of a full-size screen that showed the opponents pass, the direction of the pass, and then triggered a timing gate to turn on the light that the player should run. Since this particular test is for a netball-specific sport, it goes to a place to deal with the reactive agility element, and it involves the player deciding on a response to a stimulus. The results showed a difference in reaction time between high performer players and low-level players. High-performers showed shorter response times, most likely due to being able to predict the direction of transition by recalling previous technique and body position experience. This also concerns most commonly tennis players, predicting the opponent's serving direction. Green et al. (2010) conducted a study aiming to create a simple COD (Change of Direction) and reactive agility test that can be used to evaluate rugby players. In the test results, the two skill groups, club, and academy, were compared. The authors concluded that players with a higher game standard were superior to those who are less skilled, in reactive agility tests. Gabbett and Benton (2009) conducted a very similar study investigating reactive agility performance in rugby players. Similarly, the results of this study also revealed that reactive agility tests can distinguish between players with different abilities, but also indicate it is worth noting that reactive agility tests can distinguish the specific types of training needed to improve the individual's performance. Oliver and Meyers (2009) investigated the reliability of photoelectric timing gates and an agility test protocol similar to this study. The protocol has been recognized as reliable in distinguishing different abilities.

Although there is a lot of literature to say that elite athletes perform better in reactive agility tests than less skilled performers (Farrow et al. 2005; Sheppard et al. 2006; Gabbett et al., 2009; Oliver et al., 2009; Green et al. 2010), Ward (2011) was unable to report such clear results, unfortunately. Although the non-elite group was higher than elite players in the reactive agility test, statistically no significant difference (P> 0.05) was found.

In our study, the average of the reactive agility test of the 1st League (Konak Belediyespor) was 3.35±0.35 sec, while the average of the reactive agility test of the 2nd League (Manisa Gençlerbirliği) is 3.60±0.57 sec. There was no significant difference between the two groups.

Pereira et al. (2018) took measurements of 20m sprint, unloaded countermovement jump (CMJ), squat jump (SJ), loaded jump squat (JS), Zig-zag test and T-test of 15 men and 23 women from Brazilian National Olympic Team in their study and looked at gender differences. They found that male athletes outperformed female athletes in all tested variables. The difference between performances resulted as expected due to gender differences.

Ward (2011) the average score of elite participants was higher than that of the non-elite in the planned single agility test, however, the difference in performance was not statistically significant (P> 0.05). This result is to be expected as it is far more likely that the elite players are likely to be well trained in the requirements for quick changes. The standard deviation (SD) was also much less in the elite planned single test (SD = ± 0.78) than in the non-elite (SD = ±3.52) when it came to CODS, whereas, members of the non-elite population were very varied in their CODS ability. Given that all participants in a given group had comparable mean scores, an SD of this magnitude indicated that some participants in the non-elite group recorded much slower scores than the elite group, but the average was better. Other participants in the group performed better. Again, this is thought to be because tennis is about effective changes in direction, giving an advantage to the elite group of players.

Farrow et al. (2005) also could not find a significant difference in planned agility scores between elite and non-elite handball players.

The pre-planned zig-zag change of direction running test, which is the agility test we conducted, was found to be significant in favor of the 2nd League (Manisa Gençlerbirliği). As a result of our study, while the zig-zag change of direction running test of the 1st League was 6.51±0.37sec, the 2nd League zig-zag change of direction running test was 5.17±0.47sec. The performances of the 2nd League players have been found to be better. Considering the results of the planned agility test, the 1st League would have been expected to perform faster in the planned agility test results. The reason for this is that they have superior experience regarding technique and the individual movements required to make changes in direction and because they are more experienced than the 2nd League. However, contrary to the findings in the planned single tests, 2nd League players performed better than the 1st League players in the repeated phase of the planned test (P <0.05). After the first testing session, it was conducted by explaining to the participants what the purpose of the study was and why some individuals were tested. This information could have two possible effects on tests due to the participant's different effort levels. Participants who realized that they were in the lower skill group may be motivated to work harder to prove themselves against better players; or on the contrary, high-performance players may have complained about their abilities and took the test rather than maintaining maximum effort as desired. An attempt was made to eliminate this possibility by providing equal incentives and motivation for both groups; however, the amount of effort put into in the end depends on the participant. Contrary to what was expected, it can be said that 2nd League players were better motivated.

Reaction skill is an indispensable skill for performance athletes to take action and use their existing abilities. In a study, soccer players should watch moving balls and other players at different distances and at visual distances, which shows that it is important for soccer players to react and respond to objects of different sizes and shapes (Ando et al., 2001; Vurmaz, 2018).

A new methodological approach was presented to examine the visual reaction responses of goalkeepers during simulated penalty kicks in soccer, as the reaction skill in soccer has a great impact on goalkeepers. Goalkeepers were classified as successful or unsuccessful based on their performance by looking at the expectation test skill, thus allowing for in-group

comparison of visual search behavior between goalkeepers. In the test of expectation, participants were asked to move a joystick in response to the penalty kick situation presented on a large screen. The rate of fines recorded as well as the frequency and time of initiation of joystick corrections were evaluated. Visual search behavior was studied using a portable eye movement recording system. Consequently, when the goalkeepers who continued to do their exercises regularly and exercised in intervals were compared, the goalkeepers who were more successful in predicting the height and direction of the penalty kick were found to be the goalkeepers who continued their exercises regularly. Goalkeepers who exercised in intervals had longer waiting times before reacting and had a lower prediction rate of penalty kicks (Savelsbergh et al., 2005).

Lesiakowsk et al. (2017) included 119 men, 95 of whom were athletes in their study: soccer players (n = 24), volleyball players (n = 22), boxers (n = 26), and rowers (n = 23), and the study included simple reaction time (SRT), choice reaction time (CRT) and visual stimulus discrimination. Analysis of the results showed that volleyball and soccer players had shorter ($p < 0.01$) reaction times compared to non-athletes and representatives of other sports. We found significant differences ($p < 0.01$) between athletes and non-athletes in visual stimulus discrimination. In addition, boxers showed less correct reactions than volleyball players and showed shorter times of stimulus detection than volleyball and soccer players.

In the study conducted by Ölçülü et al. (2010) to evaluate the factors affecting the development of tennis skill in 10-14-year-old children, the conditional and coordinative factors that affect the tennis skill acquisition of young people who do sports and those who do not, have been examined. A comparison was made between the two groups who do sports and those who do not. The first measurements of the individuals were taken prior to any tennis training. Then, the same measurements were repeated in the 3rd week and the 6th week.6-week tennis training was given to the 1st and 2nd groups. During the training, pre-test, mid-test, and final-test were applied to both groups. There was no significant difference between the 2 groups in all measurements in visual reaction time. However, a significant difference was found between the initial and third measurements of the 1st group ($p<0.05$). There was no significant difference in auditory reaction time between both groups and all measurements of both groups ($p>0.05$).

In the study conducted by Dodanlı (2008), response times to visual stimulus (light) in soccer players were detected as 260.58±49.46 ms for goalkeepers, 258.03±44.86 ms for other position players, response times to auditory stimulus (sound) as; 238.88±72.52 ms for goalkeepers, 243.2±54.34 ms for other position players. Response times to visual stimulus (light) in handball players were detected as; 244.86±34.08 ms for goalkeepers, 250.77±34.6 ms for other position players, response times to auditory stimulus (sound) as; 214.5±27.66 ms for goalkeepers and 227.41±36.28 ms for other position players. These values were analyzed according to the 0.05 significance level and no statistically significant difference was found. Nowadays, players of a team in all positions must have all kinds of motor skills. Defensive and forward players should assist each other when necessary (Taş et al., 2013). Kamar (1987) in a similar study of his, compared the reaction times of goalkeepers and other position players in soccer but found no statistically significant difference.

In his study on amateur soccer players, Marancı (2001) determined the reaction times of goalkeepers, defenders, midfielders and forwards to visual stimulus as 470 ms for goalkeepers, 530 ms for defenders, 510 ms for midfielders and 490 ms for forwards, and to auditory stimulus as 397 ms for goalkeepers, 490 ms for defenders, 430 ms for midfielders, and 420 ms for forwards. Nowadays, players of a team in all positions must have all kinds of

motor skills. Defensive and forward players should assist each other when necessary (Akyüz et al., 2010).

In our study, in the reaction test, both groups were 23.91±2.21 and 24.13±1.50, respectively, and no statistically significant difference was found. The fact that the athletes participating in our study consisted of athletes who played soccer in the 1st and 2nd League actively, having better visual reaction levels can be explained by their ability to experience similar game experiences and being good at reflecting that.

As a result, since there are skills specific to soccer in the agility test, it can be said that performance is affected by technical skills. Also, the results of the running technique analysis show that to be more successful in the agility performance, the players should be more effective in making decisions rather than leaning to the ground at the moment of changing direction.

It was produced from Cansu Çoban's Master Thesis. Presented at World Congress of Sport Sciences Researches ''23-26 November 2017'', Manisa/TURKEY

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An Investigation of the Relationship between Female Volleyball Players' Intelligence Types and Their Sportive Success

Seyfi SAVAŞ[1], Yeliz AY YILDIZ[2], Yaşar İsmail GÜLÜNAY[3]
[1]Gazi University, Ankara, TURKEY
https://orcid.org/0000-0002-0780-7697
[2]Gazi University, Ankara, TURKEY
https://orcid.org/0000-0002-2002-0389
[3]Gazi University, Ankara, TURKEY
https://orcid.org/0000-0002-0590-2164
Email: seyfi@gazi.edu.tr , yelizayyildiz1977@gmail.com , ismailgulunay@karabuk.edu.tr

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Abstract

The main purpose of this study was to determine the intelligence types (verbal, mathematical, visual, musical, interpersonal, naturalist, kinesthetic and intrapersonal) of female volleyball players with their sub-dimensions and enlighten the relation between the types of intelligence and their sportive success. 104 female volleyball players, who actively play in Turkish volleyball leagues, participated in this study. "Personal Information Form" developed by researchers and "Multiple Intelligence Observation Form" by Selçuk, Kayılı, Okut (2003) were used as data collection tools. SPSS statistical software (25.0) was used for data analysis. Descriptive statistics and Pearson correlation analysis were applied to the data set. When the participants' types of intelligence were examined, it was seen that the players who possess naturalist, visual and interpersonal intelligence predominated in numbers. It was found that there were significant correlations between the sportive success and visual intelligence type, and the sportive success and verbal intelligence. The results clearly reveal that the type of intelligence was not the sole factor affecting the sportive success. The data obtained in this study is expected to blaze the way for the future studies in this field.

Keywords: Multiple Intelligence, Volleyball Players, Sportive Success

Introduction

It is crucial to choose the appropriate sports branch before starting one's sports life. In this context, while choosing sports branches, in addition to family members, friend environment and role models, they tend towards sports in the area where they can feel more relaxed and feel the sense of sportive success at the peak (Coakley, 2017, s.54). The general aim in sports branches, in order to achieve the targeted sportive success, is the improvement of the athletes 'performance by accommodating the physical features, psychological factors and motor adaptation demanded by the sport branch. Today the scientists, trainers and players exert concerted efforts to improve the performance of their teams to a maximum level (Koçak, 2012).

Volleyball, which has a history of nearly 100 years, is also a team game that needs various sports skills. It helps individuals develop physically, emotionally, mentally, and socially (Bayraktar & Sunay, 2007).

While all kinds of factors that may affect sportive success are examined comprehensively, the view that athletes' physical characteristics as well as mental characteristics are effective in their achievements, is gaining more importance day by day (Brewer, 2009). For example, a volleyball player is obliged to observe both the ball, his/her teammates, and the opponent at the same time during the match, but also to do the action that can create both the best attack and the best defense (Fleddermann, Heppe, Zentgraf, 2019). Considering all these observations and the short time that the player has, it is seen that all of them are separate from each other but at the same time in connection, and when implementing all these, a great mental activity is needed in addition to physical capacities (Raab, 2014).

Intelligence have been defined by so many scientists from different disciplines (Demirel et.al, 2006). However, the Multiple Intelligence Theory, proposed by Howard Gardner, have brought a new dimension to this area. According to Gardner, intelligence can be defined as the capacity of the creating a product which is valuable in more than one culture, the skill to bring efficient and effective solutions to the problems one encounters in daily life, and the ability to recognize new and complex structured problems that need to be resolved (Saban, 2005).

In multiple intelligence theory, which advocates that intelligence differentiates with the effect of biological and cultural structures, it is known that there are 8 different intelligence areas including Verbal-Linguistic, Logical-Mathematical, Visual-Spatial, Musical-Rhythmic, Physical-Kinesthetic, Interpersonal-Social, Intrapersonal and Naturalist Intelligences (Gardner, 2012). Determining the profiles of individuals in intelligence fields is an important educational aspect (Hassan et.al,2011). Besides, when talking about the mental skills that individuals have, it is stated that it would be better to say it as different fields that are independent from each other but also in relation, rather than a "general intelligence" (Moran, Kornhaber ve Gardner, 2009).

When the literature is analyzed, many studies in the field of multiple intelligence have been found within the scope of sports activities (Altınmakas, 2011; Tekin, 2009; Yıldız, 2019; Sevinç, 2016; Vaughan, 2015; Collins, 2005). However, studies on the potential of intelligence fields to affect sportive performance have been observed to be limited.

The aim of the research was to determine the intelligence types of female volleyball players with their sub-dimensions (Verbal-Linguistic, Logical-Mathematics, Visual-Spatial, Musical-Rhythmic, Physical-Kinesthetic, Interpersonal, Intrapersonal and Naturalist) and to reveal the relationship between it and sportive success.

Method

Research Model

The study was carried out using survey design, one of the quantitative models. Studies in which the opinions or characteristics of many participants are tried to be determined are survey studies (Büyüköztürk et.al,2018).

Participants

104 female athletes actively playing in Turkish professional volleyball leagues (Sultans League and Women 1st League) formed the research group. Participants had been informed within the scope of the research before the data was collected. Gazi University ethics commission (No: 2020–506) was informed about the publication and the data was collected from only volunteer volleyball players.

Data Collection Tools

"Personal Information Form" developed by the researchers in the scope of similar studies and "Multiple Intelligence Observation Form" from the book "Multiple Intelligence Applications" (2003) by Selçuk, Kayılı, Okut were used as data collection tools. And the number of matches for the national team was used as the indicator of sportive success.

Multiple Intelligence Observation Form consists of 80 questions in total and 10 questions for each intelligence area. The research group marked the questions between 0-4 according to themselves. The maximum score that can be achieved for an intelligence area is 40.

Cronbach Alpha reliability coefficient for the Multiple Intelligence Observation Form is .86. The values of this coefficient for the sub- dimensions are .62 for verbal intelligence, .70 for mathematical intelligence, .71 for visual intelligence, .68 for musical intelligence, .69 for kinesthetic intelligence, .86 for naturalist intelligence, .63 for interpersonal intelligence and .66 for intrapersonal intelligence.

Analysis of the Data

The data was evaluated using SPSS 25.0. The demographic information about the participants was defined and Pearson Correlation Coefficient test was used.

Findings

Table 1. Demographic Information about the Participants

		Min.	Max.	$\bar{x}$	SD	f	%
Age		19	32	24.42	4.26		
Sport Age		6	16	12.52	1.67		
Position	Libero					14	13.50
	Setter					19	18.30
	Hitter					32	30.80
	Middle blocker					29	27.90
	Opposite					10	9.60
Number of Matches for the National Team	0					50	48.00
	1-10					16	15.5
	11-20					11	10.5
	21-30					8	7.7
	31-40					10	9.6
	41+					9	8.7

Demographic information of the participants in the research was given in Table 1. Accordingly, the minimum age of athletes was 19 while the maximum age was 32. Sports age varied between 6 and 16. According to their positions, there were 14 libero, 19 setter, 32 hitter, 29 middle blocker and 10 opposites. When looking at the number of matches for the national team, 50 athletes had zero, 16 athletes had matches between 1-10, 11 athletes had matches between 11-20, 8 athletes had matches between 21-30, 10 athletes had matches between 31-40 and 9 athletes had matches more than 40.

Table 2. *T*he Distribution of the Multiple Intelligence Types of Participants

Linguistic	Mathematical	Visual	Musical	Kinesthetic	Interpersonal	Intrapersonal	Naturalist	Total
2	2	20	9	10	19	13	29	104

Table 2 was based on the distribution of the multiple intelligence types of participants. 2 players had verbal, 2 players had mathematical, 20 players had visual, 9 players had musical, 10 players had kinesthetic, 19 players had interpersonal, 13 players had intrapersonal and 29 players had naturalist intelligence.

Table 3. Intelligence Type Scores of the Participants According to the Number of Matches for the National Team

Number of matches for the national team	**0**		**1-10**		**11-20**		**21-30**		**31-40**		**41+**	
	$\bar{x}$	**SD**	$\bar{x}$	**SD**	$\bar{x}$	**SD**	$\bar{x}$	**SD**	$\bar{x}$	**SD**	$\bar{x}$	**SD**
Linguistic	26.14	4.90	27.20	5.26	23.50	7.32	19.67	2.51	22.25	5.50	21.67	4.37
Mathematical	27.42	6.26	33.20	4.07	30.25	1.70	25.67	3.32	25.50	5.19	32.67	4.59
Visual	29.18	5.11	28.10	6.82	31.25	6.65	32.00	6.00	33.25	7.50	35.33	3.98
Musical	29.06	6.91	31.20	6.94	28.25	9.06	26.00	4.16	26.00	7.57	26.83	5.56
Kinesthetic	30.12	5.27	32.70	4.11	30.75	6.65	28.67	6.11	29.75	2.98	33.50	3.33
Naturalist	31.83	5.73	34.40	6.55	29.00	7.16	30.67	6.11	29.00	10.52	30.83	3.86
Interpersonal	30.97	4.61	31.80	6.37	32.25	3.09	33.00	6.15	27.50	4.43	31.50	2.81
Intrapersonal	30.40	4.49	31.50	3.77	32.25	3.77	32.00	7.71	32.00	6.78	32.33	4.84

In table 3, the average intelligence scores of the athletes were grouped according to the number of matches they had played for national team, which was an indicator of sportive success.

Table 4. Intelligence Type Scores of the Participants According to Their Positions

Position	Libero		Passer		Smacker		Mid player		Opposite	
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Linguistic	23.57	4.90	26.79	4.80	25.57	5.72	25.69	5.59	26.00	3.74
Mathematical	24.57	6.26	29.21	5.59	29.10	6.41	28.45	6.07	28.60	4.72
Visual	32.14	5.11	30.68	5.48	31.50	5.26	30.97	5.47	33.20	6.45
Musical	28.79	6.91	28.89	6.12	28.67	6.91	29.79	6.96	25.80	7.19
Kinesthetic	31.50	5.27	30.00	5.15	29.77	5.38	31.14	4.91	33.60	3.97
Naturalist	31.93	5.73	31.16	6.62	32.17	4.88	32.76	6.36	34.20	6.81
Interpersonal	31.36	4.61	32.16	4.71	30.77	4.35	30.79	4.90	35.20	3.63
Intrapersonal	29.86	4.49	29.89	4.74	30.90	4.35	31.34	4.18	34.00	4.63

In Table 4, the average intelligence scores of the athletes were grouped according to their positions.

Table 5. The Relation between Types of Intelligence and the Number of Matches for the National Team

	Linguistic	Mathematical	Visual	Musical	Kinesthetic	Interpersonal	Intrapersonal	Naturalist
Number of matches for the national team	**-.242***	.141	**.447****	-.111	.110	.061	.181	.057

In table 5, when the correlation test was conducted in order to find a relationship between the number of matches for the national team, which was an indicator of sportive achievement, and intelligence areas, there were found a relationship between the number of matches for the national team and verbal intelligence and a relationship between the number of matches for the national team and visual intelligence.

Discussion and Conclusion

The research was conducted to determine the intelligence types of female volleyball players and to reveal the relationship between the intelligence types of these athletes and the sportive success.

As it can be seen in table 2, when the intelligence areas of the athletes participating in the study are examined, the number of athletes with naturalist intelligence type is 29, the number of athletes with visual intelligence type is 20, and the number of athletes with interpersonal intelligence type is 19. It is observed that athletes with naturalist, visual and interpersonal intelligence types are more than the athletes with other intelligence types. In this context, it

can be thought that athletes with naturalist, visual and interpersonal intelligence types may have turned towards volleyball.

The sportive success of the athletes has been determined according to the number of matches for the national team. According to table 3, when the intelligence areas of the athletes, who have played for the national team more, are examined, the presence of athletes, whose intelligence areas are physical, mathematical, and naturalist, are determined too. The result is an indication that the only factor affecting sportive success is not the type of intelligence. As seen in table 3 again, when the intelligence type average scores of the athletes, who have the highest number of matches for the national team, is examined, it is determined that the visual intelligence score has the highest value. However, as stated in table 5, according to the correlation test results, there is a positive moderate relationship between visual intelligence and the number of matches for the national team (r=.447). According to the result, it can be mentioned that athletes with high visual intelligence score may have high sportive success. Within the scope of table 3, it is seen that the athletes with the highest number of matches for the national team have the lowest intelligence score in the verbal area. In addition, according to table 5, there is a negative low relationship (r = -. 242) between verbal intelligence and the number of matches for the national team, and no significant relationships has been found between the other intelligence areas and it. According to Cohen (1988), between .10 and .29 refers to a positive low; .30 to .49 refers to a positive moderate; between .50 and 1.00 refers to a positive high; -.10 to -.29 refers to a negative low; -.30 to -.49 refers to a negative moderate; between -.50 and -1.00 refers to a negative high-level relationship. Kurt and Savaş (2019) found that there was a positive moderate relationship between physical intelligence and sportive success in their study, where they analyzed the relationship between the intelligence types and sportive success of fencing athletes competing in the World Cups of Foil Fencing. Aytaç (2017), in his research with taekwondo athletes, concluded that multiple intelligence had positive effects on sportive performance. Sivrikaya and Kaya (2009) concluded in their studies with sixth grade students that performing volleyball education in the framework of multiple intelligence theory was more effective than traditional method. Ulukan (2018), in his study examining the relationship between intelligence types and attention and performance levels in archers aged 14-20, concluded that there was a significant relationship between intelligence types and attention and performance levels. When the relationship between archers' intelligence types and their performances was examined, it was observed that there was a low positive correlation with physical intelligence, while there was a negative low relationship with naturalist intelligence. Vaughan (2015), in his research on intelligence's role in sports, discussed the approaches about intelligence and reached the conclusion that intelligence was an important difference for sportive success as a result of his studies on 330 athletes. Yıldız (2019), in his research on athletes doing individual and team sports, found that there was a relationship between the multiple intelligence levels of the athletes and the motivation levels specific to the sport. Sevinç and Şıktar (2016), in their studies with football, badminton, swimming and taekwondo athletes, reached the conclusion that interpersonal intelligence was the highest for badminton and football; logical intelligence was the highest for swimming and taekwondo; for these branches the lowest intelligence was musical. Çinkılıç and Soyer (2013) concluded that physical intelligence was high and visual intelligence was low in their studies with students of physical education. In their studies with the students of Physical Education Department, Kahraman and Bavlı (2014) stated that interpersonal and physical intelligence were the dominant intelligence and musical and naturalist were the weak intelligence areas. It may be thought that the similarities and differences between the studies are due to sample groups or sports branch types.

According to table 4, when the positions of the athletes participating in the research and multiple intelligence scores were examined, the verbal, mathematical and intrapersonal intelligence scores of the athletes playing in libero position have been found to be quite low. When libero players are evaluated according to the number of matches for the national team, the players with high naturalist intelligence score come to the fore. It is noteworthy that the players who play in setter position have high visual intelligence scores. Altınmakas (2011), in his study on elite basketball players, evaluated multiple intelligence areas according to the players' positions, but could not achieve any significant differences. Collins (2005) investigated whether intelligence was a talent and argued that intelligence was an important individual difference that could be developed with correct teaching methods.

Although the results obtained from the literature overlap with the study, it is an indicator that intelligence is an important factor affecting sports success. It is thought that the data obtained will help individuals in the direction of the volleyball branch and shed light on the studies that will examine the relationship between intelligence types and sportive success.

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Application of Non-Verbal Communication in İnterpersonal Relations "Coach - Athlete"

Detelina SMILKOVA
International Business School, BULGARIA
Email: detelina.smilkova@abv.bg

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Abstract:

Communication between people has existed since the very beginning of human civilization. As an extremely complex process, it continues to be difficult to define in a way that can cover all its aspects that it compiles and generates.
Whether verbal or non-verbal - communication expresses every change that occurs between individuals in the process of their communication. Communication is an art through which we successfully share significant and important information with each other and as such it exists in all spheres of our lives, incl. and in sports. It is the way coaches pass on their knowledge, skills and experience; through which they want to motivate and stimulate the teams; through which they provide information that will allow athletes to train effectively, productively and continuously improve and refine their performance. Whether the interpersonal "coach-athlete" relationship is based on communication with words, gestures, facial expressions or body language, they are based on communication, i.e. it is both verbal and non-verbal.
This article aims to show the important aspects of non-verbal communication and its application in interpersonal relationships between coaches and athletes, based on the importance of non-verbal communication and the requirements for its effectiveness. The reasons for choosing this topic are based on the statement that in the interpersonal relationship "coach - athlete" and sports in general, non-verbal communication has not only a significant application in this relationship, but is also a strongly dominant communication process between teams and their coaches.

Keywords: Non-Verbal Communication, İnterpersonal Relationships, Coach, Athlete, Sports Activity

Introduction

The whole process of development of our civilization is characterized by many changes in the behavior not only of individuals but also of human relationships as a whole. In this continuous course of development, we learn to control our behavior - its affects, impulses, emotions. This not only presupposes, but also imposes the need to differentiate one's own behavioral aspects, to get to know others, their attitude to the world and their personal position. In the social world, this acquaintance requires the observance of certain norms - very important for the person and for his public presentation to the audience.

Many psychologists, sociologists, non-verbal communication experts deal with the focus of public presentation and with regard to all dependencies and regularities in people's behavior. On the other hand, the differentiation of human behavior covers all aspects of public life, constantly changing the activities of people, incl. and sports activities, and thus turns them into a kind of social key to "unraveling" the components of nonverbal communication and their successful application in interpersonal relationships in sports.

In our time, sport is a major factor of social significance, and athletes are seen as "national heroes" on whom is placed a huge social responsibility to fans and spectators who identify with them. Thus, in this kind of social key, through the components of non-verbal communication (facial expression, look, gesture, posture, etc.), the main aspects of non-verbal behavior in the interpersonal relationships of coaches and athletes are sought.

It can be said that the issue of non-verbal communication in sports is a topic that is always very strong and relevant. In general, communication is the art of successfully sharing meaningful information with people using an exchange of experiences. Every coach constantly during his career wants to motivate the athletes he works with, to provide them with information that will allow them to train much more effectively to improve their performance. Non-verbal communication is also part of the whole communication process, sometimes even much more meaningful and successful than verbal communication approaches.

All this determines the main purpose of this publication, which seeks to show how nonverbal communication finds its application in interpersonal relationships between coaches and athletes.

The conclusions and summaries of the study confirm the importance of nonverbal communication in people's sports behavior and outline guidelines for the application of models of this type of communication in the theoretical field of sport.

Materıals and Methods

In order to reach its results and findings on the application of nonverbal communication in sports with a focus on interpersonal relations "coach – athlete", this article reviews the observations and research of scientists and authors in the field, focused mainly on this, that a number of conclusions stand out and are analyzed, which outline a key aspect – non-verbal communication has not only a significant application in interpersonal relationships in sports, but is also a strongly dominant communication process between teams and their coaches.

For the purpose of the article the methods of theoretical and scientific analysis, comparative analysis, systematic analysis is used - through observations, collection and summarization of information, as well as review, analysis and formation of conclusions of publications on the topic.

Today, many contemporary authors study in depth the interdisciplinary nature of nonverbal communication, which gives reason for research and application in relation to sports. Many authors do not fail to mention the social value of sport as a "multifaceted phenomenon that is measured by economic, political, educational, educational, health and moral goals, penetrating the most important aspects of contemporary life" (Zaberska, 2009, p. 17). Other nonverbal researchers believe that "sports behavior deserves more attention than it receives "(Moris, 2007, p. 477). There is also strong support for the thesis of Norbert Elias and Eric Dunning on the development of human civilization and the changes that this development requires in all spheres of life, incl. and in sports.

As we have repeatedly mentioned, the science of nonverbal communication deals in detail with facial expressions, gestures and posture. Non-verbal communication includes information that is "emitted by the appearance and movements of the body (body signs and signals) or transmitted through changes in voice (through sound, color, light, smell), as well as through spatial behavior and, consciously whether or not, intentionally or accidentally, an impact on the material environment by one individual is accepted by the tactile organs of another individual and the possible influence of his behavior is taken into account" (Rumenchev, 2006, p. 15). Given this, it can be said that the most studied type of nonverbal communication is the one that studies facial expressions and body movements. This type of nonverbal communication is called "kinesics". It is no coincidence that Shefflin and Duncan define kinesics as "a motor modality through which all functions of nonverbal communication are realized: subtext function, synchronizing function, feedback function, modal-emotional function" (Rumenchev, 2006, p. 28).

There is evidence that coaches who have a negative attitude towards nonverbal communication express different types of negative nonverbal actions, while those who have a positive attitude towards nonverbal communication express different types of positive nonverbal actions. According to researchers, this suggests a link between nonverbal communication and the coach's leadership style (Weinberg & Gould, 1995, pp. 205-225).

Given the constant possibilities for creating unforeseen situations in a team, under no circumstances can it be assumed that each style is correct or that there is an ideal leadership style. It all depends on the factors influencing the degree to which a style is appropriate, the type of team, the nature of the sport, the nature of the skills required by the coach, the characteristics, qualities and personality of the athletes in the team and the team as a whole and last but not least - from the personality of the sports leader. In all situations, however, the coach's leadership style corresponds closely to the nonverbal communication process in the relationship between him and the athletes.

An effective leader-coach is able to change his style to meet the needs of the current situation in the team, so he can "maneuver" and change his non-verbal communication approaches, but they always express positive non-verbal actions. Democratic leaders can quickly become coercive when faced with a crisis in the team, but they have a clear idea of what they are doing and why. In them, the strength of non-verbal communication will be consistent with the impending change and its successful management to achieve the goals of the team, i.e. even through coercive leadership style (based on the democratic one), they also carry the positive non-verbal aspects of communication. Bad leaders change their style at random, so the athletes on their team get confused and don't know what to expect next. This is also reflected in non-verbal communication, i.e. it is logical in this type of leadership style to observe a negative attitude towards non-verbal communication and to express negative non-verbal actions.

Good leaders can also change their style when working with individual athletes according to their characteristics. Some players need more positive guidance, therefore more positive

nonverbal communication skills. Others respond best if they participate in decision-making with their coach.

We should not forget the fact that the decoding of non-verbal communication in the "coach-athlete" relationship depends a lot on the sensitivity of the recipient of the non-verbal message, which may be the reason why sometimes positive or negative non-verbal actions do not have the expected effect. (Jowett & Cockerill, 2003, p. 321). In other words: the more sensitive individual will always perceive the negative side of nonverbal communication much more severely and extremely negatively; may feel unwell; to doubt his abilities; to lose stimulus, and when it is systemic, it can lead to permanent demotivation and unwillingness to work and achieve high sports results. Conversely, the more sensitive individual will always respond much more motivated and encouraging to positive nonverbal actions in the relationship between him and the coach. Therefore, it can be said that motivation is among the main techniques used by leaders, incl. and for more effective implementation and achievement of team goals. The practical realization of the motivation in the sports and training process presupposes a choice of techniques, methods, approaches that best reflect any problems that may arise - incl. and regarding the non-verbal actions used in the communication process. In addition, each leader must take into account the factors influencing the motivational process (organizational structure of the club, team climate, requirements for players, etc.).

In principle, maintaining a constant dialogue and communication (verbal and non-verbal) between the team and the leader can help each party to understand the other party's position on all issues related to the implementation of team goals. In this way, the optimal result can be achieved not only for the team, but also for the sports club as a whole.

Results and Discussions

As a rule, coaches, incl. Physical education and sports teachers have a specific (distinctive) work environment. This presupposes and requires specific verbal and non-verbal communication as a basis for quality and effective training and presentation of athletes.

Sports coaches aim to make their work an effective process, which is not least the building of the personality of athletes in a healthy social environment. Interpersonal interaction and communication between the coach and the athlete is a key tool for achieving this goal.

Results of research in the field of non-verbal communication show that the transfer of information takes place (Pease & Pease, 2003, p. 27):

- by verbal means - 7%;
- with sound means (including tone and intonation of the voice) - 38%;
- with non-verbal means - 55%.

In order for the interpersonal communication "coach – athlete" to be effective, the coaches use the verbal communication in their classes by applying the general pedagogical verbal methods - description, explanation, instruction, comments and remarks, instructions, analysis, etc. Verbal communication is of great importance for communication, stimulates the activity and motivation of the athlete. It is crucial for the realization of their joint activities and for achieving high sports results.

The classes during the trainings are characterized by collectivism, where everyone strives to be empathetic to each other. This empathy is most often expressed in encouraging words both from the coach to the athletes and between the athletes themselves. The volume of the voice with which instructions are given or an attempt is made to attract a player's attention is much greater than in other activities. Coaches (most of the time) have to speak loudly, but this

should not be taken negatively (such as rudeness and / or threat) - this is also dictated by external factors such as the size of the gym (if the training is in the gym) , acoustics, open space and in no way interferes with the solution of educational and training tasks. In order to be properly understood by athletes, the coach must have clear communicative competence. In other words, the communication during training is in accordance with the conditions of its conduct and is directly related to the implementation of training and sports tasks of athletes.

The coach cannot and should not be a speaker during training. Excessive "oratory" can disrupt the density of the lesson itself and this can lead to a decrease in performance and psychological attitude of the athlete, which leads to boredom and sometimes injuries. Verbal communication during the training process must be short, accurate and clear in order to be understood and perceived by athletes, even in physical fatigue and in a competitive environment.

The successful realization of the training process is inconceivable without the non-verbal communication between coaches and athletes and between the athletes themselves during the training and especially in the competitive activity. The coach largely sends conscious non-verbal signals to the athletes from his work. Unconscious signals are undesirable and can be misunderstood, so sports coaches should try to apply them minimally in their work.

Non-verbal communication in the training process is realized through signs and signals that are informative for both the coach and the athletes and athletes. It includes messages conveyed through various gestures, facial expressions, spatial behavior and more. Non-verbal communication can reveal "the emotions, thoughts and feelings of sports coaches and athletes before, during and after a training session or competition" (Peltekova, 2013, p. 356).

The research of Russian specialists in the field of sports pedagogy and psychology allows us to draw conclusions about the importance of game communication in organizing joint motor activities during play in team sports. In the first place, experts identify "the need to increase the effectiveness of communication by timely and accurate transmission of information for the implementation of tactical actions between each member of the sports team" (Gogunov & Martianov, 2004, p. 3).

The main ways of non-verbal communication in the interpersonal relations "coach – athlete" are the following:

- Eye contact;
- Facial expression;
- Head movement;
- Hand gestures;
- Body posture;
- Spatial behavior, etc.

Eye contact is an important part of the communication between the teacher and the students, as well as between the students or competitors. It is usually done between two students or between a teacher and a student. Eye contact is usually followed by hand gestures, which are accompanied by word instructions.

The facial expression and facial expressions made by the coach show approval or disapproval of the action performed by the athlete. During a competition, it is important for sports coaches to control themselves in the use of facial expressions of disapproval in order to avoid psychological stress in athletes.

The movement of the head, the position of the shoulders and the upright posture of the coach is an important message to the athletes, which is perceived as a positive attitude towards the upcoming work and shows confidence in their strength during the competition.

Hand gestures are most often associated with direct training and competition work and complement oral instructions. They can also show praise or rebuke. They are the most visible part for all participants and their use is of great importance for non-verbal communication. The gestures of sports coaches made during competitions are also seen by the audience, so they can be perceived as a desire for support, but also as a kind of provocation. Their proper use is a manifestation of exceptional sports and training skills.

The posture is an indicator of the mood of the participants in the training and competition activities. From the position of the coach one can judge his perception of the current sports situation. Through it, he can convey to athletes a sense of optimism, anxiety, tension or indifference. With the same force the posture of the athletes shows the coaches their attitude to what is happening. When athletes in the training process know each other well, this way of communication can be crucial for successful mutual understanding, because in most cases poses are a kind of controlled emotions.

The spatial behavior of sports coaches during a competition in most cases is consistent with restrictions in the sports regulations of the sport, the size and noise in the gym or stadium. In most cases, when giving instructions, coaches are close to the athletes. This is perceived positively and is dictated by the situation. The perimeter of the personal space between the participants in sports activities is not covered by the generally accepted norm for interpretation of the distance between two persons.

Non-verbal communication is always used in combination with verbal, but in a different ratio. Many studies have been done to establish the percentage ratio between them. It has been shown that when transmitting information during an interview, the ratio between verbal and nonverbal communication is 35% to 65% in favor of nonverbal communication (Shipunov, 2003, p. 37).

The combination of words and gestures is very important for communication during the training process and between coaches and athletes. In addition, there is a noticeable difference in communication during regular training and sports competition. This difference is dictated by the competitive nature and importance of the result - victory or loss, ranking and decent performance. The longer coaches and athletes are together, the better the communication between them. The better the communication, the more successful the performance of the athletes in the competition will be.

Conclusion

The analysis shows that the nature and significance of the relationship “coach – athlete” in the context of interpersonal constructions of nonverbal communication, build a sense of closeness, trust and respect, common orientation, common goals, complementary roles and tasks. The impact of the interpersonal "coach-athlete" relationship on success is obvious, and the very nature of this relationship plays an important role in the development of the athlete both as a performer and as a person.

In modern sports, non-verbal communication also serves to reveal the existing opportunities for improving interpersonal relations “coach – athlete”, to improve the work of teams and achieve much higher results. In this way, an opinion can be formed about how and how successfully or unsuccessfully the coach copes with the dialogue he leads with his team and / or his communication skills in general. For this reason, it is in the interest of every sports club to have good and competent in terms of communication coaches. Communication in sports gives an insight into the extent to which the professional knowledge, skills and training of the players are adequate to the requirements of the team. Along with this, the key role of the

leader in sports as one of the most important participants in the process is extremely important for achieving these goals. As a successful communicator and in his competencies of many personal characteristics, he is a kind of buffer between the team and achieving the team's goals.

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Comparison of Certain Physical and Motor Skills of The Students Enrolled at Sports High Schools and Other High Schools: A Case Study in Trabzon Province

Ubeyde KILIÇASLAN[1], Arslan KALKAVAN[2]
[1] Trabzon Üniversitesi, Trabzon, Türkiye
https://orcid.org/0000-0002-6489-7641
[2] Recep Tayyip Erdoğan Üniversitesi, Rize, Türkiye
https://orcid.org/0000-0001-9439-4976
Email: ubeydekilicaslan@gmail.com, akalkavan@gmail.com

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Abstract

The purpose of the present study is to compare certain motor skills of the students enrolled at sports high schools and other high schools, with a view to revealing any differentiation between the groups. The research group is composed of 129 senior-year students who were enrolled at Trabzon Sports High School, Trabzon Science High School, Trabzon Fatih Sultan Mehmet Anatolian High School and Akçaabat Multi-Program Anatolian High School. The data gathering tool employed to establish the motor skill levels of the students was the "personal info sheet", applying hand reaction, elasticity (sitting-laying), standing long jump (horizontal leap), push-up, crunch, balance, 20 m sprint and endurance (yo-yo test) motor tests. The tests revealed that the motor skills of sports high school students had been superior to those of the students of other high schools. It is possible to argue, however, that the difference may be due to the fact that athletes comprise the student body of sports high schools, rather than the training itself provided at the school.

Keywords: Sports**,** Sports high school, Motor tests

Introduction

Physical in addition to mental training of the student is vital for the realization of objectives of education in line with the contemporary understanding of education (Güneş, 2003). It is well known that bodily, spiritually and mentally healthy individuals are required in terms of quality manpower. Such a healthy framework can be achieved through physical education and sports training covering multiple aspects and principles of exercises which comprise the fundamentals of physical education and sports (Yalçıner, 1992). The fundamental purpose of physical education and sports at schools is to help every student achieve the highest level activity capabilities, by facilitating their development and reinforcing their existing abilities through physical activities, or exercises. Moreover, the physical education classes contribute to the development of one's self confidence regarding her motor skills, through improvement in basic moves such as running, climbing, maintaining balance, jumping, and somersault. In this context the physical education classes will contribute to the mental and psychological harmony as well, thanks to a positive impact on the development of nerve-muscle systems, and the coordination and control of the individual's body effected through changes in behaviors concerning movement (Tamer, 1987). Motor development refers to the process of developing, peaking out, and losing motor skills. Growth, maturation, readiness and learning play major roles in this process. Motor development emerges through changes in the behaviors concerning movement (Kalkavan, 1996). Fundamental motor skills develop through a completely natural process of change, even if the individual never engages in training. When developing a given motor skill, other motor skills would also be affected indirectly. Such an impact can be for the positive or the negative (Ziyagil, Tamer and Zorba, 1994). The fundamental structure of motor skills is reviewed under 5 major chapters, with reference to the importance of each skill set. Among these, strength, endurance and speed comprise the major skills while mobility and ability are complementary ones (Gürbüzoğulları, 2009).

Turkish education system entails a number of high school types, including not only science high schools, Anatolian high schools, and vocational high schools, but also sports high schools enrollment to which is based on competence tests. These schools stand out due to the form of the exam (MEB, 2009). The admission process of sports high schools is based on the result of the competence tests comprising 70% of the overall admission score, and secondary education placement exam results comprising 30% of the overall score, adding up to 100 (hundred) maximum points. Furthermore, students who score less than 50 (fifty) in the competence test are disqualified from further consideration. Primary admission lists and back-up admission lists, both containing the number of candidates equal to the quota assigned to each department, with reference to the ranking from the highest score to the lowest one, are announced at the schools, as well as on their web sites (MEB, 2014). The purpose of sports high schools is to raise model individuals who work in cooperation and who have the feeling of solidarity instilled in, who are capable of embracing team spirit, the discipline of sports, and gentlemanly conduct, by supporting their development (MEB, 2014).

In Turkey, the number of students who seek higher education enrollment grows each year. Students of both sports high schools and other types of high schools, who fail to secure admission to universities through centralized university entrance examinations, apply, in turn, to departments which extend admission through competence tests (Kalkavan and Kerkez, 1996). That is why a serious attitude towards the application of competence tests, and continuous revision of the process with a view to choosing optimal individuals for each occupation are crucial in terms of making utmost use of the human potential of our country, and enabling the individual to be happy (Öztürk, 2008). The admission of students in line with the founding philosophy of sports high schools is crucial in terms of the investigation of the

motor skills instilled in the students through sufficient and required education. The literature is not poor in studies on sports high schools (Çoban, 2006; Karapınar, 2007; Canal, 2008; Görmez, 2009; Altındaş, 2009; Güllü, 2009) and studies analyzing motor skills (Pang and Fong, 2009; Bilgili, 2009; Aydın, 2009; Karagöz, 2009; Aygül, 2010; Demiral, 2010; Livonen, 2011; Baran, 2012; Altınkök, 2012; Avşar, 2014; Selçuk,2014; Çoban, 2014); yet no study to compare the motor skills of sports high school students and the students of other high school types was found.

The present study, in turn, intends to compare certain motor skills of the students enrolled at sports high schools and other high schools in Trabzon province, with a view to revealing any differentiation between the groups.

Material and Method

Study Model: The study employs the relational screening model with a view to uncovering the existing state of affairs. The relational screening models are essentially research models which aim to establish the existence or extent of change between two or more variables (Karasar, 2013).

Research Group: The research group is composed of 129 (100%) senior-year students who were enrolled at Trabzon Sports High School (27%), Trabzon Science High School (27%), Trabzon Fatih Sultan Mehmet Anatolian High School (23%) and Akçaabat Multi-Program Anatolian High School (23%), in the academic year 2014-2015. 45 of the students were girls (34.9%), and 84 were boys (65.1%).

Data Gathering Tools: The data gathering tool employed to establish the motor skill levels of the students was the "personal info sheet", applying hand reaction, flexibility (sitting-laying), standing long jump (horizontal leap), push-up, crunch, balance, 20 m sprint and endurance (yo-yo test) motor tests. The data gathering tools are described below in detail.

Personal Info Sheet: The personal info sheet was developed by the researcher. The form contains questions asking the name and surname, gender, age, and school of the students included in the research group.

Hand Reaction Test: The students' data were obtained through the application of Nelson Hand Reaction Test, a simple and inexpensive assessment tool. During the Nelson hand reaction test, the students were seated on a chair, with their forearm and hand on the table. Then the hand of each student was placed with the tips of the thumb and the index finger extending 8-10 cm beyond the table, with the top sections of the thumb and the index finger laying in parallel. The researcher then kept the ruler between the thumb and index finger of the student. The student was then asked to look directly at the middle of the ruler, and to catch the ruler

using her thumb and index finger as soon as the researcher dropped the ruler. The ruler was dropped by the researcher and the ruler's position at the top side of the thumb at the moment of catching the ruler was noted.

Elasticity (Stretch Out - Reach) Test: The students were asked to sit on the ground with their legs extended, leaning the naked soles of their feet on an elasticity stand, leaning inside it from their waist up, pushing their hands as far forward as possible in front of their body, sliding the horizontally placed ruler on the stand as much as possible. The centimeter figure read on the elasticity stand was then registered as the elasticity score of the student. Special

attention was placed to prevent students from buckling their knees. Each student was granted 3 attempts to extend forward as per the rules, and the highest figure achieved was registered.

Standing Long Jump (Horizontal Leap) Test: The students leapt forward one after another from the market position, swinging in a semi-squat position. Then, the distance between the marked position they leapt from, and the heel of the foot that was behind was measured. Each student took the leap 3 times, with the highest score in centimeters getting registered. The crucial issues to take into account in this test were to have a maximum distance between the feet of each student equal to the width of their shoulders, and to prevent them from taking a further step once landed after the leap.

Push-ups: The students were asked to lay down on their face, place their hands right below their shoulders, keeping their fingers and legs stretched. They laid down in parallel to each other with small distances between each student. The students then pushed their bodies up by straightening their arms while keeping their knees and tips of their feet on the ground, and keeping their backs and hips straight. Then, the students lowered their bodies to the ground till they touched to the floor, by buckling their arms at their elbows. Once the body touched the floor, the students once again straightened their arms and lifted their bodies to assume the previous position once again. These moves amounted to a complete push-up. Once each student was made to try the move once, the test had commenced with the command "Ready? Move!", and stopped with the command "Stop" by the end of 30 seconds. The number of push-ups each student could take in 30 seconds was registered in the form.

Crunches: The student lies down on her back, joining her hands at the back of her neck, pulls her knees slightly towards her tummy (with a 90 degrees angle at the knees), with the soles lying completely on the mat. As the students move up, elbows would be brought forward, to touch the knees by the end of the move. Throughout the whole move, hands were kept joined at the back of the neck. Upon the "Ready... Move" command, the students were asked to repeat the move as quickly as possible through a period of 30 seconds. They were asked to continue with the move till the "Stop" command. The number of crunches effected at the end of a period of 30 seconds were recorded.

Balance Test: A strong wooden traverse with a length, height and width of 50 cm, 4 cm, and 3 cm respectively was procured for this test. In order to prevent this traverse from moving, it was placed on two legs, each with a length of 15 cm and width of 2 cm. The athlete was asked to maintain her balance on the traverse on the feet of her choice, without receiving any support, while bending the other leg back, holding it with the hand of the same side, behind the back of the athlete, all the while trying to maintain balance. The period through which she was able to maintain the balance was recorded with the help of a stop watch. The students were given 3 chances, with the best result getting registered.

20 m Sprint Test: A 20 m long flat surface was arranged for the sprint test. The participant assumed the standing starting position, and, upon hearing the "Ready? Move!" command of the test supervisor also standing at the starting position, ran through a straight line towards the end position, in the fastest pace available. The other test supervisor standing at the end position recorded the sprint time between the starting and end positions in seconds, using a Catiga hand chronometer. The participants were granted a 2 minutes rest after each sprint, and were asked to complete a total of 3 sprints, with the best result being registered.

Endurance (Yo-Yo) Test: In this test the students were placed at the starting position of 20 m tracks positioned next to each other on a flat and smooth surface, in a way precluding contact

with each other. Then, a tape prepared specifically for this test, increasing the running pace 0.5 km/s each passing minute was ran, starting with the "beep" tone signifying the start of the test. The participants then commenced the run, at a slow pace initially. The participants were allowed to resume the test even if they missed one beat, provided that they catch up with the rhythm with the next one. The test was concluded in case the participants failed to reach the 20 m lines in 2 consecutive laps. The time the students gave up with the test is assumed to be the test result. The test was applied regularly and the longest track the athletes were able to cover was registered as their score in the test.

Data Gathering: The tests at each school were applied on different dates.. The students to be included in the study were chosen on the basis of volunteering. First of all, the data form required to record the results was printed in a number in excess of the total student count, and then the students were asked to fill their forms. Later on, the students were asked to have warm-up exercises before the actual test. Then the students were subjected to hand reaction, flexibility, standing long jump, balance, push-up, crunch, 20 m sprint and 20 m endurance (Yo-Yo Test) testing in the said order. The tests were completed within approximately 3 hours to conclude the assessment. The same procedure was repeated in other schools as well. The data thus gathered was saved in the computer environment, followed by the application of relevant analyses.

Data Analysis: The arrangement of the data and the drawing of the graphs was performed using MS Excel for Windows (Office 2013), whereas statistics analyses were effected using SPSS for Windows (ver. 21). Finally the article was authored using MS Word for Windows (Office 2013). The data gathered through the analysis were first subjected to Saphiro Wilks normality tests. Data exhibiting a normal distribution were subjected to independent sample t-test for two distinct groups, with a significance level of $\alpha = 0.05$, whereas the data which did not present a normal distribution were subjected to Mann Whitney U test, an equivalent non-parametric test.

Findings

Reaction Levels: The test results revealed a significant level of difference between the hand reaction test scores of sports high school students and students of other high schools ($t_{0.05}$, -3.968; $p<0.05$). The scores sports high school students received in the hand reaction tests (2.24±1.62cm) were found to be significantly lower than the hand reaction test results of students enrolled in other high schools (3.43±2.01cm) (Figure 1).

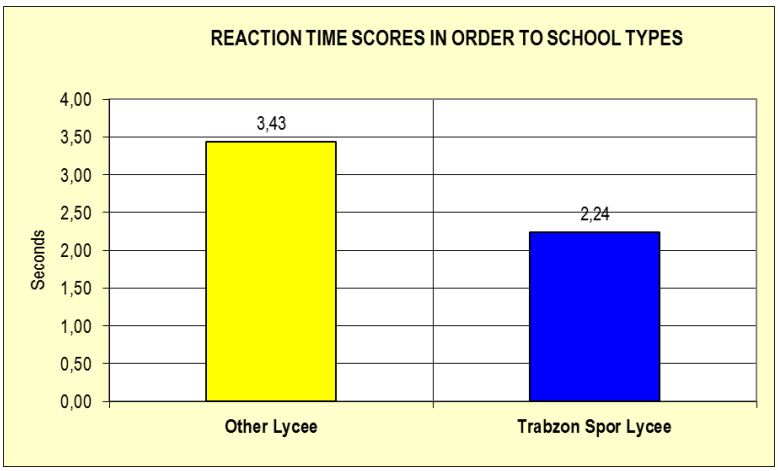

Table 1. Results of The Hand Reaction Tests

Push-up Counts: The test results revealed a significant level of difference between the push-up test scores of sports high school students and students of other high schools ($t_{0.05}$, -3.522; $p<0.05$). The sports high school students were observed to have push-up counts (24.59±11.02) significantly higher than those of other high school students (16.72±10.01) (Figure 2).

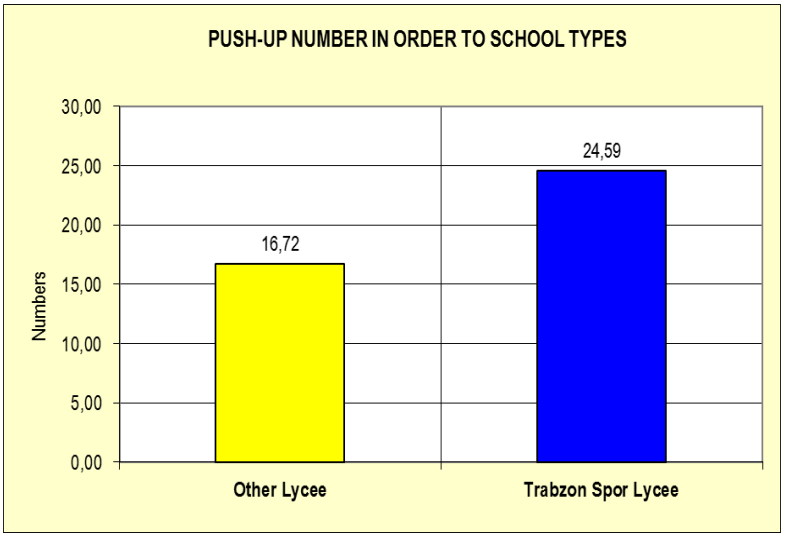

Table 2. Results of The Push-Up Tests

Shuttle-Draw: The test results revealed a significant level of difference between the crunch test scores of sports high school students and students of other high schools ($t_{0.05}$, -8.926; $p<0.05$). The sports high school students were observed to have crunch counts (29.59±4.58) significantly higher than those of other high school students (19.84±5.74) (Figure 3).

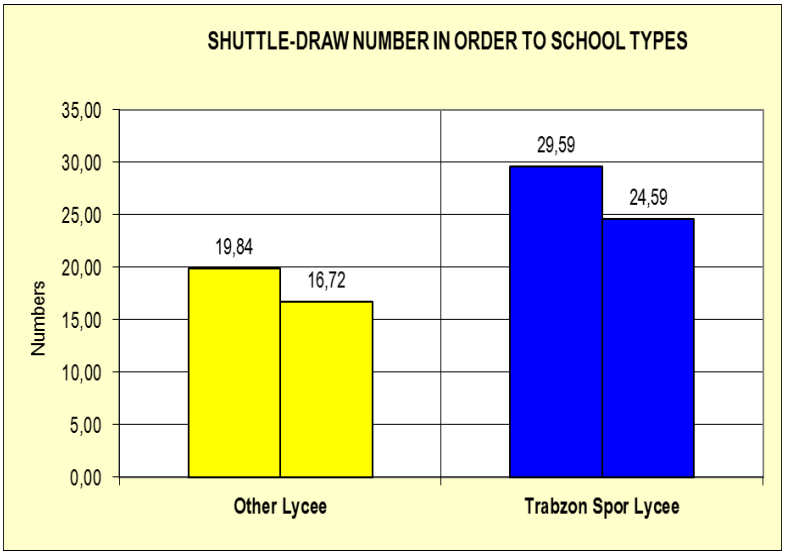

Table 3. Shuttle-Draw Results

Flexibility Levels: The test results revealed a significant level of difference between the flexibility levels of sports high school students and students of other high schools ($t_{0.05}$, -6.183; $p<0.05$). The sports high school students were observed to have flexibility levels (17.12±6.77) significantly higher than those of other high school students (8.59±7.27) (Figure 4).

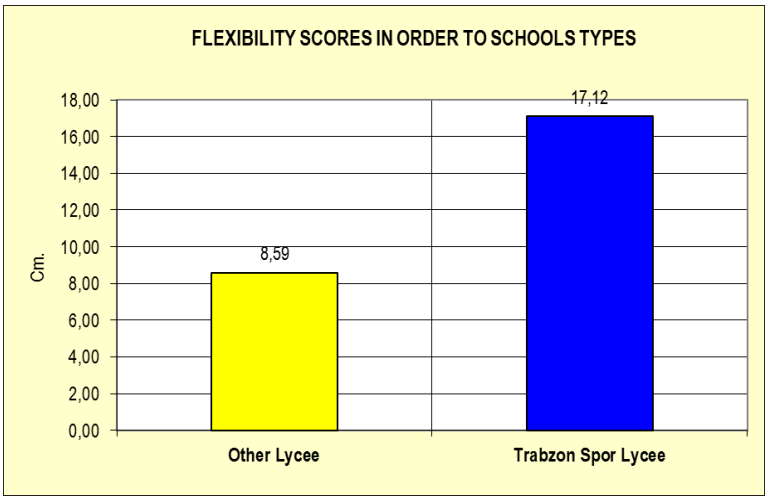

Table 4. Results of The Flexibility Level Tests

Balance Levels: The test results did not reveal a significant level of difference between the balance test scores of sports high school students and students of other high schools ($t_{0.05}$, -1.345; $p>0.05$). While sports high school students scored 35.06±36.53 seconds in the balance tests, the students of other high schools scored flexibility levels in the range 24.63±25.89 seconds (Figure 5).

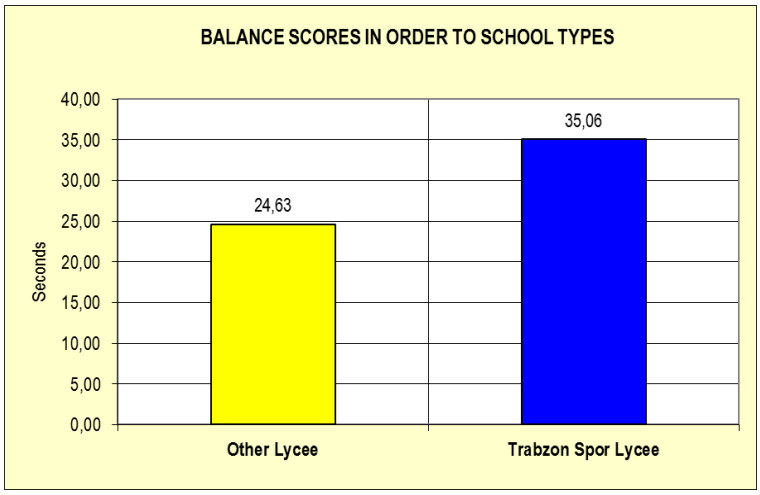

Table 5. Results Concerning The Balance Levels

Standing Long Jump Scores: The test results revealed a significant level of difference between the standing long jump test scores of sports high school students and students of other high

schools ($t_{0.05}$, -5.165; $p<0.05$). The sports high school students were observed to score significantly higher (204.71±24.77) in the standing long jump test compared to other high school students (168.85±33.92) (Figure 6).

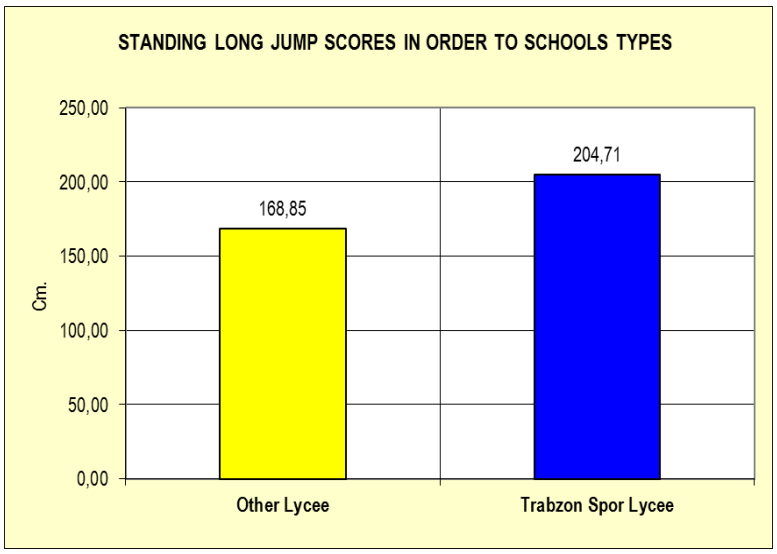

Table 6. Results of The Standing Long Jump Test

20m Sprint Results: The test results revealed a significant level of difference between the 20m sprint results of sports high school students and students of other high schools ($t_{0.05}$, -4.727; $p<0.05$). The sports high school students were observed to score significantly higher (3.48±0.51cm) in the 20m sprint test compared to other high school students (3.93±0.51cm) (Figure 7).

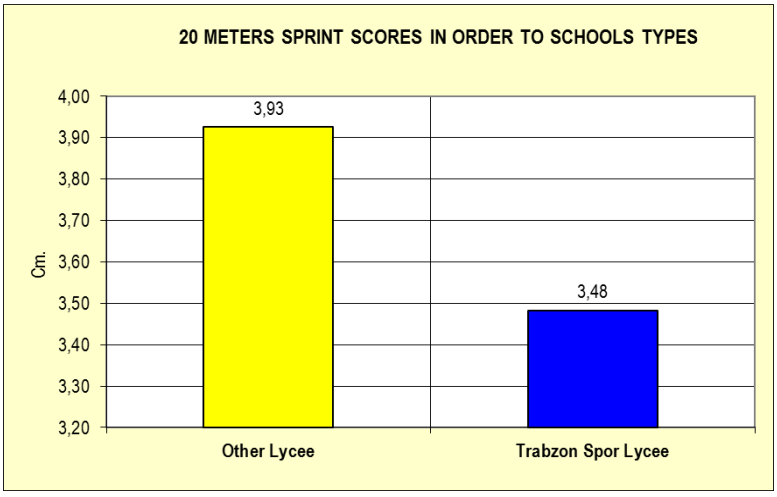

Table 7. Results of The 20m Sprint Tests

Endurance Levels: The test results revealed a significant level of difference between the endurance levels of sports high school students and students of other high schools ($t_{0.05}$, -4.954; $p<0.05$). The sports high school students were observed to score significantly higher (807.06±457.92m) in the endurance test compared to other high school students (402.11±196.01m) (Figure 8).

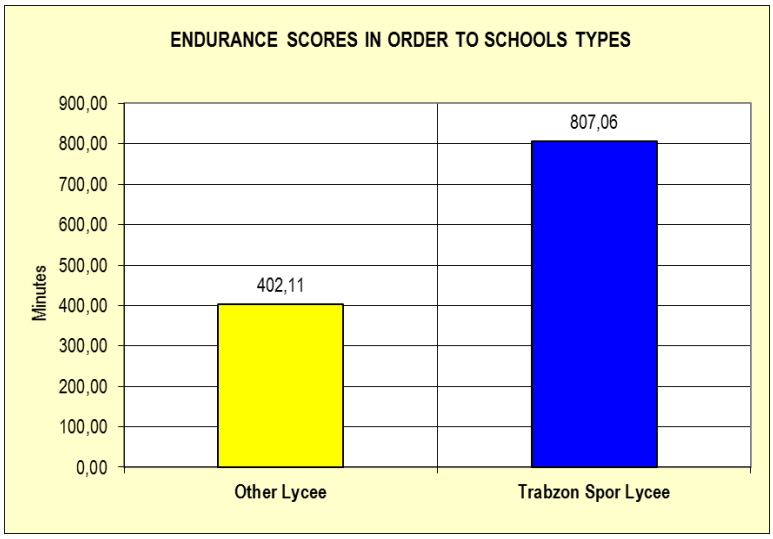

Table 8. Results of The Endurance Tests

Conclusion and Suggestions

The study found that on average sports high school students had significantly lower hand reaction times (2.24±1.62cm) compared to those of other high school students (3.43±2.01cm). The hand reaction test results of sports high school students and the students of other high schools revealed a significant difference ($t_{0.05}$, -3.968; $p<0.05$). Güçlüöver (2012) found, in a comparison of simple reaction times of elite and amateur men's teams, that elite athletes had better reaction times (02±0.04sec) compared to amateur athletes (03±0.01sec). Çolakoğlu, Selamoğlu, Gündüz, Acarbay and Çolakoğlu (1993) found that extended periods of physical trainings can lead to reduction in reaction times. Furthermore, higher levels of regular training compared to the training levels of the students of other high schools, is arguably among the reasons why sports high school students exhibit better physical, physiological and motor skills.

The average scores in the push-up test also present a picture where sports high school students achieved higher (24.59±11.02) than the students of other high schools (16.72±10.01). The results reveal a significant level of difference between the push-up test scores of sports high school students and students of other high schools ($p<0.05$). Kürkçü's (1996) study titled “The comparison of physical and physiological characteristics of 13-18 years old secondary education students who exercise and who do not" found that 13-14 years old students in the experiment group achieved an average of 36.45±5.41 in the push-up test, while the control group averaged only 16.07±4.29. In the 15-16 age group experiment group scored an average of 40.18±2.40 in the push-up test, while the control group did only 20.70±4.77.Finally, in the 17-18 age group experiment group scored an average of 37.27±5.33 in the push-up test, while the control group scored 19.83±6.86. The results reveal a significant difference between the push-up scores of the experiment group and the control group which does not exercise ($p<0.01$). The results, thus, concur with our own findings. The high level of exercise sports high school students had, as well as extended periods of strength trainings they had in

exercises and sports courses, compared to those of other high school students, have arguably, played a role in these results.

On average sports high school students had significantly higher scores in the crunch test (29.59±4.58) compared to those of other high school students (19.84±5.74). The test results of sports high school students and the students of other high schools revealed a significant difference ($p<0.05$). Pense and Serpek's (2010) study titled "The application of eurofit test battery to determine the physiological and biomotor characteristics of basketball playing girls in the 14-16 age group" found that basketball playing girls had an average crunch count of 20.00±0.53 while those who did not play basketball averaged 15.61±0.79. Even though that study was applied exclusively with girls, the trends revealed support the results we reached in our own study. Another notable study in this context was performed by Zorba, Ziyagil, Çolak, and Kalkavan (1995), and is titled "The comparison of anthropometric and physical fitness scores of volleyball players in the 12-15 age group with those of a sedentary group". The said study found that male volleyball players were capable of performing 24.8±1.80 crunches on average, while the sedentary group averaged 21.57±2.24. On the other hand, Kızılakşam's (2006) study titled "The comparison of eurofit test battery results of students who actively exercise and who do not" did not find a significant difference between the crunch test scores of men who actively exercise and those of men who do not ($p<0.05$). That result does not concur with our findings, as well as the said story's findings concerning girls. The girls who exercise have a significantly higher average compared to those who do not (23.96±5.68). In the light of these findings one can argue that the students enrolled at sports high schools, when compared against the students of other high schools, have higher muscle endurance, probably due to their higher levels of exercise activities.

The results of the flexibility test revealed that the sports high school students were more successful (17.12±6.77cm) compared to the students of other high schools (8.59±7.27cm). In this context, the test results of sports high school students and the students of other high schools revealed a significant difference ($p<0.05$). Düzgün and Baltacı (2009), in a study on the changes in the level of flexibility in 13-17 years old adolescents who regularly exercise and who do not, reached to the conclusion that 13 years old girls who exercise exhibit higher levels of flexibility. However, the same study found that the differences in flexibility levels of 13-17 years old boys who exercise and who do not had surfaced only by the age of 16. Şirin's (2009) study titled "The comparison of certain biomotor indicators of 14 years old adolescents who exercise and who do not", found, through statistical analyses, that the flexibility levels of the experiment group (22.35±4.404 cm) were higher than those of the control group (17.80±7.971 cm). Moreover, the conclusions reached by Bilim (2013) and Kızılakşam (2006) suggest that the flexibility levels of both the girls and the boys exhibit only statistically insignificant differences. These results arguably indicate that flexibility, one of the physical fitness parameters associated with health, present results favoring sports high school students, due to the fact that they regularly have warm-up exercises and have substantial levels of physical activity in the form of competitions and trainings.

In the balance test, while sports high school students scored 35.06±36.53 seconds, the students of other high schools scored flexibility levels in the range 24.63±25.89 seconds. Even though the balance test scores seemingly favor the sports high school students, the difference between the balance test scores of sports high school students and the students of other high schools were not found to be significantly different. ($p>0.05$). Bağcı (2009) compared certain physical characteristics of 10-12 years old female athletes engaged in aerobics and gymnastics, and the sedentary students in the same age group. In this vein, the average balance scores of the athletes was found to be 0.77±0.94 faults, while the sedentary

group's balance scores was found to be 8.44±4.06 faults. These figures emphasize the importance of the balance as a crucial indicator for the aerobics-gymnastics branch. Bilim (2013) presented the flamingo balance test results for girls and boys in 12-13, 14-15, and 16-17 age groups, who did and did not engage in regular exercise. The statistical analyses presented in the study revealed an average score of 11.12±2.31 for girls who do not engage in regular exercise in the 12-13 age group, while the average score of those who did was 7.27±2.81. The difference between the data for the girls who had regular exercise and for girls who engaged in aerobics and gymnastics has perhaps something to do with the differences of branches. With boys, and with the exception of the age group 16-17, exercising participants in age groups 12-13 and 14-15 had been significantly more successful compared to those who had not engaged in sports. The studies found that the flamingo balance test results of the individuals who took part in sports activities and exercises were higher compared to those of who did not. This finding is in parallel with ours. The students enrolled in sports high school had achieved better compared to the students of other high schools, yet that finding does not meet the criteria of significance, as noted above. A higher level of participation in sports events is considered to have an impact on balance.

The study found that sports high school students scored significantly higher (204.71±24.77) in the standing long jump test compared to other high school students (168.85±33.92). The test results suggest a significant level of difference between the standing long jump test scores of sports high school students and of students of other high schools ($p<0.05$). Having reached similar conclusions, Baydil (2006) found the standing long jump performance levels of boys in 12-14 age group, in his study on the physical fitness norms of that demographics, to be 146.61±16.90 cm. In a study on the comparison of certain anthropometric and motor skills of 10-12 years old boys who receive athletics trainings, and who do not, Gül et al. measured an average of 140.96±17.97 cm of standing long jump performance for the study group, and 130.58±15.69 cm for the control group. The sports high school students were found to score significantly higher (3.48±0.51cm) in the 20m sprint test compared to other high school students (3.93±0.51cm). The test results revealed a significant level of difference between the 20m sprint test scores of sports high school students and students of other high schools ($t_{0.05}$, -4.727; $p<0.05$). Soğat (2007) found that gymnasts' scores in the 20m sprint test (3.84±0.25 sec.) was higher than that of other participants who did not engage in a sport (3.67±0.17 sec.) while the 20m sprint results of handball (3.48±0.13 sec.) and basketball players (3.66±0.11 sec.) and athletes (3.64±0.23 sec.) were shorter than those of the students who did not engage in sports. Yet, the difference is not statistically significant. This finding, however, is not consistent with ours. The 20m sprint test results Şirin (2009) found indicate that the average 20m sprint times of the athletes in the study group (3.41±0.195 sec.) had been lower than those of the control group (3.90±0.359 sec.). This finding, moreover, is statistically significant ($p<0.05$). On the basis of these results, one can argue that regular exercises as well as a more emphasized engagement in physical trainings and sports classes compared to the students of other high schools, had something to do with the higher speeds achieved by the students of sports high schools compared to the students of other high schools.

The sports high school students were found to score significantly higher (807.06±457.92m) in the endurance test compared to other high school students (402.11±196.01m). The test results revealed a significant level of difference between the endurance test scores of sports high school students and students of other high schools ($p<0.05$). In the dissertation titled "The

comparison of the endurance performance achieved during the special skills examination and the endurance performance achieved throughout the academic year among the students of the

physical education and coach training department of Yüzüncü Yıl University", Ertuş (2010) employed yo-yo shuttle sprint test to measure the endurance levels of the students. The yo-yo shuttle test results revealed that the students' average endurance performance at the time of admission to the department (126.85±24.05) had been higher than their performance averages during the academic year (106.44±26.87). The findings of our study also concur. The never ending engagement of sports high school students in competitions, trainings, and a high number of physical education and sports classes at the school can be argued to have supported the finding that they have more endurance compared to the students of other high schools.

The study reached to the conclusion that certain motor skills of sports high school students were better than those of students enrolled at other high schools. The difference, perhaps, has something to do with the preferences athletic students may have towards sports high schools. This study can be followed by further investigations into the level of motor skills of sports high school students and the students of other high schools comparing such levels at the time of admission for the 1st year, and at graduation. On the other hand, increasing the volume of activities to enhance motor skills can be recommended for ordinary high schools.

Physical education classes and sports activities play crucial roles in terms of the development of abilities such as coordination, endurance, strength, speed, and mobility, during high school years. At sports high schools, physical education classes comprise a larger portion of the curriculum. In this vein, an increase in the number of physical education classes for other high schools as well can be recommended. Moreover, it is common knowledge that the students to graduate from such high schools include those who wish to get admission into the physical education and sports departments of universities. In this context, one can recommend the students of ordinary high schools focus more on motor skills required at the admission exams applied for sports-related departments of universities.

It would also be advisable to increase the volume of the studies such as the present one, to cover wider regions and a higher number of provinces, employing a higher number of participants. This study provided an opportunity to assess and compare the motor skills of students. Similar studies to be performed at the schools will enable students to gain better insights into their personal skill levels, and provide them with the means to track their personal development.

The data obtained through similar studies can help sports trainers, including but not limited to physical education teachers, to identify the shortcomings of athletes, and develop applicable training programs. The curricula applied at the schools can be improved to enhance the physical and motor skills of the students as well.

**This article is extracted from my master thesis entitled "Comparison of Certain Physical and Motor Skills of The Students Enrolled at Sports High Schools and Other High Schools: A Case Study in Trabzon Province", (Master Thesis, Karadeniz Technical University, Trabzon/Turkey, 2015).*

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Investigation of Physical and Some Motoric Characteristics of Kyrgyz Junior and Cadet Women National Wrestling Team

Madina NADİROVA[1], Bilal DEMİRHAN[2], Dzhiparkul ABDYRAKHMANOVA[1]

[1]Kyrgyz Turkish Manas University, School of Physical Education and Sport, Bishkek, KYRGYZSTAN
Orcid: https://orcid.org/0000-0002-0592-6166 / https://orcid.org/0000-0002-7569-1286
[2] Bartın University, Faculty of Sport Sciences, Bartın, TURKEY
Orcid: https://orcid.org/0000-0002-3063-9863
Email: nadirova.medina1995@gmail.com, bilaldemirhan55@gmail.com, jiparkul.abdyrahmanova@manas.edu.kg

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Abstract

The research was conducted on 17 wrestlers wrestling in the Kyrgyz national women's national team (n: 9 / age: 15.44 ± 1.13 years) and Junior (n: 8 / age: 20.38 ± 1.99 years). Wrestlers' body weight, height, body mass index (BMI), claw strength, back-leg strength, sprint levels of 10-30 meters, body fat percentages, flexibility levels, anaerobic power and circumference were measured and recorded according to the procedure. Analyzes of the data obtained were made in the SPSS-20 package program, T-test was used for independent sample groups for statistical analysis, and the differences at the level of $P<0.05$ were considered significant. The BMI average of young female wrestlers was significantly higher than cadet national women wrestlers ($p<0.05$). A difference at the level of ($p<0.05$) was found in the sports age of junior women compared to cadet women. Back and leg strengths of junior women 10 and 30 meters sprint times of junior women wrestlers were found to be significantly lower than cadet women wrestlers ($p<0.05$). Chest and right arm biceps (flexion and extension) circumference measurements of junior women wrestlers were found to be significantly higher than cadet women wrestlers ($p<0.05$). As a result, the back-leg strength of junior women wrestlers, BMI, reflected higher averages than cadet women wrestlers. As a result, the back-leg strength of junior women wrestlers, BMI, reflected higher averages than cadet women wrestlers. These results were evaluated as a natural reflection of age and sports age.

Keywords: Women wrestling, Body composition, Physical measurements

Introduction

Wrestling is one of the oldest known sports in the world and is held in two styles in the Olympic category, freestyle and Greco-Roman. United World Wrestling has determined different weight categories for Greco-Roman and freestyle wrestling since 2018. Besides, it has decided that the competitions will be held in 10 weights in the Continental and World Championships, while in 6 in the Olympic Games. These decisions increased the competition for medals in the Olympics in wrestling. Women's wrestling is performed in different weight categories, subject to the competition rules of freestyle wrestling.

The superior performance demonstrated in wrestling sport is possible with the biomotor competencies that the branch needs, as well as the predisposition of the body composition to the branch. Wrestling is the struggle of two wrestlers to gain superiority over each other by integrating technical, tactical intelligence and biomotor features with strategies within the rules determined by the United World Wrestling(UWW).

Wrestling is a regular sporting activity that continues in both the old and modern Olympic Games. The ongoing international wrestling tournaments cover gender and weight sections and various age categories (Arakawa et al., 2020). The importance of body composition for achieving success in wrestling athletes has been emphasized in many studies (Arakawa, at al 2015; Sharratt, et al., 1986; Yaşar & Sağır 2019; İmamoğlu, et al., 1999; Demirel, 2015). In addition, in many studies, the importance and necessity of motoric features such as strength, speed, and flexibility in wrestlers' superiority to the opponent have been stated in many studies. (Cicioğlu et al., 2007; Günaydın et al., 2002; Arakawa, at al 2020; Sharratt, et al., 1986).
Although many studies have been conducted on elite male wrestlers, there are limited number of studies examining elite female wrestlers representing their country and competing in international arenas. In this context, the findings of our research are thought to contribute to future studies.
In our research conducted in the light of this information, the physical and some biomotor characteristics of the Kyrgyz national cadet and junior woman wrestlers were determined and their differences according to the age factor were examined.

Material and Method

Participants

The research was carried out on 17 wrestlers wrestling in the Kyrgyz national women's team (n: 9 / age: 15.44 ± 1.13 years) and Junior (n: 8 / age: 20.38 ± 1.99 years). The research data were collected at the end of the national team camp work, which lasted 20 days during the 2018 competition period.

Measurements and Tests

Body Weight and Height Measurements: Bodyweight (VA) measurements were made with an electronic scale with an accuracy of ± 0.1 kg and wrestling jersey. Length measurements were made with an accuracy of ± 0.01mm (Gordon et al., 1988).

Body circumference Measurements: Body circumference measurements were made using Gulick anthropometric tape measure with proper methods (Harrison et al., 1988; Heyward and Stolarczyk, 1996).

Body fat measurements: Body Fat Percentage was determined by measuring skinfold thickness at 6 sites (biceps, triceps, pectoralis, subscapula, suprailic, and Quadriceps) and percentage fat calculated using the Lange formula (Açıkada et al., 1991)

Flexibility Test: This test of individual trunk and lower extremities was applied to measure flexibility. Athletes to the test stand bare feet propped in a way that is straight. Athletes body forward, taking care not to bend the knee and extend forward as far as it goes. In this way, the athletes tried to stop at the farthest point. The test was repeated three times and the higher value was recorded. (Tamer, 2000).

Strength measurements: Back and leg strengths were measured with Back and leg dynamometer (Takei-Back &Lift). Claw strengths were measured using isometric dynamometer (Takei-Hand Grip). Claw strengths were taken measurements from the dominant arm. (Heyward, 2002).

Sprint test (10–30 Meters): The athletes were subjected to the 10 and 30 m maximal running test in the gym. The scores were taken with a photocell (Sport Expert MPS 501 Model). The scores were recorded in terms of the best 10 meters and 30 meters of the athlete: 1/1000 (sec) after two repetitions.

Strength measurements: Back and leg strengths were measured with Back and leg dynamometer (Takei-Back &Lift). Claw strengths were measured using an isometric dynamometer (Takei-Hand Grip). (Heyward, 2002).

BMI (Body Mass Index): Body mass index values were calculated using the formula of body weight and height [BMI (kg/m2) = Body weight (kg)/ Height (m^2)], (Heyward and Stolarczyk, 1996).

Anaerobic Power: The peak and average anaerobic power of the volunteers were calculated with Johnson & Bahamonde formula using data from jump distance, body weight and height. (Johnson and Bahamonde, 1996).

Peak power (W)=[78.6 x VJ (cm)]+[60.3 x BW (kg)]-[15.3 x Height(cm)]-1308
Average power (W) = [43.8 x VJ(cm)]+[32.7 x BW (kg)]-[16.8 x Height(cm)]+431
VJ, (Vertical jump); BW, (bodyweight)

Body density calculation: The formula given below was used to calculate the body density (Jackson et al.,1980)
Body Density = 1.0994921 – (0.0009929 x sum of tricep, suprailiac and thigh skinfolds in mm) + (0.0000023 x square of the sum of tricep, suprailiac and thigh) – (0.0001392 x age)

Statistical evaluation: Data were analyzed by using SPSS version 20.00 software computer package program. The suitability of variables to parametric tests was evaluated according to the Shapiro-Wilk test, considering the number of subjects. It was determined that the data showed normal distribution. Independent sample t-test was applied to test whether there is a difference between the two women wrestler groups. A p-value < 0.05 was considered statistically significant.

Findings

The results determined from cadet and junior women wrestlers competing in the Kyrgyz national team and their comparisons are given in the tables below.

Table 1. Results on the demographic characteristics of women wrestlers (n=17)

Variable	Junior (n=8)	Cadet (n=9)	t	p
Age (year)	20.38±1,99	15.44±1.13	6.367	.000
Height (cm)	160.00±8.33	160.28±7.56	-0.072	.943
Weight (kg)	59.88±9.97	52.73±8.83	1.566	.138
Sport age	5.50±1.19	3.22±2.16	2.633	.019
BMI- (kg/m**2**)	23.23±1.73	20.37±1.74	3.394	.004
Body fat (%)	7.46±0.29	7.25±0.56	0.947	.359
Body density (g/ml)	1.0764±0.002	1.0781±0.003	-1.285	.218

p<0.05 BMI (body mass index)

As seen in table 1, the average age and sports age of junior women wrestlers were found to be significantly higher than cadet women wrestlers as expected. (p<0.05). In addition, BMI averages of junior women wrestlers also reflected statistically high averages (p<0.05).

Table 2. Body circumference and flexibility results of women wrestlers (n=17)

Variable	Junior (n=8)	Cadet (n=9)	t	p
Neck cir. (cm)	34.83±1.88	33.19±2.07	1.695	.111
Shoulder c. (cm)	103.44±7.47	97.22±6.64	1.816	.089
Chest c. (cm)	88.75±4.33	82.78±4.75	2.693	.017
Biceps- flx right c. (cm)	30.77±3.10	27.80±2.08	2.343	.033
Biceps-flx left c. (cm)	30.36±2.58	28.13±2.28	1.888	.079
Biceps -ex right c. (cm)	28.18±2.50	25.52±2.52	2.182	.045
Biceps-ex left c. (cm)	27.62±2.62	25.77±2.35	1.588	.147
Waist c. (cm)	76.71±5.94	73.83±5.07	1.078	.298
Hip c. (cm)	92.75±5.80	87.11±7.11	1.776	.096
Femur c. (cm)	53.26±3.93	49.55±3.94	1.935	.072
Flexibility (cm)	34.55±3.84	31.72±3.71	1.541	.144

p<0.05 ex: extantion, flx :flexion: c:Circumference

Chest of junior women wrestlers, Biceps - flx (right) and Biceps -ex (right). mean deaths in the environment were statistically significantly higher than cadet women wrestlers (p <0.05).

Table 3. Results of strength, anaerobic power and sprint and flexibility measurement results of female wrestlers (n=17).

Variable	Junior (n=8)	Cadet (n=9)	t	p
Average power (watt)	976.58±348.32	659.91±291.95	2.040	.059
peak power (watt)	2143.68±729.99	1567.97±601.31	1.783	.095
Vertical jump (cm)	29.13±5.35	27.33±7.05	0.584	.568
Sprint 10 meter	2.27±0.26	3.11±0.57	-3.769	.002
Sprint 30 meter	6.44±0.28	7.65±0.71	-4.460	.000
Back strength (kg)	88.13±9.61	73.33±8.29	3.408	.004
Leg strength (kg)	100.00±10.69	83.33±9.01	3.489	.003
Hand claw -right (kg)	33.00±14.68	25.44±5.79	1.428	.174
Hand claw -left (kg)	29.13±14.33	23.11±6.93	1.122	.279

p<0.05

As seen in table 3, the average Back-Leg strengths of junior women wrestlers are significantly higher than the cadet women wrestlers (p <0.05.) The sprint 10 and 30 meters scores reflected lower p <0.05 scores compared to the cadet women wrestlers.

Discussion and Conclusion

Physical fitness is one of the important criteria for sportive performance. Unless the physical structures of athletes reveal the requirements for sports branches, it is very difficult to demonstrate successful performance in sports (Hakkinen, 1991). In addition, physical fitness includes elements of cardio-circulatory system endurance, strength, endurance, agility, balance, coordination, flexibility and body composition, strength and speed related to health and skills (Gökmen et al. 1995).

In our study, the average age and sports age of young female wrestlers were found to be significantly higher than star female wrestlers, as expected. ($p<0.05$). In addition, BMI averages of young female wrestlers reflected statistically higher results ($p<0.05$). Body fat%, Height, Weight and Body density measurement values of women wrestlers were found to be statistically similar ($p <0.05$), (Table 1). Arakawa et al. (2020) found BMI values of 15-year-old athletes as 19.5 ± 1.6 kg / m2, and 20-year-old female wrestlers as 21.6 ± 1.0 kg / m2 in their study on elite Japanese wrestlers from different age categories. These scores were found to be higher than the scores we determined. This may be because Japanese women wrestlers are the most successful wrestlers worldwide. From another point of view, the fact that Japanese women wrestlers are more elite athletes than the wrestlers in our research group may be the reason for different results in BKI profiles. In another study conducted on female wrestlers, the results of height and body weight measurements showed similar results with the findings of our cadets' women athletes (Günaydin et al., 2002). In our study, the average fat of women wrestlers was found to be quite low. Referring to a study conducted by Mc Ardle et al. (2005), the ideal body fat ratio of wrestlers was generally between 5-9%. In the same study, it was stated that the most ideal among wrestlers was reported as 7% averages (Bağcı, 2016). This literature information presented is important in supporting the body fat percentage results obtained from female athletes in our research.

In research, young women wrestlers' chest, biceps-flx (right) and biceps-ex (right). circumference measurement values were found statistically significantly higher than star female wrestlers ($p<0.05$). Other body circumference and flexibility measurement results did not differ ($p> 0.05$), (Table 2). As can be seen, body circumference measurements generally reflected close results. In a study conducted in Japan, it was stated that physical development in Japanese women stops around the age of 15 (Isojima et al., 2016). The report of these researchers made us think that the Kyrgyz and the Japanese live in the same continent and similar geography and therefore may have similar physical characteristics. For this reason, Isojima and his friends results are important in terms of supporting the similarity of many-body circumference measurements obtained from cadet and junior Kyrgyz women wrestlers with a mean age of 15.44 ± 1.13 and 20.38 ± 1.99 in our research group. In the research, the average Back-Leg strengths determined from young female wrestlers were found to be significantly higher than the star wrestlers ($p<0.05$). In addition, the 10-meter and 30-meter sprint values of the junior women wrestlers reflected lower scores than cadet wrestlers ($p<0.05$). The determined Anaerobic power parameters, vertical jump and claw strength averages did not differ between junior and cadet women wrestlers ($p>0.05$). Back and leg strengths determined from young female wrestlers are thought to be related to age and sports age. As a matter of fact, there are many physiological changes with the rapid growth and development in childhood. During the period from childhood to early youth, muscle strength begins to increase; While this increase is gaining momentum for boys, the situation for girls is more stable (Malina, et al.,, 2004). It has been stated that the increase in strength depends on many factors such as age, height, weight and the increase in the mass of the muscles in the

body (Muratlı, 2007). In another study, it was concluded that the increase in body environmental measurements with the effect of training may be effective in the increase of anaerobic power and muscle strength properties with the increase of muscle volumes (Demirhan, 2020).

In our study 10 and 30 meters sprint scores of the junior women wrestlers reflected better scores than cadet wrestlers (Table 3). A study revealed that by improving muscle strength, speed and strength will be gained quickly. Stating that the muscles will work in the form of short-term but excessive contractions in this development (Muratlı, 1976). Our research results suggest that there is clear evidence that junior women wrestlers reflect better scores due to leg and back strength. According to the findings obtained from our study; The back-leg strength of junior women wrestlers, BMI, reflected higher averages than cadet women wrestlers. In addition, it has been observed that sprint scores are better in young wrestlers.

These results were evaluated as a natural reflection of age and sports age. The physical characteristics of junior and cadet women wrestlers, except for waist and bicep circumference measurements, generally reflect similar results, suggesting that the body profiles of Asian women do not change much after the age of 15. There is a need for multi-participatory studies to examine the physical characteristics of women athletes from different continents and ages.

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Effects of Cross-Fit Trainings on Body Composition and Some Physical Parameters in Sedentary Men

Mehmet SÖYLER[1], İdris KAYANTAŞ[2]
[1]Çankırı Karatekin Üniversitesi, Çankırı, Türkiye
https://orcid.org/0002-6912-0000-4218
[2]Bingöl Üniversitesi, Bingöl, Türkiye
https://orcid.org/0000-0001-9644-9384
Email: mehmetsoyler@karatekin.edu.tr, idris_kayantas@hotmail.com

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Abstract

Purpose: Body composition and some physical parameters of 12-week Cross-Fit training intensity in sedentary male individuals; Changes in body composition, heart rate, blood pressure, flexibility, endurance, and maximal strength were examined. Tool and Method: This study is in a private sports center operating in Çankırı, between the dates of 01 March - 31 May (12 weeks) in 2019, between the ages of 18- 54 years (average age is 40.73 ± 10.43 years, height is 177.93 ± 5.61 cm) 15 healthy adult men who did not do sports during the last 6 months participated and 12-week Cross-Fit training was done. The time set for training is 90 minutes. The participants were trained 4 days a week (Monday, Wednesday, Friday-Sunday) between 20:00 and 21:30. All the tests made to the participants were made between 08:30 and 12:00 in the morning, one day before and one day after the training programs. Statistical analysis of the findings obtained from the test results was determined by using the SPSS 25.0 for Windows package program. The subject group included in the study was analyzed at 0.05 significance level by using the reason for "Paired Samples T Test" to compare the results obtained after the measurements and to determine the significance levels of the differences between the averages (Samples were compared with the pre-post test). Results: In the light of the data obtained, it was observed that there was a statistically significant difference in the variables (body composition, cardiovascular measurements, physical measurements, maximal force measurements) in all values measured and measured (pretest-posttest). It is thought that; functional training, which is one of the determinants of these differences, is effective on the body composition of the sedentary men and some physical parameters, and the necessary training should be given to functional training activities in regularly planned and created training contents.

Key Words: Cross Fit, Sedentary, Physical Parameters

Introduction

Cross-Fit is considered as one of the high-intensity functional training methods that progress and progress very quickly. Cross-Fit, which has developed rapidly in recent years and is an alternative training method or exercise program instead of traditional fitness equipment, has gained acceptance for people today and has started to be in high demand (Hak et al., 2013). With the development of cross-fit in the 1990s, more than 200,000 athletes and approximately 11,000 gyms started to be seen worldwide (Mate-Munoz et al., 2017).

Cross-fit was originally founded by Greg Glassman, both a fitness trainer and gymnast, and published in 1995 by California / Santa Cruz. It was published in 2001 as a webcast (Glassman, 2010).

Cross-fit training (CFT) means strength and fitness program in general. This program was originally developed for military training, and later became popular among civilians. Cross-fit workouts are mostly performed in the form of high-intensity strength exercises. Cross-fit exercises are performed quickly, with repetitive movements and with little or no rest between sets (Glassman, 2007). It is observed that individuals who perform regular cross-fit training have improved both muscle endurance and muscle strength over time (Glassman, 2006). In addition, Cross-fit has been reported that contributes significantly to agility, balance, coordination, cardiovascular endurance, and flexibility, strength, speed, endurance and strength development (Glassman, 2009).

Cross-Fit training has been shown to create both a broad, overall and inclusive fitness (Turna et al., 2009). In this way, the combined style of cross-fit has been named as a workout of the day (Wod), which is called both a physical training philosophy and a competitive sports type, called exercise of the day. These wods start and end in a period of 10-50 minutes (Glassman, 2009). After a good warm-up in these training sessions, one of the power or strength programs is applied, and during these applications, high-intensity exercises, rapid repetitions and an aerobic load are performed between the sets with little or no rest period (Sprey et al., 2016).

Cross-Fit is considered an option for HIIT. The most important reason why HIIT training is in high ranks is that the Cross-Fit training system has a similar structure. While Cross-Fit training programs are considered to have positive effects on body composition, a more effective training program and a higher cruise rate are required to reach clearer data (Halson, 2014). Although there are many participants of Cross-Fit studies, there are limited studies related to Cross-Fit. The purpose of this study is to examine the effect of Cross-Fit training on body composition and some physical parameters in male sedentary individuals.

Material and Methods

Research Group and Working Design

In a private sports center operating in the city of Çankırı, between the dates of 01 March - 31 May (12 weeks) in 2019, he has not worked for the last 6 months, aged 18-54 (average age 40.73 ± 10.43 years, height length 177.93 ± 5.61 cm) voluntary 15 healthy adult males participated. The subject group was informed about the content, purpose and application form of the study and their approvals were obtained for their willingness to participate in the study. During the research, the whole program was implemented at the sports center between 08:30 and 12:00 in the morning.

Training Criteria;

- Being over the age of 18 and under 55,
- Having a sports history for doing all the physical activities in the study,
- Ones who have no history and presently still without coronary artery disease, cancer, hypertension (systolic> 140 mmHg, diastolic> 90 mmHg) and have no diabetes,
- Those who do not use alcohol and drug-like substances,

Tests and Training Protocol

In the Cross Fit application area established in a private sports center for the participants, strength training, resistance enhancer that lasts 90 minutes a day for 4 weeks (Monday, Wednesday, Friday, Sunday) between 20:00-21:30 in the training unit, aerobic capacity-building circular training (circuit training) and flexibility-enhancing cross-fit training program were implemented. Warm-up and Stretching (10-15 min.), Demo application (5-10min.), Cross-fit exercises (55-60 min.), Cooling and stretching movements (3-5min.) it is formed. One week before the start of the study, the trainings were given about the movements in the training program and application studies were carried out for the participants to apply these movements correctly. The participants were asked to lift the heaviest weight they could lift the movements in 1 repetition provided that they applied the movements correctly. The measurements were taken as values before the participants started training and after 12 weeks of exercises (body composition, cardiovascular fitness, aerobic capacity and physical parameters). Volunteers were warned not to consume alcohol, drugs, excessive fatty foods or to engage in strenuous activities 1 day before the test measurements. In the research, pretest-posttest model was applied. Participants did not have a certain nutritional program and any food restrictions during their training.

Table 1. CrossFit Training Program

Program 1	Program 2	Program 3
Air Squat	Front Squat	Overhead Squat
Push Press	Push Jerk	Deadlift
Sumo Deadlift	High Pull	Medicine Ball Clean
500 Rowing	30 Push Up	10 Thruster
40 Wall Ball	20 Box Jump	10 Kettle Bell Swiang
5 Hang Power Clean	7 Cleans (kg)	10 Pull Up (Barfiks)

Measurements

Health and performance measurement controls of the participants were taken in a fully equipped sports center in Çankırı. The subjects were subjected to height, body weight, body composition measurements and physical exercise tests in the order specified.

1. Body Composition Measurements

Participants whose height was measured were included in body composition measurement. Body weight (kg) and composition evaluations of the subject group (Body mass index-BMI (kg / m^2), Body Fat Ratio-BFR (%) bio-electric impedance (BIA) analysis method (Inbody 270 Body Composition Analyzer, model Plus 270) BIA is an analysis method based on lean tissue mass and electrical permeability difference of fat (Lukaski, 2003).

The test measurements of the subjects are between 8:30-12:00 in the morning, before the liquid and food intake in the evening, before toilet, etc. needs were made in a way that was met. The metal and ornaments on the subjects were removed and the subject to be measured was dressed in a minimum suit, feet bare, the analysis tool was asked to hold the hand electrodes by standing vertically on the aluminum bases. The results were recorded with the help of a laptop connected to the Body Composition Analyzer.

2. Cardiovascular Measurements

2.1. Heart Beat Rate Measurement: The resting HR values of the volunteers were measured by recording the Polar brand RS800cx hour based on the lowest heart rate every 5 seconds. The recordings were recorded by throwing them to the computer with the infrared of the watch. The Polar brand is a Finnish watch and consists of two parts. One piece is clock-shaped, worn on the subject's wrist, the other piece is in the form of a rubber band and is worn around the chest at heart level, there are interval options of 5-10-15 seconds for heart rate recording, and the information recorded for detailed, long-term analysis can be uploaded to the computer (Tamer, 2000).

2.2. Blood Pressures' Measurement: Each subject was provided to repeat the test 3 times and the lowest value measurement was recorded from these 3 applications. Blood pressure measurements of the subject group at rest were determined in mmHg by using aneroid – sphingomano-meter and stethoscope devices (Tamer, 2000).

3. **Physical – Physiological Measurements**

3.1. Sit and Reach Test: The test bench was used for the Sit-Reach test with a length of 35 cm, width of 45 cm, and height of 32 cm to measure the flexibility of the muscles and the test was repeated 3 times and the best result was recorded as the flexibility value (Raven et al., 1976).

3.2. VO_{2max} and HR Max. Measurement: Subjects maxVO_2 - VO_2 KAH max. 20 m for the estimating; the shuttle running test was used. The test is a test that starts at a running speed of 8.5 km / h, and the running speed increases by 0.5 km / sec every 1 minute, and a distance of 20 meters is run round-trip. The test cassette used for the 20 m shuttle run according to the protocol was used to determine the running speed. The test was terminated when the subject did not overlap the two signals or when he left the test. According to the results obtained, the VO_2 max values of the subjects were recorded in ml / kg / min (Bangsbo and Krustrup, 2009).

3.3. Bench Press and Leg Press Measurement (5 RPM): Standard plate weights of 1kg / 1.5kg / 2kg / 2.5kg / 3kg / 5kg / 10kg / 15kg / 20kg were used for bench press and Leg Press measurement. The maximal force of each participant was determined by 5 repetition method. This method has been determined during the application phase by trying before the measurement to determine the weight of each participant. After the weight was increased to the barbell in the bench press movement, each participant was provided to lift this weight with the appropriate technique, if the participant was able to lift the weight without difficulty, 5 minutes of rest were provided and additional additions were made to the weights (Haff and Triplett, 2016).

3.4. One minute sit up test: For crunch test measurement; Participants were allowed to sit up with maximum repetition for 1 minute when the start command was given with the knees bent at an angle of 90 degrees in the supine position, hands on the nape and the soles of the feet in contact with the ground. During the shuttle application, an assistant was provided to hold the

participant's feet to prevent the feet from touching the ground. Subjects were asked to try the test before the measurement was applied. The subjects were asked to touch the shoulders when they lie on the ground, their elbows to touch the knees when they are straightened, and the shuttle was written on the number of record records repeated at the end of 1 minute (Brisebois et al., 2017).

3.5. One minute Squat Test: For squat measurement, fixed plate weights of 1kg / 1.5kg / 2kg / 2.5kg / 3kg / 5kg / 10kg / 15kg / 20kg were used. The maximal force of each participant was determined by 5 repetition method. During the application of this method, the weight of each participant was determined by trial and error. After the weight was increased to the barbell in the Smıth Machıne tool, each participant was provided to lift this weight with the appropriate technique, and if it was able to lift the weight without difficulty, additional additions were made to the weights by providing 5 minutes rest (Haff and Triplett, 2016).

3.6. One minute Burpee Test: The burpee movement is a practice movement combined with squatting movement, push-ups and vertical bounce quickly, sequencing one after another, and the number of burpee movements that the participants can repeat this mixed motion series in 1 minute was recorded in the data sheet (Brisebois et al., 2017). Although the Burpee movement is a movement that targets all muscles; During exercise, various muscles, such as triceps, trapezes, deltoids, quadriceps and pectorals, work harder than others, named after the American psychologist Royal H. Burpee, who thought and discovered fitness movements for agility, coordination and fitness (Haff and Triplett, 2016).

Statistical Analysis

The statistical analysis of the data obtained as a result of the measurements was made using the SPSS 25.0 for Windows package program. In order to compare the data obtained after the measurements of the subjects participating in the study with each other and to determine the significance levels of the differences between the averages, the “Paired Samples T Test” was used at the 0.05 significance level.

Results

The study was conducted between 15 March and 31 May in 2019 with a total of 15 subjects, voluntary sedentary men. The ages of the subjects ranged between 18 and 55, with an average of 40.73 ± 10.43 years. The results of the study in which the effects of Cross-Fit training on sedentary men on body composition and some physical variables are aimed are given below.

Table 1: Comparison of; Body Weight, Body Fat Percentage and Body Mass Index Pretest-Posttest Values of Males Participating in the Study.

Variances (n=15)	**Pre - Test** $\bar{X}\pm$ Sd	**Post - Test** $\bar{X}\pm$ Sd	**T**	**p**
Body Weight (kg)	89,06±9,43	77,62±7,20	8,923	0,000*
Body Fat Percentage (%)	24,98±8,80	17,62±6,51	7,316	0,000*
BMI (kg/m^2)	28,76±4,03	21,86±2,34	8,157	0,000*

p<0,05*

When Table 1 is examined, the pre and post test values of the participants as a result of the statistical analysis; A statistically significant difference was observed between Body Weight ($t = 8.923$, $p < 0.05$), Body Fat Percentage ($t = 7.316$, $p < 0.05$) and Body Mass Index values ($t = 8.157$, $p < 0,05$).

Table 2: Comparison of RHBS, DBP, SBP Pre-test and Post-test Values of the Male Participants

Variances (n=15)	**Pre - Test** $\bar{X}\pm$ Sd	**Post - Test** $\bar{X}\pm$ Sd	**T**	**p**
RHBS (beat/min.)	80,40±8,92	75,86±4,89	3,445	0,004*
DBP (mm/hg)	80,80±4,12	78,00±3,04	3,581	0,003*
SBP (mm/hg)	122,46±5,27	120,20±4,41	3,900	0,002*

*RHBS: Resting Heart Beat Speed *DBP: Diastolic Blood Pressure *SBP: Systolic Blood Pressure

When Table 2 is examined, as a result of the statistical analysis, according to the results of the pre and post test measurements of the volunteers; There was a statistically significant difference between Resting Heart Rate ($t = 3.445$, $p < 0.05$), Diastolic Blood Pressure ($t = 3.581$, $p < 0.05$) and Systolic Blood Pressure values ($t = 3.900$, $p < 0.05$).

Table 3: Comparison of Resilience, Flexibility and Strength Pre test – Post test Values of Male Participants

Variances (n=15)	**Pre-Test** $\bar{X}\pm$ Sd	**Post - Test** $\bar{X}\pm$ Sd	**t**	**p**
Flexibility (cm)	19,32±4,57	23,08±4,09	-5,325	0,000*
KAH Max (ml/kg/min)	192,86±5,43	185,26±4,49	5,253	0,000*
VO_2 Max. (ml/kg/min)	57,08±5,69	60,09±5,33	-2,270	0,040*
5 RPM Leg Press (kg)	120,66±31,27	253,00±91,21	-8,204	0,000*
5 RPM Bench Press (kg)	39,66±14,93	80,00±17,92	-16,711	0,000*
1 Min. Crunch	28,00±8,53	40,20±11,46	-8,134	0,000*
1 Min. Squat	23,80±8,96	35,06±12,09	-8,791	0,000*
1 Min. Burpee	22,66±8,32	32,80±10,19	-10,605	0,000*

p<0,05*

When Table 3 is examined, as a result of the statistical analysis, according to the pre and post test measurement results of the volunteers; There was a meaningful difference between; Flexibility (t = -5,325, p <0.05), KAH max (t = -5,253, p <0.05), VO2 max (t = -2,270, p <0.05), 5RPM Leg Press (t = -8,204, p <0.05), 5RPM Bench Press (t = -16,711, p <0.05), 1 minute Crunch (t = -8,134, p <0.05), 1 minute Squat (t = -8,791, p <0.05) and 1 minute Burpee (t = -10.605, p <0.05).

Discussion

Although there are many studies about Cross-Fit; there are limited studies existing related to Cross-Fit.

Body Composition Measurements

In our study, when we compared the participants' body weights before and after the training, it was found that there was a significant decrease in the body weight (p = 0.000; p <0.05) (Table 1).

According to Baynaz et al. It was determined that the strength exercises performed with their own body weight for 6 weeks with cross-fit training had a positive effect on the body weight values of the sedentary (Baynaz et al., 2017). According to Paoli et al., in a study with three different groups performing endurance training, high intensity circular training and low intensity circular training, found that the group that performed high intensity circular training had a higher decrease in body weight than the other training groups (Paoli et al., 2010). Carol et al., investigated the effect of jogging and walking exercise on performance with 60 women and men aged 24-48. They practiced the participants for 8 weeks. They found that there was a significant reduction in the body weight of the participating women and men. In our study, when the pre and post values of the participants were compared (p = 0.005; p <0.05) (Table 1), a significant decrease was found (Carol et al., 2002). Gomez et al., stated that there was a significant increase in total lean mass with 10-week resistance training ((Gomez et al., 2015). Mertens et al. [19] applied a 2-month running program with 8 sedentary female and 8 male subjects with an average age of 54.9 years (Mertesn et al., 2015).

At the end of the study, they found that the body fat rates decreased significantly. Katzmarzyk et al.; As a result of aerobic exercise exercises, which were applied to 650 men between the ages of 17-65 for 20 weeks, changes in blood lipids and body fat mass were discussed. At the end of the training, a 3.3% decrease in the body fat masses of the participants was observed. In our study, when the BMI pre and post values of the participants were compared (p = 0.005; p <0.05) (Table 1), a significant decrease was found (Katmarzky et al., 2001). Choi et al., showed that the BMI values of students decreased from 22.58 kg / m2 to 22.65 kg / m2 as a result of their study (Choi et al., 2017). In the study of Murawska-Cialowicz et al., it was stated that three-month cross-fit training performed on 15 adults significantly reduced body mass index values (Murawska-Cialowicz et al., 2015). Schjerve et al. [23], in the study of adults who applied the HIIT (Cross-Fit, PX90) training method, BMI decreased from 36.6 ± 1.2 kgm2 to 36.0 ± 1.2 kgm2 and this decrease was found to be significant 2% (Schjerve et al., 2008). The results in this study are similar to the results of our study. In our study; the decrease in body weight, body fat percentage and BMI values of male participants doing Cross-Fit training is thought to be caused by the effectiveness of the training process. Considering the literature, the findings we obtain are also supported by the literature.

Cardiovascular Measurements

In our study, it was found that there was a significant decrease when the pre and final values of the participants with RHBS, DBP, SBP were compared respectively (p = 0.004; p = 3; p = 2; p <0.05) (Table 2). Ersöz et al., For 17 adults between the ages of 30 and 45, they underwent aerobic studies at 50-75% intensity for 45/60 minutes 3 times a week for 8 weeks and 6% at systolic blood pressure at the end of exercise; It was determined that a 10% reduction in the number of resting heart beats occurred (Ersöz et al., 1996). Green et al.; They performed circular training to chronic heart patients with an average age of 62 ± 3 years, and at the end of the exercise, participants found a significant reduction in diastolic and systolic blood pressures (Green et al., 2001). Grace et al., reported that 8-week high-intensity interval training is an effective method for improving respiratory function in men who do not play sports and do regular sports, with an average of 16-19 years of age, and changes blood pressure and resting heart rate in both sports and non-sports (Grace et al., 2016).

At the end of the 12-week Cross-Fit training, it was observed that the subjects performed the recovery with a lower heart rate and the Diastolic and Systolic blood pressures decreased (Perez et al., 2013). When these three results are considered together; we can say that the heart works more economically, therefore it is more efficient. The results obtained are also parallel with the literature.

Physical – Physiological Measurements

In our study, it was found that there was a significant increase in the flexibility pre and post values of the participants (p = 0.000; p <0.00) (Table 3). According to VelazqueAs and Wilmore; a significant change in flexibility has been reported as a result of the 12-week intensive physical activity program (Velazquez and Wilmore, 1991). Zorba et al., performed intense step exercise for young people between the ages of 18-24, 8 days a week for 8 weeks and at the end of the study they found a significant difference in the flexibility values of the experimental group (Zorba et al., 2000). Blake et al., had a 14-week intense exercise program for sedentary obese and normal body weight adults and compared both groups' responses to exercise and physical fitness levels. Flexibility in both groups at the end of the study; they recorded a positive change in their (sit-reach) values (Blake et al., 2000). In our study, it was found that there was a significant difference when the durability pre and post values of the participants were compared (p = 0.000; p <0.00) (Table 3). In their research conducted by Alan et al., they applied sub-maximal intensity aerobic training for 12 weeks to adult subjects. At the end of the training program, it was observed that there was a 9% improvement in the participants' MaxVO2 values (Alan et al, 2000). Hopkins et al.; They applied Cross-fit with a severity of 60-80% to 17 men aged between 30 and 45, 8 weeks, 3 days a week, and a significant increase of 6% in MaxVO2 values was observed at the end of the study. The results obtained in our study in terms of cardiovascular endurance are similar to those in the literature (Hopkins et al., 2009).

Maximal Force Measurements

In our study, when the participants' maximal force pre and post values were compared (p = 0.000; p <0.00) (Table 3), there was a significant change. Clarkson and Hubal. (2002), in a study, the increase in weight level after the leg resistance exercise increased gradually from the end of the 2nd week (Clarkson and Hubal, 2002).

Choi et al.; In Korea, 22 students (11 subjects and 11 control groups) were trained at the university for 14 weeks and 2 days a week Cross-Fit training was done, and they concluded that Cross-Fit training was significantly effective in maximal strength values (Choi et al., 2017).

Conclusion

As a result, we have observed that the individuals who do not actively do sports do not know their bodies thanks to Cross-fit training, their level of self-confidence in training and exercise and their desire for training. As a result of the 12-week data and evaluations obtained; it is concluded that Cross-fit training programs have a positive effect on all parameters evaluated in sedentary male individuals. It is also thought that there is an increase in the level of social motivation of the participants, who are constantly observed, depending on the change in their body structures. Of the work done; it is considered that cross fit training can contribute to different age and gender age groups and the world of sports.

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Examination of the Relationship Between the Reasons for Orientation to Sports Activities and Health Perceptions of Women Receiving Pilates Training

Remziye Özlem ÇAYIRLI[1], Bilal DEMİRHAN[2]
[1] Bartın Üniversitesi, Bartın, Turkey
https://orcid.org/0000-0002-5223-9043
[2] Bartın Üniversitesi, Bartın, Turkey
https://orcid.org/0000-0002-3063-9863
Email: ozlemcayirli74@gmail.com, bilaldemirhan55@gmail.com

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Abstract

The main purpose of the study is to examine the relationship between the reasons for orientation to sports activities and health perceptions of women who receive pilates training. Female trainees who have received pilates training for at least one year under the roof of public education center in Ulus district of Bartın province were included in the study. There are 72 trainees in total in the research group determined by the facilitation method. "Sports Activities Orientation Scale" and "Perception of Health Scale" were used to collect data in the study. In the analysis of the data obtained, KruskalWallis test and Mann Whitney U test were used in SPSS package program. At the same time, Spearman rank difference correlation coefficient technique was used to determine the relationship between sub-dimensions of data collection tools. As a result of the research, no difference was found regarding the variables of age, education level and marital status of the participants. A significant difference was found in the "Socialization" sub-dimension of the scale of orientation towards sports activities in the occupational group variable. This difference is due to the fact that those with the "Private Sector" occupational group have a higher average score than the "Student" ones. A significant difference was found in the "Precision" sub-dimension of the health perception scale related to the monthly average income variable, and this difference is due to the higher average scores of the "2200 TL and Less" and "2201-3500 TL" groups than the "5001 TL and above" group. As a result of the correlation analysis of the sub-dimensions of both scales, it was found that there were low and medium level relationships. As a result; There is a relationship between the reasons for orientation to sports activities of women who take pilates training and their perception of health.

Keywords: Pilates, Orientation to sports activities, Perception of health.

Introduction

With the acceleration of technology, industrialization in societies and the increase in mechanization have caused many changes. In industrialized societies, technology has limited physical activity in most occupations and occupations with limited mobility emerged (Zorba, 2011).

It is known that in order to accept that an individual is healthy, he / she must feel healthy and be biologically healthy (Belek, 1998). Since the concept of health constitutes human life itself, it has existed for humans since the first day of human history. However, as societies reach certain goals, changes occur in the concept of health and understanding of health (Karacabey & Özmerdivenli, 2011). It can be thought that the changes in the understanding of health are caused by the new discoveries in the rapidly developing medical science, the changing nutrition culture, the importance of sports and sports nutrition. It has been stated that health is directly related to the inclusion of healthy living behaviors in the life of the individual and to ensure the continuity of these behaviors and to develop and maintain health (Alkan et al., 2017; Çaka et al., 2017).

The perception of health has emerged as a psychological concept that has been widely used in research topics in recent years. Ermiş (2020), found in his study that reformer pilates exercises increase the perception of health and quality of life in women. Many external factors such as crime rate in society, economic situation, concept of equality, friendship, environmental science, climate and air cleanliness are variables that directly affect the quality of life (Kabadayı, 2006). It is known that orientation towards sports activities contributes positively to the psychological development of the individual. Regardless of the physical equipment of the athlete, what will enable him to use this equipment in the best way is his orientation to sports and his motivation (Erpehlivan, 2008).

The main purpose of physical activities; To increase physiological performance and psychological resilience, to protect the form obtained from sports for many years, to reduce and prevent disruptions caused by sedentary life (Zorba & Saygın, 2013). The Pilates exercise method, developed by Joseph Pilates, was introduced to ensure the continuity of health, like other physical activities. Pilates is an exercise method that has been used for soldiers injured during World War I. Later, he took an active role in improving the injuries of athletes who were engaged in ballet. Until the 1980s, the Pilates exercise method was not well known. The benefits of increasing flexibility, balance and strength form have gained popularity in pilates in recent years. It has been stated that the Pilates method is a prerequisite for the integration of the whole body and mind as well as a physical exercise (Latey, 2001). Many studies reveal that pilates is one of the most preferred exercises in improving body composition. Şavkın (2014) studied 60 minutes of pilates training with 42 women for 8 weeks, 3 days a week, and found that pilates exercises revealed positive effects on body composition parameters. Sekendiz and Ark. (2007) revealed that sedentary women who did 5-week mat pilates exercise increased abdominal muscle endurance, leg strength and flexibility.

In our study conducted in the light of this information, the relationship between the reasons for orientation to sports activities and health perceptions of women who receive pilates training is examined.

Material and Method

Research Model

Relational screening model was used to determine the reasons for orientation to sports activities and health perception attitudes of women who have received 60 minutes of second level pilates training 3 days a week for 1 year at Bartın Ulus Public Education Center. This study is a quantitative study in terms of evaluation of data.

Research Group

The universe of this research consists of 72 women who have been doing mat pilates for 1 year at Bartın Ulus Public Education Center in 2019-2020. The research group consists of women who participate in the surveys on a voluntary basis and answer the questions in the survey completely.

A personal information form, sports activities orientation scale and health perception scale were applied to the participants. Exercises for strength and flexibility for the spine, hips, legs, shoulder circumference and the whole body from Pilates mat movements were performed.

Data Collection Tools

‘’Personel Information Form’’, ‘’Sports Activities Orientation Scale’’ and ‘’Health Perception Scale’’ were used in the study to collect data.

Personel Information Form

In the sutdy, ‘’Personel Information Form’’ was used in order to reach the personal informstion of the participants.This form consists of 5(five) items determinedby the researcher. These substances; It includes age, educational status, occupational group, marital status and average monthly income.

Health Perception Scale

It was developed by Diamond et al (2007). Turkish reliability and validity studies were carried out by Kadıoğlu ve Yıldız (2012). While the internal consistency of the scale varied between .60 and .76 in the sub-dimensions, the ovverall total score was .77 Cronbach’s Alpha value. The scale is in 5 point Likert type , consists of the 15 items and 4 sub-dimensions. The Cronbach Alpha value for the sub-dimensions is .76 for the ‘’Control Center’’; .63 for ‘’Self Awareness ‘’; .71 for ‘’certainty’’; it is .60 for ‘’Importance of Health’’ (Kadıoğlu & Yıldız, 2012).

Sports Activities Orientation Scale

Sports Activities Orientation Scale was developed by Pons et al (2006). The Turkish validity and reliability study was carried out by Çevik et al (2019). The scale is five point Likert type scale with 15 items and 3 sub-dimension. The internal consistency of the scale was found to be .87 Cronbach Alpha in total. .75 for socializing; .87 Emotion searching and .75 for İnformation search (Çevik et al., 2019).

Data Analysis

SPSS 23.0 packaged software was utilised for data analysis. Arithmetic averages and standard deviations of the answers gathered from scales was calculated parametric test assumptions were examined according to independent variables about sub-problems and scale total score averages of participants and Mann Whitney U test was carried out for paired comparisons and Kruskal Wallis test was carried out for multiple comparisons out of non-parametric tests.

Spearman's rank-difference correlation coefficient(r) was utilised in an attempt to detect the relation between sub-dimension of scales in accordance with answers of study group. In the analysis significance level was taken as ''0.05''.

Findings

Results of data which were gathered about demographical properties of women who do regularly pilates and counted in research sample were included in this section. Findings to women's demographical properties were acquired from the answers which were given to 'Perfonal Info' section. Number of persons (N) and percent value (%) related to findings are in the table right below.

Table 1. Percentage distribution of participant group according to demographical information.

Variable	Group	N	%
Age	18-24 age	15	20.8
	25-30 age	48	66.7
	31-36 age	3	4.2
	37-42 age	6	8.3
Education Status	Primary-Secondary school	5	6.9
	High School	7	9.7
	University	60	83.3
Occupational Group	Housewife	16	22.2
	Officer	26	36.1
	Private Sector	17	23.6
	Student	13	18.1
Marital Status	Single	50	69.4
	Married	22	30.6
Average Monthly Income	2200 TL and below	24	33.3
	2201-3500 TL	23	31.9
	3501-5000 TL	19	26.4
	5001 TL and above	6	8.3
Total		72	100

As seen in Table 1 participants' demographical information (Age, Educational Status, Occupational Group, Marital Status, Average Monthly Income) who were counted in the research was given by percentage distribution.

Table 2. Kruskal Wallis test results of participant group tendency reason scale to sport activities and sub-dimension of health perception scale towards age variable.

Lower Dimensions	Age Group	N	Average	df	x^2	p
Socializing	18-24 age	15	30.50	3	1.654	.647
	25-30 age	48	37.98			
	31-36 age	3	36.50			
	37-42 age	6	39.67			
Seeking Emotion	18-24 age	15	38.73	3	1.027	.795
	25-30 age	48	36.98			
	31-36 age	3	30.33			
	37-42 age	6	30.17			
Seeking Knowledge	18-24 age	15	41.57	3	1.955	.582
	25-30 age	48	34.70			
	31-36 age	3	29.50			

	37-42 age	6	41.75			
Control Center	18-24 age	15	37.63	3	.712	.870
	25-30 age	48	36.75			
	31-36 age	3	39.83			
	37-42 age	6	30.00			
Accuracy	18-24 age	15	36.47	3	.867	.833
	25-30 age	48	37.59			
	31-36 age	3	32.83			
	37-42 age	6	29.67			
Importance of Health	18-24 age	15	39.57	3	2.417	.490
	25-30 age	48	36.21			
	31-36 age	3	46.17			
	37-42 age	6	26.33			
Self Consciousness	18-24 age	15	40.43	3	.940	.816
	25-30 age	48	35.10			
	31-36 age	3	33.33			
	37-42 age	6	39.42			

According to Table 2 in the result of analysis based on age variable, no significant differentiation occurred in participant group's tendency to sports activities and sub-dimension of health perception scale.

Table 3. Kruskal Wallis test results of participant group tendency reason scale to sport activities and sub-dimension of health perception scale towards educational status variable.

Lower Dimensions	**Educational Status**	**N**	**Average**	**df**	**x^2**	**p**
Socializing	Primary-Secondary school	5	30.10	2	.533	.647
	High School	7	37.93			
	University	60	36.87			
Seeking Emotion	Primary-Secondary school	5	30.30	2	.481	.786
	High School	7	36.93			
	University	60	36.97			
Seeking Knowledge	Primary-Secondary school	5	38.60	2	.057	.972
	High School	7	35.93			
	University	60	36.39			
Control Center	Primary-Secondary school	5	21.80	2	2.714	.257
	High School	7	39.07			
	University	60	37.43			
Accuracy	Primary-Secondary school	5	28.80	2	1.154	.562
	High School	7	41.93			
	University	60	36.51			
Importance of Health	Primary-Secondary school	5	17.00	2	4.762	.092
	High School	7	36.50			
	University	60	38.13			
Self Consciousnes	Primary-Secondary school	5	39.30	2	1.002	.606
	High School	7	29.21			
	University	60	37.12			

According to Table 3 in the result of analysis based on educational status variable, no significant differentiation in terms of statistical was detected in participant group's tendency to sports activities and sub-dimension of health perception scale.

Table 4. Kruskal Wallis test results of participant group tendency reason scale to sport activities and sub-dimension of health perception scale towards occupational group variable.

Lower Dimensions	Occupational Group	N	Average	df	x^2	p	Difference
Socializing	(1) Housewife	16	35.44	3	10.586	**.014**	3>4
	(2) Officer	26	38.29				
	(3)Private Sector	17	46.09				
	(4) Student	13	21.69				
Seeking Emotion	(1) Houewife	16	37.63	3	.807	.848	-
	(2) Officer	26	36.56				
	(3) Private Sector	17	38.68				
	(4) Student	13	32.15				
Seeking Knowledge	(1) Housewife	16	46.16	3	4.542	.209	-
	(2) Officer	26	33.73				
	(3) Private Sector	17	32.47				
	(4) Student	13	35.42				
Control Center	(1) Housewife	16	37.97	3	.784	.853	-
	(2) Officer	26	34.31				
	(3) Private Sector	17	35.71				
	(4) Student	13	40.12				
Accuracy	(1) Housewife	16	45.69	3	4.270	.234	-
	(2) Officer	26	32.67				
	(3) Private Sector	17	36.09				
	(4) Student	13	33.38				
Importance of Health	(1) Housewife	16	32.22	3	1.264	.738	-
	(2) Officer	26	38.90				
	(3) Private Sector	17	35.09				
	(3) Student	13	38.81				
Self Consciousnes	(1) Housewife	16	30.94	3	2.657	.448	-
	(2) Officer	26	37.60				
	(3) Private Sector	17	34.94				
	(4) Student	13	43.19				

According to Table 4 A significant differentiation ($p<0,014$) was detected in 'Socialization' sub-dimension of participant group's tendency scale to sports activities in the result of analysis based on occupational group variable. No significant differentiation was detected in 'Seeking emotion' and 'Seeking Knowledge' sub-dimensions. No significant differentiation occurred in the sub-dimensions which are 'Control Center', 'Accuracy', 'Importance of Health', 'Self Consciousness' of health perception scale.

Table 5. Mann Whitney U test results of participant group tendency reason scale to sport activities and sub-dimension of health perception scale towards marital status variable.

Lower Dimensions	Marital Status	N	Average	z	p
Socializing	Single	50	34.73	-1.096	.273
	Married	22	40.52		
Seeking emotion	Single	50	35.10	-.864	.387
	Married	22	39.68		
Seeking	Single	50	36.24		

Knowledge	Married	22	37.09	-.159	.874
Control Center	Single	50	39.03		
	Married	22	30.75	-1.553	.120
Accuracy	Single	50	33.75		
	Married	22	42.75	-1.685	.092
Importance of Health	Single	50	39.56		
	Married	22	29.55	-1.882	.060
Self Consciousness	Single	50	37.08		
	Married	22	35.18	-.357	.721

According to Table 5 in the result of analysis based on marital status variable, no significant differentiation in terms of statistical was detected in participant group's tendency to sports activities and sub-dimension of health perception scale.

Tablo 6. Kruskal Wallis test results of participant group tendency reason scale to sport activities and sub-dimension of health perception scale towards average monthly income variable.

Lower Dimensions	Average Monthly Income	N	Average	df	x^2	p	Difference
Socializing	(1) 2200 TL and below	24	29.73	3	4.517	.211	-
	(2) 2201-3500 TL	23	41.11				
	(3) 3501-5000 TL	19	37.13				
	(4) 5001 TL and above	6	43.92				
Seeking Emotion	(1) 2200 TL and below	24	35.75	3	1.806	.614	-
	(2) 2201-3500 TL	23	36.41				
	(3) 3501-5000 TL	19	40.37				
	(4) 5001 TL and above	6	27.58				
Seeking Knowledge	(1) 2200 TL and below	24	40.33	3	3.987	.263	-
	(2) 2201-3500 TL	23	39.80				
	(3) 3501-5000 TL	19	29.47				
	(4) 5001 TL and above	6	30.75				
Control Center	(1) 2200 TL and below	24	39.08	3	2.861	.414	-
	(2) 2201-3500 TL	23	39.59				
	(3) 3501-5000 TL	19	32.58				
	(4) 5001 TL and above	6	26.75				
Accuracy	(1) 2200 TL and below	24	43.58	3	9.013	**.029**	1>4
	(2) 2201-3500 TL	23	38.41				2>4
	(3) 3501-5000 TL	19	31.13				
	(4) 5001 TL and above	6	17.83				
Importance of Health	(1) 2200 TL ve Altı	24	39.73	3	2.220	.528	-
	(2) 2201-3500 TL	23	33.35				
	(3) 3501-5000 TL	19	38.76				
	(4) 5001 TL and above	6	28.5				
Self Consciousness	(1) 2200 TL and below	24	35.56	3	.770	.857	-
	(2) 2201-3500 TL	23	35.15				
	(3) 3501-5000 TL	19	37.24				
	(4) 5001 TL and above	6	43.08				

According to Table 6 No significant differentiation was detected in 'socialization', 'seeking knowledge' and 'seeking emotion' sub-dimension of tendency to sports scale towards average monthly income. No significant differentiation was detected in the "Control Center", "Importance of Health" and 'Self Consciousness' sub-dimensions of the health perception scale. However, a significant difference was detected in the "Accuracy" sub-dimension and this difference is due to the higher average scores of the "2200 TL and Less" and "2201-3500 TL" groups than the "5001 TL and above" group.

Tablo 7. The results of the Spearman's rank-difference correlation coefficient test of the participant group's reasons for tendency towards sports activities scale and sub-dimensions of the health perception scale.

		Socializing	Seeking Emotion	Seeking Knowledge	Control Center	Accuracy	Importance of Health	Self Consciousness
Socializing	r							
	p	1						
Seeking Emotion	r	.459**						
	p	.000	1					
Seeking Knowledge	r	.142	.393**					
	p	.233	.001	1				
Control Center	r	-.079	.129	-.092				
	p	.511	.279	.440	1			
Accuracy	r	.171	.278*	.180	.399**			
	p	.152	.018	.130	.001	1		
Importance of Health	r	.188	.293*	.135	.192	.194		
	p	.114	.013	.258	.107	.103	1	
Self Consciousness	r	.238*	.348**	.246*	.275*	.122	.337**	
	p	.044	.003	.037	.019	.307	.004	1

As seen in Table 7, between the emotion seeking sub-dimension and socialization, a positive moderate relation (r =.459**) between the seeking knowledge sub-dimension and the seeking emotion sub-dimension (r=.393**) a positive relation, while there was a positive low-intensity correlation (r=.278*) in the accuracy and seeking emotion sub-dimensions, a moderate positive (r = .399**) correlation was found between the accuracy and control center sub-dimensions. There was a low and positive relationship (r =.293*) between the importance of health sub-dimension and the seeking emotion sub-dimension, while there was statistically meaningful relation (r=.238*) in self-consciousness and socialization, there was moderately positive relation (r=.337**) between sub-dimensions of self-consciousness and importance of health.

Discussion and Conclusion

The human bening has taken an active rol in along struggle from past to present to reach a quality and health life. Eventough the constantly devoloping Technologies seem to make life effortless, they cause the Daily activity intenstiy to desrease gradualy, moving life is one of the most important problems for a large number of who spend all day in front of a computer and fulfill all their needs over the internet. People who move less day by day also move away from healthy eating over time (Bek, 2008). İt is tought that this of situation health in the person.

İn this direction, our study was conducted with 72 women between the ages of 18-42 who participated in mat pilates training for one year in the results of our study, a significant difference was found in the socialization sub-dimension of the occupational group variable of the reasons for arientation towards sports activities scale and the health perception scale (p>0,05). This difference is thougth to reveal the need for sociallication that people working in the public and private sectors have a higer average, studies have shown that apart from biological factors, many factors such as education , age, chronic ilness, gender, smoking, addiction and income level also affect perseption of health (Bobak et al.., 2000; Mikolajczyk et al., 2008). In another study, Özüdoğru (2013), reported a generally significant difference in

the comparison of participants quality of life according to their physical activity levels. The mentioned litarature supports our research findings. The stress brought about by business life leads people to the desire to spend their leissure time in a better quality and more productive and to seek new people. Çubuk (2019), found a moderately significant positive correlation between the health perception of the research group and physical activities including sports and exercise, which are one of the leisure activities. It is tought that the city where the participants live, socio-cultural opportunities, the type of exercise preferred the degree of difficult, the fact that the exercise is done in a group or individually and it's popularity level contribute greatly to socialization. In a study on the subject Vergili &Yalıman (2012), applied a 12 week pilates exercise program on 153 healty women aged 20-55 for at least two years and examined the effects of calisthenich and pilates exercise on health-related quality of life and that calisthenich- pilates exercise were associated with health found that it improved the quality of life. In a study on the subject Gillison at al. (2009), revealed the difference between low intensity exercise and modarete- intensity exercise performed collectively and found that the exercise that increase the physical quality of life of individuals are medium intensity exercises. Perception of health is measured by the individuals personal response to a question about his own health and includes individual thoughts and emotional aspects of one's own health behavior (Şenol at al., 2010). In our study, a significant difference was found in the precision dimesion of of the monthly average income variable ($p<0,05$). This difference is due to the fact that the average scores of the ''2200 TL and below '' and ''2201-3500 TL'' groups are higger than the ''5001 Tl and above'' group. As the income level of a person decreases he begins to worry about health exercises and is tought to be due to his desire certainty that his health is good.

As can be seen it has been observed that our research findings and the literatüre examined have produced results in a largely similar direction. As a result; a low and medium level positive correlation was found in the correlation coeffient analysis of our research findings and possitive correlation was found between the reasons for orientatiton the sports activities and health perceptions of women who received pilates training.

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Investigation of the Relationship between Healthy Lifestyle Behavior, Quality of Life and Leisure Constraint Levels of Amputee Individuals Who Take Sports Education

Ali Ozan SARIGÖZ[1], Fatih YAŞARTÜRK[2]
[1] Bartın University, Education Sciences Institute, Bartın, TURKEY
https://orcid.org/0000-0003-4861-9868
[2] Bartın University, Faculty of Sport Sciences, Bartın, TURKEY
https://orcid.org/ 0000-0003-4934-101X
Email: aliozansarigoz@hotmail.com, fatihyasarturk@gmail.com

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Abstract

This study analyzes the relationship between a healthy lifestyle behavior, quality of life, and leisure constraint levels of amputee individuals receiving sports education. The research participants include 106 volunteer amputee football athletes from the amputee football super league teams of the Turkish Sports Federation for the Physically Disabled. The study utilizes the "Personal Information Form" prepared by the researchers, "Healthy Lifestyle Behaviors Scale (HLBS)" developed by Walker, Sechrist, and Pender (1987) and adapted to Turkish by Esin (1999) as the data collection tool. "World Health Organization Quality of Life Short Form (WHOQOL-BREF-TR)" was employed, which was developed by the World Health Organization and adapted into Turkish by Fidaner et al. (1999). Besides, "The Leisure Constraints Questionnaire-18 (LCQ)" developed by Alexandris and Carroll (1997) and adapted to Turkish by Gürbüz and Karaküçük (2007) was utilized. In analyzing the data, frequency, percentage, t-test, ANOVA, and Pearson Correlation tests were employed to analyze the data. Per the study findings, a significant difference was found between the sub-dimensions of HLBS ($p<0,05$) in the results of the ANOVA test by the age variable, but no significant difference was found between the sub-dimensions of WHOQOL and LCQ ($p>0,05$). No significant difference was found between the sub-dimensions of HLBS, WHOQOL, and LCQ in the t-Test results ($p>0,05$) by the amputation time variable. Besides, per the correlation analysis results, a statistically moderate and positive correlation was found between HLBS and WHOQOL and LCQ ($p>0,05$). Similarly, a moderate and positive correlation was found between WHOQOL and LCQ ($p>0,05$). In conclusion, as the quality of life increases mentally and socially due to the leisure time activities in which amputee individuals receiving sports education participate, we can observe that their healthy lifestyle behaviors are directly affected and positively affect their leisure constraint mentally and physically.

Keywords: Amputee individuals who take sports education, Healthy lifestyle behaviors, Quality of life, Leisure constraints

Introduction

As it is known, everybody is a disabled candidate and can experience it before, during, or after birth. Being disabled can affect a person physically and mentally as well as psychologically. In particular, negative opinions and behaviors of society towards people with disabilities affect the process quickly. Change can begin with a conscious society and active or passive participation in recreational sports activities.

The World Health Organization (WHO) defines health as a condition without disease or disability and a state of physical, mental, and social well-being (WHO, 2017). Health behavior is referred to as all kinds of behavior that an individual believes and does to be healthy, protected from diseases, and maintains well-being. A healthy lifestyle is defined as controlling all behaviors that may affect the health of the individual, choosing and regulating the behaviors appropriate to the health condition while performing daily life activities with his decision-making ability and making these behaviors a habit (Kostak et al., 2014). Examples of healthy lifestyle behaviors include regular physical activity, adequate sleep, good communication in social relationships, regular and balanced nutrition (Hu, Liu & Wilett, 2011). With increasing sensitivity towards a healthy lifestyle, the quality of life can be improved by providing control over the individual's health, lifestyles that can pave the way for diseases can be changed, and positive, healthy lifestyle behaviors can be acquired, accordingly (Cirhinlioğlu, 2001). Therefore, increasing the quality of life will improve happiness by being satisfied in many disabled or amputee individuals.

Quality of life is a broad concept and represents an individual's well-being and subjective satisfaction in different life areas. Quality of life is referred to as how individuals perceive themselves based on their goals, expectations, interests, and living standards that are constituted within the culture and values in their lives (Akvardar et al., 2006; Özçelik & Karaçam, 2014). Quality of life is a concept that describes the difference between family, work-life, socioeconomic conditions and the goals, expectations, hopes, dreams, and realities of the person and involves the perception of satisfaction and well-being from the daily life of the person (Eser, Yüksel & Sieberer, 2008). Therefore, increasing the quality of life will motivate the disabled or amputated individual and create a desire for efficient leisure activities.

While the concept of leisure time is defined as the time allocated for compulsory work such as rest, study, nutrition, among others, they observe that what matters is that people spend their time more efficiently by participating in quality activities in the free time (Gürbüz and Karaküçük, 2007). The concept of disability refers to the leisure literature, the reasons that prevent or restrict people's participation in recreational activities in their leisure time and are also perceived by the individual (Öztürk, 2016). Today's living conditions pushed individuals to leisure activities to achieve peace and happiness, and the need for leisure activities improved in parallel with it. Except for the increase in need, we observe in many research findings that participation in such activities, which are considered significant for people and societies' health, is limited or that participation is prevented for different reasons (Alexandris & Carroll, 1999; Devine, 2004; Ayhan & Özel, 2020). It is vital to assess leisure activities with sports activities and make it a pivotal issue to overcome leisure constraint.

Therefore, sports competitions' rehabilitative and therapeutic effects have begun to be employed as a physical, mental, emotional, and social development tool for physically disabled people (Kabasakal, 2007). Being able to move, exercise, participate in sports

activities, regardless of their disability and degree, pleasures the person, and the admiration toward mobility positively affects the motivation of a person for life (Özer, 2001).

Therefore, we can note that some ways to change the motivation and general condition of disabled or amputee individuals in sports education will positively affect both the quality of life and the healthy lifestyle by performing recreational and socializing leisure time activities.

In this context, this study analyzes the relationship between a healthy lifestyle, quality of life, and leisure constraint levels of amputee individuals receiving sports education.

Method

Research Model

We utilized the "Descriptive and Relational Screening Model" for research purposes. Descriptive screening models are conducted on the whole population or a group or sample to make a general judgment in a population composed of many elements. (Karasar, 1994). Relational screening models research models aiming to identify the existence and/or degree of co-change between two or more variables (Karasar, 2017).

Research population and sampling

The research population includes 102 volunteer amputee football athletes from the following amputee football super league teams of Turkish Sports Federation for the Physically Disabled;

- TSK Rehabilitasyon Merkezi Engelliler Sport Club,
- Osmanli Engelliler Sport Club,
- Izmir Büyüksehir Belediye Amputee Sports Club,
- Anadolu Erciyes Engelliler Sports Club,
- Sahinbey Belediyesi Sports Club,
- Malatya Büyüksehir Sports Club,
- Bursa Amputee Sports Club,

which are chosen with a random sampling method.

Data Collection Tools

The study employs a personal information form developed by the researchers as the data collection tool. The personal information form includes questions for the participants about age, monthly income, amputee time, national athlete status, and their teams.

The Healthy Lifestyle Behavior Scale (HLBS) was adapted into Turkish by Esin (1999), which was developed by Walker, Sechrist, and Pender (1987) to measure the health-promoting behaviors of individuals concerning a healthy lifestyle. The scale, which consists of 48 items in total and six sub-dimensions: "self-actualization, health responsibility, exercise, nutrition, interpersonal support and stress management", was prepared in a 4-point Likert type and was scored as "1 - Never" and "4 - Regularly".

World Health Organization Quality of Life (WHOQOL) was developed by the World Health Organization (1996) to identify the quality of life of the individual, and the WHOQOL-BREF short form consisting of 26 questions was adapted to Turkish by Fidaner et al. (1999). A total of 27 items of WHOQOL are scored by reverse coding of the 3rd, 4th, 26th, and 27th questions and consist of five sub-dimensions such as "general health, physical health,

psychological, social relationships, and environment". Area scores are calculated between 4-20, and the higher the score, the higher the quality of life (Oliver, 1997).

The Leisure Constraints Questionnaire -18 (LCQ) was developed by Alexandris and Carroll (1997) to identify the situations that may prevent individuals from participating in recreational activities, and adapted to Turkish by Gürbüz and Karaküçük (2007) and, its short form was adapted to Turkish by Gürbüz, Öncü and Emir (2020). The LCQ was prepared in a 4-point Likert type consisting of 18 items and six sub-dimensions such as "individual/psychological, lack of knowledge, facilities/services and lack of partners, time and lack of interest" and scored as "1 - Absolutely not important" and "4 - Very important". The high score obtained from the sub-dimensions of LCQ indicates that the perception of leisure activities' constraint is high.

Data Analysis

SPSS 20.0 package program was employed to analyze the data. The descriptive statistical methods, independent sample t-test, one-way analysis of variance (ANOVA), and Pearson correlation test results were analyzed and resolved. The level of significance calculated for the equality of variances was accepted as $p < 0.05$ (Büyüköztürk, et al., 2012).

Results

Table 1. Descriptive Statistics Results of Participants According to Demographic Variables

	Groups	n	%
Age (29,25±7,83)	20 years and under	14	13,7
	21-25 years old	26	25,5
	26-30 years old	24	23,5
	31-35 years old	18	17,6
	36 years and older	20	19,6
Monthly İncome	2000 TL and below	40	39,2
	2001-3000 TL	34	33,3
	3000 TL over	28	27,5
Amputation time	Prenatal	33	32,4
	Post-natal	69	67,6
National athlete	Yes	31	30,4
	No	71	69,6
Team including	TSK Reh.Merk.Eng.SK	16	15,7
	Osmanli Eng. SK	20	19,6
	İzmir Büyüksehir BLD Ampute Futbol SK	15	14,7
	Anadolu Erciyes Eng SK	13	12,7
	Sahinbey Belediyesi SK	14	13,7
	Malatya Büyüksehir SK	12	11,8
	Bursa Ampute SK	12	11,8

According to the table, the 20 years and under age of 102 amputees receiving sports training 29,25 was determined as 13.7%. And also 25.5% for aged 21-25, 23.5% for aged 26-30, 17.6% for between the ages of 31-35 and 19.6% of them were determined to be 36 years old and above. The monthly income of 39.2% of the participants was 2000 TL and below, 3.3% of the participants was 2001-3000 TL, 27.5% of the participants was over 3000 TL and 32.4% of prenatal, 67.4% of post-natal have amputee time. 30.4% of the participants were national

athletes. The teams they played were 15.7% TSK Rehberlik Merkezi Engelli, %19,6 Osmanli Engelliler, %14,7 Izmir Büyüksehir Belediyesi Ampute Futbol, %12,7 Anadolu Erciyes Engelli, %13,7 Sahinbey Belediyesi, %11,8 Malatya Büyüksehir, %11,8 Bursa Amputee sports clubs.

Table 2. According to the Age Variable of the Participants HLBS ANOVA Test Results

Sub-scales	Age Groups	n	$\overline{X}$	SS	F	p	Significant Difference
Self-actualization	20 years and under	14	2,75	0,61	3,28	0,014*	B,C,D>E
	21-25 years old	26	2,86	0,50			
	26-30 years old	24	2,83	0,52			
	31-35 years old	18	3,01	0,47			
	36 years and older	20	2,44	0,47			
Health responsibility	20 years and under	14	2,67	0,56	2,87	0,027*	C,D>E
	21-25 years old	26	2,73	0,55			
	26-30 years old	24	2,89	0,53			
	31-35 years old	18	3,06	0,49			
	36 years and older	20	2,53	0,50			
Exercise	20 years and under	14	2,84	0,46	2,98	0,023*	C,D>E
	21-25 years old	26	2,77	0,48			
	26-30 years old	24	2,91	0,52			
	31-35 years old	18	3,04	0,55			
	36 years and older	20	2,51	0,53			
Nutrition	20 years and under	14	2,83	0,62	1,69	0,159	-
	21-25 years old	26	2,72	0,61			
	26-30 years old	24	2,85	0,55			
	31-35 years old	18	3,06	0,51			
	36 years and older	20	2,60	0,56			
Interpersonal support	20 years and under	14	2,67	0,54	2,70	0,035*	C,D>E
	21-25 years old	26	2,75	0,64			
	26-30 years old	24	2,83	0,52			
	31-35 years old	18	3,13	0,45			
	36 years and older	20	2,58	0,57			
Stress management	20 years and under	14	2,79	0,58	1,88	0,120	-
	21-25 years old	26	2,81	0,56			
	26-30 years old	24	2,91	0,54			
	31-35 years old	18	2,99	0,57			
	36 years and older	20	2,53	0,56			
HLBS	20 years and under	14	2,76	0,53	2,74	0,033*	C,D>E
	21-25 years old	26	2,77	0,53			
	26-30 years old	24	2,87	0,48			
	31-35 years old	18	3,05	0,46			
	36 years and older	20	2,53	0,47			

* p<.05 A= 20 years and under, B= 21-25 years old, C= 26-30 years old, D= 31-35 years old, E= 36 years and older

According to the table, when examined in terms of age variable "self-actualization, health responsibility, exercise, interpersonal support", it can be seen the participants HLBS total mean scores and sub-dimensions. Sub-scales and HLBS in total score average a statistically significant difference was detected (p<0,05). "Self-actualization" significant difference in sub-dimension was "21-25 years old, 26-30 years old and 31-35 years old" group of persons "36 years and older" were found to be beneficial for amputees in the group. Also "health responsibility, exercise, interpersonal support bottom sizes and HLBS" significant differences

"26-30 years old and 31-35 years old" group of persons "36 years and older" have been found to be beneficial for the individuals in the group.

Table 3. According to the Age Variable of the Participants WHOQOL ANOVA Test Results

Sub-scales	Age Groups	n	$\overline{X}$	SS	F	p
General health	20 years and under	14	12,32	4,10	0,87	0,487
	21-25 years old	26	12,60	4,09		
	31-35 years old	18	13,61	3,35		
	36 years and older	20	11,63	4,08		
Physical health	20 years and under	14	11,73	3,96	1,51	0,207
	21-25 years old	26	11,51	3,71		
	31-35 years old	18	13,65	3,00		
	36 years and older	20	10,75	4,03		
Psychological	20 years and under	14	12,44	4,22	1,36	0,253
	21-25 years old	26	11,31	3,58		
	31-35 years old	18	13,89	3,37		
	36 years and older	20	11,63	4,25		
Social relationships	20 years and under	14	12,14	6,22	0,90	0,469
	21-25 years old	26	11,79	5,27		
	31-35 years old	18	13,89	4,54		
	36 years and older	20	11,08	4,50		
Environment	20 years and under	14	12,14	4,03	1,01	0,408
	21-25 years old	26	11,58	4,24		
	31-35 years old	18	13,27	2,58		
	36 years and older	20	10,89	3,98		
WHOQOL	20 years and under	14	60,78	20,28	1,23	0,305
	21-25 years old	26	58,80	18,88		
	31-35 years old	18	68,31	14,20		
	36 years and older	20	55,97	19,80		

A=20 years and under, B=21-25 years old, D=31-35 years old, E=36 years and older

According to the table, the age variable of the participants ANOVA in test results WHOQOL had no statistically significant difference between the total mean scores and sub-dimensions. (p>0,05).

Table 4. According to the Age Variable of the Participants LCQ ANOVA Test Results

Sub-scales	Age Groups	n	$\overline{X}$	SS	F	p
Individual/psychological	20 years and under	14	2,45	0,58	1,00	0,409
	21-25 years old	26	2,35	0,85		
	26-30 years old	24	2,63	0,85		
	31-35 years old	18	2,76	0,95		
	36 years and older	20	2,37	0,66		
Lack of knowledge	20 years and under	14	2,62	0,60	0,39	0,818
	21-25 years old	26	2,72	1,07		
	26-30 years old	24	2,67	0,80		
	31-35 years old	18	2,89	0,80		
	36 years and older	20	2,88	0,80		
Facilities/services	20 years and under	14	2,24	0,89	1,94	0,110
	21-25 years old	26	2,92	1,09		
	26-30 years old	24	2,69	0,88		
	31-35 years old	18	3,06	0,79		
	36 years and older	20	2,83	0,71		
Lack of partners	20 years and under	14	2,48	0,86	0,72	0,583

	21-25 years old	26	2,86	0,78		
	26-30 years old	24	2,76	0,90		
	31-35 years old	18	2,70	0,74		
	36 years and older	20	2,57	0,66		
Time	20 years and under	14	2,19	0,57	2,03	0,096
	21-25 years old	26	2,77	0,79		
	26-30 years old	24	2,54	0,74		
	31-35 years old	18	2,83	0,84		
	36 years and older	20	2,78	0,73		
Lack of interest	20 years and under	14	2,24	0,74	0,85	0,499
	21-25 years old	26	2,59	0,74		
	26-30 years old	24	2,51	0,62		
	31-35 years old	18	2,65	0,79		
	36 years and older	20	2,42	0,67		
LCQ	20 years and under	14	2,37	0,43	1,27	0,286
	21-25 years old	26	2,70	0,68		
	26-30 years old	24	2,63	0,62		
	31-35 years old	18	2,81	0,45		
	36 years and older	20	2,64	0,54		

A=20 years and under, B=21-25 years old, C=26-30 years old, D=31-35 years old, E=36 years and older

According to the table, the age variable of the participants ANOVA in test results LCQ, there was no statistically significant difference between the total mean scores and sub-dimensions (p>0,05).

Table 5. According to the Amputation Time Variable of the Participants HLBS t-Test Results

Sub-scales	Amputation Time	N	$\overline{X}$	SS	t	p
Self-actualization	Prenatal	33	2,88	0,50	1,32	0,189
	Post-natal	69	2,73	0,55		
Health responsibility	Prenatal	33	2,80	0,51	0,36	0,717
	Post-natal	69	2,76	0,56		
Exercise	Prenatal	33	2,85	0,42	0,57	0,570
	Post-natal	69	2,79	0,58		
Nutrition	Prenatal	33	2,87	0,59	0,82	0,413
	Post-natal	69	2,77	0,58		
Interpersonal support	Prenatal	33	2,83	0,52	0,41	0,679
	Post-natal	69	2,78	0,60		
Stress management	Prenatal	33	2,81	0,51	0,05	0,959
	Post-natal	69	2,80	0,60		
HLBS	Prenatal	33	2,84	0,47	0,63	0,529
	Post-natal	69	2,77	0,54		

According to the table, in the t-Test results of the amputation time variable of the participants HLBS, there was no statistically significant difference between the total mean scores and sub-dimensions (p>0,05).

Table 6. According to the Amputation Time Variable of the Participants WHOQOL t-Test Results

Sub-scales	Amputation Time	N	$\overline{X}$	SS	t	p
General health	Prenatal	33	12,65	4,84	-0,24	0,813
	Post-natal	69	12,86	3,87		
Physical health	Prenatal	33	12,51	4,05	1,18	0,242

	Post-natal	69	11,56	3,69		
Psychological	Prenatal	33	13,16	3,66	1,56	0,122
	Post-natal	69	11,87	3,99		
Social relationships	Prenatal	33	13,84	4,42	2,17	0,052
	Post-natal	69	11,59	5,09		
Environment	Prenatal	33	12,79	4,06	1,60	0,112
	Post-natal	69	11,51	3,63		
WHOQOL	Prenatal	33	64,95	18,66	1,41	0,161
	Post-natal	69	59,41	18,53		

According to the table, in the t-Test results of the amputation time variable of the participants WHOQOL, there was no statistically significant difference between the total mean scores and sub-dimensions (p>0,05).

Table 7. According to the Amputation Time Variable of the Participants LCQ t-Test Results

Sub-scales	Amputation Time	N	$\overline{X}$	SS	t	p
Individual/psychological	Prenatal	33	2,71	0,75	1,79	0,076
	Post-natal	69	2,41	0,81		
Lack of knowledge	Prenatal	33	2,89	0,85	1,11	0,270
	Post-natal	69	2,69	0,84		
Facilities/services	Prenatal	33	2,67	1,07	-0,87	0,385
	Post-natal	69	2,84	0,83		
Lack of partners	Prenatal	33	2,62	0,86	-0,73	0,465
	Post-natal	69	2,74	0,76		
Time	Prenatal	33	2,62	0,85	-0,31	0,757
	Post-natal	69	2,67	0,73		
Lack of interest	Prenatal	33	2,52	0,83	0,15	0,882
	Post-natal	69	2,49	0,65		
LCQ	Prenatal	33	2,67	0,61	0,24	0,808
	Post-natal	69	2,64	0,56		

According to the table, in the t-test results of the amputation time variable of the participants LCQ, there was no statistically significant difference between the total mean scores and sub-dimensions (p>0,05).

Table 8. Monthly Income Variable of Participants HLBS ANOVA Test Results

Sub-scales	Monthly Income	n	$\overline{X}$	SS	F	p
Self-actualization	2000 TL and below	40	2,78	0,52	0,40	0,674
	2001-3000 TL	34	2,73	0,50		
	3000 TL Over	28	2,85	0,60		
Health responsibility	2000 TL and below	40	2,74	0,53	1,52	0,223
	2001-3000 TL	34	2,69	0,49		
	3000 TL Over	28	2,92	0,62		
Exercise	2000 TL and below	40	2,81	0,51	0,14	0,869
	2001-3000 TL	34	2,78	0,49		
	3000 TL Over	28	2,85	0,62		
Nutrition	2000 TL and below	40	2,79	0,56	0,96	0,385
	2001-3000 TL	34	2,72	0,57		
	3000 TL Over	28	2,92	0,63		
Interpersonal support	2000 TL and below	40	2,77	0,60	1,44	0,243
	2001-3000 TL	34	2,69	0,44		
	3000 TL Over	28	2,94	0,66		

	2000 TL and below	40	2,82	0,54		
Stress management	2001-3000 TL	34	2,69	0,55	1,23	0,296
	3000 TL Over	28	2,92	0,63		
	2000 TL and below	40	2,78	0,49		
HLBS	2001-3000 TL	34	2,72	0,46	0,98	0,378
	3000 TL Over	28	2,90	0,60		

A= 2000TL and below, B= 2001-3000TL, C= 3000TL Over

According to the table, the monthly income variable of the participants ANOVA in test results HLBS, there was no statistically significant difference between the total mean scores and sub-dimensions (p>0,05).

Table 9. Monthly Income Variable of Participants WHOQOL ANOVA Test Results

Sub-scales	Monthly Income	n	$\bar{X}$	SS	F	p
	2000 TL and below	40	12,13	3,69		
General health	2001-3000 TL	34	12,43	4,01	2,27	0,108
	3000 TL Over	28	14,20	4,81		
	2000 TL and below	40	11,64	3,70		
Physical health	2001-3000 TL	34	11,09	3,04	2,39	0,097
	3000 TL Over	28	13,14	4,56		
	2000 TL and below	40	11,88	3,70		
Psychological	2001-3000 TL	34	12,38	3,52	0,44	0,648
	3000 TL Over	28	12,77	4,69		
	2000 TL and below	40	11,21	5,31		
Social relationships	2001-3000 TL	34	12,55	4,17	2,05	0,134
	3000 TL Over	28	13,63	5,19		
	2000 TL and below	40	11,38	3,58		
Environment	2001-3000 TL	34	11,91	3,44	1,06	0,350
	3000 TL Over	28	12,74	4,46		
	2000 TL and below	40	58,23	17,50		
WHOQOL	2001-3000 TL	34	60,36	15,83	1,68	0,191
	3000 TL Over	28	66,47	22,63		

A=2000 TL and below, B=2001-3000 TL, C=3000 TL Over

According to the table, the monthly income variable of the participants ANOVA in test results WHOQOL, there was no statistically significant difference between the total mean scores and sub-dimensions (p>0,05).

Table 10. Monthly Income Variable of Participants LCQ ANOVA Test Results

Sub-scales	Monthly Income	n	$\bar{X}$	SS	F	p	Significant Difference
	2000 TL and below	40	2,44	0,75			
Individual/psychological	2001-3000 TL	34	2,60	0,72	0,37	0,694	
	3000 TL Over	28	2,48	0,97			
	2000 TL and below	40	2,60	0,96			
Lack of knowledge	2001-3000 TL	34	2,90	0,71	1,23	0,298	
	3000 TL Over	28	2,80	0,82			
	2000 TL and below	40	2,55	0,96			
Facilities/services	2001-3000 TL	34	2,77	0,84	3,34	0,039*	C>A
	3000 TL Over	28	3,12	0,85			
	2000 TL and below	40	2,49	0,78			
Lack of partners	2001-3000 TL	34	2,80	0,75	2,38	0,098	
	3000 TL Over	28	2,87	0,81			

	2000 TL and below	40	2,48	0,71		
Time	2001-3000 TL	34	2,78	0,74	1,63	0,201
	3000 TL Over	28	2,73	0,85		
	2000 TL and below	40	2,44	0,70		
Lack of interest	2001-3000 TL	34	2,55	0,61	0,23	0,795
	3000 TL Over	28	2,52	0,83		
	2000 TL and below	40	2,50	0,56		
LCQ	2001-3000 TL	34	2,74	0,47	2,20	0,117
	3000 TL Over	28	2,75	0,68		

* p<,05 A=2000 TL and below, B=2001-3000 TL, C=3000 TL Over

According to the table, participants LCQ when the total score averages and sub-dimensions are analysed in terms of monthly income variable “facilities/services”, there was a statistically significant difference in the sub-dimension (p<0,05). “facilities/services” significant difference in sub-dimension was “3000 TL over” income level and “2000 TL and below” was found to be in favour of those with an income level.

Table 11. Participants HLBS, WHOQOL and LCQ Correlation test results

	HLBS	**WHOQOL**	**LCQ**
HLBS	1	0,72**	0,53**
WHOQOL		1	0,53*
LCQ			1

** p<,01

According to the table “HLBS, WHOQOL and LCQ total score averages”, correlation analysis result was given to show the relationship among the analysis results of HLBS, WHOQOL and LCQ a positive and moderately significant relationship was found.

Discussion and Conclusion

This study analyzes the relationship between a healthy lifestyle behavior, quality of life, and leisure constraint levels of amputee individuals receiving sports education.

By the age variable, a statistically significant difference was found between "self-actualization, health responsibility, exercise, interpersonal support, and HLBS" due to the ANOVA test conducted to analyze the difference between HLBS total score averages ($p<0.05$). We observe that individuals receiving amputee education at a young age were more successful in self-realization, being responsible for health, exercise, and dialogue and support than individuals of a higher age than themselves. Besides, we can note that individuals receiving amputee education at an early age are more successful and at a higher level in assessing healthy lifestyle behavior. Besides, Kayapınar (2012), Balıkçı (2017), Söyleyici & Zorba (2017) and Şahin (2018) found that individuals engaged in physical activity have a high level of healthy lifestyle behaviors. Our research shows similarities with the literature, and we can observe that the healthy lifestyle behaviors of amputees interested in sports are high. No statistically significant difference was found due to the ANOVA test conducted to analyze the difference between the age variable and the mean scores of WHOQOL and its sub-dimensions ($p> 0.05$). In his study, Gülmez (2013) observed no significant difference between the age variable and quality of life. In their study, Ulukan & Esenkaya (2020) noted no significant difference between the age variable and life quality. No statistically significant difference was

found due to the ANOVA test conducted to analyze the difference between the age variable and the total mean scores of LCQ and its sub-dimensions (p>0,05). Age has a vital place in participating in recreational activities, and it varies by the people and the types of activities (Torkildsen, 2000). In their study, Amin, Suleman, Gamal & Al Wehedy (2011) observed a significant difference in the individual psychology and lack of knowledge dimensions of the age variable and leisure constraints; however, they did not conclude a statistically significant difference in other sub-dimensions. Besides, Alexandris & Carroll (1997) similarly observed a significant difference in the same sub-dimensions; however, they did not conclude a significant difference in other dimensions. While the literature review differs in some sub-dimensions, we can observe that leisure constraints are not directly related to age, yet constraints to leisure activities may decline by increasing age.

By the amputation time variable, a statistically significant difference was not observed due to the t-Test conducted to analyze the difference between the mean scores of HLBS, WHOQOL and LCQ and their sub-dimensions (p>0,05). Per such findings, the amputation status of amputated athletes who received sports education before or after does not create a difference between healthy lifestyle behaviors, quality of life, and the level of disability in assessing leisure activities.

No statistically significant difference was found by the monthly income variable due to the ANOVA test conducted to analyze the difference between the HLBS total score averages and its sub-dimensions. (p>0,05). In the same vein, Şahin (2018) observed that self-actualization and health responsibility behaviors are not related to monthly income. The study findings and literature review show similarities, and we can observe that amputees' healthy lifestyle behaviors are not related to monthly income and amputation time. No statistically significant difference was found due to the ANOVA test conducted to analyze the difference between the monthly income variable and the mean scores of WHOQOL and its sub-dimensions (p>0,05). In their study, Akyüz et al. (2017) did not find a significant relationship between personal income and quality of life. However, Esin (1997) reported that those with a high monthly income adopted healthy lifestyle behaviors. A study by Aldinç et al. (2004) observed that the higher the income level, the higher its quality. Research abroad has similarly defined the effect of socioeconomic status on health behaviors (Acheson et al., 2000; Li, 2004). While some researches are parallel with our study, some studies indicate that monthly income changes positively affect health lifestyle in the literature. We can observe that it does not affect the situation between the monthly income and quality of life of amputees, received sports education in our sample group. Per the ANOVA test conducted to analyze the difference between the monthly income variable and the LCQ total score mean and its sub-dimensions, a significant difference was found in the “facilities/services” sub-dimension (p<0,05), no statistically significant difference found in other sub-dimensions (p>0,05). In their study, Yaşartürk et al. (2016) did not observe a significant difference between income level and leisure activities participation. However, in the study by Karaküçük & Gürbüz (2007) they found that the higher the participants' welfare level, the less affected by the income variable in participation. In the research conducted by Dong & Chick (2012) they observed that income has a vital place in participating in recreational activities. The literature review shows similarities with our research yet conflicts in some aspects. Insufficiency of facilities is a vital requirement in evaluating leisure activities, and we can observe that it eliminates the lack of leisure constraints.

Per the correlation conducted to illustrate the relationship between the total mean scores of HLBS, WHOQOL, and LCQ of amputated individuals who received sports education, a

positive and moderately significant relationship was found between HLBS, WHOQOL, and LCQ. In his study, Balıkçı (2017) observed a significant relationship between the healthy lifestyle behaviors of individuals who do sports and their quality of life. Akyürek & Bumin (2013) found a positive and significant relationship between amputees' quality of life and leisure time. In their study, Arı (2017) and Sevil (2015) observed a significant relationship between quality of life and leisure time attitudes. Ayhan (2017) observed a significant relationship between the quality of life of individuals who do sports and their evaluations of leisure constraints. Per the literature review, we can observe that as the leisure constraints of amputee individuals who receive sports education increase, their quality of life and healthy lifestyle behaviors decline.

Recommendations

- In conclusion, the most vital leisure time obstacle per the research is the lack of facilities; we need to increase local governments' sports facilities and organize them suitable for citizens and physically disabled individuals.
- It is crucial to direct amputee individuals who receive sports education to mental resistance and sports recreation activities to develop healthy lifestyle behaviors.
- To increase the quality of life of amputee individuals who receive sports education, we need to develop unimpeded access facilities and provide sufficient materials.

**This article is extracted from my master thesis entitled "Investigation of the Relationship between Healthy Lifestyle Behavior, Quality of Life and Leisure Constraint Levels of Amputee Individuals Who Take Sports Education", (Master Thesis, Bartın University, Bartın/Turkey, 2019).*

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Is There a Difference in Isokinetic Knee Muscle between Player Positions in Volleyball?

Hasan AKA[1], Sinem HAZIR AYTAR[2], Cengiz AKARÇEŞME[3], Zait Burak AKTUĞ[4]

[1] Niğde Ömer Halisdemir University, Faculty of Sport Science, Niğde, Turkey
https://orcid.org/0000-0003-0603-9478
[2] Baskent University, Exercise and Sports Sciences Department, Faculty of Health Science, Ankara, Turkey
https://orcid.org/0000-0002-0389-6020
[3] Gazi University, Faculty of Sport Science, Ankara, Turkey
https://orcid.org/0000-0001-6231-0950
[4] Niğde Ömer Halisdemir University, Faculty of Sport Science, Niğde, Turkey
https://orcid.org/0000-0002-5102-4331
Email: hasanaka06@gmail.com, sinemhazir@gmail.com, cengizakarcesme@gazi.edu.tr, zaitburak@gmail.com

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Abstract

Background and Purpose: This study was conducted to compare the isokinetic knee muscle strength and hamstring / quadriceps (H / Q) ratios of female volleyball players according to their player positions. Methods: 59 elite female volleyball players playing in different positions (hitter n=26, setter n=14, middle blocker n=19) participated in the study voluntarily. The dominant and nondominant isokinetic leg strengths of the participants were determined by isokinetic dynamometer at the angular velocities of $60°s^{-1}$ and $180°s^{-1}$. Kruskal Wallis H test was used in determining the isokinetic strength difference between the players' positions. Results: According to the statistical analysis, there is no significant difference between the positions of the female players and isokinetic knee muscle strength and H/Q ratios ($p<0,05$). Conclusion: This situation can be explained by the fact that although players have different roles depending on their positions, they perform similar training programs.

Keywords: Volleyball, İsokinetic Strength, Player's position

Introduction

Volleyball is an Olympic team game that is characterized with short and explosive action patterns, agility and rapid take offs (Lidor & Ziv, 2010) and required explosive actions such as spiking and blocking (Marques, González-Badillo & Kluka, 2006; Marques, Van den Tillaar, Gabbett, Reis & Gonzalez-Badillo, 2009). Therefore, in volleyball, while a minimum level of aerobic capacity is needed to meet the requirements of the game, anaerobic capacity is the determinant of the performance in maximum efforts that determine the result of the game such as blocking and hitting the ball (Grgantov, Milic & Katic, 2013). Although upper extremity performance is important in the actions performed with maximum effort, lower extremity performance is more important to perform these actions and their efficiency (Almeida & Soares, 2003; Dal Pupo, Detanico & dos Santos, 2012; İbiş, İri & Aktuğ, 2015; Yenigün et al., 2008). Especially the strength of hamstring and quadriceps among the lower extremity muscles is an important factor in achieving optimal performance in sports.

Quadriceps and hamstring muscle groups both provide joint stability and play a significant role in performing athletic activity in all actions in which knee joint is used (Malliou, Ispirlidis, Beneka, Taxildaris & Godolis, 2003). One of the actions in volleyball performed by the contraction of quadriceps muscle actively is take off (Şimşek, Ertan, Göktepe & Yazıcıoğlu, 2007). Considering that elite volleyball players take off multiple times during spiking, blocks, serves and passes throughout a game, and they also practice take off exercises in training, an increase in quadriceps muscle strength and a decrease in H/Q muscle strength ratio is an expected condition (Akarçeşme, Aktuğ, Aka & İbiş, 2017).

It is stated that volleyball players' poor lower extremity knee flexor-extensor muscle strength and lower strength balance between these muscles may cause performance loss in basic actions in volleyball (spike, block and bump pass) (Akarçeşme, Aktuğ, Aka & İbiş, 2017; İbiş, İri & Aktuğ, 2015). In addition, it is known that strength instabilities in lower extremity affect volleyball players' take off skills negatively and cause injuries (Dal Pupo, Detanico & dos Santos, 2012; Schons et al., 2019). Thus, the isokinetic strength of volleyball players' knee muscles is at vital importance in both improving their performances and preventing possible injuries.

Considering that a volleyball team includes players having different physical, physiological and motoric characteristics and playing in different positions such as hitter, middle blocker and setter and that these players perform different actions in accordance with their positions (e.g. the severity and the repetition numbers of the actions) (Marques, Van den Tillaar, Gabbett, Reis & Gonzalez-Badillo, 2009; Gabbett et al., 2006; Sheppard, Gabbett & Stanganelli, 2009) being strength differences between player positions is an expected situation. Thus, the object of this study is to compare volleyball players' isokinetic knee muscle strength and H/Q ratios in terms of their game positions.

The fact that there is no study in the literature analyzing volleyball players' isokinetic knee muscle strength in terms of their positions makes this study unique.

Material and Method

59 elite female volleyball players (age=23,00±4,14) playing in different positions (hitter n=26, setter n=14, middle blocker n=19) participated in the study voluntarily. Setter diagonals and hitters were included in the same group since they had similar action patterns. It was taken care of that the participants did not have any muscle or ligament injuries in the knee and

thigh area in the last 6 months and did not do any physical activity until 24 hours before the measurements. The heights of the players were measured by a device of Seca brand (Seca, Germany), and their weights by a body analysis system device of Tanita brand (Tanita BC-418 Segmental, Tokyo, Japan).

Isokinetic Strength Test

The players' lower extremity (knee) isokinetic muscle strengths were measured by an isokinetic dynamometer of Isomed 2000 (Ferstl, Germany) by specialists. Before the test, volleyball players performed cycling ergometer exercise or a 5 minute mild warm-up on a treadmill and a 3-4 minute stretching exercise depending on their preference. After the warm-up program, the players were taken one by one on the isokinetic dynamometer on which the measurements would be performed. The bodies of the volleyball players and the thighs of the legs which they would exercise were fixed to the seat with the help of bands from the middle parts. In addition, during the test, the freedom of the arms was prevented by holding on both sides of the seat. The test of concentric hamstring – concentric quadriceps isokinetic knee strength in angular velocities of $60°s^{-1}$ and $180°s^{-1}$ and with 10 repetitions was performed.

Statistical Analysis

The data were analyzed with SPSS 24 software. Kruskal Wallis H test, which was one of the nonparametric tests, was used in comparing the isokinetic strength values in terms of the players' positions. The significance level was accepted as $p<0,05$ in the study.

Results

Table 1. Demographic characteristics of the players

	Hitter (N=26)	**Setter (N=14)**	**Middle Blocker (N=19)**
	Mean±Sd	**Mean±Sd**	**Mean±Sd**
Age (year)	23,00±4,14	22,92±3,79	22,89±2,72
Height (cm)	185,57±8,43	185,11±9,76	188,94±8,94
Weight (kg)	74,97±12,50	76,49±13,44	81,63±13,78

Table 2. Comparison of the isokinetic knee muscle peak torques in terms of players' positions

(Nm)	**Position**	**N**	**Mean±Sd**	**Sequence Mean**	**X^2**	**p**
D60°s^{-1}Q	Hitter	26	234,19±59,54	27,63	1,855	,39
	Setter	14	243,07±63,80	28,43		
	Middle Blocker	19	263,05±69,79	34,39		
ND60°s^{-1}Q	Hitter	26	219,34±56,60	26,48	3,217	,20
	Setter	14	228,28±55,25	28,86		
	Middle Blocker	19	248,05±65,00	35,66		
D60°s^{-1}H	Hitter	26	124,76±40,24	26,87	2,052	,35
	Setter	14	130,42±39,28	30,00		
	Middle Blocker	19	137,10±36,88	34,29		
ND60°s^{-1}H	Hitter	26	116,84±38,56	27,12	1,172	,42
	Setter	14	121,92±36,79	30,07		
	Middle Blocker	19	127,94±35,91	33,89		
D180°s^{-1}Q	Hitter	26	174,50±50,46	26,62	1,892	,38
	Setter	14	191,42±64,64	31,64		
	Middle Blocker	19	198,05±64,84	33,42		
ND180°s^{-1}Q	Hitter	26	163,00±46,84	26,92	2,564	,27
	Setter	14	171,92±56,36	28,82		
	Middle Blocker	19	188,68±60,97	35,08		

D180°s^{-1}H	Hitter	26	97,65±35,25	26,67	2,034	,36
	Setter	14	101,07±28,53	30,75		
	Middle Blocker	19	107,89±32,32	34,00		
ND180°s^{-1}H	Hitter	26	98,69±32,83	26,15	3,490	,17
	Setter	14	101,14±26,10	29,29		
	Middle Blocker	19	110,94±27,82	30,97		

p<0,05 D= Dominant ND= Nondominant H=Hamstring Q=Quadriceps

When Table 2 was analyzed, no significant difference was found in the isokinetic knee muscle peak torques in terms of player's positions (p<0,05).

Table 3. Comparison of the isokinetic knee muscle relative strengths in terms of players' positions

(Nm/kg)	**Position**	**N**	**Mean±Sd**	**Sequence Mean**	**X^2**	**p**
D60°s^{-1}Q	Hitter	26	3,10±,43	27,69	,839	,65
	Setter	14	3,18±,57	31,79		
	Middle Blocker	19	3,19±,43	31,84		
ND60°s^{-1}Q	Hitter	26	2,91±,46	27,35	1,117	,57
	Setter	14	2,99±,49	32,39		
	Middle Blocker	19	3,03±,48	31,87		
D60°s^{-1}H	Hitter	26	1,63±,28	27,15	1,279	,52
	Setter	14	1,68±,29	32,43		
	Middle Blocker	19	1,66±,23	32,11		
ND60°s^{-1}H	Hitter	26	1,53±,27	27,69	,842	,65
	Setter	14	1,57±,27	32,00		
	Middle Blocker	19	1,54±,25	31,68		
D180°s^{-1}Q	Hitter	26	2,30±,35	27,62	1,051	,59
	Setter	14	2,48±,55	33,25		
	Middle Blocker	19	2,38±,40	30,87		
ND180°s^{-1}Q	Hitter	26	2,15±,36	27,46	1,066	,58
	Setter	14	2,23±,50	31,21		
	Middle Blocker	19	2,27±,43	32,58		
D180°s^{-1}H	Hitter	26	1,27±,28	27,69	,854	,65
	Setter	14	1,30±,19	31,39		
	Middle Blocker	19	1,46±,62	32,13		
ND180°s^{-1}H	Hitter	26	1,29±,24	26,65	2,220	,33
	Setter	14	1,30±,17	30,29		
	Middle Blocker	19	1,34±,20	34,37		

p<0,05 D= Dominant ND= Nondominant H=Hamstring Q=Quadriceps

When Table 3 was analyzed, no significant difference was found in the isokinetic knee muscle peak torques in terms of players' positions (p<0,05).

Table 4. Comparison of isokinetic H/Q ratios in terms of the players' positions

	Group	N	Mean±Sd	Sequence Mean	X^2	p
D60°s^{-1}H/Q	Hitter	26	,53±,08	29,67	,095	,95
	Setter	14	,53±,10	29,29		
	Middle Blocker	19	,52±,05	30,97		
ND60°s-1H/Q	Hitter	26	,53±,10	29,58	,065	,96
	Setter	14	,53±,09	31,00		
	Middle Blocker	19	,51±,08	29,84		
D180°s-1H/Q	Hitter	26	,55±,06	31,33	,537	,76
	Setter	14	,53±,09	27,18		
	Middle Blocker	19	,55±,09	30,26		
ND180°s^{-1}H/Q	Hitter	26	,60±,09	30,92	,317	,85
	Setter	14	,61±,15	27,79		
	Middle Blocker	19	,60±,13	30,37		

p<0,05 H/Q= Hamstring quadriceps ratio D= Dominant ND= Nondominant

When Table 4 was analyzed, no significant difference was found in isokinetic H/Q ratios in terms of the players' positions (p<0,05).

Discussion

This study was conducted to compare the isokinetic knee muscle strengths and H/Q ratios in terms of the positions of female volleyball players. According to the findings, it was determined that there was no significance difference between the positions of the players in the game (hitter, setter and middle blocker) and isokinetic knee muscle strength. While there is no study in the literature analyzing isokinetic strength in terms of the players' game positions, there are few studies evaluating strength in term of game positions. In one of these studies, Marques, Van den Tillaar, Gabbett, Reis & Gonzalez-Badillo (2009) find that there are serious anthropometric and strength differences between the game positions of male volleyball players, and that squat performances of the setters are lower than the players' playing in other positions. In a similar study, Küçükbaycan, Yenigün, Yenigün & Dinçer (2003) divided female volleyball players into two as corner and middle players, and compare their leg strengths before and after the preparation period. As a result of the study, while no difference is found between the corner and middle players' leg strengths before the preparation, it is determined that the leg strength in middle players is significantly higher after the preparation period. In another study, Schaal, Ransdell, Simonson & Gao (2013) state that hitters have a higher strength of lower extremity than liberos, and also setters, hitters and liberos produce similar lower extremity strength.

In volleyball, hitters and middle players have important roles in both offense (spike) and defense (block) organizations. The high take off height of hitters and middle blockers is among the determining factors in the success of these organizations. On the other hand, athletes playing in the setter position require less take off height in offensive and defensive duties. When teams attack in volleyball, the second passes are mostly met with the setter (Game area number 3). Thus, the player in the setter position has to run towards the game area number 3 several times throughout the game and usually make a take off action in the passes. Therefore, the reason of the similarities in the isokinetic knee muscle strengths of volleyball players in terms of their positions can arise that although the take off action, which increases lower extremity muscles strength (especially quadriceps), is performed by hitters and middle blockers very intensively, setters perform take off action less intensively but many more times. Sattler, Sekulic, Hadzic, Uljevic & Dervisevic, (2012) state that despite the hitters in

volleyball have the highest capacity of taking off among all players, their take off number is fewer than the players in other positions due to the tactical positions in the game.

Another variable in the study is that the comparison of H/Q ratios of the players in terms of their positions. Isokinetic H/Q ratios provide information about strength balances instead of muscle strength. It is stated that the H/Q ratio obtained as a result of the comparison of knee flexors with the knee extensors (Alexander, 1990; Kannus & Jarvinen, 1990) must be at the ratio of 2/3 (Steindler, 1955). As a result of the performed analysis, it was determined that there was no significant difference between the isokinetic H/Q ratios of the players in terms of their positions. This result may arise from that volleyball players perform the same trainings since volleyball is a team sport. The fact that the studies analyzing H/Q ratios in the literature mostly investigate injury risks and there is no study for players' positions limited the comparison of our results.

In the study, it was determined that the H/Q ratio of the female players was under the required level. Similarly, in a study conducted on elite volleyball players, H/Q ratios of female players were stated to be low[11]. In another study conducted on volleyball players, Yenigün et al. (2008) determined that H/Q ratios of the players were below the desired level, similarly with our study. Studies in the literature support the result of our study, and this situation is thought to be the result of the strengthening of the quadriceps muscle more than the hamstring muscle due to the excessive take off action in volleyball.

Consequently, it was determined that knee muscles isokinetic strength and H/Q ratios of the elite women volleyball players did not differ in terms of their positions in the game (hitter, setter and middle blocker). It is thought that this result is due to the fact that although the take off height of the hitters and middle blockers is high, the number of setters' position changes, runs and take offs in different directions in the game are in higher numbers, and that all players encounter similar loads in training.

Conflict of Interest

The authors declare that they have no conflict of interest.

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Plyometric versus Resistance Training Against Linear Sprinting Speed and RSA Performance of Soccer Players

Belayneh CHEKLE

Email: admbelaya@gmail.com

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Abstract

The study was ultimately aimed at comparing the effect of resistance training, plyometric and resistance training plus plyometric exercise on linear speed and RSA performance. A completely randomized block design of experimental research was employed so as to compare the effect of four weeks resistance training, plyometric training and combined training (resistance + plyometric) on linear speed over 40m dash and 6*35m RSA total time performance development. Then the performance gain level for each treatment group was analyzed by comparing the pretest performance score with the posttest score using paired sample t-test and Cohen`s d. the Cohen`s d value ranges between 0.724-7.386. The difference in performance gain level among the three treatment (training) groups was analyzed using ANOA with a subsequent post hoc test. Using paired sample t-test, all the three training groups achieved a significant level of performance gain in linear speed and RSA. The performance gain level in linear speed among the three groups was significant $F(2, 33) = 11.758$, $p>.001$, $\eta p2 = 0.416$. The plyometric and combined groups achieved a significantly greater speed performance than the resistance group. But there was no significant difference among the groups in RSA performance gain. Thus, it was concluded that plyometric exercises are the most effective kind of training to impact speed qualities for soccer players. Using plyometric exercises alone or combining with resistance training is by far better than resistance training alone to improve linear speed or RSA performance with youth soccer players.

Keywords: Resistance, Plyometric, Training, Speed, Repeated sprinting ability

Introduction

Success in soccer, which can be equated with higher winning rate and being able to be champions with trophy, is the ultimate in today's soccer (Bradley et al., 2013). Accounting to their work (method) of training, coaches with the higher winning rate or number of trophies are highly sought by clubs or national teams with huge money deals. The highly commercialized sport, soccer, attracts big business enterprises (i.e., Medias and companies) because of the expected money gain which is guaranteed for winning teams and clubs. All these, however, rely on the players' level of performance. Thus, the resulting business gain or loss is highly dependent on the players' level of performance (Bangsbo, Mohr & Krustrup, 2006). Still performance in contemporary soccer is the result of varied factors or there are numerous performance parameters.

The psychological make-up (i.e., level of motivation, aggression, confidence, perseverance, winning mentality, etc.), physical fitness (aerobic and anaerobic fitness) and technical-tactical ability are ingredients which enable a player to be capable of playing soccer with its demand and modern essence (Alghannam, 2013; Bradley et al., 2013; Durate, Araujo, Vanda & Davids, 2012). It is well-established that an optimal level with the required balance among the factors (performance parameters) is too important. For example, though aerobic fitness is necessary to a certain level, anaerobic fitness is the most important and highly sought physical fitness (Barnes, Archer, Hogg, Bush & Bradley, 2014). Basically the most frequent anaerobic actions including sprinting, acceleration, jumping, charging and change of direction accounts only smaller portion of the players activity profile (Barnes et al., 2014; Girard, Mendez-Villanueva & Bishop, 2011). However, the most decisive phases or moments of goal scoring or defending highly rely on anaerobic fitness qualities of the players (Faude, Koch & Meyer, 2012). To this end, the concern of developing and maintaining anaerobic fitness is the ultimate of coaches and strength and conditioning specialists.

Soccer specific anaerobic fitness including linear speed and repeated sprinting ability (RSA) are fitness segments (Gabbett, 2016; Haugen, Tonnessen, Hisdal & Seiler, 2014: Nedelec, Halson, Abaidia, Ahmaidi & Dupont, 2015; Schimpchen, Skorski, Nopp & Meyer, 2015), which can be determined by different factors like genetic make-up (endowed muscle fiber type), maturity (Aughey, Elias, Esmaeili, Lazarus & Stewart, 2016), and training (Bompa & Haff, 2009). In some way linear speed and RSA are associated or accounted to overall weekly training load. On the other way, the development of soccer related speed quality is connected with soccer specific exercises in the form of small-sided games (SSG) (Eniseler, Sahan & Dinler, 2017). Other findings reported the most effective method to develop linear speed or RSA is simply by having repeated sprinting exercises (Cipryan, Tschakert & Hofmann, 2017: Taylor, Macpherson, Spears & Weston, 2015).

Strength and conditioning experts recommend there to be resistance training to cultivate speed and performance related fitness qualities for soccer (Ullrich, Pelzer & Pfeiffer, 2018). Some other recent findings recommend plyometric exercise for a better adaptive response in terms of speed development (Hammami, Negra & Audi, 2016). It is also a common recommendation and approach to have plyometric exercises in the microcycles of the competition period so as to maintain speed and speed related soccer fitness (Ramirez-Campillo et al., 2015). However, regardless of all these, the effect that resistance training had on speed and RSA and plyometric training had on speed or RSA is not compared and studied. Moreover, the effect that a combined training (resistance exercise plus plyometric exercise in each session) had on linear speed and RSA is not clearly known. Thus, a study that compares

resistance training, plyometric training and combined training is worthy of investigation. Therefore, this study was done to show the effect that resistance training and plyometric exercise had on speed or RSA when they are used alone (isolated). In addition the study aimed at revealing how a combined training regimen of resistance exercise plus plyometric affects speed and RSA. Thus, different training intervention as resistance training, plyometric training and combined training has been compared against speed and RSA performance improvement. As such it was hypothesized that all these training methods can significantly improve linear speed and RSA without significant differences among.

Method

True experimental design has been used for this research. A randomized block design with three treatment groups named as resistance group (RG), plyometric group (PG) and combined group (CG) with a different treatment or training regimen as outlined the procedure section were used. First players were grouped based on their main playing position then randomly assigned into the treatment groups. The players in the common playing positions such as center backs, fullbacks, holding midfielders, outside midfielders, attacking midfielders and strikers were randomly assigned to the three intervention groups. Thus, the randomization was after grouping of the players as different position players are expected to have a certain fitness qualities which they are believed to be better than other position players. All the players were informed about the purpose and they were volunteer to participate. Comparison of the effect and effect magnitude of each training regimen on performance gains of some selected physical fitness parameters as linear speed over 40m and RSA total time has been done.

Participants

Thirty six U20 outfield soccer players` 17±3.212 years of age and 55±3.580kg of body weight were participants of the study. The researcher has made these trainees the study participant purposely because of convenience, familiarity and they are the one at the age level to have the predisposition for sport specific physical fitness development. All of the participants were informed to have only their team based normal soccer training and the study intervention exercise in their respective group which were both guided by the coach. The soccer specific training was the same for all the groups as the players were from the same team.

Experimental Procedure

Since the ultimate of the study is to compare different exercise/training regimens to improve linear speed and RSA, three different groups for different training intervention were used. In each treatment group 12 players from each position assigned randomly. The first group was having resistance training for about four weeks. For this, the group was designated as resistance group (RG). The second group, the plyometric group (PG), was having plyometric trainings for about four weeks in addition to the common soccer specific training. The third group, named the combined group (CG), received both resistance and plyometric training combined in each of the intervention sessions. Thus, each group was having their intervention specific training sessions 3 times a week and the same soccer specific training together 3 times a week.

A week before the intervention, each group was assessed in terms of their linear speed and RSA performance the same way they were tested in the post-test. Based on their pretest result, it was confirmed that there was no any significant difference among the groups in terms of

their linear speed and RSA total time performance score. A summary of the intervention training and the training program or protocol employed is outlined here under (table 1 & 2).

Table 1 The intervention training regimen and exercise prescriptions

Week	Resistance Group (RG)			Plyometric Group (PG)			Combined Group (CG)		
Week 1	Exercise	Repetition	Set	Exercise	Repetition	Set	Exercise	Repetition	Set
	Leg extension	7	3	Jump to box	7	3	Jump t	7	3
	Squat rock	4	3	Tuck jumps	4	3	leg extension	4	3
	Lunge	6	3	Bounding with rings	6	3	Tuck jumps	6	3
	Seated calf raise	6	3	Lateral hurdle jump	6	3	Squat rock	6	3
	Calf raise	8	3	Single leg lateral hops	8	3	Single leg lateral hops	8	3
Week 2	Leg extension	6	3	Jump to box	6	3	Jump to box	6	3
	Squat rock	6	3	Tuck jumps	6	3	Leg extension	6	3
	Lunge	8	4	Bounding with rings	8	4	Bounding with rings	8	4
	Seated calf raise	8	4	Lateral hurdle jump	8	4	Lunge	8	4
	Calf raise	8	4	Single leg lateral hops	8	4	Depth jumps	8	4
Week 3	Leg extension	10	3	Tuck jumps	10	3	Jump to box	10	3
	Squat rock	10	4	Bounding with rings	10	4	Squat rock	10	4
	Lunge	10-12	4	Lateral hurdle jump	10-12	4	Bounding with rings	10-12	4
	Seated calf raise	10-12	4	Single leg lateral hops	10-12	4	Lunge	10-12	4
	Calf raise	10-12	4	Depth jumps	10-12	4	Depth jumps	10-12	4
Week 4	Leg extension	10-12	4	Tuck jumps	10-12	4	Jump to box	10-12	4
	Squat rock	10-12	4	Bounding with rings	10-12	4	Squat rock	10-12	4
	Lunge	10-12	4	Lateral hurdle jump	10-12	4	Single leg lateral hops	10-12	4
	Seated calf raise	10-12	4	Single leg lateral hops	10-12	4	Lunge	10-12	4

	Calf raise	10-12	4	Depth jump	10-12	4	Depth jumps	10-12	4

Table 2 The four weeks training program

Day	Week 1	Week 2	Week 3	Week 4
Monday	Normal soccer training	Normal soccer training	Normal soccer training	Normal soccer training
Tuesday	❖ Resistance training for the RG ❖ Plyometric training for the PG ❖ Combined training for the CG	❖ Resistance training for the RG ❖ Plyometric training for the PG ❖ Combined training for the CG	❖ Resistance training for the RG ❖ Plyometric training for the PG ❖ Combined training for the CG	❖ Resistance training for the RG ❖ Plyometric training for the PG ❖ Combined training for the CG
Wednesday	Normal soccer training	Normal soccer training	Normal soccer training	Normal soccer training
Thursday	❖ Resistance training for the RG ❖ Plyometric training for the PG ❖ Combined training for the CG	❖ Resistance training for the RG ❖ Plyometric training for the PG ❖ Combined training for the CG	❖ Resistance training for the RG ❖ Plyometric training for the PG ❖ Combined training for the CG	❖ Resistance training for the RG ❖ Plyometric training for the PG ❖ Combined training for the CG
Friday	Normal soccer training	Normal soccer training	Normal soccer training	Normal soccer training
Saturday	❖ Resistance training for the RG ❖ Plyometric training for the PG ❖ Combined training for the CG	❖ Resistance training for the RG ❖ Plyometric training for the PG ❖ Combined training for the CG	❖ Resistance training for the RG ❖ Plyometric training for the PG ❖ Combined training for the CG	❖ Resistance training for the RG ❖ Plyometric training for the PG ❖ Combined training for the CG
Sunday	Rest	Rest	Rest	Rest

Testing Methods

40m dash linear speed was used to test sprinting speed. To test40m dash linear sprinting speed, each participant was given three trials and the best time score was taken as a score for analysis. For RSA total time measure, the participants tested using the 6*35 test protocol.

This test involves sprinting over 35m for about 6 times with 30 seconds recovery time between each sprint. The time in second for each of the 6 sprint was summed up to get the RSA total time score.

Method of Analysis

Using the statistical package for social science (SPSS) version 23, paired sample t-test and one way ANOVA with a post hoc test was used. After identifying the significance level in difference, Cohen`s d and partial eta-squared (ηp2) was used to estimate the effect size of the intervention. For the overall analysis, the critical value was set to be .05.

Result

The analysis was made using mean, standard deviation, paired sample t-test and one way ANOVA with post hoc test. Effect size was also considered using Cohen`s and partial eta-squared (ηp2).

Table 3 Descriptive statistics of pre and post test score of speed and RSA (in seconds)

	RSA total Pre			RSA Total Post			40m speed Pre			40m speed Post		
	RG	PG	CG	RG	PG	CG	RG	PG	CG	RG	PG	CG
Mean	41.015	41.372	40.798	39.148	38.154	37.095	6.155	6.179	6.133	5.275	5.093	5.122
SD	2.548	2.609	2.147	2.730	3.102	1.509	0.247	0.228	0.123	0.137	0.073	0.072
Minimum	38.190	36.700	36.950	36.050	34.420	34.270	5.800	5.920	5.920	5.100	5.000	5.020
Maximum	44.620	44.460	43.630	44.080	44.710	40.240	6.680	6.680	6.330	5.590	5.240	5.230

The descriptive statistics shows the performance score of the RSA (6*35m) total time that each intervention group scored. The resistance group (RG) had a mean value of 41.015 seconds to the test, while the plyometric group (PG) had a mean score of 41.372 in the pretest (table 3). The mean pretest score of the combined group (CG) is 40.798 seconds. Despite the different figures, there was no a significant difference among the three groups in their pretest performance score (appendix A). The post test score however was 39.148, 38.154 and 37.095 seconds for the RG, PG and CG respectively.

In terms of linear sprinting speed over 40m, 6.155, 6.179 and 6.133 seconds were taken by the RG, PG and CG each to cover the distance during the pretest (table 3). With this score, there was no significant difference among the groups (appendix A), which can be accounted to the methodological approach of employing block randomization. However, the post test score for the RG, PG and CG was 5.275, 5.093 and 5.122 seconds respectively (table 3).

Table 4 Paired sample t-test comparing the pretest score with the post test for each group

Treatment Group			t	df	p	Mean Difference	Cohen`s d
RG	RSA pre	RSA post	2.509	11	0.029	1.867	0.724
	40m speed	40m speed	10.309	11	< .001	0.880	2.976
PG	RSA pre	RSA post	6.298	11	< .001	3.217	1.818

	40m speed	40m speed	16.204	11	< .001	1.087	4.678
CG	RSA pre	RSA post	9.710	11	< .001	0.381	2.803
	40m speed	40m speed	25.586	11	< .001	0.040	7.386

The RG achieved a statistically significant performance increment in 40m dash linear speed, t (11) = 10.309, p<.001, ES = 2.976 and in 6*35m RSA performance t (11) = 2.509, p=.029, ES = 0.724 after the intervention training. The PG also achieved a significant linear speed performance gain after the training, t (11) = 16.204, p<.001, ES = 4.678. The same way, the PG has a significant RSA performance gain as the pre-post difference is significant, t (11) = 6.298, p<.001, ES = 1.818. The CG achieved a significant performance increment in both linear speed, t (11) = 25.586, p<.001, ES = 7.386 and RSA, t (11) = 9.710, p<.001, ES = 2.803 (table 4). In terms of mean difference, the PG achieved the greatest linear speed gain (mean difference is 1.88). In this case the RG and CG has a mean difference of 0.880 and 1.87 respectively. With that of RSA the PG still had the greatest gain with a mean difference of 3.217 seconds, when the RG and CG had 1.867 and 0.381 seconds each (table 4).

Table 5 ANOVA result of the three training methods (groups) based on their posttest performance score

Performance Measures		Sum of Squares	df	Mean Square	F	Sig.	ηp2
RSA Total Post	Between Groups	25.306	2	12.653	1.961	.157	
	Within Groups	212.889	33	6.451			
	Total	238.195	35				
Linear Speed 40m	Between Groups	.231	2	.115	11.758	.000	0.416
Post	Within Groups	.324	33	.010			
	Total	.554	35				

RSA total time measure or performance gain difference is not statistically significant among the three groups of the RG, PG and CG, though each grouped has showed significant performance improvement after their respective training. But, linear speed performance gain level was significantly different among the three groups F (2, 33) = 11.758, p>.001, ηp2 = 0.416 (table 5).

After testing the difference in performance gain among the three training methods, post hoc test (Benferroni) was used to have multiple comparisons. This way, each group was compared one another pair wise. The mean time taken by the PG to cover the 40m dash is visibly smaller (figure 1)

Figure 1 Diagrammatic view of the mean time taken to cover 40m dash

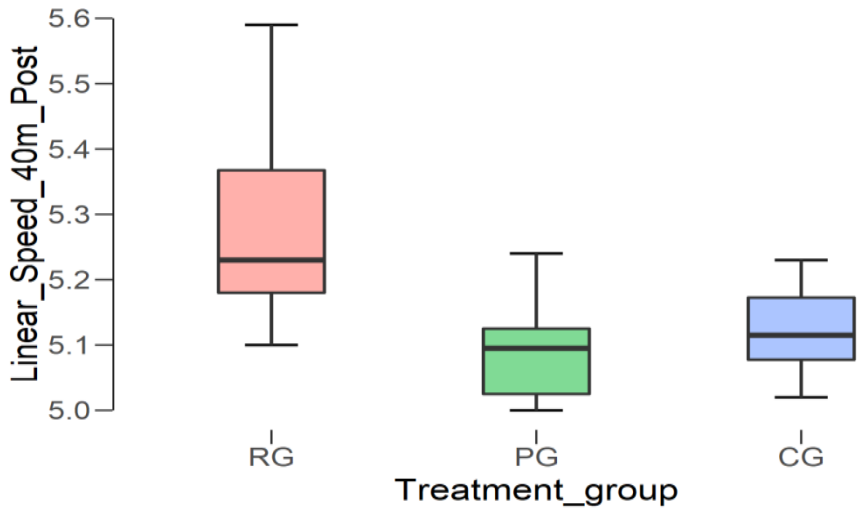

Table 6 Post hoc result (multiple comparison) of 40 linear speed post score

(I) Treatment group	(J) Treatment group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
RG	PG	.18250*	.04043	.000	.0805	.2845
	CG	.15333*	.04043	.002	.0514	.2553
PG	RG	-.18250*	.04043	.000	-.2845	-.0805
	CG	-.02917	.04043	1.000	-.1311	.0728
CG	RG	-.15333*	.04043	.002	-.2553	-.0514
	PG	.02917	.04043	1.000	-.0728	.1311

With the post hoc result, it is found that the RG linear speed performance gain is significantly lower than both the PG ($p<.001$) and the CG ($p=.002$). However, there is no a significant difference in 40m linear sprinting speed performance gain between the PG and CG. Thus, the plyometric training group and the combined training group are superior in linear speed gains than the resistance training group.

Discussion

The ultimate of the study was identifying the kind of training regimen that can help to get the most out of training based on 40m linear sprinting speed and 6*35m RSA performance test score. For this, three intervention groups designated as RG, PG and CG were used for different intervention and to make subsequent comparison. Therefore, the effect of resistance exercises, plyometric exercises and the combined training (resistance plus plyometric exercise) on linear speed and RSA were compared.

The study revealed that resistance training, plyometric training or the combination of resistance and plyometric training can improve linear speed and RSA performance. Here with this study, it is found that plyometric exercises or the combination of resistance and plyometric exercises in each session can yield a greater linear speed performance increment than resistance exercise alone. This can be accounted to the kind of muscle contraction caused during resistance and plyometric exercise. The speed of movement was not considered in this

study. But speed of movement when doing resistance training is one factor to impact the transfer of strength gained from resistance training to speed performance (Blazevich & Jenkins, 2002). With that of plyometric exercise the movement is inherently fast and explosive using own body weight. This is the kind of muscle contraction too necessary during sprinting. But with that of resistance training, the focus is on generating the maximum possible contraction repeatedly without a due consideration of speed of movement or rate of force generation. With resistance training, the muscle mostly accustomed to force generation regardless of rate of force generation or explosiveness. On the contrary, plyometric exercises are mainly explosive which is meant there is quick force generation. Thus, explosiveness with force generation can cause the muscle to adapt to the ability of quick force generation, which can help to be speedy enough (Behm et al., 2017). Thus, the significant difference in linear speed with the three training regimens is convincing and acceptable.

As a training intervention, the significant performance increment in linear speed and RSA is inherent with all the intervention groups of RG, PG and CG. Still the existence of non-significant RSA total time performance score among the groups can be accounted to different factors. RSA can rely to other physiological factors as aerobic capacity (da Silva, Guglielmo & Bishop, 2010) to an extent. The physiologic burden of each bout needs to be counted during the recovery between sprints as it relies on the aerobic capacity of clearing lactate to enable the muscle to produce the required force during the subsequent sprints. However, RSA more relates with anaerobic fitness of strength and explosive power (Kenney, Wilmore & Costill, 2015; Lopez-Segovia et al., 2015). Here it needs to be recalled that all the intervention trainings are mainly anaerobic exercises, which can impact the anaerobic adaptation. Findings in this regard showed that RSA performance measures as RSA mean time and most commonly RSA total time depends on aerobic fitness (da Silva et al., 2010) and anaerobic fitness (Dardour et al., 2014; Lopez-Segovia, Pareja-Blanco, Jimenez-Reyes & Gonzalez-Badillo, 2015). Thus, for the performance gain in RSA total time to be low may be the negligence of aerobic fitness development and appropriate training regimens to impact in addition. Future researches on the area can benefit by considering the consideration and acknowledgement of the effect of aerobic capacity on RSA performance or the effect of RSA performance enhancement targeting interventions.

This superior improvement in the RG can be attributed to adaptations like increases in the thickness, fascicle length and pennation angle of knee flexor and extensor muscles (Ullrich, Pelzer & Pfeiffer, 2018). A number of study findings goes in parallel with this study as plyometric or plyometric plus resistance training can positively affect performance of lower limbs (Ozbar, Ates & Agopyan, 2014; Ramirez- Campillo, Garcia-Pinillos et al., 2018; Ramirez-Campillo et al., 2016; Ramirez-Campillo et al., 2016; Ullrich et al., 2018).

Conclusion

Resistance training, plyometric or combination of resistance and plyometric exercises can significantly improve linear speed and RSA performance level. A 4 week additional trainings of resistance, plyometric or combination of the two in addition to a normal soccer specific training can significantly improve linear speed and RSA total time performance.

Linear speed over 40m dash can be improved more by plyometric or combination of plyometric exercise with resistance training than resistance training alone.

RSA performance improvement can be equally developed by resistance training, plyometric exercise or by the combination of resistance and plyometric exercise equally if aerobic fitness improvement is not considered.

Recommendation

When the focus is improvement of pure linear speed, the inclusion and/or addition of plyometric exercises is too important. The inclusion of plyometric training in the preparation period and as well during the competitive period is therefore, ought to be considered. Players who lack linear speed can highly benefit from plyometric training regimen or the addition of plyometric exercises with soccer specific trainings. Youth or promising youngsters who are at a stage with the predisposition to develop linear speed are advised to consider the inclusion of plyometric exercises.

Interventions or trainings which target RSA total time performance need to have plyometric or (combination of plyometric with resistance) trainings with a due consideration of incorporating exercises which can improve aerobic capacity or fitness as well.

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The Analysis of the Some Matches of Turkey National Futsal Team in terms of Some Performance Criteria*

Serhat ÇİÇEK[1], Kemal GÖRAL[2]
[1] Mugla Sıtkı Koçman University, Institute of Health Sciences, Mugla, TURKEY
https://orcid.org/0000-0003-4269-6002
[2] Mugla Sıtkı Koçman University, Faculty of Sport Sciences, Mugla, TURKEY
https://orcid.org/0000-0001-8030-2276
Email: serhatcicekk@hotmail.com, kgoral@mu.edu.tr

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Abstract

In this study, the Turkey national futsal competitions played by the team was carried out to analyze the technical and tactical terms of some performance criteria. In this study, the competitions played in the specified time interval are presented based on winning and losing teams. The competitions are analyzed and analyzed in terms of technical and tactical parameters. The population of the study, all of the competitions of the National Futsal team Turkey, between the years 2015-2018 constitute the sample of the matches played by the National Futsal Team Turkey. In the collection of the research data, the matches presented to open access were analyzed in the computer environment by using the "Paper-Pen Method" and "e-analyze soccer" program.

According to the findings obtained in the study, of the 2203 positive passes, 63.1% were at home and 36.9% at home. Of the 271 balls won by the Futsal A national team in all matches, 79.3% were in their half, and 20.7% were in the opponent's field. Of the 427 balls lost in all matches, 47.8% in their own half area, 52.2% in the competing field.

Consequently, increasing the parameters such as the number of passes made in the opponent half field, the number of ball wins in the front zone, minimizing the difference in the number of balls won and lost, are considered to be the parameters that will directly affect the result in international competitions, it can be said that the training program should be designed for development these variables.

Keywords: Futsal, Match Analysis, Performance.

Introduction

Futsal is a very high-intensity indoor sport with more than 12 million players worldwide and has grown significantly in recent years, requiring short rest periods and movements requiring multi-plane explosions (Vähäkoitti, 2017). Futsal is one of the modern sports of today, where there is a chance to find a goal at every moment of the competition and a high-speed game characteristic with fast passes. Since the national and international teams have very similar performance levels, the analyzes made to understand the differences between the teams are increasingly important to gain an advantage in the competition (Medina et al., 2019).

The analysis is a method that can be counted, measured, and obtained mathematical results called systematic examination. Competition analysis also provides an objective review and recording of behavioral events during the match (Nara et al., 1998; Carling et al., 2005). Competition analysis is used to access information, to determine training types, and to select talent to reach decisions based on strategies to be applied in coaching. The most contributing athletes during the competition can be identified through computer programs that have become popular in recent years. Problem-solving through training can be achieved through competition analysis (Gürkan et al., 2017; Müniroğlu et al, 2008). Scientific analysis of team sports focused on determining the actual performances of the teams and reporting the stages that make up the frequency and actions. The main goal of these methods is to document who takes action, what kind of action is produced, what part of the game is observed, and when the action is carried out in an approach that describes sports behavior (McGarry, 2009). In recent years, competition analysis has been an important method used by sports scientists to identify different performance determinants in the team and individual sports. Many analysts have used analysis methods for various goals, such as technical skills and tactical behavior assessment, feedback, and analysis of movements (Shafizadeh et al., 2013; Hughes et al., 2008).

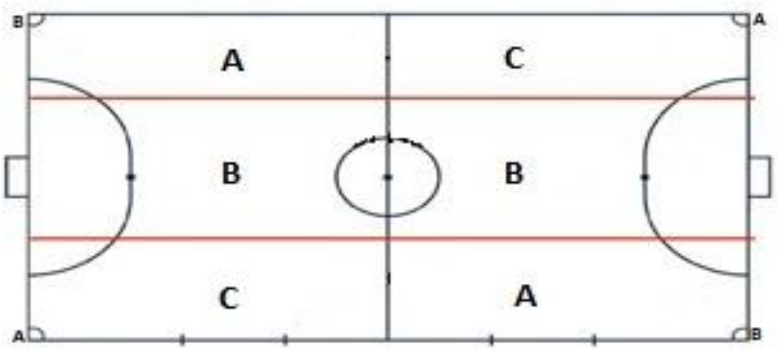
Many analysts working in the field of analysis and working at different levels have benefited from the analysis for many purposes, such as technical and tactical evaluation, providing feedback, and developing different criteria. Under the purpose, a well-designed analysis system can easily give the desired information to the team officials. This can benefit significantly from the performance to be realized. Therefore, the examination of performance criteria suitable for the branch can be considered as one of the most critical factors to reach the desired level (Göral et al., 2014). Analysis studies on futsal in the world cover areas such as some physical parameter measurements (Benvenuti et al., 2010), interpersonal coordination and finding goal opportunities (Vilar et al., 2014), futsal training with image analysis (Polidoro et al., 2012), and attempted offensive attempts (Sarmento et al., 2016). The aim of this study to examine the parameters, which might have an impact on match results, including periods of the scored and conceded goals, passes, shots, frequency of ball won and lost, free kicks in Turkey national futsal a team matches.

Method

In this research, observational research method was used for data collection. Studies on competition analysis are examined, and theoretical information is given. The matches of Turkey's national futsal A team between 2015 and 2018 were analyzed in terms of technical and tactical criteria. This research was approved by Mugla Sitki Kocman University Human Research Ethics Committee with decision number 180 and dated 22.10.2019.

Data was collected from Turkey National Futsal A Team's eight matches that were open-access and proper to analyze. The matches were analyzed by using the "Paper-Pen Method" and "e-analyze soccer program."

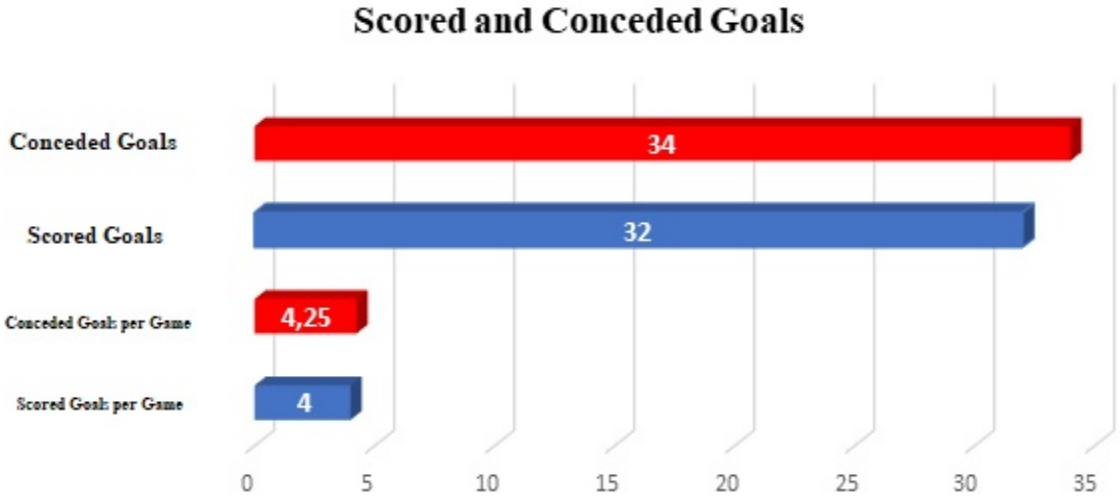
The following criteria were used to analyze the matches. In the research, the number of scored and conceded goals, corner kicks, passes completed in the opponent and own field, shots on target and missed shots in fields, fouls in fields, free kicks, cards to be seen, ball won and lost according to the fields consisted the criteria.



Data Analysis: All data obtained in the study were recorded in SPSS (version 18.0) program and interpreted by calculating frequency and percentage values.

Results

The findings obtained in the research are presented in this section in the form of tables and graphics.



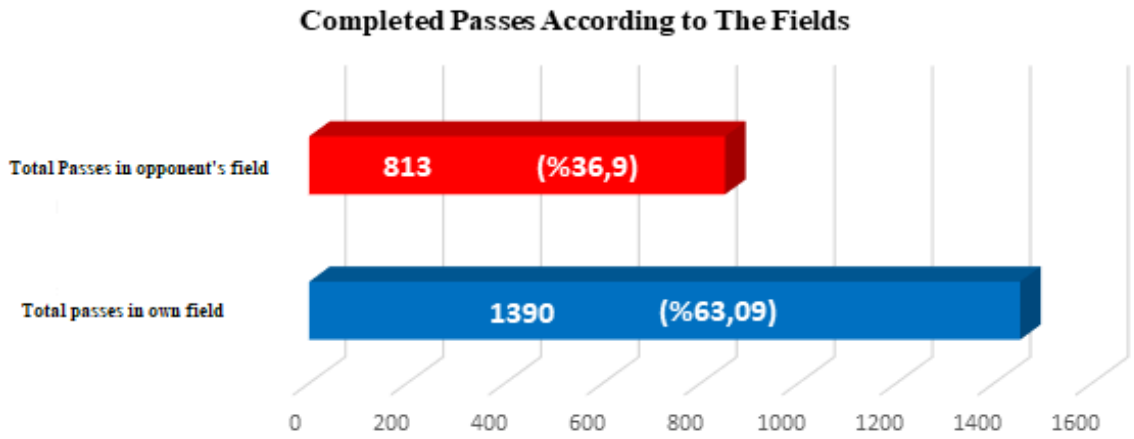
Graph 1. Scored and Conceded Goals

According to the findings obtained in the research, 32 goals were scored with an average of 4 goals per game in 8 games, while 34 goals were conceded with an average of 4.25 goals per game.

Table 1. Completed Passes According to the Fields

Passes in Own Field per Match	Passes in Opponent's Field per Match	Total Passes in Own Field		Total Passes in Opponent's Field		Total Completed Passes	
F	F	F	%	F	%	F	%
173,8	101,6	1390	63,09	813	36,90	2023	100

According to the findings obtained in the study, in 8 games played, a total of 1390 passes were completed in own field with an average of 173.8 passes per game, while a total of 813 passes were completed in the opponent filed with an average of 101.6 passes per match. It was determined that 63.09% of the majority of 2023 passes made positively took place in its own half area.

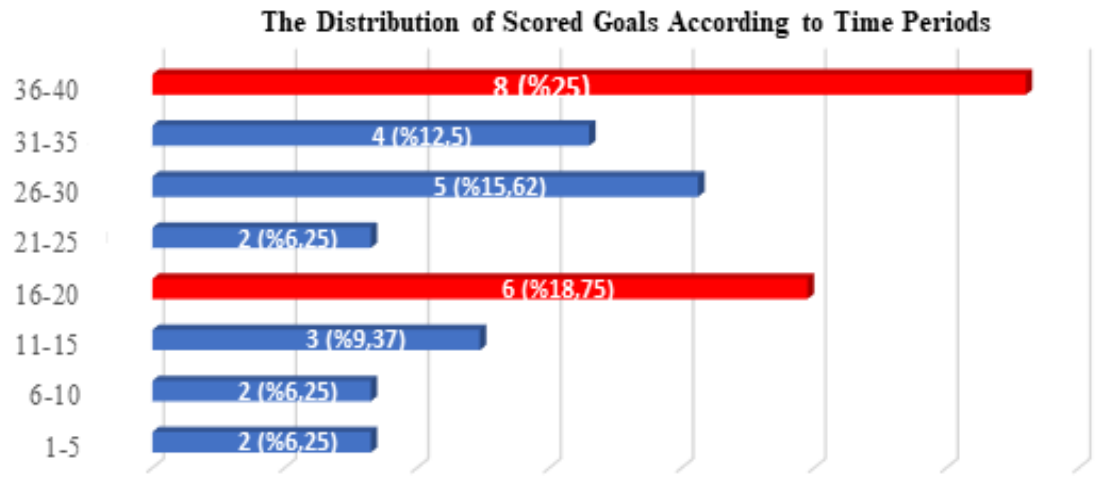


Graph 2. Completed Passes According to The Fields

Table 2. The Distribution of Scored Goals

Periods	1-5 min.		6-10 min.		11-15 min.		16-20 min.		Total	
1. Half	Goal	%	Goal	%	Goal	%	Goal	%	Goal	%
	2	6,25	2	6,25	3	9,37	6	18,75	13	40,62
Periods	21-25 min.		26-30 min.		31-35 min.		36-40 min.		Total	
2. Half	Goal	%	Goal	%	Goal	%	Goal	%	Goal	%
	2	6,25	5	15,62	4	12,50	8	25,00	19	59,38
Total	4	12,50	7	21,87	7	21,87	14	43,75	32	100

In the competitions played, 13 goals (40.62%) were scored in first halves with an average of 1.62 goals, and 19 goals (59.38%) were scored in second halves with an average of 2.38 goals. The last periods of both the 1st and the 2nd halves were determined as the periods with the highest goals rate (14 goals - 43.75%).

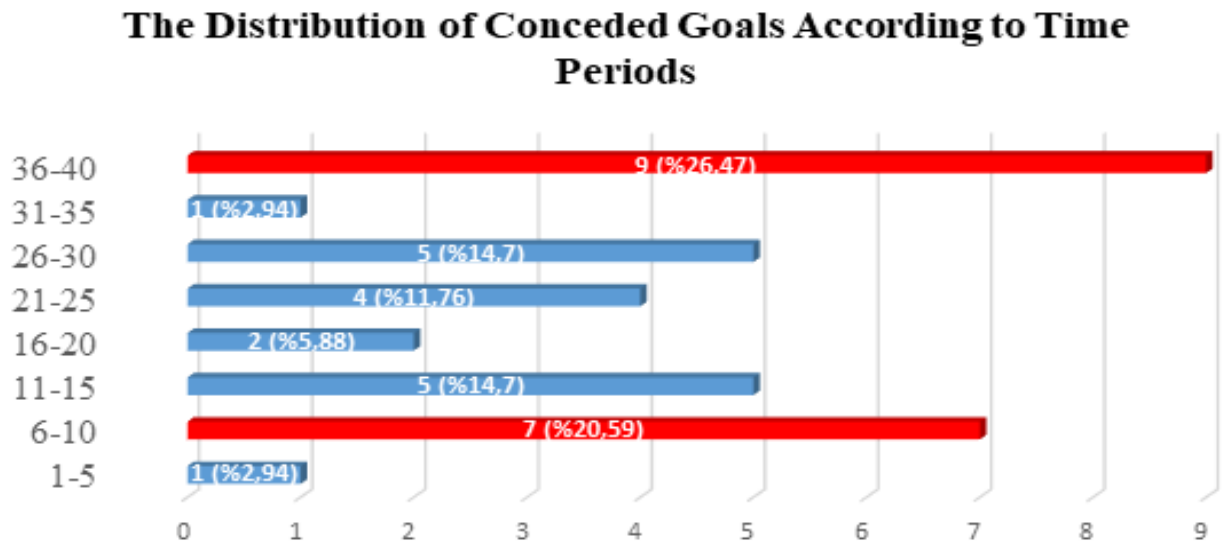


Graph 3. The Distribution of Scored Goals According to Time Periods

Table 3. The Distribution of Conceded Goals

Periods	1-5 min.		6-10 min.		11-15 min.		16-20 min.		Total	
1. Half	Goal	%	Goal	%	Goal	%	Goal	%	Goal	%
	1	2,94	7	20,59	5	14,70	2	5,88	15	44,12
Periods	21-25 min.		26-30 min.		31-35 min.		36-40 min.		Total	
2. Half	Goal	%	Goal	%	Goal	%	Goal	%	Goal	%
	4	11,76	5	14,70	1	2,94	9	26,47	19	55,88
Total	5	14,70	12	35,29	6	17,64	11	32,35	34	100

In the competitions played, it was determined that 15 goals (44.12%) were conceded in the 1st halves with 1.87 goals average, and 19 goals (55.88%) were conceded in the 2nd halves with 2.38 goals average. When the conceded goals were analyzed by half, it was found that the highest number of goals were conceded in the second five-minute period of the first half (7 goals - 20.59%) and the last five-minute period of the second half (9 goals - 26.47%).

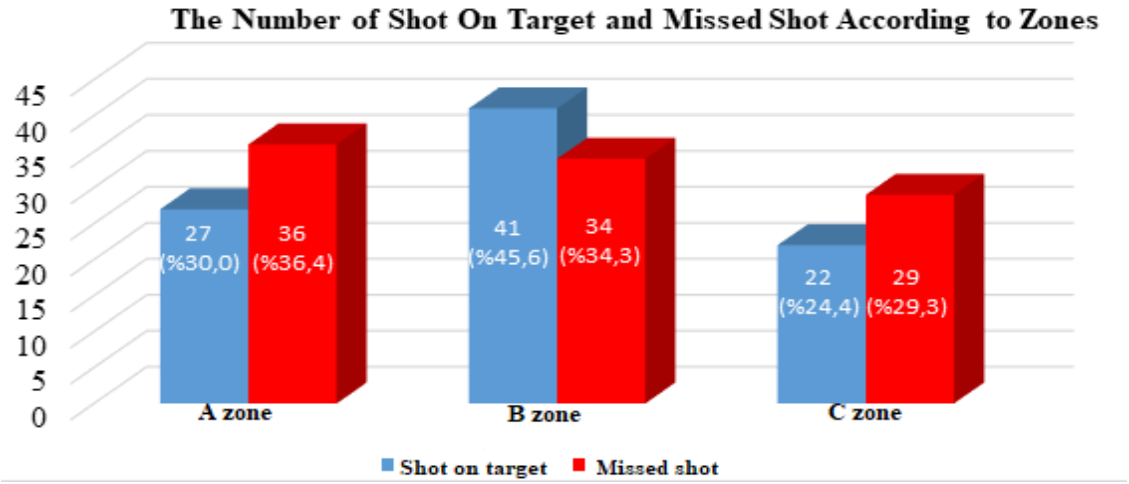


Graph 4. The Distribution of Conceded Goals According to Time Periods

Table 4. The Number of Shot On Target and Missed Shot in the Zones of A, B, and C

	A Zone		B Zone		C Zone		Total	
	F	%	F	%	F	%	F	%
Shot on Target	27	30,0	41	45,6	22	24,4	90	47,62
Missed Shot	36	36,4	34	34,3	29	29,3	99	52,38
Total	63	33,3	75	39,7	51	27,0	189	100

Table 4 presented the number of shot on target and missed shot in the zones of A, B, and C. While the highest number of shots (75 - 39.7%) and shots on target (45.6%) were from the central zone B, the highest rate in missed shots was found in the A zone (36.4%). While 90 of the 189 shots taken were on target (47.62%), 99 were missed (52.38%).

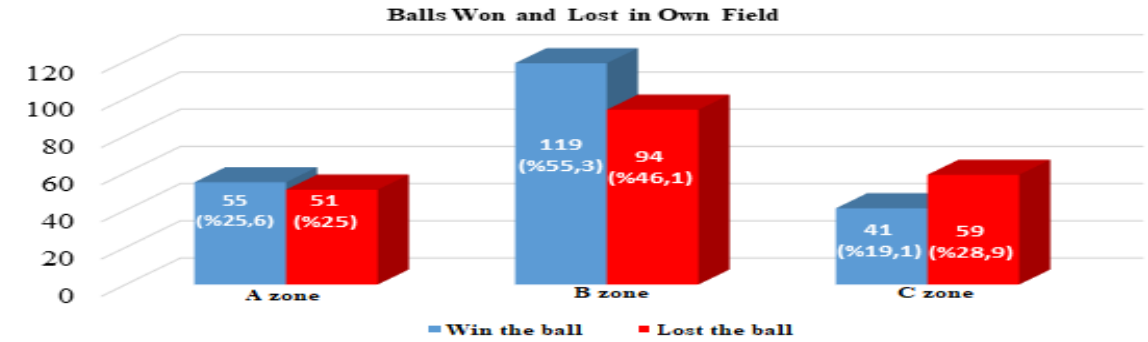


Graph 5. The Number of Shot on Target and Missed Shot According to Zones

Table 5. The Number of Ball Won and Lost in the Zones of A, B, and C in Own Field

	A Zone		B Zone		C Zone		Total	
	F	%	F	%	F	%	F	%
Won	55	25,6	119	55,3	41	19,1	215	100
Lost	51	25,0	94	46,1	59	28,9	204	100

Table 5 shows the number of wined and lost the ball in the zones of A, B, and C. When the numbers of both balls won and lost are evaluated, it is seen that the zone with the highest number of ball wins and balls lost is central zone B in own field. It was determined that the number of balls won in the B zone constitutes 55.3% of the total number of balls won, while the number of balls lost in the same region constitutes 46.1% of the total.

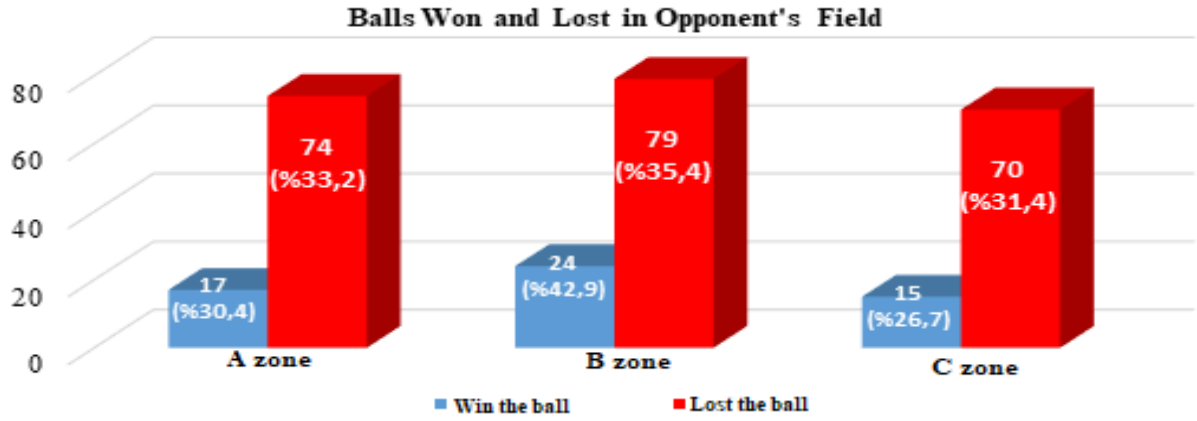


Graph 6. Won and Lost Balls in the Zones of A, B, and C in Own Field

Table 6. The number of Won and Lost Balls in the Zones of A, B, and C in Opponent's Field

	A Zone		B Zone		C Zone		Total	
	F	%	F	%	F	%	F	%
Won	17	30,4	24	42,9	15	26,7	56	100
Lost	74	33,2	79	35,4	70	31,4	223	100

Table 6 displays the number of won and lost balls in the zones of A, B, and C in the opponent's field. When the numbers of both balls won and lost are evaluated, it is seen that the zone with the highest number of ball wins and balls lost is central zone B in the opponent's field. It was determined that the number of balls won in the B zone of the opposing half field constitutes 42.9% of the total number of balls won, while the number of balls lost in the same zone constitutes 35.4% of the total.

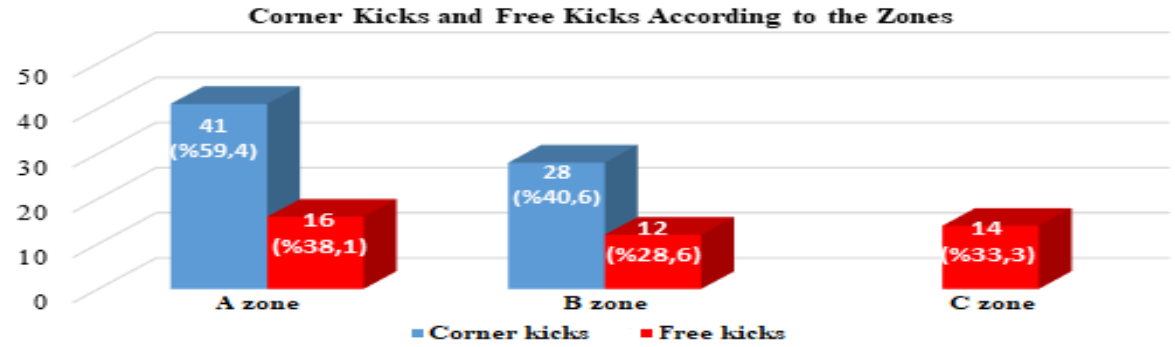


Graph 7. Won and Lost Balls in the Zones of A, B, and C in Opponent's Field

Table 7. Corner Kicks in the Zones of A and B, and Free Kicks in the Zones of A, B, and C

	A Zone		B Zone		C Zone	Total		
	F	%	F	%	F	%	F	%
Corner Kick	41	59,4	28	40,6		69	100	
Free Kick	16	38,1	12	28,6	14	33,3	42	100

Table 7 represents the corner kicks in the zones of A and B, and free kicks in the zones of A, B, and C. 59.4% of the corner kicks used from zone A and 40.6% from zone B. Although free distributions were seen in the number of free kicks, it was determined that the highest number of free-kicks were used from A zone (38.1%).

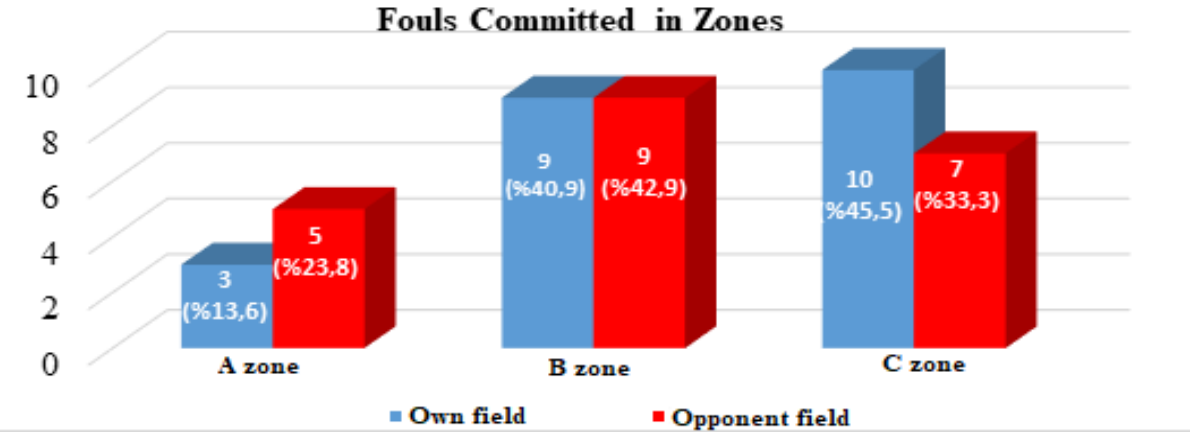


Graphic 8. Corner Kicks in the Zones (A and B), and Free Kicks in the Zones (A, B, and C)

Table 8. The number of Fouls Committed According to Zones

	A Zone		B Zone		C Zone		Total	
	F	%	F	%	F	%	F	%
Own Field	3	13,6	9	40,9	10	45,5	22	100
Opponent's Field	5	23,8	9	42,9	7	33,3	21	100
Total	8	18,6	18	41,9	17	39,5	43	100

Table 8 shows the number of Fouls Committed According to Zones in own and opponent's fields While it was determined that the national A team committed the highest number of fouls in its own half in the C zone (45.5%), it was found that the area with the highest number of fouls in the opponent half was the B zone (42.9%).



Graph 9. The number of fouls committed in zones

Discussion and Conclusion

In this study, the Turkey national futsal competitions played by the team (2015-2018) was carried out to analyze the technical and tactical terms of some criteria. In the study, the competitions played in the specified time interval were presented based on the winning and losing teams, and the competitions were analyzed in terms of technical and tactical parameters.

In the matches of the Futsal national A team, 32 goals were scored with an average of 4 goals per game, while 34 goals were conceded with an average of 4.25 goals per game.

In the competitions played, 13 goals (40.62%) were scored in first halves with an average of 1.62 goals, and 19 goals (59.38%) were scored in second halves with an average of 2.38

goals. The last periods of both the 1st and the 2nd halves were determined as the periods with the highest goals rate (14 goals - 43.75%). It was determined that 15 goals (44.12%) were conceded in the 1st halves with 1.87 goals average, and 19 goals (55.88%) were conceded in the 2nd halves with 2.38 goals average. When the conceded goals were analyzed by half, it was found that the highest number of goals were conceded in the second five-minute period of the first half (7 goals - 20.59%) and the last five-minute period of the second half (9 goals - 26.47%). A total of 1390 passes were completed in own field with an average of 173.8 passes per game, while a total of 813 passes were completed in the opponent filed with an average of 101.6 passes per match. It was determined that 63.09% of the majority of 2023 passes made positively took place in its own half area. In the study, where Göral et al. (2014) analyzed the competitions played in the 2012 FIFA Futsal World Cup, it was found that the maximum number of goals in the competitions was between 36-40 minutes with 61 goals (17.47%). In the study in which the 2012 Futsal World Cup was analyzed by Abdel-Hakim (2014), it was found that the highest number of goals (32.95%) was scored in the last periods between 31 and 40 minutes. Göral (2018) determined that the highest number of goals was scored in the last section between 36-40 minutes in the study that analyzed the competitions played in UEFA Futsal Euro 2016. Similarly, studies revealed that the goals in the last period of competitions were scored in the last period. (Armatas et al., 2010; Kubayi et al., 2019; Armatas et al., 2007; İmamoğlu et al., 2011; Mahamad Ali et al., 2015; Michailidis et al., 2013; Göral et al., 2012; Njororai, 2013; Giampietro et al., 2013; Göral, 2016; Cerrah et al., 2016).

In a study by Göral (2015) on the pass success percentages of successful teams, it was determined that the teams that were successful in the tournament had a very high pass success rate of 78.22%. In the study conducted by Bostancı et al. (2017), when the positive, negative, and total shot count values taken by the teams were examined, it was found that the most positive, negative, and total shot count belonged to the first three teams of the league. Konefal et al. (2019) emphasized that in winning a competition, players should take more shots in general, these shots should be on target, as well as increasing ball possessions and completed pass rate.

The fact that the size of the futsal area is narrower means that it can be shot from many parts of the field. Along with other steps, compared to football, futsal has some basic shooting principles. If the shooting takes place easily and slowly for the goalkeeper in football, the goalkeeper can quickly start a counterattack for the team (Şenel, 2016). While the highest number of shots (75 - 39.7%) and shots on target (45.6%) were from the central zone B, the highest rate in missed shots was found in the A zone (36.4%). While 90 of the 189 shots taken were on target (47.62%), 99 were missed (52.38%). Göral et al. (2014) stated that in the Futsal World Cup, the shot on target rate of the teams that won the matches (62.2%) was quite higher than the teams who lost the matches (37.8%). Alvurdu (2013), in his study of the technical and tactical analysis of Turkey futsal national team in the Euro 2012 group match, Alvurdu (2013) found that the teams that won the game took more shots than the losing teams.

In the study on competitions played in Futsal Euro 2016 by Göral (2018), it was pointed out that such criteria can be accepted as essential factors in winning matches by emphasizing the importance of increasing the number of shots on target in competitions. Chen (2011) found that the majority of shots were taken between the distant penalty point and the halfway field (47%). Sarmento et al. (2016) also showed that the majority of the goals were scored in the offensive position with the inside of foot from the central area. Therefore, shot on goal in the futsal depends not only on the shooter but also on the defensive performance behavior.

When the numbers of both balls won and lost are evaluated, it is seen that the zone with the highest number of ball wins and balls lost is central zone B in own field. It was determined that the number of balls won in the B zone constitutes 55.3% of the total number of balls won, while the number of balls lost in the same region constitutes 46.1% of the total. When the numbers of both balls won and lost are evaluated, it is seen that the zone with the highest number of ball wins and balls lost is central zone B in the opponent's field. It was determined that the number of balls won in the B region of the opposing half field constitutes 42.9% of the total number of balls won, while the number of balls lost in the same region constitutes 35.4% of the total. Gómez et al. (2015) found that the most valuable possession of the ball was achieved, along with the offenses ending in the penalty area, when the teams used a free-kick, the team was on the counterattacks, and the defending team defended on the half-court. Göral et al. (2014) emphasized that many and accurate shots were taken in competitions are considered as an essential criterion in winning the matches.

Vilar et al., (2014) used ecological dynamics as a theoretical explanation for creating goal opportunities or preventing these opportunities during futsal. They have included the active role of competitors in performance analysis in shaping each other's performance behaviors and influencing the outcomes of the game. Distinctive patterns of movement coordination between the shooter, the closest defender, and the ball's position have been identified, leading to the creation and prevention of goal opportunities.

According to the findings of the study, 32 goals were scored with an average of 4 goals per game in the analyzed matches, 34 goals were conceded with an average of 4.25 goals per game, 63.1% of the decisive passes were completed in own field and 36.9% in the opponent. While 79.3% of the balls won in all matches were in their own half of the field, 52.2% of the balls lost in all matches were found to be in the opponent's field. While the highest score in both the scored and conceded goals occurs in the second half of the competitions, it was found that the highest number of goals scored and conceded according to the periods in the matches were in the last 5-minute periods of the second half. Consequently, increasing the parameters such as the number of passes made in the opponent half field, the number of ball wins in the front zone, minimizing the difference in the number of balls won and lost, are considered to be the parameters that will directly affect the result in international competitions, it can be said that the training program should be designed for development these variables.

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The Effect of Covid-19 Pandemic on Digital Games and eSports

Ahmet Emre FAKAZLI[1]
[1] Millî Eğitim Bakanlığı, Kastamonu, TURKEY
https://orcid.org/0000-0003-1325-6980
Email: ahmetemrefakazli@gmail.com

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Abstract

The period of pandemic caused by Covid-19 virus has affected the whole world. During this time, people had to spend a long time in their houses with various restrictions such as quarantine periods, travel restrictions between cities or countries. In this process, digitalization has gained momentum in daily life; especially digital games have been an important tool for people to spend time. Accordingly, it is thought that the digital game and eSports industry has been affected by this situation in various ways. The aim of this research is to make a review by examining the effects of Covid-19 pandemic on digital games and eSports in the light of various sources and data. As a result of the research, it has been found that the digital game industry has been positively affected especially in the economic sense. eSports sector, on the other hand, has been adversely affected in the economic sense since the pre-determined organizations have not been implemented. In this period, the digital game area that has attracted attention with its development has been mobile games. In the eSports area, sim racing games and organizations have attracted a lot of attention.

Keywords: Sports, Digital game, Covid-19, Pandemic, Sim racing

Introduction

The period of pandemic caused by Covid-19 virus has brought important problems in global sense. The health systems, economic expectations and political life of the countries have been adversely influenced. Death news, quarantine periods, various restrictions varying from country to country have had a negative impact on the entire society psychologically. In this sense, it can be said that academic research and suggestions are very important for the pandemic period and afterwards.

Covid-19 disease is a virus identified on January 13, 2020, as a result of research conducted in a group of patients who first applied to the hospital in Wuhan, China in December, with the complaints of respiratory tract disease (fever, cough, shortness of breath) (Republic of Turkey, Ministry of Health, 2020). As a result of Covid-19 virus, more than 11 million people worldwide were infected and more than 500 thousand people died (World Health Organization (WHO), 2020). Covid-19 pandemics led to many negative situations such as quarantines, travel restrictions, closure of schools and dismissals as a consequence of reduced workforce in the economic sectors (Nicola et al. 2020). This process has also affected significantly daily activities globally (King et al., 2020). The United Nations Development Program (2020) emphasized that this virus is much more than a health crisis, underlining that it will likely cause poverty and inequality on a global scale, although it varies from country to country.

While the whole world was fighting with Covid-19, the sports world was also affected by this situation and faced a series of crises (Turkmen & Özsarı, 2020). Given the networked nature of the sports industry and the organizational dimension that brings athletes together, workers and fans in this field have been viewed as potential threats to the spread of the virus (Parnell, 2020). In this sense, almost all major sports events and events, including the Olympic games, have been canceled or postponed (Hull, Loosemore & Schwellnus, 2020). It can be said that the most obvious and greatest effect of this situation is in the economic dimension. The fact that the inability to obtain match and advertisement revenues due to the failure to implement the planned program has negatively affected the financial statement. Compared to individual sports, team sports and clubs in this scope have more financial obligations. It can be stated that clubs in this context have been affected more negatively during the pandemic period. For this reason, a decision has been made to help the clubs. For example, FIFA has decided to help and announced that it will provide $ 1.5 billion of aid to the clubs in three stages with the "Covid-19 aid plan" (FIFA, 2020). It is believed that for the post-Covid-19 clubs may shrink economically and some events in traditional sports can be transferred to the eSports environment. Considering these developments, it can be said that expectations from digital games may be different in the future.

The most important effect of this period is that it has forced social and commercial life to be digitalized to a great extent (Türkmen & Özsarı, 2020). The quarantine process during which people had to stay at home significantly increased the number of participants of online games (King et al. 2020). While many areas have been negatively impacted in this period, the interest in the digital game industry has increased considerably. Accordingly, the game industry has been positively affected both in terms of economy and participants.

The aim of this study is to make a review by examining the effects of Covid-19 pandemic period on digital game and eSports world from different perspectives and evaluating the current situation.

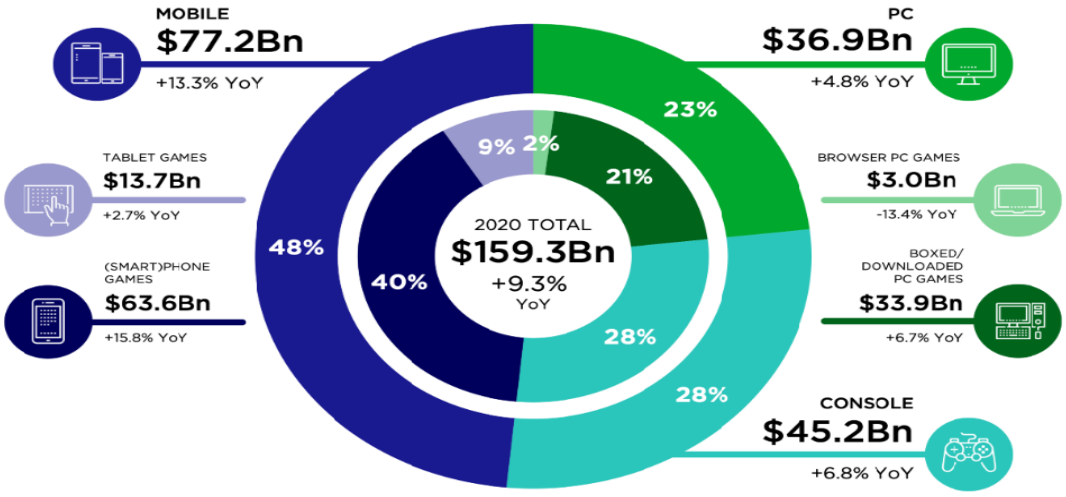
Economic Effects of Covid-19 Pandemic on Game Industry

Prolonged quarantine periods led people to different quests and daily activities tended to become more digital. Besides watching TV series and movies on different platforms, it can be said that playing games has been the most popular activity in this period. At this point, the digital game industry has made significant progress. While the world was experiencing an unprecedented period, games were used as an escape and time passing tool for humans. Therefore, it is estimated that the global game market will reach a growth rate of 9.3% by 20.3 billion dollars in 2020. The number of players is estimated to reach 2.7 billion (Wijman, 2020). According to March data, it is seen that the money spent by the players increased by 60% compared to the previous year (Facteus, 2020). In this study, the projected revenues of mobile games, pc and console games in 2020 are discussed.

All gaming platforms have showed some improvement during the Covid-19 pandemic. However, mobile games became the playground that showed the greatest development in this period (Wijman, 2020). Globally, the mobile game market is projected to generate $ 77.2 billion in revenue in 2020 and reach a healthy growth rate of 13.3%. The main reason for this increase is that people have had to stay home because of the measures taken as a result of the covid-19 pandemic (Gu, 2020). According to another argument, the global smartphone and tablet games market, which was 58.3 billion dollars in 2019, is expected to be 97 billion dollars in 2020 (Research and Markets, 2020). It can be said that the fact that smart phones and tablets are easily accessible and widespread, and that popular mobile games are free has importantly affected this development. The Apple App Store is projected to generate $ 38.8 billion in mobile gaming revenue in 2020, and will grow by 10.3%. This figure is more than half of the revenue in the mobile game market. On the other hand, Google Play is expected to generate $ 27.8 billion in revenue from mobile games this year, and will grow by 15.0%. Finally, the Android app store is expected to grow 20.5% by earning $ 10.6 billion in mobile games this year. Banning Google Play in China is thought to have a significant impact on increasing Android revenues (Gu, 2020).

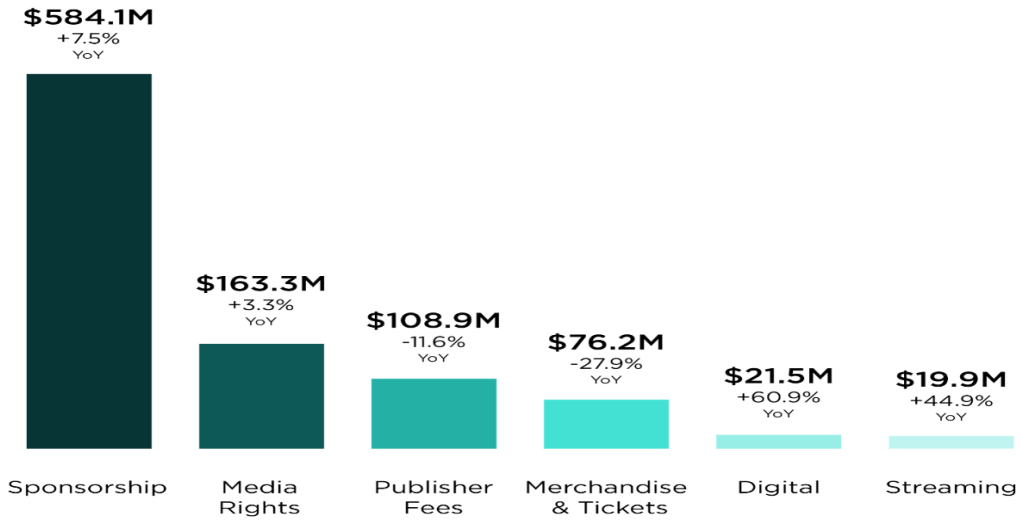
There is physical distribution in console games. For this reason, the release date of some games has been postponed and console games have been negatively influenced by this situation. Despite these disadvantages, console games are developing in a sectoral sense. The console game industry is expected to grow by 6.8% by generating $ 45.2 billion in revenue in 2020. In this process, it is predicted that 729 million players will participate in console games. Finally, the PC gaming industry is expected to grow 4.8%, generating $ 36.9 billion in revenue. 1.3 billion players are expected to participate in PC games (Wijman, 2020). It can be suggested that it is very important to play e-sports games on PC. It can also be claimed that the Covid-19 pandemic period has given momentum to the growing game industry. In this period, especially the development of mobile games has attracted much attention. The fact that phones and tablets are easily accessible provides a significant advantage over other devices. Especially considering the development of mobile game consoles and the existing data, it is thought that this may have a significant impact in the game industry in the future.

Table 1. Per Device & Segment with Year-on-Year Growth Rates (Newzoo, 2020a).



In the Covid-19 period, eSports organizations have gone through important changes. Many national or international esports events have been postponed, canceled or transferred online, which has adversely affected the esports sector in the economic sense. Despite this situation, eSports sector is expected to make a progress. While the Esports sector reached $ 957.5 billion in 2019, this figure is expected to be $ 973.9 billion in 2020 (Rietkerk, 2020). Game makers, players and eSports clubs have the opportunity to get resources from different areas. These are sponsorship, media rights, publisher free, merchandise & tickets, digital and streaming revenues. In this process, the fact that the players and the audience could not come together physically and the organizations could not be made has affected especially the merchandise & tickets revenues. For example, in 2019 Fortnite World cup held at Arthur Ashe stadium in New York, only $ 5 million of revenue was obtained from tickets. (Grossobel, 2020). The inability to hold organizations has negatively impacted eSports sector, similar to traditional sports. Unlike traditional sports, it can be seen as an important advantage that e-sports is digital and online broadcasts can be made. As a matter of fact, when Table 2 is analyzed, it is estimated that the streaming revenues will develop by 44.9%.

Table 2. eSports revenue streams for 2020 according to Global Esports Market Report data (Newzoo, 2020b).



As a result, it is predicted that in general the digital game industry will improve. However, the most remarkable economic development in the Covid-19 pandemic period is expected to be in the size of mobile games. This development may be because mobile devices are more easily accessible, less software-intensive and more preferred by children. In the eSports dimension, it can be said that the organization revenues have been negatively affected so far for 2020. However, it is thought that the interest and awareness of eSports has increased. This may have a positive effect on the eSports economy for the post-pandemic period.

Developments in Esports in the Covid-19 Pandemic Period

Games played on PC, mobile or console platforms can be called as digital games. However, not every digital game is covered by esports. In order to define a digital game as eSports, it is necessary to organize amateur or professional competitions at the national or international level within the scope of that game (Rubleske, Fletcher and Westerfeld, 2020). Turkey e-sports federation (TESFED) identified e-sports games under the category of Real-time strategy (RTS), the first-person shooter (FPS), Multi-player online battle arena (MOBA), Battle royale, Massively multiplayer online role-playing Game (MMORPG), fighter, and Sports games (TESFED, 2020). In general, during this period, players both participated in digital games and followed the games through different platforms. When the growth data of Newzoo between December and 2020 between the players is analyzed; It is found out that the game groups have improved in the rates of Shooters 40%, Gambling Games 36%, Deck-Bulding Games 34%, Arcade Games 28%, Platformers 25% and Battle Royale 17%. However, the greatest improvement has been in games in the MOBA group (Jackson, 2020). It seems that the pandemic process has significantly changed the number of players.

Players and viewers from all over the world participate in eSports organizations. However, due to travel restrictions, quarantine periods, and uncertainties, players could not leave their cities or countries. Since the covid-19 virus, which emerged in the first quarter of 2020, is expected to continue to show its effect in the second half of the year, many e-sports organizations have been postponed, canceled or transferred online.

Table 3. Esports organizations postponed and canceled due to Covid-19 pandemics

eSports Events	Canceled	Postponed
Arena of Valor World Cup 2020	*	
ESL One Birmingham 2020 Online Leagues	*	
Tekken World Tour 2020		*
PUBG 2020 Global Series	*	
Combo Breaker 2020	*	
Street Fighter League Season 3		*
The OGA Dota PIT Minor 2020	*	
Taipei Major 2020	*	
ESL One Los Angeles Major		*
NBA 2K League		*
Fighter's Spirit 2020		*
Rainbow Six SiegePro League	*	
NorCal Regionals 2020	*	
League of Legends Mid-Season Invitational	*	
Tekken World Tour	*	
WESG APAC Finals	*	
Asia Pacific Predator League 2020		*

China's League of Legends Pro League		*
SNK World Championship Japan Tour Final		*
ESL One Los Angeles Major Chinese Qualifiers		*
Overwatch League		*
League of Legends Championship Korea		*
Rocket League World Championship	*	
Apex Legend Global Series		*
LEC Spring Finals	*	
Pokemon World Championships 2020	*	
Combo Breaker 2020	*	
The ESL One Rio 2020 CS		*
The Evolution Championships Series	*	
Call of Duty League	*	
Mortol Kombat 11	*	

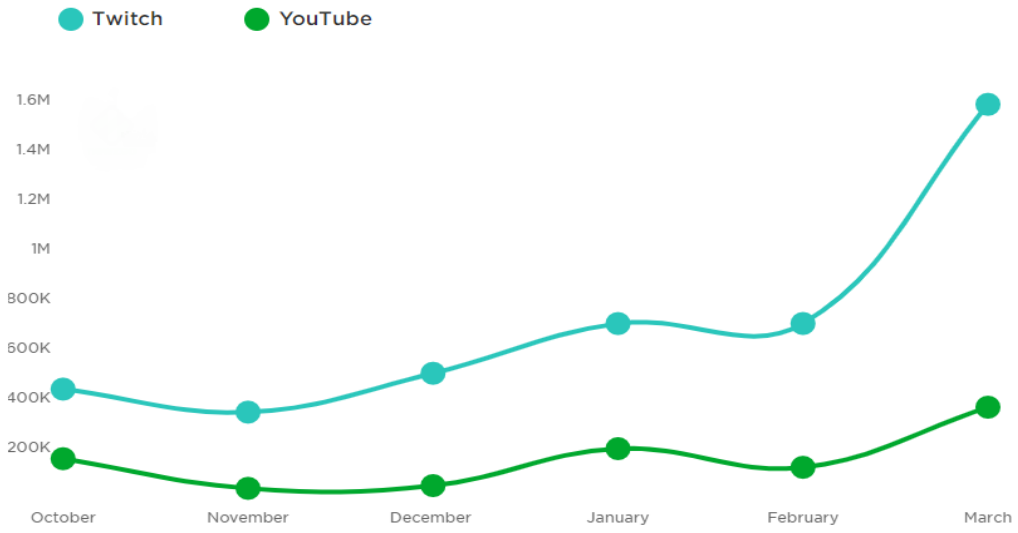
In this period, various organizations were organized over eSports as an alternative to traditional sports. English Premier League organized online events called "ePremier League Invitational Tournament" with the participation of Premier League players on the English Premier League FIFA 20 game. The first organization was attended by Trent Alexander-Arnold, Raheem Sterling, Diogo Jota and Dwight McNeil. In the final, Diogo Jota beat Trent Alexander-Arnold 2-1 and became the winner of the first tournament. This organization was wactched by 52.00 spectators (Grossobel, 2020). The second tournament was held between May 5-9, and matches were broadcast on Sky Sports, YouTube, Twitch, BBC Sports website and iPlayer. Many Premier League players participated in this tournament, and James Maddison, who beat John Egan 5-1 in the final, became the champion (Premier League, 2020). Likewise, NBA players joined the "NBA2K20 Players Tournament" online via the NBA2K20 game. Devin Booker, who defeated Deandre Ayton in the final, won the tournament with the names of Kevin Durant, Trae Young, Zach Lavine and won the 100-thousand-dollar prize. The prize was donated as determined at the beginning of the tournament (NBA2K, 2020). Similarly, NFL organized a tournament called "The Checkdown NFL Madden 20 Tournamenet" on NFL Madden 20. A total of 10 NFL players such as Desean Jackson, Derwin James and Keenan Allen participated in the tournament. Derwin James won the tournament (NFL, 2020).

Covid-19 Pandemic and the Rise of Sim Racing

Racing games in eSports are the digital races of traditional races. "Sim racing" means simulation racing; It is a simulation type that briefly aims to recreate auto racing in digital environment. It tries to offer the player as close as possible experiences to activities that could actually occur in an automobile race (Paiva, 2015). Sim racing players aim to control the same way in the game as they actually control a car in racing games (Chan, Chan & Gelowitz, 2015). Sim racing games are simulation games that offer the most realistic experience among eSports games. Not all racing games fall into the sim racing class. In Sim racing games, physics of vehicles are exactly the same as real ones. Real tracks are scanned with laser scanning technology and transferred to digital media. Many details such as the effect of

weather conditions, tire and brake wear are included in these games. Your equipment is very important in Sim racing. Accordingly, players get feedback in the game with steering, pedal, movable or immobile cockpits. As Sim racing games, iRacing, F1, rFactor, Asetto Corsa and Dirt Rally game series are preferred on PC, while Grand Turizmo, Project Cars and Forza game series are preferred on consoles. It can be said that Sim Racing games showed a significant improvement in terms of players and viewers during the covid-19 pandemic period. The main reason for this development is thought to be the participation of many professional racing pilots in sim racing organizations held in this period. Sim racing games are quite realistic and allow playing online. This situation has attracted a lot of viewers. When Table 4 is analyzed, according to the data of Newzoo analysis company, iRacing game's audience increase in March is remarkable. Live view rate increased by 117%.

Table 4. Number of viewers of iRacing between October and March (Jackson, 2020).



Many sim racing organizations were organized during this period. The "24 Hours of Le Mans Virtual" held on 13-14 June attracted great attention. Sim racing players participated in the race along with world famous racing pilots such as Fernando Alonso, Felipe Massa, Max Verstappen, Jenson Button. The race was played on the rFactor2 game, and the famous basketball player Tony Parker started the game. The 24-hour race was followed by a total of 20 million people on TV and social media (24 Hours of Le Mans Virtual, 2020). In this period, the organization of “Formula 1 Virtual Grand Prix” was organized. More than 30 million viewers on TV and social media in more than 100 countries followed this organization implemented with the participation of professional racing pilots (Formula 1 Virtual Grand Prix Series, 2020). Finally, the "eNascar iRacing Pro Invitational Series" organization, held during the covid-19 pandemic period, with professional racing pilots such as Kyle Busch and Denny Hamlin, attracted great attention (eNascar, 2020). During the Covid-19 pandemic, similar to these organizations. many other sim racing races were held.

Conclusion

The game industry has been significantly affected by the covid-19 virus. During the Covid-19 pandemic period, this influence on the digital game industry positive has been positive. Especially, the development of mobile games has attracted attention. In the eSports

dimension, many organizations have been postponed, canceled or moved online. This situation has caused loss of income for the eSports sector. Despite this situation, it is predicted that eSports sector will develop. One of the Esports areas that has aroused interest during the pandemic period was sim racing. Along with the technological developments, sim racing games have reached the level of reality. Sim racing games offer a lifelike experience for viewers and players. It can be said that it is very important for professional racing pilots to transfer their skills to the virtual world. Therefore, these organizations are thought to be followed with interest.

The Covid-19 pandemic period has paved the way for digitalization in all areas. Platforms that allow online games and live broadcasting have caught people's attention in this period. It can now be said that people are more aware of digital games and eSports. The world of digital games and eSports will undoubtedly continue its development faster after this process.

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